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SECTION 1

SOCIO-ECOLOGICAL, ETHICAL AND PEDAGOGICAL PROBLEMS OF OUR TIME

THE INFLUENCE OF VIDE O GAMES ON SOCIAL COMMUNICATION AND SOCIALIZATION OF YOUTH: A SOCIOLOGICAL STUDY

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This article examines the impact of video games on social communication and the socialization of youth.

Keywords: video games, social communication, socialization.

Video games are now an integral part of modern culture. Video games, which have become an important part of young people's leisure time, can have both positive and negative effects on the development of social skills and communication. It is important to note that with moderate engagement, video games can contribute to improving communication skills and developing social connections.

While some studies emphasize the potentially negative impact of video games, many recent works highlight their positive influence on social skills and the overall psycho-emotional state of players. In our study, we aim to find out how video games affect youth communication and socialization, as well as understand what factors contribute to the positive role of video games in developing communication skills.

To achieve this goal, we conducted a sociological survey among young people aged 12 to 25. The survey included 15 brief and simple questions regarding their experience with communication in video games and the influence of this communication on their lives. 100 respondents participated in the survey. Among those surveyed, 15.8% were under 14 years old, 61.4% were aged 14-19, and 22.8% were older than 19. This shows that video games attract young people of various ages.

76.2% of respondents confirmed that they had played or still play video games. This high percentage demonstrates that video games are a popular form of leisure among youth.

The question regarding the number of languages known by the respondents revealed that 10.9% know only one language, 34.7% know two languages, and 54.5% know more than two. This highlights the diversity of language skills among young people, which may promote communication in international gaming communities. For example, 51% of respondents use a foreign language learned in school during the gaming process, while 26% noted that they also use a language they are learning for personal purposes. This demonstrates a valuable opportunity to practice the language with native speakers. As a result of the survey, it was found that 67% of respondents successfully practiced a language and enjoyed the gaming process. At the same time, 15% either were not understood or were unable to understand the foreign language. However, the majority succeeded, as shown by the statistic that 83% of respondents communicate with strangers online in a foreign language. Only 6% of the participants mentioned that their experience was unsuccessful and that they neither learned anything nor had the chance to practice.

Today, video games have become a multifaceted form of entertainment for people of all age groups. They provide many positive outcomes: from stress reduction and cognitive effects to social connections and therapeutic applications. However, it is important to maintain a balanced approach to gaming and avoid excessive use, which may lead to negative consequences. By responsibly utilizing the potential benefits of video games, one can improve well-being, cognitive abilities, and social connections, enriching one's life in the digital era.

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AYURVEDA AND PSYCHOSOMATICS

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This article discusses the features and relationship between Ayurveda and psychosomatics.

Keywords: ayurveda, psychosomatics, integrated approach.

Ayurveda is an ancient Indian system of medicine. It views the human being as a holistic system where physical, mental and spiritual health are interconnected. Psychosomatics is a field of medicine and psychology that studies the influence of psychological factors on physical health. Psychosomatics and Ayurveda, despite of their different roots and approaches, are closely related and complementary in understanding the influence of mental state on physical health.

Psychosomatics studies the relationship between mental processes and bodily symptoms. It recognises that stress, emotions, trauma and other psychological factors can affect physiological processes, leading to the development of disease [1]. Ayurveda uses a holistic system of treatment that includes diet, lifestyle, herbal medicines and yoga to achieve balance in the body and prevent disease as well as reduce stress levels and increase resistance to emotional overload.

Both systems state that the mind and body are inextricably linked [2]. Psychosomatics explores the mechanisms of this connection, while Ayurveda focuses on maintaining their balance to achieve health. Also, both systems emphasise the detrimental effects of stress on the body. Psychosomatics explores how stress can cause various physical symptoms, while Ayurveda offers stress management techniques such as yoga and meditation.

Both psychosomatics and Ayurveda believe that the approach to treatment should be individualised, taking into account the peculiarities of each person. Each person is unique, and their reaction to stressful situations can be different. What causes psychoemotional stress in one person may not have the same effect on the other, and vice versa. This highlights the importance of an individual approach to diagnosis and treatment. An integrated approach is equally important, because the goal of Ayurveda and psychosomatics is not only to eliminate physical symptoms, but also to work with psychological aspects. It is important that these systems pay great attention to disease prevention, promoting a healthy lifestyle, a balanced diet, stress management and harmonious relationships with the world around us [3].

Psychosomatics and Ayurveda can complement each other, offering a more holistic approach to treatment. Psychosomatics helps to understand the reason of psychosomatic illnesses, while Ayurveda offers natural methods to restore balance in the body and maintain health.

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PANIC ATTACKS

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This article discusses such a concept as panic attacks. They affect a significant number of people around the world. According to recent data, about 10-20% of the population suffers one or more panic attacks throughout their lives. This means that every fifth person has a panic attack at least once in their life. This fact served as a reason to attribute a panic attack not to pathology, but to a special type of human behavior. Panic attacks are a subspecies of anxiety disorder, which refers to neurotic stress–related disorders. They can occur for no apparent reason and are often accompanied by physical symptoms such as palpitations, sweating, trembling and a feeling of lack of air. The relevance of the topic of panic attacks is increasing in modern society, where stress and anxiety are becoming an integral part of life.

Keywords: Panic attacks, depression, causes of panic attacks, treatment.

Doctors investigated the topic of panic attacks and found that panic attacks can be caused by various factors. During the research, doctors and psychologists identified 4 types of factors that cause panic attacks: psychological, physiological, social factors and bad habits (for example, smoking). Psychological factors include high levels of stress, melancholy, depression and pessimism. Physiological disorders include disorders in the body, such as heart attacks and strokes. Also, if one of the parents of a person suffered from anxiety, depressive or bipolar disorder, the risk of panic attacks in such a person increases. Social factors include problems in interpersonal relationships, social isolation, child abuse in childhood, as well as the experience of sexual or physical abuse [1].

As a rule, the first signs of a panic attack resemble a heart attack. It may seem to a person that the heart is beating more often than usual, with interruptions or stops. Also, during a panic attack, it becomes difficult to breathe and there is not enough air. In addition, a panic attack may be accompanied by dizziness. And also a person sweats a lot, he is thrown into heat, then into cold. Your knees may tremble, your arms and legs get cold, and goosebumps run through your body. Also, sometimes a person has a "lump in his throat", during an attack he becomes numb or partially loses his voice and eyesight. Some people have impaired coordination of movements, the body stretches, turns out, and twists their arms. Sometimes there is a feeling of separation of one's own self, as if the person is not inside the situation [2].

Unfortunately, most people suffering from panic attacks do not seek help from specialists. And modern medicine has already identified several methods of treating panic attacks:

1. Psychotherapy: Cognitive behavioral therapy is considered one of the most effective treatment methods. As part of this approach, a psychologist trains a person to notice recurring thinking errors that arise in connection with certain situations and correct them. As a result, a person's behavior changes, he knows what to do with a panic attack and can independently cope with anxiety and prevent the development of panic attacks at the very beginning.
2. Medication: antidepressants and anxiolytics can help reduce the frequency and intensity of panic attacks.
3. Self-help methods: Relaxation techniques, breathing exercises, and physical activity can help manage symptoms.

Panic attacks are a serious problem that requires attention from both the medical community and society as a whole. We have reviewed the main symptoms and causes of panic attacks, as well as their impact on daily activities and psychological health. The relevance of the topic is enhanced by the increasing pace of life and increasing stress levels. It is important to raise awareness about panic attacks, their symptoms and treatment methods to improve the quality of life of people suffering from this disorder. Thus, further study of panic attacks and the development of methods for their prevention and treatment remain urgent tasks for the medical community [3].

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INNOVATIVE APPROACHES IN PSYCHOTHERAPY

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Comparing the effectiveness and advantages of various approaches in psychotherapy, both traditional and modern, it is possible to identify weaknesses or strengths and analyze the evolution of various methods of non-medical psychotherapy.

Keywords: psychotherapy, psychoanalysis, AST, psychodynamic psychotherapy, group psychotherapy.

Psychotherapy is a process in which a person, with the help of an experienced psychologist, works to change their thoughts, emotions and behavior in order to improve their mental health and quality of life.

Psychological counseling, which does not require the use of drugs, is under active development. Modern approaches make it possible to effectively solve a wide range of psychological problems - from anxiety and depression to addictions and family conflicts [1].

There are five main methods of traditional psychotherapy that still remain relevant. 1. Psychoanalysis: the study of unconscious processes and early traumas to identify and overcome internal conflicts. 2. Behavioral therapy: focus on behavioral patterns based on scientific principles of learning. 3. Cognitive behavioral therapy (CBT): changing negative thought patterns and reactions to stressful situations. 4. Humanistic therapy: emphasis on personal development, self-knowledge and self-acceptance. 5. Interpersonal psychotherapy: working to improve interpersonal relationships and communication [2].

Innovative methods that change the approach to psychotherapy due to their accessibility and effectiveness of treatment:

- Acceptance Commitment Therapy (ACT): learning to accept and become aware of one's own emotions and thoughts without fighting them, focusing on values and actions.
- Schema Therapy: dealing with deep-rooted negative patterns that form in early childhood and affect relationships and self-perception.
- Art therapy: the creative process of creating works of art to improve mental and emotional well-being [3].
- Diary therapy: keeping records of your emotions, thoughts, and behavior for analysis and self-understanding.
- Online psychotherapy: using available online platforms to get help from a distance.
- Virtual Reality (VR) in psychotherapy: using VR technologies to create simulations and work on phobias, anxiety and other fears.

Thus, it is worth noting the advantages of non-pharmacological psychotherapy:

1. Long-term effect: changing thinking and behavior can have long-term positive effects.
2. Focus on the causes: helps to understand the roots of the problem and change them.
3. Development of self-awareness: increases the understanding of oneself and one's reactions.
4. Traditional and innovative methods, interacting together, help a person to recognize their advantages, master the skills of managing emotions and achieve fullness in life [1].

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THE EMERGENCE OF DENTISTRY AS A SEPARATE SCIENTIFIC DIRECTION OF MEDICINE

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The paper examines the development of dentistry as a separate science, as well as the appearance of the first dental prostheses. The work of the greatest dentist of the 18th century, Pierre Fauchard, and a description of his contribution to the formation of medical dentistry and materials science are analyzed.

Keywords: dental medicine, dental instruments, dental prosthetics, dental theory of P. Fauchard.

The study of the history of dentistry is one of the important and integral parts of the history of medical science.

Despite the origins of dental care in ancient times, dentistry acquired the character of a scientific direction only in France during the time of Louis XIV. When the royal edict regulated the issues of providing assistance to dental patients, the functions of medieval barbers and tooth extractors were transferred to professional dentists, who began to be trained in French educational institutions. The emergence of professional dentists with a royal license, guided by a code of medical ethics, is a sign of the professionalization of dentists. Medical equipment also stepped forward. Thus, the appearance of the first professional dental instruments, in particular hand and foot drills, gave doctors more opportunities for effective dental treatment. However, in the first quarter of the 18th century, dentistry in France still cannot be considered a separate established science, since the scientific and theoretical basis of dentistry, which could be used as a guide by professional dentists, was not formulated and provided.

This gap was filled only as a result of scientific research by the greatest dentist of the 18th century, Pierre Fauchard. In his scientific and theoretical work, “The Dentist-Surgeon or Treatise on Teeth” 1728, he described and developed methods for treating more than one hundred and thirty different types of dental defects, and also developed in detail effective methods and options for their treatment based on practical research. Thus, Pierre Fauchard managed to develop effective methods and materials for filling teeth, contributing not only to medical dentistry, but also to materials science. It was he who discovered the properties and first began to use braces and full-size easily removable dentures. He developed the highest quality gold alloys for dental prosthetics, substantiating the difference in the required gold samples for dentures and crowns. Fauchard's dental theory became the basis for the development of dentistry as a science. His ideas were adopted in other countries as a basis for establishing their own dental schools, whose graduates founded professional dental clinics. That is, by the middle of the 18th century, dental science had developed with all the attributes of scientific knowledge and the professionalization of dentists as a special category of medical specialists.

Thus, the development of dentistry as a science took place from the end of the 17th century to the middle of the 18th century, due to the emergence of regulatory frameworks and technical innovations, as well as the activities of the innovative French dentist P. Fauchard.

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THE ROLE OF THE MILITARY FIELD MEDICAL DOCTRINE OF 1942 IN THE DEVELOPMENT OF MILITARY SURGERY IN THE USSR DURING THE GREAT PATRIOTIC WAR

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At the beginning of the Great Patriotic War, the Red Army had a developed military medical service, which had all the necessary resources for high-quality medical support for units and formations of the Red Army.

Since the June of 1941, all medical institutions in the USSR were mobilized and transferred to military staffing levels. This helped to cope with the challenges of the first months of the war. Already in February 1942, a new military field medical doctrine was developed and adopted, reflecting the experience of military medical surgery in the first months of the war. According to it, stabilization (dressing) points were organized along the front line, the main task of which was primary medical care for wounded soldiers, stabilization of their condition by stopping bleeding, and stopping wound infections [3]. After field medical points, the wounded were delivered to medical battalions, where they were given first professional surgical care, and the wounded were distributed: lightly wounded - to their units for recovery, and seriously wounded - for surgical treatment inland. Evacuation to the interior of the country took place by military medical trains. All the necessary conditions for the treatment and rehabilitation of the wounded were created in the rear hospitals. This approach gave the best results in terms of treatment and further rehabilitation of soldiers, because when professional medical care was provided in the first hours after receiving an injury and professional care for the seriously wounded in specialized medical institutions, the process of treatment and recovery of soldiers occurred much faster and with better indicators for recovery times.

Thus, in February 1942, an advanced military medical strategy was developed and put into practice, ensuring the best recovery rates for the wounded, and Soviet military field surgery during the Great Patriotic War became the best military field medicine in the world.

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SOME ANTI-CORRUPTION MEASURES IN THE REPUBLIC OF BELARUS AND OTHER COUNTRIES OF THE WORLD

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Corruption crime today can be confidently called a traditional and fairly widespread type of crime that exists not only in our country, but also in many other civilized countries of the world. Each country has developed its own system of anti-corruption measures, as well as active international cooperation in the field of preventing the manifestation of corruption crimes.

Keywords: corruption, crime, punishability, corruption perception index, anti-corruption treaty, Transparency International.

Corruption (from the Latin word corrumpere – to spoil) is the use by an official of his/her authority and entrusted rights for personal gain, contrary to the established law and rules. Since the proclamation of independence of the Republic of Belarus, the fight against corruption remains one of the top priorities of the country's domestic policy. At the end of 2023, Belarus ranked 98th in the "Corruption Perception Index" published by Transparency International. A total of 177 states are included in the "Index" (in 2018 – 70th place) [1]. The main regulatory legal document aimed at eradicating corruption in Belarus is the law "On Combating Corruption". The following types of legal liability are applied for committing a corruption offence: criminal, administrative, disciplinary and civil. The subjects of crime prevention are: the prosecutor's office, the police, the KGB, the KCC, the Customs Committee, the Ministry of Health, educational institutions, the protection of wildlife and voluntary squads. In our country, the interaction of these state bodies is well developed, which has a positive effect on exposing corrupt criminals [2].

According to Transparency International, Somalia has been the most corrupt country for years. Corruption in Somalia covers the entire regime: from the judicial system to public services, administration, police, tax and customs administration, legislation. The Government has developed a Public Finance Management (PFM) Policy in order to create a more transparent and accurate public sector financial system. The Law on Public Procurement, Concessions and Alienation has also been adopted, and the Office of the Auditor General (OAG) has been established to audit all government agencies. The Government has launched a campaign to raise public awareness about the fight against corruption [3].

According to Transparency International, Denmark is considered the least corrupt country, where the main way to combat corruption is a mandatory anti-corruption agreement between the applicant and the employer, which contains the obligation of the parties to refuse to take and give bribes. In Denmark, all citizens actively participate in the prevention of corruption, because in Denmark, an aversion to corruption is cultivated in the public consciousness and an honest official is encouraged in every possible way. To identify the reasons for Denmark's presence in the list of leaders, scientists from the University of Copenhagen conducted scientific research, the results of which were published by the American Economic Journal: Economic Policy, and showed that Denmark has maintained a low level of official corruption for many years due to the selection of persons for civil service for whom the motivation is the desire to be useful to society, and not the opportunity to enrich themselves. The experiment involved 862 students studying law, economics and political science. The researchers compared the students' personal qualities with their preferences for future work, as well as with their motivation. It turned out that respondents who were inclined to honesty were more likely to be interested in working for the state, even if such work was paid less. Less honest people, when choosing their future profession, focused primarily on high salaries and preferred to work in the private sector [4]. Denmark does not apply the death penalty for a corruption crime, as, for example, in China or Thailand, but this does not prevent it from being the least corrupt country in the world. It can be noted that the least number of corruption crimes were recorded in the EU countries.

Based on the above, it can be noted that too severe punishment is not a solution to this problem. It is important to place very high demands on the selection for public positions at the start, up to the use of a lie detector and frequent

testing of candidates by a psychologist, which in the future will effectively affect the work of an official. Citizens need to feel, on the one hand, the protection of their legitimate interests from corrupt officials, and on the other hand, the inevitability of responsibility for the slightest participation in corruption crimes. It is also important to interest citizens in anti-corruption activities, to provide comprehensive information about the results of combating corruption in the state, so that they understand from an early age what a bribe is and why it is bad. We believe that it is necessary to focus specifically on children and adolescents. To hold more public events for them, which will explain the essence of corruption crimes and manifestations in an accessible and interesting way and prevent their further growth.

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AYURVEDIC APPROACH TO WASTE MANAGEMENT

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This article discusses the nuances of Ayurvedic waste management.

Keywords: Panchakarma, waste, health, recycling, composting.

In the area of environmental sustainability, Ayurveda, the ancient Indian medical system, offers a comprehensive approach to waste management that goes beyond simple disposal. Based on the principles of balance, harmony and interconnectedness, Ayurveda posits that waste is not just a physical byproduct, but also a reflection of our internal state and the health of our environment.

1. Panchakarma Cleansing Techniques:

Ayurveda emphasizes detoxification as a fundamental aspect of health. Panchakarma, a series of five therapeutic procedures, plays a key role in waste management. These methods aim to remove accumulated toxins from the body. By promoting effective elimination from the body, Panchakarma not only detoxifies the individual but also promotes environmental balance.

2. Conscious Consumption and Digestion:

Ayurveda emphasizes the importance of mindful eating and digestion. When we consume food mindfully, we optimize nutrient absorption and minimize waste generation. The concept of agni (digestive fire) emphasizes the importance of maintaining healthy digestion. Properly digested food creates minimal waste, reducing the burden on the environment.

3. Composting and Recycling:

Ayurveda views waste as a resource, not a burden. Organic waste, including kitchen scraps and plant materials, can be composted to create nutrient-rich soil fertilizers. Recycling practices are in line with the Ayurvedic principles of prakriti (natural elements) and guna (qualities). By recycling materials, we honor their inherent qualities and contribute to a circular economy.

4. Herbal Alternatives to Chemicals:

Ayurveda encourages the use of natural substances instead of synthetic chemicals. Herbal-based cleaning products such as neem soaps and citrus-infused floor cleaners minimize chemical pollution. These alternatives not only keep our homes clean but also protect aquatic ecosystems.

5. Community Awareness and Participation:

Ayurveda emphasizes collective responsibility. Community awareness programs can educate people about waste reduction, segregation, and sustainable practices. When people understand the consequences of their actions, they become active participants in waste management [1-2].

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INTRODUCTION OF ENVIRONMENTAL HABITS IN BELARUS USING PHONE APPS

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Belarus faces environmental challenges, including pollution and low public eco-awareness. Only 11–12% of citizens actively engage in eco-friendly practices. Drawing on the experience of developed countries, Belarus can use mobile apps to track environmental habits, connect users with government initiatives, and motivate through gamification. This could significantly improve environmental awareness and sustainability in the country.

Keywords: environmental challenges, waste sorting, mobile applications, environmental habits, sustainable development, pollution.

Environmental Problems in Belarus.

Belarus faces numerous environmental challenges, such as air, water, and soil pollution, waste accumulation, and radioactive contamination. The situation is worsened by the low level of environmental awareness among the population, which is reflected in weak social activity—only 11–12% [1]. Air pollution remains a pressing issue: in 2022, emissions of pollutants into the atmosphere amounted to 872.9 thousand tons, with the main sources being transport (47.7%) and industrial enterprises (52.3%) [2.1]. According to statistics, around 66.1% of household and 53.4% of industrial waste is sent to landfills without prior sorting [2.2]. The lack of educational programs and waste recycling infrastructure slows the transition to more sustainable environmental practices.

Experience of Other Countries. The experience of developed countries shows that the active introduction of environmental propaganda and educational programmes contributes to the improvement of environmental behaviour of the population. In Germany and Sweden, thanks to waste sorting and recycling programs, as well as increased public awareness, about 40% of plastic waste was recycled in 2016 [3]. In countries such as the USA, awareness of environmental issues continues to grow; however, the plastic recycling rate remains low — in 2021, only 5-6% of plastic waste was recycled, mainly due to corporate lobbying and the limitations of recycling most types of plastic [4]. In Nigeria, the level of environmental awareness among the population is only around 30%, and combined with a lack of infrastructure and government support, issues like air and water pollution continue to pose serious threats to public health. Belarus can learn from the experience of leading countries by implementing social campaigns and developing the necessary infrastructure, while also avoiding the mistakes made by other nations.

How mobile applications can help address environmental issues. Mobile applications can become an effective tool for solving environmental problems in Belarus. Firstly, they allow users to track their environmental habits in real time and provide information on ways to address environmental challenges. Secondly, apps can serve as intermediaries between government environmental programs and the population, offering reminders and recommendations on waste sorting, resource conservation, and reducing plastic use. For the app to succeed, a motivational system is crucial: gamification, social involvement, personalized reminders, discounts, and bonuses for completed tasks.

The project's goal is to raise environmental awareness in Belarus, reduce household pollution by promoting waste sorting, and support government initiatives by creating a sustainable ecological community.

Conclusion.

Environmental consciousness and responsibility are key elements that need to be developed in Belarusian society. Mobile applications can become a practical and convenient tool for fostering environmental habits in every citizen. Through modern technology and well-designed motivation, we can move closer to sustainable development and improve the environmental situation in Belarus.

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YOUNG PEOPLE'S SUBCULTURES AND STUDENTS' ATTITUDE TOWARDS THEM

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This article analyzes students' attitude toward various subcultures and reviewed current information about the subcultures we know about in general.

Keywords: youth subculture, subculture movement.

The topic of youth subcultures is actual in the modern world. More and more often we meet representatives of subcultures among young people.

Subculture is understood as a set of accumulated values and orders of a group of people united by specific interests that determine their worldview. Subculture is part of the general culture, and its components are values, style, lifestyle, skills and abilities [1]. The prevalence of youth subcultures is of particular interest to study, as their influence on the behavior, lifestyle and attitude to traditional values of some young people is becoming more and more significant. Modern youth subcultures are diverse - the interests and needs of young people differ, for the sake of their satisfaction they seek like-minded people and form groups. One of the fundamental needs of a young person - building an image of "I" - is realized within the subculture. Especially important is the external solution of the image, which is often far from the generally accepted canons.

We conducted a sociological survey among the students of our institute in order to find out their attitude to modern youth subcultures. The questions concerned the general attitude to subcultures, their influence on young people, as well as what primarily affects the opinion of students about subcultures and representatives of subcultures. Students were also questioned about their affiliation with any of the subcultures. The knowledge gained can help us determine not only students' attitudes towards this phenomenon, but also the importance and role of subcultures in their lives. This understanding is also important in determining the possibility of conflict and disagreement between members of subcultures and student youth in general.

We interviewed 30 students. Among them, 80% were female and 20% were male. The ages of the interviewees ranged from eighteen to twenty years old.

When asked about attitudes towards subcultures, 70% answered that they had a neutral attitude towards subcultures, 20% had a positive attitude towards the phenomenon of subcultures, and 10% had a very positive attitude towards subcultures. To the next question about the influence of subcultures on young people, the majority, 83.3% to be exact, answered that participation in the movement of subcultures affects young people positively and brings benefits, while 13.3% thought that the movement of subcultures has no influence on young people, and only 3.3% percent of the respondents expressed the opinion that subcultures have a negative influence on young people.

To a greater extent, students' opinions are influenced by media space (mass media, social networks) (80% of respondents), the next place was occupied by friends and acquaintances (60% of respondents), and the last thing that influenced the opinion about subcultures was relatives (20%).

The following answers were given to the question "What is the first thing you pay attention to when you see a person who is a member of a subculture?": the majority first of all pay attention to the appearance (56.7% of respondents), the rest pay attention to the behavior of the person (30% of respondents).

It turned out that 70% of students do not belong to any subculture, 16.7% answered that they do, and the remaining 13.3% do not know or are undecided about the answer. Thus, the majority of students do not participate in the subculture movement.

From the obtained data we can conclude that students have a positive attitude to the movement of subcultures, while they do not consider themselves to be representatives of subcultures. Also, the majority of students believe that the attitude to subculture does not bring anything bad, but brings benefits to young people.

As we can see, in general, there is a picture of mutual understanding between the surveyed students and representatives of youth subcultures, which means that misunderstandings and conflicts between them are unlikely to arise.

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CAUSES OF ADOLESCENT ANXIETY

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Adolescence is a period of intense physical, emotional and social development that is accompanied by many changes. One of the most common mental states experienced by adolescents is anxiety. In recent years, there has been an increase in the incidence of anxiety disorders in adolescents due to many factors including changes in modern society, information overload, social media, and academic pressures.

Keywords: anxiety, fear, adolescence.

Anxiety is a negative emotion that expresses a feeling of uncertainty, expectation of negative events, and hard-to-define premonitions.

Unlike the causes of fear, the causes of anxiety are usually not realized, but it prevents a person from engaging in potentially harmful behavior or encourages him to take actions to increase the probability of a favorable outcome of events. Anxiety is associated with the unconscious mobilization of the body's mental forces to overcome a potentially dangerous situation [3].

The cause of anxiety in adolescence is often internal conflict, contradictory aspirations of the adolescent, when one of his desires contradicts another, one need interferes with another. Internal anxiety in adolescence can be caused by: contradictory demands on the adolescent, coming from different sources (or even from a single source: it happens that parents contradict themselves, then allowing, then strictly prohibiting the same thing); disproportionate demands that do not correspond to the capabilities and aspirations of the child; negative demands that put the child in a humiliating,

dependent position. In all three cases there is a feeling of “loss of support”; loss of solid reference points in life, uncertainty in the world around [2].

Girls and boys differ in what situations they associate their anxiety with, how they explain it, what they fear. And the older the children are, the more noticeable the difference. Girls may associate anxiety with other people. They may be worried about the attitude of others, possible quarrels and separations from loved ones. Fifteen- to sixteen-year-old girls are anxious about their relatives and friends, worry about their state of mind, health, etc.

Boys are most often afraid of physical injuries, troubles, and punishments that can be received from parents or “bosses” outside the family: teachers, policeman, school head. If during inspections girls fail to cope with the task, boys in such situations are concerned only about the possibility of upcoming punishment. Apparently, the life experience of boys by fifteen-sixteen has not brought up in them a sense of personal responsibility for their failures. Failure is unpleasant only because it will be followed by punishment [1].

Thus, the main causes of anxiety in adolescence are negative interactions with adults, excessive demands on the teenager, dogmatic methods of education, etc. In addition, there is a difference in the manifestation of anxiety in boys and girls. The state of anxiety develops in adolescents in the process of communication with adults, who in the process of upbringing do not take into account the state of the child. This manifests itself in the presentation of increased demands, which the child is unable to fulfill - there is an internal conflict, which develops into a state of anxiety.

Anxiety in adolescents is a serious problem that requires attention and action. It is necessary to create a more favorable environment for adolescents, taking into account their peculiarities of development and psychological needs. It is important to prevent anxiety disorders through educational programs, development of emotional intelligence, creating conditions for a healthy and happy childhood.

Timely diagnosis and specialist help is essential to prevent the development of chronic anxiety disorders and improve the quality of life of adolescents.

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POST-TRAUMATIC STRESS DISORDER

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Traumatic events are events that cause a person to have feelings such as horror, shock, and a sense of helplessness. Such events include natural disasters, the loss of a loved one, experiencing or witnessing violence, accidents, etc. It is important to note that even if an individual has been subjected to a potentially traumatic event, this does not necessarily mean that his psyche is traumatized, since the process of traumatization itself is very individual and it is influenced by many additional factors.

Keywords: traumatic event, PTSD, psyche.

Post-traumatic stress disorder (PTSD) is a mental illness that occurs in people who have experienced or witnessed severe traumatic events. With PTSD, an individual constantly experiences intrusive memories of trauma, nightmares, sleep paralysis, flashbacks, increased anxiety, irritability, guilt and depression. These symptoms interfere with normal life activities and social relationships, and they can last for long months or years after a traumatic event. A person can encounter this disorder at any age.

As we noted earlier, not all people who experience traumatic events have PTSD. It all depends on the individual personal qualities of a person, as well as the influence of the environment, the degree of support provided to the victim. It should also be noted that the longer and more intense the impact of the traumatic event was, the higher the probability of traumatization of the victim's psyche. The likelihood of injury also depends on the context of the psychotrauma and its meaning for a person, that is, the more unexpected and uncontrollable the event was, the stronger the feeling of insecurity.

Here are examples of some of the most common causes of psychotrauma: military operations, sexual and physical violence, loss of a loved one, natural and man-made disasters, terrorist attacks and hostage-taking, domestic violence or abuse in childhood, serious accidents or injuries.

As a rule, this disorder is based on a violation of the normal functioning of the brain when processing information about a traumatic event. After experiencing a concussion, the brain is unable to process all the information, so it is deposited in the psyche and manifests itself in the form of nightmares or physical reactions to triggers. The psyche, as it were, "splits into pieces" the memory of the trauma, but does not fully process it.

It should be noted that it is not the traumatic event itself that is relevant to the destruction of the psyche, but the internal reaction to it in the individual himself. A person who has experienced a traumatic event, due to a state of shock and other factors, is not able to direct his natural aggression to the right place, so he directs it inside himself, destroying his own psyche with this aggression. For example, a child may not be able to direct aggression towards the abusive father because he loves him as the only parent. and therefore, he directs this aggression at himself and his "weakness" and "dependence", thereby injuring himself even more.

As a result of severe injuries, the psyche cannot produce integration processes through symbolization in dreams, that is, it cannot interpret events through other images in dreams, as it happens in healthy people, but instead reproduces everything literally. The dreams of soldiers experiencing acute mental trauma during combat illustrate this problem. The nightmares of soldiers exactly repeat the traumatic situation without any changes. Over time, under favorable conditions and if a person has the opportunity to share their experiences in the required amount, the process of symbolization gradually begins in dreams, which helps to complete the process of processing the trauma experienced by the psyche.

After a trauma, a number of biochemical and physiological changes occur in the body, designed to ensure survival in extreme conditions. The level of hormones such as adrenaline and cortisol increases, which are responsible for the reaction to danger. Under normal conditions, when the source of danger is eliminated, the level of these hormones returns to normal. However, this process is disrupted in people with PTSD, which leads to the fact that a person begins to experience a constant sense of danger.

The fight against PTSD is a long process and a painstaking process, it requires an individual approach to each patient. With proper and timely treatment, most people achieve significant improvement in their condition. It is always important to seek help from a specialist in time.

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FAMILY AS A FACTOR INFLUENCING THE FORMATION OF THE CHILD'S PSYCHE

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A family plays a key role in the formation of a child's psyche. It sets the direction of development and motivates the behavior of both parents and children.

Keywords: family, upbringing, influence, child, health.

Family remains an integral and paramount factor in the upbringing and development of modern children. In a rapidly changing digital world, where children often spend more time on the internet than with loved ones, the family plays a crucial role in shaping their mental state and full development. [1]

Everything a child absorbs in the family becomes fundamental to his or her worldview, on which future relationships and life achievements depend. It is the family circle that lays the foundation for the child's development as a unique and wealthy individual, since it is the family that the child spends most of time with. [1]

Nowadays, the family fulfills both constructive and destructive functions in upbringing. Certainly, no one can compare with relatives in terms of love and care, but the family can also become a source of significant harm. The wrong approach to upbringing can lead to serious problems in the mental and behavioral development of the child.

The family is a complex system of relationships, in which a special atmosphere is formed, directly affecting the emotional state of its members. A favorable family environment teaches the child to perceive the surrounding world with trust and benevolence. Of particular importance is the parental style of upbringing, which has a significant impact on the mental health, self-esteem and behavior of children. [2]

Three main styles of parental upbringing are distinguished:

1. Democratic is characterized by a high degree of perception of the child, developed communication and belief in his independence.
2. Controlling is manifested in strict control over the behavior of children, with the explanation of prohibitions and restrictions.
3. Mixed combines elements of democratic and controlling styles.

The effectiveness of parenting largely depends on the absence of unhealthy styles such as:

- Emotional aversion or rejection, strict rules and lack of control.
- Hypersocializing parenting, which is expressed through excessive custody and worrying about the child.
- Egocentric parenting where the whole family focuses on one child. [3]

The family is the primary source of communication for the child. Parents and siblings provide opportunities for the child to develop language and social skills and to express thoughts and feelings. Healthy family communication contributes to the development of emotional intelligence and the child's ability to cope with stress.

Children learn by observing the behavior of their parents and other family members. Parents are role models for their children, showing them how to deal with emotions, resolve conflicts, and interact with others. Positive behaviors help children develop healthy social skills and emotional regulation.

It is important to note that children do not simply "copy" their parents. They are forming their own character and personality. Manners of communication, behavior patterns, and character traits formed in the family become part of their personality, determining their relationship with the world, choice of partner, style of raising their own children, even their ability to build a career. This does not mean that a person is doomed to repeat the fate of his parents or to live by their rules. But to understand his roots, to see how the family system influenced him is the key to self-knowledge and the opportunity to create his own life, freed from the limitations of the past.

Thus, a positive psychological atmosphere in the family promotes cohesion, the development of the individuality of each member and the formation of a favorable attitude to the world around. Creating a harmonious and supportive family environment remains the most important priority for the full and happy development of modern children.

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THE IMPACT OF FEAR ON THE HUMAN PSYCHE

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Nowadays, the problem of human psychological well-being in connection with threats to the safety of existence of social systems and individuals has a significant relevance. The variety and number of dangers threatening mankind grows every year. Millions of people lived and live in a state of fear for themselves and their loved ones. So “fear, mastering human consciousness and subconsciousness, is one of the most important characteristics of society and has a significant impact on the lives of citizens and the course of the historical process”.

Keywords: the human psyche, types of fear, fear.

Fear is an acute psychoemotional reaction caused by various real or phantom circumstances. Fear is always based on a threat to a person (not only in physical, but also in emotional or psychological terms) [1]. Since ancient times, the most important human emotion that allows a person to survive in dangerous conditions is fear.

Fear can have both positive and negative effects on a person. The positive effect of fear is to enhance the endocrine system, which in turn is responsible for the release of adrenaline into the bloodstream. Fear also slows down digestive processes, improves perception (vision and hearing are temporarily enhanced), increases breathing and heart rate. All this makes it possible, without being distracted by the internal stimuli of the body, to resist danger with maximum efficiency or to escape from it [2].

In addition to useful fear, there is irrational and undoubtedly harmful to the person. Therefore, in some situations, even fear itself can be considered a mental disorder. At the moment, society is struggling with this disease through the combined efforts of psychologists and psychotherapists [1].

The negative impact is often uncontrolled panic. The person loses control over emotions, and control over his or her own body deteriorates. This is due to the uncontrolled release of such a substance as serotonin. It is thanks to him that a person in moments of danger can freeze in place, unable to move. Presumably, this reaction serves as an analog of defense against rash actions in the first seconds of panic [1].

In the modern world, fear for one's life recedes into the background, its place is taken by more directed fears, such as loss of work for careerists, fear of strangers for introverts, etc. These and similar fears do not give a person enough adrenaline, due to which life begins to seem gray and bland to them. Society has come up with a way to combat this problem. Roller coasters, quest rooms, and horror movies are able to level out the lack of the hormone in the body [1].

However, in everyday life, the constant effect of fear on the body is extremely negative. The adrenaline rush can help, but the sticky, oppressive fear that follows a person everywhere is dangerous to the mental state and even to mental health. Most often, this kind of fear is experienced by people who have been bullied, assaulted or robbed. They become self-conscious and uptight [2].

So, we can conclude that fear is often useful to our body, but disproportionately harmful to the psyche in the long term. In this situation, the saying “everything is good in moderation” is best suited. In small quantities, fear can expand the emotional spectrum of a person, narrowed due to the prolonged routine [2].

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THE EFFECTS OF HYPERFIXATION ON HUMANS

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Hyperfixation is a special psychological state of a person characterized by intense and prolonged fixation on a single task.

Keywords: hyperfixation, fixation.

Have you ever felt like the world around you disappears when you are engaged in something you are deeply interested in? That is what hyperfocusing is. It can also be called “hyperfocusing” because the activity you are focused on takes up most of your thoughts, time, and energy [1]. Losing chunks of time and not being able to focus on other important aspects of your life can lead to imbalances that can affect your overall well-being. Hyperfocus disconnects us from the outside world and other equally important responsibilities. While symptoms can vary from person to person, here are some common signs to look out for: You lose track of time: Whether it's an hour or ten, when you come out of the fixated state, you have a hard time remembering where all that time went [2]. You don't notice what is going on around you: You don't hear the people around you, you don't remember to eat or drink water, and you don't even notice that there is a strong thunderstorm raging outside your window. You lose awareness of your surroundings and focus only on your activities. You have an extraordinary level of concentration: You spend hours absorbed in your work, so you manage to achieve great success in your activity, but not very much in the rest. You involuntarily neglect responsibilities: You miss work deadlines or fail to fulfill household chores. As a result, you have strained relationships and difficulties at work. You feel lonely or alienated from loved ones: You are so absorbed in your activities that you often decline invitations or isolate yourself by not showing up socially. You feel physically exhausted: you can't sleep or eat properly because of the stress and anxiety your hyperfixation causes [3]. The causes of hyperfixation can be as varied as the people who experience it. It is often a combination of genetic, environmental, and psychological factors. Some of the possible causes include: stress, mental disorders, excessive interest and passion for a particular object [4]. There are several strategies to help you cope with hyperfixation and maintain a balanced life: keeping yourself organized, time management, creating and seeking support, going to a therapist or psychiatrist.

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INNOVATIVE TECHNOLOGIES TO ACHIEVE IMMORTALITY IN THE FORESEEABLE FUTURE

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For centuries, man has been striving to expand his capabilities and search for immortality. This was also thought about by the followers of Taoism in Ancient China, European alchemists and other scientists and mystics. Today, technology is developing at an amazing rate, and its progress is becoming increasingly difficult to control or stop. With such high costs for these developments, is there a threat of class conflicts? Will humanity soon be ready for the concept of immortality? Is it possible to humanize robots if it is already possible to partially robotize a person?

Keywords: gerontology, immortality, mind loading, exocortex, living collagen, cryonics, cyborginization, telomeres.

The science that studies the biological, social and psychological aspects of aging, as well as the analysis of its causes and methods of slowing down, is called gerontology. This science originated only at the end of the XX century, but has already managed to gain a foothold and continues to develop actively.

In a biological context, the main barriers are considered to be the Hayflick limit (the limit of the number of divisions of somatic cells) and a decrease in the level of collagen, which can be considered as the "support" of the body. However, these problems also have their solutions.

In gerontology, there is a concept of "healthy aging", which implies that the natural aging process proceeds much more slowly [1]. But is it really possible to preserve not only the appearance of youth, but also the ability to work of a person?

Zoltan Istvan's book "The Transhumanist's Bet" reflects on how far an individual can go who aspires to an indefinite life expectancy due to the achievements of science and technology.

Some innovations are already "on the threshold of humanity." For example:

Mind loading is a proposed technique that allows scanning and mapping of the brain in order to transfer human consciousness to another system, such as a computer or other computing device. Currently, there are several scientific projects dedicated to creating a working computer model of the brain.

Progress in bioengineering, which includes the development of devices for restoring the functions of neurons and receptors, neurobiology, neuromorphic processors and computational neuroscience, can lead to the creation of an exocortex [2].

Living collagen is another area associated with aging, because one of the reasons for its manifestation is the depletion of collagen, which significantly affects the appearance of a person. Scientists and developers began to think about creating a vitamin supplement containing this protein, resulting in the appearance of "living collagen". However, when studying its biochemical properties, it was found that collagen molecules are too large for assimilation, and in practice this turned out to be only a marketing technique that does not contribute to increasing the level of collagen in the body.

Endless cell division. In 2012, Spanish scientists investigated gene therapy that can increase life expectancy – in particular, in laboratory mice. During the experiment, it was found that the life expectancy of one-year-old rodents injected with the active telomerase gene increased by an average of 24%. This method can eliminate the problem associated with the Hayflick chapel.

Cryonics is a method of storing living creatures at very low temperatures with the hope that in the future they will be able to be resurrected and, if necessary, cured. At the moment, the Russian company KrioRus has cryonized 94 people, among whom 27 are foreigners. In the state of Michigan, there is a cryonics institute, as of December 2022, which had 1916 participants who signed contracts for the cryopreservation procedure upon legal death.

Cyborgization is the process of integrating the human body with various technological devices to improve it. The era of cyborgization is expected in the future, when powerful nanotechnology will be developed, and will probably begin in the second half of the XXI century [3].

Of course, due to the high cost of all the above-mentioned innovations, there is a risk of inciting inter-class conflict, since only very well-off segments of the population of our planet will be able to get the right to live for a long time. Thus, there will be the opposite of modernity in the form of "you work more, you live longer." When the panacea of immortality is discovered, the issue of the relocation of the planet, which is already being discussed in our time, will be aggravated. What happens if humanity stops dying? There is also the problem of the Earth's resources, both non-renewable and renewable, which require considerable time to recover.

Today, various types of neural networks and artificial intelligence have become available and popular. Does immortality make sense in the future, where the symbiosis of natural and artificial intelligence will coexist? If it is possible to robotize a human being, are we able to humanize a robot? But scientists are also working on this, trying to isolate the brain, which retains its working capacity and vital activity. However, the question of whether they will preserve the human essence remains open and requires time to answer…

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THE GENDER ASPECT OF SOCIAL PHOBIA

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There are many opinions about social phobia, but we rarely think about how this fear manifests itself in different gender groups. Social phobia is not just a fear of public speaking and not shyness. It is a psychological disorder that can affect every aspect of life, limiting social opportunities to communicate with other people due to fear of social interactions. Men and women overcome such barriers in different ways, and social expectations affect their experience and further worldview.

Keywords: social phobia, stress, fear, anxiety.

Social phobia is an anxiety disorder characterized by a strong fear of a social life in which a person may be judged, criticized, or embarrassed. It is often accompanied by a strong sense of self-doubt, which can lead to avoidance of people, events, and public places. This significantly complicates the life of a modern person. This feeling can be described as a fear of attention to oneself caused by fear of negative evaluation from others.

It is important to understand that social phobia is not limited to any one gender. But social norms and expectations from men and women can influence their manifestations of social phobia and how their behavior is perceived by others.

Men often try to hide their feelings of fear and insecurity, which can lead to more aggressive behavior and attempts to dominate a social group due to an inferiority complex. Social expectations from men are often associated with strength, independence and lack of vulnerability. Knowing that fears and anxieties are normal human experiences can

help break down stereotypes about masculinity. These expectations can increase a man's fear of showing weakness and emotions like sadness and despondency. With social phobia, it is harder for men to maintain eye contact.

Men are more likely to show physical symptoms of social phobia, such as sweating, tremor, shortness of breath and tachycardia. There is often a fear of public speaking and official events where they should be the center of attention [1]. Social phobia can affect a man's career growth, preventing him from moving up the career ladder.

Men are often less willing to seek help, which can worsen their condition. A man risks being isolated, which can lead to depression and other mental disorders. It is important to note that social phobia is not just a "character flaw", but a real disorder that requires attention and treatment.

Women often have more pronounced anxiety. It is expressed by excessive concern about the opinions of others, most often it concerns their appearance and behavior. Women are more likely to be afraid of competition between other women and judgments about appearance and personal life. Social phobia can affect women's personal relationships [2]. This prevents them from building trusting contacts with other people due to anxiety and fear of judgment, misunderstanding and fear of being abandoned.

Women often use avoidance strategies to deal with social phobia, which can lead to social isolation. Sometimes isolation can lead to other more dangerous consequences such as loneliness, depression, and also increases the risk of suicidal tendencies.

Women often avoid communication, do not want to be noticed in other people's companies, and there is a desire to go home early.

Thus, it is important to take into account the social norms and expectations that men and women face when choosing methods of treating social phobia. Treatment should be individual and take into account the specific problems and needs of each patient. Referring to clinical psychology, cognitive behavioral therapy (CBT) is one of the most effective methods of treating social phobia [3]. It works with the unconscious beliefs and motivations of the patient. In some cases, medication may be prescribed, such as anxiolytics or antidepressants.

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SUSTAINABLE DEVELOPMENT GOALS. WE WILL ACHIEVE TOGETHER

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The Green Schools program for Belarus within the framework of the UN Development Program project "Raising Environmental Awareness among the Youth of Belarus" is a way to achieve global goals at the local level.

Keywords: sustainable development, sustainable development goals, environmental awareness of youth, "Green schools".

The Sustainable Development Goals (SDGs) are a set of measures aimed at ensuring that people can meet their current material needs, but at the same time preserve the environment and resources for future generations On September 25, 2015, the UN Member States adopted the 2030 Agenda for Sustainable Development. It contains 17 Sustainable Development Goals aimed at eradicating poverty, preserving the planet's resources and ensuring well-being for all people. The Republic of Belarus has been actively involved in the development of the 2030 Agenda at all its stages and has committed itself to achieving the Sustainable Development Goals. In order to increase the involvement of schoolchildren and students in the process of achieving Sustainable Development Goals, the Coordination Center

"Education for Sustainable Development" of BSPU has developed a series of posters "Sustainable Development Goals. Let's achieve together" and methodological recommendations for conducting classes using them, which will allow organizing a discussion of the 2030 Agenda with students and students in an interactive format. The posters were developed on the basis of materials from the United Nations and UNESCO as part of the Youth Campaign "Towards the Future We Want" dedicated to the 75th anniversary of the United Nations in the Republic of Belarus.

The Green Schools program was adapted for Belarus within the framework of the UN Development Program project "Raising Environmental Awareness of Youth through the establishment and Development of Green Schools in Belarus", funded by the European Union. The Ministry of Natural Resources and Environmental Protection became the national executing agency of the project. The project ended on December 31, 2010. In one year, methodological materials were developed, training seminars for teachers and excursions for schoolchildren were held. In 2013, the Regulation on the implementation of the Green Schools project was signed by representatives of the Ministries of Education and Natural Resources and Environmental Protection of the Republic of Belarus. Thus, a new model of environmental education was introduced in Belarus.

Any school, school forestry, extracurricular work center, and environmental center for children and youth of Belarus were invited to become a member of the environmental movement. Today, 109 institutions in Belarus have a special Green School certificate.

The Green Map is a resource that collects information about important environmental facilities: waste collection points and unnecessary things; organizations involved in environmental protection; places where there are renewable energy installations; unique natural areas – parks, squares, nature reserves, etc.

This resource, we hope, will help you to "green up" your life. For example, now you can definitely find the nearest waste collection points. Although it is important to note here: it is better to change your habits so that as little garbage as possible is formed at your home. For example, using rechargeable batteries or a reusable water bottle is really eco–friendly and much more important than handing over disposable items for recycling! The places where renewable energy installations are located are marked on the map: solar panels and collectors, wind turbines, etc. Now everyone has the opportunity to see how they work. The Green Schools program in Belarus has become a new model of environmental education for young people, which will allow achieving the set global sustainable development goals at the local level.

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CYBERBULLYING AS A PROBLEM OF MODERN SOCIETY

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The problem of cyberbullying in modern society seems to be very crucial. Cyberbullying is a new form of bullying that takes place on the Internet. Cyberbullying differs from traditional bullying in its constant accessibility, anonymity of aggressors and rapid dissemination of information, which makes it more powerful and destructive to the human psyche. Victims of cyberbullying in most cases cannot defend themselves against aggression, and adults often do not notice what is happening to their children, which makes the problem especially relevant for teenagers.

Keywords: bullying, victim, aggressor, Internet, social networks.

Due to the emergence of new technologies and the rapid development of the Internet, a new type of bullying has emerged - cyberbullying. Cyberbullying or electronic bullying is a type of bullying in which there are purposeful

aggressive actions carried out by a group of individuals or one person systematically over a long period of time, using social networks, against a victim who cannot defend himself [1].

In particular, bullying can occur through text messages, social networking, the creation of compromising web pages or the posting of offensive material, and in other ways. The perpetrators of such bullying, often referred to as 'trolls', 'bullies' or 'mobbers', often operate anonymously. Because of this, the victim does not always know who the aggressive actions are coming from, which makes bullying even more dangerous to the psyche.

School bullying peaks between the ages of 11-16 - the puberty period, which is characterized by high sensitivity to any insults, rumors and social failures, which often leads to neurosis, stress and depression.

Victims of cyberbullying are often more vulnerable than those who are directly attacked in real life, as there is no protection in the form of stopping the school day or leaving the place where bullying takes place. Victims' privacy can be interfered with constantly, at all hours of the day and in a variety of ways.

Of course, the aggressor can be blocked or blacklisted, but this does not give any guarantee that the person will not use another account or another network to carry out bullying. Another feature that makes cyberbullying more dangerous than attacks in real life is the speed of information dissemination. As we know, information spreads uncontrollably and very quickly on the Internet, a compromising video can be viewed by all mutual acquaintances and a hundred strangers within minutes of the shooting, and the size of the audience can reach colossal proportions. All files are stored online, usually in the public domain, and can be picked up again even after the first wave has subsided.

It is almost unrealistic to completely remove information that has gone online. It requires a large expenditure of both time and effort. Countering cyberattacks is hampered by the possibility of anonymity. In most cases, artificial pages and addresses are created for cyberbullying, the aggressor does not reveal his identity and continues to make the victim nervous in every possible way [2].

Cyberbullying on social media is often invisible to adults, and children are reluctant to share information about such behavior and ask for help, because at the age of 11-16, children already consider themselves mature enough and do not want to take their problems to their elders. It is also difficult to identify the perpetrator, as he or she may not have the physical strength or authority among other peers to ruin someone's life, especially if the actions are done anonymously. Often, these aggressors are insecure teenagers who self-assert themselves through bullying [3].

Thus cyberbullying is a dangerous phenomenon for the psyche of teenagers. It causes severe damage to the mental state, often leads to neurosis, stress, phobias. The child begins to close in himself and often cannot cope with his problems on his own. Such traumas can be tried to correct with the help of psychological specialists through therapy. However, in adulthood it is already almost impossible to cope with this problem, since the body and psyche are formed.

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ETHICAL ISSUES OF TEACHING MEDICINE IN NON-MEDICAL UNIVERSITIES

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Teaching medical disciplines to students of non-medical specialties performs a number of important social-medical functions, such as providing students with basic medical knowledge to preserve their own health and provide pre-

medical care in emergency situations, training specialists in related medical specialties. At the same time, teaching medicine in non-medical universities has its own specific ethical issues.

Keywords: ethics, teaching, medicine, medical ethics, bioethics.

The importance of developing the teaching of medicine in non-medical universities is justified by the presence of many medical and social problems of modern society, such as the lack of basic skills in providing pre-medical care, extremely high prevalence of non-communicable diseases, etc. Moreover, non-medical specialists (biologists, medical physicists, bioinformatics), which involved in medical scientific research and analytical work are widely in demand in the modern labor market. The quality and equipment of research work largely depends on the qualifications and level of competence of these specialists.

An important aspect of medical education is medical ethics. While there is considerable literature on the teaching of medical ethics to medical students, much less attention is paid to the ethics of teaching of medical disciplines in medical and non-medical universities. Ethical issues of teaching and studying medicine to students of non-medical specialties are of great importance. There is a huge ethical importance of the curriculum, especially the absence of contradictions in its values and learning objectives. It is necessary to clearly define the goals and objectives for teaching medicine to students of a particular specialty and create the necessary conditions for obtaining medical knowledge. The graduation of incompetent and unethical specialists is the most serious consequence of the lack of ethics in the system of teaching medical knowledge [1]. With regard to the study of medicine in non-medical universities, the consistency of teaching with the norms of bioethics as a part of the structure of medical ethics is of particular importance. The emergence of biomedical ethics as an offshoot of traditional medical ethics was facilitated by the development of the ethics of medical scientific research, the moral aspects of human relationships in the process of research and their practical application, the ethics of scientific research on living objects [2].

A group of biological specialties was selected as an example of non-medical specialties containing medical disciplines in the curriculum. The identification of the main ethical problems of teaching medicine to biology students was carried out using a survey among fourth-year students of the specialty "Medical and biological science". The survey consisted of ten questions about the ethics of studying medical disciplines and the ethics of organizing the educational process.

The following questions received the largest number of positive answers: "Do you consider it useful for biologists to study medicine?" (100%), "Do you consider it important to preserve medical secrecy?" (100%), "Is it necessary to develop a document regulating the training of biology students at the healthcare institutions?" (94%), "Is professional ethics important in biology?" (96%).

A large number of the respondents wish for improving their level of knowledge in medical disciplines (35%) and consider it’s necessary to improve the organization of the educational process (28%). 85% of the surveyed students consider that practice at the healthcare institutions is effective for learning. At the same time, 80% of respondents do not consider that to interact directly with patients is important for the quality of education, but consider it possible to use patients' medical documentation for educational purposes when obtaining their personal consent.

The survey results indicate a significant impact of ethical issues of teaching on the organization and quality of the medical education process. The development of medical ethics and bioethics in the teaching of medicine in non-medical universities contributes to the formation of moral qualities of a person corresponding to the goals of teaching and studying medical knowledge. High-quality teaching of medical disciplines contributes to the training of highly qualified non-medical specialists in the field of healthcare, as well as students with basic knowledge in the field of medicine.

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ON RAISING ENVIRONMENTAL AWARENESS IN UGANDA TO FOSTER SUSTAINABLE DEVELOPMENT

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The article dwells on some of the ingenious and unique ways employed in Uganda to foster environmental awareness of young people and local businesses, with the focus on educational activities, supporting sustainable lifestyle via promotion of eco-friendly products, upcycling and recycling and even arts.

Keywords: environmental awareness, sustainable development, recycling, upcycling, environmental education, eco-sensitising.

Uganda is particularly vulnerable to climate change owing to its geographical location, agrarian-based economy and lack of government oversight in the public sectors [1]. Uganda's main economic activity is agriculture. When the natural environment is threatened, the agricultural sector suffers the most, leading to economic degradation. Some of the problems affecting the environment cannot be solved without global interaction, e.g. the global warming and other climate change effects leading to droughts, flooding and landslides. Despite the fact that climate is the key factor in all the sectors, there are certain issues, like reducing pollution, which could be tackled by acting locally and by raising the environmental awareness of people and local businesses. In order to address these issues, the following have been put into consideration:

- educational activities, including both awareness-raising special events and longer-term programmes;
- encouraging social responsibility in cooperation with businesses;
- using a variety of art forms to promote environmental awareness at different levels, thus creating an emotional response among citizens, especially young people.

Educational activities. These include school programmes, school extracurricular activities as well as programmes reaching out to citizens of all ages. Many schools have introduced environmental programmes through formation of environmental clubs (e.g. wild life clubs, patriotism clubs) in order to teach the youth and children about the importance of preserving the environment. In addition to this, seminars and debates are being organised to teach different aspects concerning environment. However, this has not been limited to young schools. Workshops have been held to discuss environmental issues and teach people the benefits of preserving the environment. Different programmes have been launched, e.g. *Uganda Go Green*, *Youth Go Green, Little Hands Go Green* and others. *Uganda Go Green* was started with the intention of practicing afforestation [2]: people have been encouraged to plant trees everywhere. *Little Hands Go Green* was created with the aim of educating children on the environment [3].

Promoting sustainable production and social responsibility of businesses. Recycling and upcycling have become a habit because there are many people earning from it. New enterprises have been built to recycle plastics and this save the environment. The companies that have been established include *Reform Africa*, which focuses on upcycling plastic bags to unique waterproof artistic bags [4]; *Ecoplastile Limited*, which recycles wastes into tiles and roofing [5], and many others. Many people have been employed in such companies hence boosting the economy. Separation of garbage cans has been introduced in order to ease recycling. More and more products, such as polyester fibres, polyester sheets, strapping, now come from recycling.

Evoking emotional response and using art. Art has always focused on the environment, but the recent years have brought it to a new level. With the help of NEMA (*National Environment Management Authority*), masses have been sensitised to importance of sustainability on various media platforms [6], such as the television, radio, social networks. Adverts have been displayed showing the dangers of disposing of rubbish improperly. Songs have been composed and videos have been created in order to reach across social boundaries and educate people about preserving the environment and promoting sustainable development. Everyone is entitled to preserve, protect and promote the environment through the 3R'S (Reduce, Reuse and Recycle), and the slogan which expresses it the best is "OUR ENVIRONMENT, OUR RESPONSIBILITY".

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PSYCHOLOGY OF AGGRESSION IN YOUTH

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After studying of aggressive behavior in young people, taking into account the survey, an assessment of the level of aggressiveness in young people is given.

Keywords: aggression, aggressiveness, aggressive behavior.

Aggression is a model of behavior that ensures human adaptation, one of the ways to meet current needs in a crisis situation of development and life [2]. Aggression is a personality trait expressed in actions and deeds aimed at causing harm to others or oneself.

The analysis of aggressive behavior among young people is a pressing issue since the modern world shows an increase in aggressive manifestations among this age group. In the youth environment, visual aggression, mocking aggression, resentment, hostility, and unjustified cruelty in interactions with others, both on the street and in public places, are commonly observed [3]. Such behavior is especially important since it reflects a deeper social problem and requires further research, understanding, and solving.

It is necessary to highlight the following forms of aggressive reactions in young people:

1. Physical aggression is a direct attack or the use of physical force against another person.
2. Indirect aggression is aggression directed at another person in a roundabout way or not directed at anyone.
3. Verbal aggression is the expression of negative feelings through the content of verbal responses, aimed at emotionally suppressing another person.
4. Irritation is the readiness to show negative feelings at the slightest excitement [1].
5. Negativism is a personality trait in which a person always acts contrary to others, even if the actions do not meet his interests and needs.
6. Resentment is a person's reaction to an insult or unfairly caused grief.
7. Suspicion is a feeling of distrust and caution towards people, assuming that they have bad intention.
8. Guilt expresses the subject's conviction that he is a bad person, that he is doing evil, as well as the remorse he feels.

The study included a survey among 110 students of the International Sakharov Environmental Institute of Belarusian State University. The study used the Bass-Dark Aggression Level Questionnaire, which yielded the following results: 11.8% showed a high aggressiveness index, 30.9% - an average index, 57.3% - a low index. The study also showed that the most common among students are: indirect aggression, which is characteristic of 31.8% of students, suspiciousness - 29%, negativism - 24.5%.

From the presented statistical data, it can be concluded that the prevailing indicators (medium and low index of aggressiveness) are characteristic of young people who usually demonstrate non-aggressive behavior. However, under circumstances of intense emotional stress, girls, and boys can demonstrate a number of aggressive reactions. Young people also exhibit such forms of aggression as indirect aggression, suspiciousness, and negativism. Reducing the level of aggressiveness in young people requires a multifaceted approach that takes into account both internal and external factors.

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BURNOUT

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The article discusses burnout syndrome - this is physical, emotional or motivational exhaustion, characterized by impaired productivity at work, fatigue, insomnia, and increased susceptibility to somatic diseases. The manifestation of burnout syndrome in professional activities can increase and gain a foothold in the absence of diagnosis, prevention of subsequent work to reduce the impact of negative and consolidate positive factors in the life of each person. The risk group for professional burnout is made up of employees who, by the nature of their activities, are forced to communicate a lot and intensively with different people.

Keywords: burnout syndrome, burnout, causes of burnout, ways to prevent burnout.

Emotional burnout is a psychological state described by the American psychiatrist H.J.Freudenberger in 1974. The term is used to describe the exhaustion of resources and power by people working under emotional pressure in providing professional help. Emotional burnout syndrome is a negative response to stress caused by the performance of professional duties and includes psychological, physiological and behavioral aspects. As the work stress develops, the person becomes morally and physically exhausted, which leads to degradation of health and energy. He becomes less productive, loses interest in the work and degradates the quality of the work. Exhaustion leads to a reduction in contact with others, which in turn leads to an intensified experience of loneliness. The «burned» people at work decrease labor motivation, develop indifference to work, deteriorate quality and productivity [1].

Based on the classification of symptoms of burnout, they can all be combined into 5 groups: affective, cognitive, physical, behavioral and motivational. These symptoms are manifested on three levels: individual-psychological, interpersonal, organizational. One of the common symptoms is a feeling of «confinement in the cage» which manifests itself in emotional-intellectual deadlock. The person feels himself in a hopeless position and loses interest in work, his energy goes to constant nervous tension [2].

To prevent emotional burnout, it is important to understand the factors that lead to its development. These factors can be divided into socio-demographic, personal, organizational and socio-psychological. The socio-demographic include: age, gender, work experience, family status.

The following are personal factors:

- endurance
- a predisposition to emotional burnout (this factor is most often observed in people with a high life pace, who have a strong need to keep everything under their control);
- self-assessment (low self-esteem predisposes to emotional burnout, as the insecure person himself remains in a state of stress);

Organizational factors include:

- working conditions
- The content of the work (increased responsibility for the functions performed, a lot of information to be reprocessed and often not always justified spent time).

The group of socio-psychological factors are:

- support from the administration of the organization (support from colleagues and people with higher social and professional status significantly reduces the level of emotional burnout);

- underremuneration

- Role conflict and role duality (unclear organization and planning of work, vague information, existence of conflicts in the collective etc.) [3].

In summary, it should be mentioned that most working people are exposed to emotional burnout, especially those who have multiple communications and an abnormal work day. That is why the prevention of emotional as a negative state should be one of the priority areas in the activities of any organization. Mentally and physically healthy worker will achieve much greater success and improve the performance of his company, institution, organization, etc. Building stress resistance in personnel, and early diagnosis of emotional burnout will keep the staff as well as the highly qualified specialists and increase the efficiency of any activity.

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THE INFLUENCE OF FAMILY ON THE FORMATION OF SELF-ESTEEM AND SELF-CONSCIOUSNESS OF THE PERSON

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The study presents the results of generalization and analysis of data on the topic of upbringing and development of personality in society due to upbringing and family environment. Adults play a leading role in the development of self-awareness of a child and the development of a full-fledged personality. Relationships in the family act as a source and driving force of mental development of the child, they determine the internal plan of action, emotional experiences, self-esteem. Social and psychological factors of the family can lead to behavioral disorders and negative phenomena of the formation of inadequate self-esteem of the individual, due to an irregular situation in the family.

Keywords: self-esteem, personality, education, family, parent-child relationships.

Psychologists consider self-awareness to be one of the main indicators of human ontogenetic development, analyzing it as a complex personal formation and a fundamental personality trait. An evaluative attitude towards oneself, the ability to evaluate one's capabilities, the ability to treat oneself critically, the ability to independently set one or another task for oneself play an important role in the formation of a full-fledged personality. Self-esteem is an important factor in the development of self-awareness of the individual and affects emotional well-being, success in various activities and the development of the individual as a whole.

The research methodology included: studying scientific articles and reports on the topic of self-awareness, self-esteem - the works of famous psychologists were studied, and previous studies of modern scientists devoted to family influence on personality development were analyzed. Based on the materials read, hypotheses were put forward:

"An authoritarian parenting style has a negative impact on self-esteem and forms a dependent personality type", "A democratic parenting style promotes independence and high self-esteem", "Warm and supportive family relationships have a positive impact on self-awareness and self-worth". Ten participants aged 17 to 65 years, representing different social groups, were selected for the study. Selection criteria: different types of families, different parenting styles. Personal interviews were conducted with each participant, using a series of questions regarding their upbringing and current behavior. It was necessary to create a trusting atmosphere so that the participants could openly talk about their experience of interaction in the family and their current sense of self. To establish situations and themes that were

repeated in the participants' stories, as well as to identify unique features of their experience, different types of upbringing, to understand how family relationships influenced the formation of the participants' personality, finding interrelations and correlations. The dialogue was recorded with the participants' permission. At the final stages of the study, it was necessary to compare the obtained data with existing theoretical models of the formation of self-awareness and self-esteem, identifying similarities and differences.

The analysis of personal interviews showed that the influence of the family on the formation of self-esteem and self-awareness of the individual is ambiguous. Although 35.7% of the participants demonstrate adequate self-esteem, the remaining part (64.3%) has underestimated or overestimated self-esteem. The data indicate the prevalence of the negative influence of family relationships on the formation of self-esteem in the majority of respondents. 20% of the participants grew up in single-parent families, 10% of them have adequate self-esteem despite the absence of one of the parents, which indicates the importance of compensatory factors that can smooth out the negative impact of a single-parent family on the formation of personality.

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THE CURRENT STATUS OF THE COMMON MAGPIE POPULATION (PICA PICA) IN MINSK

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The paper examines the state of the population of the common magpie in the conditions of the urban territory of Minsk. The features of the modern seasonal dynamics of the magpie population in the anthropogenic landscapes of the capital of Belarus are revealed. Permanent ecological and epidemiological monitoring, management of their populations in order to prevent damage to the city's infrastructure and the comfort of Minsk residents are proposed.

Keywords: common magpie, numbers, density, urban landscapes, synanthropy.

In recent decades, the number of corvids in anthropogenic landscapes of European countries has increased everywhere, and the degree of synanthropy of these birds has also increased. In the context of increasing economic development of natural landscapes, corvids have become an indispensable component of ornithocomplexes of urban landscapes in Russia and Belarus [1, 2].

In the structure of the capital's early birds, the common magpie occupies a modest 4th place (2.5 ± 1.2%). During the nesting period, the differences in the numerical indicators of the magpie population between individual sections of the urban territory do not exceed 4-fold values, varying from 2.5 ± 1.4 to 10.5 ± 3.8 individuals per 1 km^2. The minimum density of the nesting population of this species is characteristic of individual forest areas (Uruchye microdistrict). In the microdistricts of Minsk, its density can reach 10.5 ± 3.8 individuals per 1 km^2. The lowest magpie population density is only 2.5 ± 1.4 individuals per 1 km^2 (Medvezhino station).

The preferred nesting sites of the magpie in the city are residential buildings built in the 60s and 70s – 16.8 ± 2.2 per 1 km^2. To a lesser extent – multi-storey buildings of the 1990s-2000s. In the new urban development areas (2010-2022), in the private sector, nesting of the magpie is a very rare phenomenon.

The following can be attributed to the adaptation features of magpies to urban areas: building nests in trees that are not found in natural conditions; building nests that include paper, rags, threads, cotton wool, cellophane; building nests that consist entirely of wire, etc. There is also a reduction in the distance from which they are startled by humans and

man-made noise (nests can be located near the windows of schools, kindergartens and highways); earlier nesting and breeding periods; increased fertility of the species; switching to other foods, etc.

Considering the small significance of the magpie in the population structure of corvids, as a city orderly, it is impossible to consider it a harmful bird. It can pose a threat to backyard birds. Sometimes there is a need for its constant ecological and epidemiological monitoring and population management in order to prevent damage to cultural monuments, history, comfort and health of citizens. The following measures can be taken to regulate the magpie population: a) disposal of organic waste; b) stretching a net over the pens of domestic birds; c) installation of scarecrows and sparkling bright objects on fruit and berry crops of private backyards, etc.

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ENVIRONMENTAL LITERACY OF SCHOOL CHILDREN IN DEALING WITH URBAN LITTER POLLUTION ISSUES

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Environmental literacy of schoolchildren in solving the problem of urban rubbish pollution is assessed. Environmental competences of pupils in solving environmental problems of the city are shown.

Keywords: environmental literacy, environmental competencies, litter pollution, urban ecosystem.

The environmental situation in urban ecosystems depends on the level of environmental literacy of the population. In the context of the growing number of environmental problems, it is necessary to study the environmental awareness of the urban population in order to further develop it for the normal functioning of the world community, in general, and individual subjects, in particular [1]. Environmental literacy is a logical component of education for sustainable development, as its attention to the various interactions of different elements of the environment includes human activities that are important for achieving a self-sufficient community that preserves resources for future generations [2].

The research was carried out on the basis of the State Educational Institution ‘Ivieva Secondary School’ and Gymnasium No. 12 in Minsk. Minsk. The target group consisted of schoolchildren of 9-11 grades (91 people).

It was found out that for the majority of schoolchildren (79.1%) the environmental topic was important and they want to know more about environmental problems of the present (71.4%). Half of the interviewees (51.1%) believe that they have the necessary knowledge to actively participate in environmental protection activities.

Pupils consider the subject ‘Biology’ (40.7%) and the subject ‘Geography’ (39.6%) as the main subjects that influence the formation of environmental literacy. These subjects touch upon ecological topics and environmental protection issues to a greater extent.

In order to form environmental literacy, schoolchildren believe that it is necessary to hold environmental actions (71.1%) and hold talks on environmental topics (57.8%).

The main environmental habits of the interviewees are: reusing paper - 47.8%; collecting waste paper - 63.3%; buying only necessary things - 63.3%; giving unnecessary things to someone who will need them - 55.6%.

Containers for separate collection of solid domestic waste are present in the yard of 84.4% of schoolchildren and 66.7% of schoolchildren have no problems with separate collection of solid domestic waste, but 12.2% are lazy to sort rubbish.

To solve the rubbish pollution problem, schoolchildren think that it is worth learning how to sort waste properly (79.1%), how to save resources (64.8%), and how to follow a healthy lifestyle (56%).

In general, schoolchildren consider their level of environmental literacy as sufficiently high (54.9%) and 59.3% always use their environmental literacy skills in everyday life.

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REFLECTING SUSTAINABLE DEVELOPMENT GOALS IN THE TRAINING OF ENGINEERING STUDENTS

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The level of environmental competencies of students is assessed in the context of solving the Sustainable Development Goals. Priority goals for environmental students have been established. The attachment of the SDGs to the students' specialty is shown.

Keywords: sustainable development goals, environmental education.

In modern conditions, the process of forming a competent specialist is inextricably linked with sustainable development issues and the solution of the SDGs. The readiness to apply environmental competencies in the framework of professional activities is determined by the degree of implementation of SDG issues in the educational process [4]. In 2022, the Republic of Belarus took 34th place among 163 countries in the Sustainable Development Goals achievement rating according to the Sustainable Development Report. Countries are ranked by the overall score, which measures progress in achieving all 17 SDGs. Belarus scored 76 points out of 100 possible, which reflects the country's progress in sustainable development for the period up to 2030 and can be interpreted as the percentage of achievement of the Sustainable Development Goals [1].

As part of the educational process for specialists, it is important to implement the SDGs in the formation of students' professional competencies.

We have analysed the standards of the specialty "Environmental Protection Activity" (EPA) and the specialty "Nuclear and Radiation Safety" (NRS). MGEI named after A.D. Sakharov BSU with the aim of possible implementation of the issues of solving the SDGs in the educational disciplines of the specialty [2,3]. It was found that out of 17 SDGs, it is possible to include the issues of 15 SDGs (88.24%) in the educational disciplines of 1st-year students of the EPA specialty and 9 SDGs (52.94%) in the educational disciplines of 2nd-year students of the NRS specialty.

The implementation of the SDG issues for students majoring in environmental protection is most possible when mastering the disciplines "Fundamentals of environmental protection" and "Biology" (5 out of 17 SDGs (29.41%)).

The most feasible goal for the implementation of the process of developing environmental competencies among students majoring in the POD specialty is Goal No. 12 "Responsible consumption and production" (14.28%).

The implementation of the SDG issues for students majoring in the NRS specialty is most feasible when mastering the discipline "Biology" (5 out of 17 SDGs (29.41%)). The most feasible goal for the implementation of the process of developing environmental competencies among students majoring in the NRS specialty is Goal №.3 "Good health and well-being" (16.67%).

It has been established that for students of both specialties the most possible implementation of the SDGs is: Goal No. 3 Good Health and Well-Being, Goal No. 6 Clean Water and Sanitation, Goal No. 13 Climate Action, Goal No. 14 Preservation of Marine Ecosystems, Goal No. 15 Preservation of Terrestrial Ecosystems are most possible for the formation of environmental competencies. As a result of the analysis of the content of the educational and program documentation of the specialties of ED and NRS, potentially possible levels of inclusion of the SDGs were identified using the example of the specialty of the BSU Sakharov Moscow State University.

It has been established that the level of potentially possible inclusion of issues of covering the SDGs in the curriculum is quite high, which makes it possible to effectively form environmental competencies of students of the ED and NRS specialties.

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THE CURRENT STATE OF THE ROOK POPULATION (*CORVUS FRUGILEGUS*) IN THE CITY OF MINSK

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The paper presents information on the nesting population of rooks and their distribution in the urban landscapes of Minsk. An analysis of the rook population density is conducted depending on both the degree of anthropogenic load and the degree of remoteness from the center of the capital. A tendency for large rook colonies to disappear annually and the emergence of small and medium-sized point colonies is noted.

Keywords: rook, corvids, urban environment, colonies, park areas, residential development.

The rook *Corvus frugilegus* is one of the numerous nesting and wintering species of corvids in Belarus. In the mid-20th century, rooks were rare in winter here, in particular, in Minsk they were encountered singly and irregularly. Currently, many factors contribute to the growth of the number of corvids in cities [1,2].

Using the example of urban landscapes of Minsk, a clear differentiation of the population density of corvids was established from uninhabited urban areas – parks, to inhabited ones – residential development, distance from the city center. Thus, the population density of rooks in residential areas is significantly higher than the population density of the city's park areas – 150.4±22.5 individuals/km^2 and 94.4±18.8 individuals/km^2, respectively.

According to the obtained results, the rook preferentially accumulates in residential areas. Most often, this species is found near garbage bins and places where people rest, and builds nesting colonies in such places. Taking into account the fact that the rook was previously considered an exclusively migratory species, its density in Minsk in winter is quite high, both in parks and in residential areas, which confirms the formation of sedentary habits in the rook. The sedentary nature of urban rook populations is also indicated by the fact that during long thaws in the second half of winter, individual pairs of rooks begin to occupy old nests in colonies long before the beginning of spring, and some do not leave the colonies at all all year round.

A tendency of disappearance of large rook colonies and emergence of small and medium-sized point colonies has been noted. Over the past three years (2022-2023), several large colonies consisting of 68-217 nests have been observed in Minsk, but over time the number of nests in them has decreased, up to the complete disappearance of large colonies.

In 2023-2024, several medium and small colonies of 5-22 nests were identified. The average number of nests in a colony is 11, the nests are compact in nature – on 2-10 trees. In places with an increased degree of anthropogenic disturbance, rooks place their nests slightly higher (±15 m) than in quieter places (±7 m). It was also noted that in park areas, the rook rarely nests and closer to the periphery, where waste collection sites are often located. Apparently, the disappearance of large rook colonies can be explained by intra- and interspecific competition for resources, and primarily by anthropogenic interference. Thus, over the past 3 years, 302 rook nests, or 23.4% of all rook nests, have been completely destroyed based on complaints from the local population. Of these, in the 60th Anniversary of the Great October Park (105), on st. M. Lynkova (28), along Mayakovsky Street (64), along Odoevsky Street (19), along B. Beruta Street (26), along Voronyansky Street (29), along Vodolazhsky Street (31), etc. In general, there is a tendency for sedentary habits to form in urban rook populations, despite active human intervention.

Thus, an urbanized habitat promotes behavioral changes in rooks, which include a transition to a sedentary lifestyle, a lack of fear of people, a change in eating habits, etc.

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PSYCHOLOGY OF INTERPERSONAL RELATIONSHIPS

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Adolescence is a period of rapid physical, psychological and social development, accompanied by the formation of one's own identity, the search for one's place in the world and the establishment of new interpersonal relationships. During this period, adolescents face a number of difficulties that can lead to disruption of interpersonal relationships, affecting their emotional well-being and social adaptation.

1. Characteristic features of interpersonal relationships in adolescence

In adolescence, interpersonal relationships become particularly important. Teenagers strive for independence from their parents, for self-affirmation in a group of peers, and for the search for romantic relationships.

* Changing the role of parents: Relationships with parents become more complex, and adolescents seek autonomy, which can lead to conflicts and misunderstandings.

* The role of peers: A group of peers becomes very important, and adolescents seek acceptance and belonging to the group, which can influence their behavior and values.

* Formation of romantic relationships: The emergence of interest in the opposite sex, the first romantic relationship can be associated with failures, disappointments and emotional experiences.

* Increased conflict: Emotional lability, hormonal changes, and the desire for self-affirmation can lead to frequent conflicts with parents, peers, and teachers.

2. Causes of impaired interpersonal relationships in adolescence

Violation of interpersonal relationships in adolescence can be caused by various factors:

* Physiological changes: Hormonal changes, accelerated growth, and changes in appearance can cause self-doubt, increased anxiety, and communication difficulties.

* Psychological characteristics: Forming an identity, finding your place in life, striving for independence, increased sensitivity to criticism can lead to conflicts and misunderstandings.

* Social factors: Unfavorable family atmosphere, problems at school, lack of peer support, negative influence of social networks can contribute to the development of communication problems.

Lack of communication skills: The inability to express your emotions, listen to others, and resolve conflicts can lead to misunderstandings and conflicts in relationships.

3. Manifestations of violations of interpersonal relationships

Violation of interpersonal relationships can manifest itself in various forms:

* Isolation: The teenager avoids socializing, prefers solitude, and has difficulty making contact with other people.

* Aggressive behavior: The teenager shows aggression towards others, a tendency to conflict, fights, insults.

* Depressive state: A teenager feels hopeless, depressed, loses interest in life, and suffers from low self-esteem.

* Problems with learning: The teenager loses interest in studying, skips classes, has difficulty concentrating, and low academic performance.

* Addictions: A teenager may resort to bad habits (alcohol, drugs, Internet addiction) as a way to cope with communication difficulties.

4. Ways to correct violations of interpersonal relationships

Correction of interpersonal disorders in adolescence requires a comprehensive approach that includes:

* Psychological assistance: Working with a psychologist helps a teenager understand their feelings, learn to cope with emotions, develop communication skills, and build healthy relationships.

* Family therapy: Involving parents in the process of correction helps to improve mutual understanding in the family, solve communication problems, and create a favorable atmosphere for the development of a teenager.

* Group therapy: Participation in groups for teenagers with similar problems helps the teenager to feel not alone, to learn to communicate with other people, to develop social skills.

* Communication skills training: Trainings on communication, assertiveness, and conflict resolution help teenagers learn how to communicate effectively, express their thoughts and feelings, and build healthy relationships.

* Creating a supportive environment: Support from teachers, peers, and close people helps teenagers feel more confident, increases their self-esteem, and encourages the development of healthy interpersonal relationships.

Disruption of interpersonal relationships during adolescence is a serious problem that can negatively affect the rest of a teenager's life. Early detection and correction of these disorders through a comprehensive approach that includes psychological assistance, family therapy, group therapy and communication skills training, allows a teenager to overcome difficulties, develop healthy interpersonal relationships and successfully adapt to life.

SOCIO-PSYCHOLOGICAL ASPECTS OF FORMING STUDENTS' ENVIRONMENTAL CONSCIOUSNESS

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The formation of students' environmental consciousness is important for promoting sustainable development goals and instilling environmental responsibility. The article examines the socio-psychological aspects influencing the formation of students' environmental consciousness, emphasizing the relationship between personal psychological processes and the socio-cultural environment. By examining current theories, empirical data and educational practices, this article provides insights into strategies for raising students' environmental awareness.

Keywords: environmental consciousness, socio-cultural factors, psychological factors

Environmental consciousness is expertise, opinion, attitudes and values that determine the attitude of a person to the environment and nature, awareness and understanding of environmental problems and consequences of human interaction with nature. The formation of environmental consciousness is one of the priority objectives of education and

upbringing in many countries, because as a result of the formation of environmental consciousness, a careful attitude to the environment is formed, which ensures a safe future for all mankind. In order to develop effective educational strategies for the formation of environmental consciousness of students, it is necessary to understand the socio-psychological factors influencing its formation. These include: sociocultural (family and family values, peer influence, formal education, cultural values) and psychological (personal identity and values, emotional engagement, experiential learning).

The role of the family and family values in the formation of environmental attitudes can hardly be overestimated. Studies show that children who grow up in families where environmental issues are discussed and prioritized usually develop a deeper environmental consciousness and a holistic environmental identity.

During adolescence, students are often influenced by the behavior and beliefs of their peers. Collaborative projects, group discussions on environmental issues, and social media platforms raise awareness, foster a sense of collective responsibility, and shape students' environmental attitudes.

The educational system is the most important platform for the formation of environmental awareness. The integration of environmental education into the curriculum of all disciplines contributes to a holistic understanding of environmental issues. Experiential learning opportunities such as excursions to nature reserves and participation in environmental education projects deepen students' connection to the environment.

Environmental identity is the degree to which people perceive themselves as part of the natural world, which influences their attitudes and behavior towards environmental issues. Environmental identity can be formed through practices and activities that encourage students to explore their connection to the environment (nature journaling, environmental restoration projects, etc.). Emotions such as feelings of anxiety, guilt or hope prompt environmental behavior. Educational programmes that evoke an emotional response through storytelling, visuals or immersion reinforce commitment to environmental care.

Empirical studies cover various methodologies, including surveys, experimental designs, case studies and emphasize the effectiveness of different educational approaches.

Thus, taking into account socio-psychological factors allows building an optimal strategy of forming students' ecological consciousness.

DYNAMICS OF STUDENTS' ANXIETY

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The research presents the results of the current anxiety level study among 1st-3th year students, conducted in late September – early October 2024. It was found that the highest anxiety level was among first-year students - 49%. The lowest was among second-year students - 40.93% and 41.52%. It was found that among third-year students, the current anxiety level was 46.12%.

Keywords: anxiety, students, analysis, stress, worries, monitoring.

Anxiety is a state of excessive worry in situations that threaten negative consequences. People suffering from high anxiety complain of lack of concentration and irritation over the smallest things. Anxiety manifests itself in fear of things that need to be done, in frustration over the slightest failures, in an acute reaction to trifles and difficulty falling asleep. In the absence of timely help, people with increased anxiety wear out their nervous system and body due to constant stress, which can lead to a breakdown of adaptation mechanisms and the development of chronic diseases.

There is a fine line between the feeling of anxiety in the norm and pathology due to the fact that the feeling of anxiety is a natural protective reaction of the body to external stimuli. Therefore, it is so important to adequately assess and know your current level of anxiety. At the same time, it is unacceptable to independently diagnose and treat the disease, this entails an aggravation of an existing condition.

Students of 1-3 courses were surveyed. Students were offered an anonymous survey consisting of 15 questions. During the survey, the expected level of anxiety was identified as a percentage, and then the actual level of anxiety of students was calculated. The sample consisted of 150 students who completed the survey, 47 boys and 103 girls. The number of young men who completed the survey is 2.2 times less than that of young women. Such results can be explained by the reluctance of the male gender to undergo testing, due to the fact that they are not used to sharing their problems and focusing on them. They often refuse to undergo psychological tests due to the inability to interpret their emotions, public opinion, upbringing, and the inability to express their feelings.

Let's consider the dynamics of anxiety by courses. The expected level of anxiety among first-year female students averages 59%, the final level is 66.33%. Among the male part of the first course, the expected level is 25%, and the actual level is 31.67%. We can observe an underestimation of the problems of their mental state. This is explained by the fact that during the period of study at a higher educational institution, adaptation to new learning conditions occurs.

Considering the situation of the second course, we observe an underestimation of the current level of anxiety among girls: their expected level is 43.52%, and the actual level is 47.41%. The opposite situation is observed among the second-year young men: the expected level of anxiety was 46.66%, and the actual one was 34.45%. This is explained by the uneven workload in the schedule of second-year students and the increase in academic and social workload, which prevents them from combining study and work.

The third year is distinguished by awareness and an adequate assessment of the mental state. The female part of the third year estimated their anxiety at 48.18%, and the actual one was 47.16%. The expected level of anxiety among the guys was 45.38%, and the actual one was 45.07%. These data are explained by the fact that third-year students are more adapted to learning and a greater workload at the beginning of the school year and setting goals and making plans for the year.

The purpose of the study was to assess the current level of personal and situational anxiety of students. Based on the results obtained, the following conclusions can be formulated: 1) we observe patterns depending on gender. Basically, the male gender has the lowest level of anxiety, regardless of the year of study. In girls, it is increased due to hormonal influence, social expectations and pressure. 2) during the analysis of the data obtained, it was determined that all courses have an increased level of anxiety, which is approximately equal to 44.4%.

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NEUROSES: CAUSES AND CONSEQUENCES

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Neuroses are a group of mental disorders that are characterized by prolonged and exaggerated reactions to stress. They are not caused by organic brain damage or other physiological condition, but rather are the result of psychological factors.

Keywords: disorder, stress, causes, condition.

There are several different types of neuroses, including:

1) Anxiety disorders: generalized anxiety disorder, panic disorder, phobias, social anxiety disorder.

2) Obsessive-compulsive disorder (OCD): obsessive thoughts and compulsive actions.

3) Post-traumatic stress disorder (PTSD): occurs after a traumatic event and causes flashbacks, nightmares, and avoidance.

4) Somatoform disorders: physical symptoms that have no clear organic cause, such as conversion disorder and hypochondriacal disorder.

5) Dissociative disorders: split personality, memory, and consciousness, such as dissociative identity disorder and dissociative amnesia.

Symptoms of neuroses vary depending on the specific disorder, but may include: Anxiety, fear, and panic, obsessive thoughts and behavior, reliving trauma, physical symptoms (headaches, stomach pain, and fatigue), avoidance of situations or people, sleep and appetite disturbances, feelings of guilt, shame, and inadequacy.

The causes of neuroses are complex and multifactorial, but they typically include:

1) Genetic factors: a genetic predisposition to develop neuroses.

2) Psychological factors: stressful life events, relationship difficulties, negative thinking patterns, and dysfunctional coping strategies.

3) Biological factors: hormonal imbalances, neurotransmitter imbalances, and certain medical conditions can increase the risk of developing neuroses.

Treatment for neuroses typically involves psychotherapy, medication, or a combination of both.

Psychotherapy: cognitive behavioral therapy (CBT), exposure therapy, and psychodynamic therapy are common forms of psychotherapy used to treat neuroses. They help people understand their triggers, change their thinking patterns, and develop healthier coping strategies.

Medications: antidepressants, anti-anxiety medications, and mood stabilizers can be used to reduce the symptoms of neuroses. Lifestyle changes: Regular exercise, healthy eating, and adequate sleep can help reduce stress and improve mental health.

It is not always possible to prevent neuroses from developing, but there are some steps you can take to reduce your risk: Learning stress management skills such as relaxation, yoga, and meditation can help you cope with everyday stressors. Building healthy relationships. Positive thinking. Seeking professional help: If you are experiencing symptoms of neurosis, seeking help from a psychiatrist or psychologist can lead to a correct diagnosis and appropriate treatment.

Thus, neuroses are serious conditions that require attention and appropriate treatment. Timely diagnosis and a comprehensive approach to therapy can significantly improve a person's quality of life and help them cope with symptoms. It is important to remember that mental health is as important as physical health, and taking care of it should be a priority.

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STUDY OF VALUE ORIENTATIONS OF ADOLESCENTS FROM DISADVANTAGED FAMILIES

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In the course of the study, the main life values of adolescents of the two groups were assessed on the basis of survey indicators using M. Rokic and S. Schwartz methods, including the analysis of value orientations. According to the

obtained data, young men and girls of both groups pay attention to such aspects of life as family and health, they pay less attention to the aspect of creative activity.

Keywords: values, adolescents, family, creativity, health, life attitudes.

The problem of value attitudes of adolescents from inferior families is relevant for most regions of the world. To diagnose and assess the basic life values of young men and women, we use the methodology of M. Rokich “Value orientations” and Sh. Schwartz [1].

Value orientations are stable attitudes and preferences of a person that determine his behavior, choice and attitude to the world around him The value orientations of an adolescent are always characterized by the stage-by-stage process of his socialization through the penetration of information received from the outside [2], [5].

The Rokich values questionnaire allows us to assess the orientation of the personality and determine its attitude to the world around us, to other people, to oneself, and investigates the key motives of actions [3]. The Schwartz questionnaire is a theory of universal human values and includes 10 basic types of values, which are universal categories important for all cultures [4].

The work was based on the results of a survey of a group of adolescents (12 people in each group). In the study, the main life values of young men and women were assessed using the methods of M. Rokic and S. Schwartz.

When analyzing the testing, we found that for teenagers from incomplete families the predominant terminal values are: health (12.3%), having good and loyal friends (10.58%), happy family life (10.48%); and instrumental values are: education (10.18%), honesty (10.15%), cheerfulness (9.94%), freedom (9.79%), education (9.21%). For adolescents from complete families, the preferred terminal values are: health (15.33%), happy family life (14.73%), active life (12.76%), having friends (12.1%); instrumental values are: responsibility (14.64%), honesty (13.9%), cheerfulness (10.97%), and education (10.7%). Considering the least significant values for the two groups of adolescents, the following results were obtained: for adolescents from incomplete families, the unimportant terminal beliefs are: social recognition (5.91%) and creativity (4.24%); the instrumental ones are: high demands (6.79%), intolerance for shortcomings in themselves and others (6.39%). Young men and girls from complete families have such terminal values as entertainment (4,12%), creativity (4,39%), beauty of nature (6,88%); instrumental values are intolerance to shortcomings (5,94%) and self-control (6,15%).

Thus, according to the results obtained, the orientation of the terminal values of adolescents in both groups is expressed in similar directions: the most preferred values are health (12.3% for adolescents from disadvantaged families and 15.33% for adolescents from advantaged families), friends and family (10.48% and 14.73%, respectively). This indicates that adolescents prioritize family values and the quality of their health. Young people attach less importance to creativity, characterized by the following ratio: 4.24% for adolescents from disadvantaged families and 4.39% for advantaged families.

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BLENDED LEARNING AS AN EFFECTIVE FORM OF ORGANIZING THE MODERN EDUCATIONAL PROCESS

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The article discusses the features of a blended learning model, the efficiency of use as well as the advantages and disadvantages of this approach.

Keywords: problems of education, learning technologies, blended learning, distance learning, online learning.

The epidemiological situation of the past years required educational institutions to make a sharp transition to distance learning, however, the results of the final certification showed a decrease in students' academic performance in many disciplines, especially in applied sciences, as well as a low level of assimilation of acquired knowledge. Lecturers, as well as students, were not ready for such changes, since distance learning has its own specifics, such as a high level of self-organization and self-discipline, as well as certain technical requirements. On the other hand, distance learning allows you to personalize the learning process itself, make it mobile enough and independent of place and time – the opportunity to receive education "anywhere in the world". Today, taking into account the development of ICT and an increase in the speed of data transmission, the most promising form of organizing the educational process is blended learning [1].

Blended learning is a synthesis of traditional classroom classes and distance learning based on the use of modern information technologies, online platforms and Internet resources. This form of education is becoming more and more popular and resonates not only with lecturers, but also with students [2]. So, as part of the dissertation research, students of the third and fourth courses of the Faculty of Environmental Medicine ISEI of BSU, the Faculty of Economics of BSU and the Faculty of Information and Document Communications of BSUCA were invited to take a questionnaire on the implementation of blended learning. A total of 204 respondents took part in the survey. The analysis of some of the survey questions showed the following results: 41.67% of respondents indicated an increase in the level of motivation to study within the framework of distance education. 37.75% of respondents said that the level of motivation has not changed, only 10.29% indicated a decrease in the level of motivation to study. When asked about satisfaction with the process of teaching remotely, 46.8% of respondents answered "Yes", 33.82% answered "Yes rather than no", only 8.82% answered "No". The next set of questions concerned the advantages and disadvantages of the mixed form of education. The majority of respondents identified saving time on the road as the main plus – 22.55%, as well as the availability of educational materials "twenty-four hours a day, seven days a week" – 19.11%. Among the disadvantages of the mixed form of education, the majority of respondents answered the lack of "live" communication with peers – 25.95%. One of the last questions of the survey was the question of choosing the form of education, the majority of respondents chose the traditional form with elements of distance learning – 82.35%.

Thus, blended learning has significant advantages over the traditional form of education, these include: improving the effectiveness of learning by combining work in the classroom and independent work of students, activating the educational activities of students, increasing their self-organization and responsibility, allows solving issues with differentiation and individualization of learning, allows making education more accessible, independently from the place of residence, work, study [3].

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PSYCHOLOGY OF VIOLENCE IN THE MEDIA

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In the modern world, mass media have a significant impact on the emotional and psychological state of people through watching, reading and studying films, books, reports, TV series, chronicles, stories and public trials of the most brutal criminals in the world, containing scenes and mentions of violence. Analysis and research of data on the impact of scenes of violence on modern society allows us to assess the extent of this impact and develop measures to prevent negative consequences for the psychological state of people.

Keywords: mass media, violence, emotional and psychological state, social dependence, public opinion

In today's society, scenes of violence in the mass media have become widespread. Their impact on society is of serious concern. Constant exposure to violence in the media can lead to destabilization of the emotional and psychological state of people. Studies have shown that such people become more sensitive to violence and more tolerant of cruelty. This is especially true for children and young people, who are most susceptible to the influence of the media [1, 2]. Children and young people in the conditions of large volumes of information are not always able to distinguish what is “good” and what is “evil”, which leads to the fact that scenes of violence can cause positive emotions in them [3]. The relevance of this problem is due to the fact that programs containing scenes of violence make up a significant part of many films, television programs and computer games. Approximately 60% of American television programs and 90% of television films contain scenes of fights and violence [1]. A survey was conducted among students of the A.D. Sakharov Moscow State University of Economics and Humanities, during which the following results were obtained: 14.3% of all respondents often encounter scenes of violence in the media; 30.8% believe that information about violent crimes influences modern society; 15.4% of respondents sometimes watch or read materials about murderers and maniacs; 17.8% consider themselves dependent on external information. The most common feelings when viewing information about violence and murder are anxiety (57.1%), disgust (43.7%), shock (44%), but students also experienced awe (7.7%), satisfaction (11%) and interest (28.6%). 75.8% of students watch such information to gain new knowledge; 6.6% of respondents sympathize with rapists.

From the presented statistical data, it can be concluded that a positive attitude towards violence is not widespread, but there are students who enjoy scenes of violence. To reduce the spread of scenes of violence in the media, it is advisable to limit and prohibit such information, especially on children's forums and platforms.

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THE INFLUENCE OF INDIVIDUAL PSYCHOLOGICAL CHARACTERISTICS OF STUDENTS ON EDUCATIONAL ACTIVITIES

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This article explores the individual psychological characteristics of students, which are critically important factors influencing their behavior, social interaction and academic achievements.

Keywords: personal qualities, educational activity, psychological profile, development.

Individual psychological characteristics are a generalized concept that includes the orientation of a personality, features of motivational, volitional, emotional spheres, character, temperament, cognitive activity, stereotypes of behavior and emotional response. Some factors have a positive effect on the process of communication and interaction, while other properties may have a negative effect. It is important to determine the qualities of a person and their influence on the group in order to understand which ones have a positive effect on the formation of communication abilities and skills, and which ones have a negative effect.

For students, they represent a set of personality traits that influence their behavior, social interactions, learning process and the formation of life orientations. Understanding these characteristics is important not only for teachers, but also for the trainees themselves, as this can help identify their strengths and weaknesses, as well as allow for the adjustment of learning approaches. Motivation, degree of anxiety, preferred learning styles, cognitive abilities and level of social skills play a key role in learning activities. Intrinsic motivation, as a rule, promotes the desire to learn and actively acquire knowledge, while high anxiety can have a negative impact on learning outcomes, reducing concentration levels and making it difficult to actively participate in the learning process. [1]

The psychological characteristics of students significantly affect their academic achievements. For example, students with high motivation and developed self-organization skills can effectively plan their time, organize the learning space and find the necessary resources for self-study. In contrast, students with insufficient motivation often have difficulty assimilating educational material and regularly attending classes, which leads to a feeling of insecurity and dissatisfaction with their results. Anxiety levels also play a significant role in the learning process. Students who have self-confidence and have a supportive environment tend to participate more actively in educational activities, ask questions and share their thoughts. On the contrary, anxious students may avoid active learning activities, which limits their opportunities to develop important skills and interact with other students. The formation of students' worldview also depends on their psychological type and individual life circumstances. Students with an openness to new knowledge and experience tend to have a broader view of the world and adapt independently to changes. At the same time, students who adhere to conservative views and demonstrate a low tolerance for uncertainty may experience difficulties in perceiving new ideas and concepts, which, in turn, limits their development and personal growth. The formed worldview of students influences their subsequent life choices: career choice, social connections, participation in social activity, as well as the formation of personal beliefs. [3]

In conclusion, it should be emphasized that the individual psychological characteristics of students occupy a central place in their educational process and overall development. In a rapidly changing world, where adaptability skills and willingness to change are becoming especially important, it is necessary to apply personalized learning methods that take into account different styles of perception and the needs of students. This will not only create a more favorable learning environment, but also serve as a basis for the formation of purposeful and harmoniously developed personalities who are ready for modern challenges and are able to consciously choose the direction of their careers and life orientations. Thus, investments in the study and development of individual psychological characteristics of students represent investments not only in their future, but also in a more successful and sustainable society as a whole. [2]

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ASSESSMENT OF CORRUPTION OFFENSES IN THE FORESTRY SECTOR AS A RISK FACTOR FOR THE ECOLOGICAL POTENTIAL FORESTS OF BELARUS

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Corruption offenses in the forestry sector related to illegal logging can be considered as one of the risk factors for the ecosystem functions and ecological potential of forests in Belarus.

Keywords: forest, ecological capital, ecosystem services, environmental crime, corruption.

Currently occupying more than 40% of the territory of the Republic of Belarus, forests are one of the principal assets of the country's national wealth. They constitute both its physical and ecological capital. The actual realisation of the ecological potential of forest ecosystems in Belarus facilitates an increase in the state's prosperity, maintains the quality of life of the Belarusian people and determines the significant role of the country's territory in biosphere processes, which helps to build a positive image of Belarus in the modern world. The National Security Concept of the Republic of Belarus, approved by the delegates of the 7th Belarusian People's Congress on April 25, 2024, states, in particular, that 'Belarus provides considerable ecosystem services throughout the European continent' [1]. Paramount in this respect is the fulfilment of the environment-forming and environment-regulating functions crucial for the planet by the country's forest ecosystems. On that account, the Republic of Belarus acts as one of the donors of environmental benefits to many developed countries of the world.

In order to preserve the state of things noted above, it is essential for the modern world to maintain the ecological potential of Belarusian forests. And in our view, perceived manifestations of corruption in the forestry sector might be considered one of the possible threats to it. The evidence points that major corruption offenses identified in the forestry sector of our country are related to illegal logging [2, etc.]. Such practice causes damage to forest ecosystems and leads to a decrease in the capacity of carbon dioxide sequestration and oxygen production by forest vegetation. With regard to this, the State Programme 'Belarusian Forest' for 2021-2025 [3], which is being implemented in the country at present, asserts that the destruction of trees even on 1-2 percent of the forest area or a loss of 2.5 percent of the forest resources can create a hazard to the ecosystem function of forest plantations.

Having compared the potential environmental consequences of corruption offenses possible in different spheres of management, we conclude that corruption in the forestry sector is capable of generating environmental damage like in no other economic sector of our country. Therefore, in the forestry sector it can be regarded not only as a threat to the order of management and economic activity, but also as an important risk factor for the ecological potential and ecosystem functions of forests in Belarus.

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I.STRAVINSKY'S BALLET AS A MEANS OF ECOLOGICAL AND AESTHETIC EDUCATION OF THE AUDIENCE

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Ballet is a complex symbiosis of many types and genres of art, such as music with its means of musical expression: melody, rhythm, fret, harmony, register, timbre, tempo, modulation, sequence, etc.; choreography with its brilliant plasticity and dance thinking system; literature, visual arts, set design, theatrical directing, sculpture, lighting art, stage costumes, makeup, etc.

Keywords: art, ballet, means of artistic expression, dissonance, choreography, score, libretto, set design, stage costume.

Nature attracts musicians, poets and artists with its charming uniqueness. Speaking about the means of artistic expression that draw images of nature to the listener and the viewer, it should be noted that all of them are brilliantly and exhaustively represented in ballet art. However, another side of artistic expression can also be distinguished – the side that offers its own interpretation from beginning to end: this is ballet and opera art, "serviced" and fueled by all the above-mentioned types of art, sources and means of artistic expression. Music, like a giant dome, covers with its ephemerality entire layers of culture, types and genres of art, penetrates into them and subordinates them to its motives. It is necessary to focus on the following phenomenon: where music is born, dance is born a few seconds later, like a fantastic brother. A person has been dancing since time immemorial, without ceasing to create new plastics, new rhythms, new music. Dance is also a tool for expressing the spiritual and intellectual activity of a person, it is also the ability to communicate, it is also one of the primary factors in the formation of human self–awareness and culture. In a number of fine arts, dance plays the role of an initiating and system-forming factor. Each epoch creates its own model (system) of dance thinking. The choreographic language forms the dance consciousness and is inextricably linked with the historical processes of the development of various types of art [1].

The difference between ballet and other types of dance art lies in the fact that its whole essence is aimed at overcoming the basic laws of nature and, most importantly, the human body. To this, it is worth adding incredibly strict discipline and every second the concentration of all your physical strength on every centimeter of muscle tissue. This circumstance makes ballet related to sports. Do not forget the fact that this type of art was and remains, along with opera, the most expensive: previously, it constantly demanded fabulous funds from the royal treasury, requested the best composers capable of writing a ballet score, librettists, choreographers, artists, set designers, make-up artists, tailors (later, masters of stage costumes), sculptors and illuminators. Thus, we come to the conclusion: ballet is a kind of elite art that is able to develop the spiritual spheres of human life, far from the everyday and utilitarian areas of human existence, perception of the surrounding world and artistic images.

The most striking example in the history of classical ballet was the Diaghilev seasons at the beginning of the 20th century in Paris, which embodied academism and innovations that stunned the sophisticated public and thundered all over the world in the first quarter of the 20th century. Ballet music of the early 20th century, in particular, the music for Igor Stravinsky's ballets, strikes with constantly recurring consonances and, most often, dissonances (meetings and separations of absolute opposites). The harsh, deliberately disharmonious sound combinations in the ballet "Sacred Spring", which speak about the mysterious face of primitive people, about their horror of an unknown and therefore terrible nature, destroyed both the epic and contemplative scenography. Rhythm has become the dominant element of the ballet — hypnotic, subordinating everything to itself. He reigns in an unusual, full of elemental force music, controls the movement of bent, as if pinned to the ground people. The introduction creates a picture of the gradual awakening of

nature: from the first timid streams to the raging joy of spring. A clear rhythm sustained by the strings and the exclamations of French horns open the "Spring Divination. The dances of the dandies" [2].

It can be argued that the history of ballet art after the premieres of ballets to the music of Igor Stravinsky was divided into before and after, while the same can be said about dramatic art, fashion, economic, cultural and sports life of ordinary people. The choreography of Vaclav Nijinsky and the music of Igor Stravinsky intertwined and created an unprecedented "Something" called the ballet "Sacred Spring", and our compatriot Leon Bakst created unique costumes reflecting the amazing specifics of Russian myths and legends. The great artist N. Roerich became a set designer for the ballet "Sacred Spring". Roerich's artistic vision was characterized by pantheism, and the favorite theme of his work was the unity of ancient man with nature. The epic prevails in Roerich's canvases and in his sketches of "Spring". The artist asserted the union of man with nature and poetized man's worship of the mighty power of the earth.

Ballet culture can also be turned into a serious spiritual and educational weapon, instilling love for art, nature, and the Motherland. Speaking about the ecological and aesthetic education of the audience with the help of the means of artistic expression of a ballet performance, drawing images of nature to the viewer, we must note that this type of art, along with opera art, solves this problem as successfully as possible [3].

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PSYCHOLOGY OF STRESS TOLERANCE IN STUDENTS

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"Stress is not what happened to you, but how you perceive it." The universal rule of Hans Selye, the "father" of stress theory.

Stress is an integral part of every student's life. Academic activities, worries, lack of communication, lack of sleep, unhealthy lifestyle, lack of free time, exciting situations as stress for students hinder academic performance and in the future can lead to a halt in personal growth, psychosomatic diseases.

Keywords: human, psychology, stress, stress tolerance, emotions, various types of stress, three phases of stress, stressors.

The student's lifestyle determines how often and for how long he will be in a stressful state. In this regard, the analysis of students' stress tolerance is important for both academic performance and health. Low stress resistance.

Stress has a very strong effect on our lives. Only about 25% of people are stress-ready. The starting chemical link in the development of a stress reaction is an increase in the level of adrenaline and norepinephrine in human blood.

For the first time, the term "stress" was introduced into physiology and psychology by Walter Cannon. Hans Selye believed that stress is the process of our adaptation to changes, it forces the body to mobilize the necessary forces and

move forward. Initially, Selye considered stress exclusively as a destructive, negative phenomenon, but later Selye additionally introduced the concept of "positive stress" - eustress, and designated "negative stress" as distress.

Whether stress is harmful to health or not is determined by the duration, intensity, novelty, and multiplicity of stressful situations. If disappointments and failures are added to the strain of forces, then the risk of diseases increases significantly. Exposure to stress as a result of increased academic loads depends on a person's performance.

The most common stress formula: "Activity" – "Overexertion" - "Negative emotions". Every time we realize that we do not have what we want, every time we regard any situation as threatening our well-being or self-esteem, we trigger a stress reaction in our body.

A psychological stressor always consists of two parts: the situation causing stress and the person's attitude to this situation. It is enough to eliminate any of the components so that the cause of stress ceases to act.

Stress is a protective mechanism for controlling human behavior in order to maintain its survival. It is important that stress does not become chronic, does not disrupt the balance in the body. It is important that students in no case succumb to stressful situations, fear, otherwise they will face high "cortisol", which will lead to irreversible consequences.

Each student can noticeably improve their stress management skills by realizing their thinking mistakes. Therefore, the formation of stress tolerance can become a guarantee of their health, success in training and professional activity in the future.

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PRINCIPLES AND PHILOSOPHY OF THE DIRECTION ZERO WASTE

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The increasing anthropogenic and technogenic load is the cause of nature destruction. Every year the world generates about 2 billion tons of solid domestic waste, which decompose and release toxic substances, so the problem of conscious consumption is especially acute nowadays. One of the positive examples of environmentally friendly attitude to nature and one's own life is the Zero Waste movement.

Keywords: ecology, nature, climate change, waste, conscious consumption, ecological culture, education, 5R-principles, eco-trend, eco-habits.

The Zero Waste movement has become an important part of the modern environmental movement. It is aimed at minimizing the waste produced by mankind and creating a sustainable resource management system. This trend was born in 2009 in America. The founder of the movement is Bea Johnson, who formulated the basic principles of the concept: recycle, reuse and reduce consumption, which ultimately leads to a reduction in the number of landfills that poison our planet. The movement promotes the development of closed-loop industries, where materials are used for as long as possible, which helps conserve natural resources and generate economic benefits, as recycling is a source of new resources and reduces waste disposal costs. By adhering to Zero Waste principles, you can reduce the amount of junk and unnecessary items in your own living space. This is not just a set of rules of behavior, but rather a way of life, a way of thinking or even a kind of philosophy. Active supporters of this movement educate and involve other people in their ranks, sharing knowledge about Zero Waste methods.

The Zero Waste theory is based on five main principles, the 5Rs:

- Refuse - Refuse unnecessary items. The idea is to replace disposable items with reusable ones as much as possible. For example, instead of plastic bags, go to the store with a shopper or eco-bag, buy food without packaging, etc.

- Reduce - Refuse to buy unnecessary items, reduce your consumption.

- Reuse - use things repeatedly, give away things you don't need, exchange things and goods.

- Recycle - sorting your trash is very important. It allows you to recycle up to 90% of your waste.

- Rot (composting) - compost pits in the private sector and kitchen composters can convert organic garbage into valuable fertilizer for plants.

Self-restraint is the “magic pill” that will help cure our planet from global pollution, it makes our life easier, leads to the ordering of our consciousness, frees up time for really important activities and hobbies. “Life without waste” is not about giving up the comforts and joys of life, but simply a rational attitude to consumption.

Introduce new eco habits gradually, step by step. It will take 3 to 6 months to fully adapt, during this time you can choose the optimal eco-formula for yourself, and as a nice bonus save money for more valuable purchases. To change something in the system alone is impossible, the realization of one's own weakness in the face of global problems is paralyzing. Still, it is important to remember that everyone's personal efforts matter, that together we can make a difference.

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ARTIFICIAL INTELLIGENCE IN HIGHER EDUCATION

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With the development of technology, the world is changing, and approaches and methods in education are also changing. Innovations are becoming part of the university system. Artificial Intelligence (AI) is firmly entering the life of universities, offering solutions that recently seemed fantastic. This paper gives a brief overview of how artificial intelligence is currently used in higher education and what are the development prospects for the use of AI by teachers and students.

Keywords: AI, digital education, information technology.

The term “artificial intelligence” was coined in 1956 by McCarthy [3]. Currently, the term AI refers to computing systems that are capable of engaging in human-like processes such as learning, adapting, synthesizing, self-correcting, and using data for complex processing tasks [4].

The importance of AI in higher education has grown rapidly over the last 5 years. The use of this innovative development within the educational environment opens up fundamentally new opportunities for the qualitative development of the services provided and received from the point of view of all participants in the process. This tool is applied in all subject disciplines, including language, engineering, mathematics and medical education. It is important to note the accessibility of AI for both teachers and students of higher education institutions, which provides ample opportunities for the implementation of new approaches in higher education. For example, AI is already used to adapt learning to the needs of different types of students, provide individualized operational feedback, develop curricula and schedules, predict academic success, monitor assignments, and create special environments in educational institutions, such as a “smart campus,” for example.

A promising area of AI use in higher education today is so-called proctoring - the process of remote monitoring and control over a test or exam. Gamification - the possibility of organizing the learning process in a game format - is also gaining popularity. This variant of training is characterized by easy assimilation of the taught information, as well as competition, creating a favorable mood for the acquisition of new knowledge.

Partial automation of the educational process by transferring to the artificial intelligence system a share of consulting and mentoring powers causes mixed reactions among teachers around the world. This is associated with potential risks such as: loss of live communication between student and teacher, lack of competent specialists in this field, possible data security breach.

The introduction of AI in the educational sphere makes it possible to vary the educational process and promotes active involvement of students in various types of learning activities. Artificial intelligence technologies are undoubtedly a tool for improving methods and ways of learning, contribute to the improvement and acceleration of teaching, learning, pedagogical and communication processes. However, we should not forget that only a true professional is able to understand and take into account all the needs and requirements of the learner, so the full automation of the learning process is unacceptable and lacks a certain degree of efficiency.

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HISTORY OF THE DEVELOPMENT OF THE RAILWAY NETWORK IN BELARUS (MID 19TH CENTURY)

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The paper examines the history of the development of the railway in the territory of modern Belarus and its features. It is shown that the reasons for the advanced development of railway communication were the development of heavy industry and the geographical location of Belarus.

Keywords: railway, transport, industry, construction

One of the integral consequences of the industrial revolution, which fundamentally changed the face of not only the 19th century, but also the entire New Age, was the emergence of rail transport. Distances that had previously been difficult to overcome were now easily conquered. It is difficult to overestimate all the consequences that these changes caused.

The first railways appeared in Great Britain in the late 1820s. Their full potential was soon appreciated on the territory of modern Belarus; thus, the industrialist A.I. Benckendorff, in order to reduce costs and increase productivity at his Starinka metallurgical and machine-building plant, already in the mid-1840s introduced his own railway line, although it cannot be considered a full-fledged railway, since horse traction was used instead of a steam engine in the form of a locomotive.

Soon the great importance of railways was also appreciated in St. Petersburg, and Belarus was a major transit corridor on both the east-west and north-south routes, so the first railways of the Russian Empire were built through the territory of Belarus. Thus, the first permanent section was the Porechye-Petersburg Mainline (in the Grodno region), which began operating at the very end of 1862. This was the first real railway, since it used a steam locomotive instead

of horse traction. A special feature of the Belarusian railways was the width of the track, which instead of 114.5 sm, as adopted in other countries, was 122 sm, which made it impossible to use foreign rolling stock on the territory of the Russian Empire. Among other things, this led to the accelerated development of heavy industry in the Russian Empire, since it was necessary to produce a larger quantity of rolling stock suitable specifically for Russian railways.

In general, full-scale railway traffic on the line to Warsaw was opened in 1867, and along the north-south corridor in 1873.

Thus, the construction of railways on the territory of Belarus was carried out at an accelerated pace compared to other parts of the Russian Empire, and, in general, by the end of the 1870s, a developed railway network had been formed in Belarus, which was of great importance for subsequent development.

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RAISING STUDENTS' AWARENESS OF ISSUES RELATED TO SOLVING THE SUSTAINABLE DEVELOPMENT GOALS

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To show the level of students' awareness in the context of the Sustainable Development Goals. Priority SDGs for students of the specialty “Nature Protection” and “Nuclear and Radiation Safety” were established.

Keywords: competence-based approach, Sustainable Development Goals, sustainable development.

Ecological competence is an integral part of ecological culture of each person, as everyone daily has to solve problems of ecological character of this or that degree of complexity on the basis of formed values and motives, knowledge, educational and life experience, individual characteristics, inclinations, needs. Competencies in the field of SDG implementation are important and necessary structural elements for addressing sustainable development issues. In modern concepts, the importance of environmental competence as an important component of the value-semantic space of the student's personality is clearly traced. The concept of sustainable development is based primarily on solving the problem of preserving the ecological space of the present for the future.

The target group of the study is the first- and second-year students of the specialty “Environmental Protection Activity (EPA)” and “Nuclear and Radiation Safety (NRS)” of the A.D. Sakharov ISEI BSU. Students were asked to fulfill the following tasks: 1. Identify the most significant SDGs related to your professional activity and 2. Identify the SDGs in terms of their importance for you.

Students of EPA specialization arranged the most significant SDGs related to professional activity as follows: Goal № 13 Combat climate change-19.23%, Goal № 6 Clean water and sanitation-16.67%, Goal № 15 Conservation of terrestrial ecosystems-15.39%.

Students of the specialty “Nuclear and Radiation Safety” put Goal № 7 Affordable and clean energy in the first place - 16.05%, Goal № 3 Good health and well-being - 12.35%, Goal № 9 Industrialization, innovation and infrastructure - 12.35%. The choice of SDGs related to professional activity is related to the specialty of the students.

The result of distribution of SDGs according to the degree of importance for students showed that students of EPA specialty arranged the selected SDGs as follows: Goal № 13 Combating climate change - 17.95%, Goal № 7 Affordable and clean energy - 15.39%, Goal № 6 Clean water and sanitation - 14.10%. And students of NRS specialty chose Goal № 3 Good health and well-being - 13.42%, Goal № 8 Decent work and economic growth - 13.42%, Goal № 4 Quality education - 10.98%. The choice of SDGs in this case was determined by the student's personal preference.

Students were asked to write an essay on the topic "I advocate the solution of the Goal ....." and propose mechanisms for achieving the selected SDGs. Students of the NRS specialty chose Goal № 16 Peace, justice and effective institutions - 17.65%, and students of the EPA specialty preferred Goal № 15 Conservation of terrestrial ecosystems – 40%.

Students' awareness in the field of SDGs solution is an important component of environmental competence formation. Students' identification of the most significant SDGs is related to their future specialty and is based on their own judgment and experience [2]. It is shown that the choice of SDGs is related to professional activities and personal attitude of students to the Sustainable Development Goals.

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COEVOLUTION OF NATURE AND MAN

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The definition of coevolution is given. The historical periods of coevolution and modern human attitude to nature in the concept of “ecological education” are considered.

Keywords: coevolution, man, nature, environmental education.

Coevolution is the joint development of nature and human society. This definition refers to the mutual change of nature and man in their interaction with each other in the process of evolution.

American ecologists Paul Ehrlich and Peter Raven first used the term “coevolution” in 1964 to describe the coordinated development of different species within the same ecosystem. In 1968, Soviet biologist N. V. Timofeef-Ressovsky defined coevolution as the optimal balance between the interests of mankind and the rest of the biosphere, their coordinated, tolerant, peaceful, equal co-development[1].

The general concept of co-evolution can be based on the flexible transformation of human society to meet the “requirements” of the environment during the period of active use of its resources for its needs. Historically, five main periods of coevolution of nature and man can be distinguished:

1) Archaic - harmony of nature and man;
2) Agrarian - the first use of environmental resources by humans in the transition to a sedentary lifestyle;
3) Industrial - man's conquest of nature to satisfy his own needs;
4) Violation of the ecological balance “nature-human”. The environment is considered solely as a source of resources for the development of civilization;
5) Modern - mankind's realization of the scale of damage caused to nature and search for ways of transition to noospheric thinking [2].

One of the goals of sustainable development is to ensure the transition to sustainable consumption and production patterns. It gave the basis for the development of environmental education among preschool children, schoolchildren and students. Environmental education, based on a humane, value-based attitude to nature, based on the development and improvement of knowledge, skills and abilities, forms the culture of interaction between man and nature.

According to the results of the student survey, 80% of students first learned about the term “ecology” and environmental problems of our time at school. During biology, history and geography lessons, students get a full understanding of coevolution, realize their own attitude to the use of nature's resources and offer interesting ideas and projects on nature conservation and optimal use of its resources. About 40% of students are currently actively involved

in various environmental events and activities, such as recycling paper and plastic, beautification of parks and backyard areas, ecology weeks and volunteer activities. 11 % actively support the use of alternative energy sources.

For several hundred thousand years, humankind has been living in symbiosis with nature. In some periods, it makes excessive use of its resources, while in other periods it maintains full harmony with it. The further development of co-evolution is a debatable issue, but there are already many projects to preserve equality in the development of nature and man.

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CURRENT PERCEPTIONS OF LITERATURE AMONG TEENAGERS

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A definition of literature is given. A survey was conducted among teenagers about their attitude to modern and classical literature.

Keywords: literature, books, teenagers.

Literature is the art of the word. Broadly speaking, literature is texts of artistic or social significance enshrined in writing. From papyrus to the printing of books and the subsequent emergence of electronic resources, literature has undergone many changes, reflecting each time. In today's world, where any information is always available in various forms, the book remains an important source of knowledge, emotion and inspiration. Jean-Paul Sartre wrote: “The book is the most refined and ancient form of literature; we will return to it in one way or another” [1].

Literature is a cultural phenomenon that expresses the richness and diversity of human existence in artistic images. Through the book, different generations communicate, passing on information about the history, culture, values of the time [2]. However, there is an opinion among the older generation that with the advent of the Internet and various gadgets, teenagers have stopped reading books. This is mainly due to the unwillingness of young people to read the school literature program. However, it is worth noting the growing popularity of literary societies among teenagers in the last few years. So-called “book-clubs” and “book-blogs” gather a large number of modern readers around them.

According to the results of the survey conducted among teenagers, it was revealed that despite the prevailing opinion about “non-reading youth” 82% of schoolchildren and students read books. Among them 54%, prefer to read printed publications and keep home libraries. 46% read in electronic format, attributing this to convenience and accessibility. The most frequent place for reading is public transportation. In addition, 40% of young people listen to books in audio format. Along with audiobooks, a new type of audio content - podcasts - is gaining rapid popularity. Choosing a topic of interest, young people usefully spend their free time, gaining new knowledge in different areas.

The most popular genres of literature are detectives and fantasy (28.6%). Novels (25%) and scientific literature (10.7%) follow them. Graphic novels, comics and manga should be singled out as a separate genre. 48% of young people read these kinds of works and develop artistic skills in creating their own graphic works.

Choosing between classic and modern literature, 68% of young people prefer the latter. On average, reading one book takes one or two weeks (50%) and, some, up to a month (17.9%). The most common reading language is Russian (96%), but there are also those who prefer reading in the original language (English, German, etc.).

The most popular books among teenagers were detectives by Agatha Christie and Darya Dontsova, novels by 20th century writers and Mikhail Bulgakov's novel “The Master and Margarita”, which became very popular after its film adaptation.

The modern view of literature differs from the traditional view. The availability of printed and electronic publications, the popularization of online book communities, and the emergence of new genres have had a direct impact on today's youth, helping them to form as individuals, actively develop critical thinking, inspire them, and help them cognize the world around them.

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ENVIRONMENTAL EDUCATION AND EDUCATION ON CONSERVATION OF ECOSYSTEMS IN BELARUS

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The modern era with the progressive development of industrial production in the world does not leave any chance for the natural environment to maintain its condition in its original form.

Agricultural production, pursuing the humane goal of «feeding humanity», was part of a process that has negative effects on the planet's ecology through its agrotechnical practices. All stages of processing crop and livestock raw materials further aggravate the environmental degradation.

Keywords: ecology, environmental education, conservation of the environment, biodiversity.

The last hundred years have proven that industry has a negative impact on the earth's biosphere. In the pursuit of profit, having lost their sense of reason, a certain part of people who, unfortunately, possess huge finances do not think about their future and the future of many generations of people. These people, unlike animals, have completely ignored the environmental aspects (destruction of forests, pollution of the world's oceans, destructive wars, etc.).

In the current situation, humanity must focus and draw attention of the inhabitants of the planet to the threat that is really present and can lead to irreversible environmental processes. It is the involvement of more people in environmental conservation activities on all continents that is the primary goal of environmental education. Strangely enough, most of the population of our planet not only do not think about the future of planet Earth, but also do not know about the problems that have arisen in the field of ecology. Generally, knowledge and information allow a person to think and draw conclusions. In our case, it's a proposal, a conclusion and, most importantly, an action to preserve the environment. Just environmental education that can be organized by human society members who have received appropriate environmental education.

Education in any field of human activity is itself a costly undertaking both for the state and (in some cases) for people who wish to receive it.

Environmental education is simple at first sight, but in fact it is considered to be quite complex and unusual in the use of socially applicable subjects. The complexity of environmental education is not so much in its acquisition as in its subsequent use (application). The person who has obtained environmental knowledge becomes fully a diplomat by its nature, which using knowledge and applying convincing methods must prove that the only correct is the ecological method of any production process.

It has long been proven that biological education is the basis of forming a person as a personality. We can't agree with this, but as you can see in practice, we live in a different world where everything has to be proven and everyone has to be convinced.

On a land where not many states, including Belarus, can afford such a general educational subject as biology - to introduce in the rank of fundamental. Biology, in a number of other subjects, educates (the person) personality that will be with special care related to its natural environment.

In conclusion - the ecological and biological education of the modern young generation is the basis for developing environmentally sound technologies in all areas of human activity. Humanity will save itself if it can save its environment.

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FACTORS IN SHAPING ENVIRONMENTAL BEHAVIOR

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This article reflects important aspects concerning the issues of environmental behavior education.

Keywords: environmental behavior, education, consciousness, psychology, family, nature.

In the context of growing global environmental problems and growing awareness of the need to support sustainable development goals, the education of environmental behavior becomes an important area of educational activity. Environmental behavior is a set of conscious actions aimed at minimizing the negative human impact on nature. Education of ecological behavior in the younger generation is the basis for the formation of a sustainable ecosystem of the future and preservation of natural resources [1].

In this regard, it is possible to identify and suggest the main environmental aspects aimed at fostering environmental habits in society.

Ecological behavior begins with the awareness of personal responsibility for the state of the environment. An important role is played by the formation of a value attitude to nature through emotional and psychological perception of environmental problems, which contributes to the development of environmental and ethical norms of behavior.

Educational institutions play a key role in fostering environmental culture. This is possible through the introduction of environmental education at all levels - from pre-school to higher education, with special emphasis on practical lessons and involvement of students in real environmental projects. Interdisciplinary approaches that include biological, chemical, social and cultural aspects of environmental problems are important [2].

Family education plays an equally important role in the formation of environmental habits in children. Everyday life with careful attitude to resources (saving water, energy, proper waste management) becomes an example to follow. An important element is the involvement of parents in environmental projects and the formation of a common family ecological rhythm of life.

Mass media and social networks have a significant impact on shaping the environmental attitudes of young people. Environmental campaigns and social movements aimed at protecting the environment become sources of information and inspiration for new generations. Education of environmental consciousness is possible through participation in such movements, as well as through educational programmes in the media [1, 3].

Thus, the formation of environmental behavior is a complex and multifaceted process that requires the participation of both educational institutions, family and society as a whole. Environmental education should become an important part of general culture and be oriented towards the formation of a conscious and responsible attitude to nature from childhood. Only through joint efforts it is possible to build a sustainable ecological future.

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ETHICAL AND PHILOSOPHICAL ASPECTS OF IN VITRO FERTILIZATION

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This article examines the ethical and philosophical aspects of in vitro fertilization (IVF).

Keywords: moral and ethical problems, in vitro fertilization, bioethics

According to current WHO data, approximately 5% of people of reproductive age are diagnosed with infertility. 50 years ago, the only way out of this situation was adoption. However, now, thanks to the rapid development of assisted reproductive technologies (ATR), there are ways to cope with both male and female infertility. For the latter, this is the IVF technique [1].

The first person to try IVF was British surgeon John Hunter. However, his successful experiment with fertilizing the eggs of a female silkworm was ignored. The modern IVF method was founded by physiologist Robert Edwards and obstetrician-gynecologist Patrick Steptoe [2].

Since IVF directly affects human life, the question has now arisen about the legal and moral boundaries of the use of this technique. There are not only medical, but also moral and ethical problems that arise from this procedure: commercialization of donation, destruction of "extra" embryos, eugenics. Thus, human life is deprived of its uniqueness and value [3]. However, taking into account the undeniable advantages of IVF for patients with infertility, we can come to the conclusion that this technique is considered justified if it has a therapeutic effect, does not infringe on the rights and value of the individual, and does not include the use of eugenics (for the purpose of creating biorobots). It is stated that the main purpose of IVF is to focus on the benefit of society. In this regard, the WMA has developed recommendations, one of which is a ban on choosing the gender of a child if the gender does not entail hereditary diseases. However, these recommendations are not followed in all countries. In some countries, the commercialization of IVF goes as far as the possibility of choosing the color of the child's eyes and hair, although this is not encouraged by most of the scientific community [4].

IVF is not just a medical procedure, but has deep philosophical and moral implications. At the center of the discussion is the problem of the status of the embryo: on the one hand, it is a potential life, on the other hand, it is part of the reproductive process, in which parents are included. Bioethics is an interdisciplinary science designed to form moral norms and principles that, among other things, will help us use IVF responsibly and humanely. Drawing on the work of many generations of philosophers, bioethics studies the moral boundaries and consequences of reproductive technologies. It helps us understand how IVF affects our understanding of man, life, family and morality.

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SECTION 2

MEDICAL ECOLOGY

CHONDRODYSTROPHY IN CHILDREN OF THE REPUBLIC OF BELARUS

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Congenital malformations are the leading causes of stillbirth, infant and early childhood morbidity and mortality, and childhood disability, which leads to significant medical and social problems. According to the World Health Organisation, 5-7% of newborns have various hereditary and congenital pathologies.

Keywords: musculoskeletal system, limb malformations, mutations, dysplasias, gene, cartilage tissue.

Chondrodystrophy is one of the most common inherited connective tissue diseases and a cause of disproportionate stunting. The incidence of chondrodystrophy among newborns in the Republic of Belarus is 1:10,000. Chondrodystrophy is a congenital genetic disease with autosomal dominant inheritance, which is manifested by systemic skeletal damage with impaired enchondral osteogenesis, dwarfism, and damage to the respiratory system due to deformation of the thorax and spine. Patients have somatotropic deficiency, marked stunting, shortened limbs with normal trunk length and deformed lower limbs. The main cause of the disease is a mutation of the FGFR3 gene, mapped at locus 4p16.3, which disrupts the process of enchondral ossification and leads to irreversible activation of the fibroblast receptor, which prevents normal development of cartilage tissue [1].

Potential causes of the development of malformations of the musculoskeletal system are biological inferiority of gametes, changes in the genetic apparatus of germ cells in the form of mutations that occur under the influence of metabolic disorders in the mother's body during germ cell overripening. ionising radiation, pharmacological drugs, hormones, toxic substances contribute to changes in the hereditary apparatus in the form of mutations [2].

FGFR3 is a transmembrane tyrosine kinase receptor which activation inhibits chondrocyte proliferation and promotes chondrocyte growth and differentiation in the growth plate of bone tissue. The c.1138 G>A mutation in the FGFR3 gene becomes the cause of chondrodystrophy, which occurs for the first time in 80% of cases. The c.1138 G>C mutation is less common. Genetic aberrations in other regions of the FGFR3 gene lead to the development of milder forms of skeletal developmental disorders, including hypochondroplasia. In rare cases, chondrodystrophy is caused by mutations in the FGFR3 gene regions p.Asn540Thr, p.Lys650Asn, p.Asn540Ser, p.Ile538Val, p.Lys652Gln, p.Lys650Gln [3].

There are several forms of chondrodystrophy that may have similar causes: hypoplastic chondrodystrophy (hypochondroplasia), hyperplastic chondrodystrophy (epiphyseal dysplasias), malacia chondrodystrophy, combined chondrodystrophy (combination of all three forms), and atypical chondrodystrophy (not similar to the classical type of the disease [4].

Correction of chondrodystrophies is performed in children who have reached the first year of life, which includes the use of lockless orthopaedic devices, complex physiotherapeutic treatment, physical therapy and massage courses. During the first year of life, the patient is prescribed hormonal therapy in the form of daily administration of somatotropin, which helps prevent significant stunting in children with chondrodystrophy [5].

Thus, chondrodystrophy is a congenital systemic disease caused by a malformation of the cartilage-forming system of the embryo and manifested mainly by damage of bones of cartilaginous origin (limbs, skull base).

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COMPARATIVE ANALYSIS OF LEAD, ZINC AND ARSENIC CONTENT IN THE SOIL OF DIFFERENT DISTRICTS OF THE CITY OF MINSK

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The work shows that in soil samples of the Kamennaya Gorka-4 district no excess of maximum permissible levels of heavy metals was detected: zinc, lead and arsenic. Analysis of soil samples of the Brilevichi microdistrict showed the zinc content to be 2 times lower than the maximum permissible concentration. The lead content was close to the MPC, but did not exceed it. Arsenic was absent in soil samples of this district of Minsk at the time of the analysis. Soils from the city center, near the Oktyabrskaya underground station, in terms of the content of all the studied heavy metals exceeded the MPC: zinc by 2.22 times; lead by 1.66 times; arsenic by 7 times. Soil samples taken in the area of the Traktorny Zavod underground station also showed excess of the MPC: lead by 1.46 times; zinc by 1.7 times, arsenic by 6.1 times.

Keywords: zinc, lead, arsenic, maximum permissible concentrations, X-ray fluorescence analysis, soil analysis.

The ecological state of soils is one of the main parameters of the ecosystem. Monitoring the state of soils is an integral part of ecological studies of ecosystems. An important parameter of the state of the soil is the content of heavy metals. Excessive concentrations of heavy metals can be dangerous because they can accumulate in the tissues of living organisms and be transmitted through trophic levels. The most dangerous and common pollutants among heavy metals are zinc, lead and arsenic.

In this regard, the aim of this work was to conduct a comparative analysis of the content of lead, zinc and arsenic in areas with different anthropogenic loads in the city of Minsk.

During the work, four 100x100 m sites were selected in the areas of Kamennaya Gorka 4, Brilevichi 2 (near the Malinovka underground station), the city center (near the Oktyabrskaya underground station) and a site in the Zavodskoy district (near the Traktorny Zavod underground station). It is worth noting that two of the four sampling points are “young districts” (Brilevichi - 2 began to be gradually built up in 2006, Kamennaya Gorka 4 - since 2008), due to which the level of anthropogenic load on them is expected to be lower than in the two remaining old districts.

Three sectors were selected at each site, from each of which three samples were collected at a depth of 10-20 cm. The soil was examined for contamination with the elements zinc, lead, arsenic and compared with the established maximum permissible concentrations.[1,2]. The data were obtained using X-ray fluorescence analysis. In this work, an energy-dispersive X-ray fluorescence spectrometer Skyray Instrument EDX6000B (China) was used.

The conducted studies showed that soil samples from the Kamennaya Gorka-4 area did not reveal any excess of maximum permissible levels of heavy metals: zinc, lead and arsenic.

Analysis of soil samples in the Brilevichi microdistrict showed zinc content to be 2 times lower than the maximum permissible concentration. Lead content was close to the maximum permissible concentration, but did not exceed it. Arsenic was absent from soil samples in this district of Minsk at the time of analysis.

The soils from the city center, near the Oktyabrskaya underground station, exceeded the maximum permissible concentrations of all the heavy metals studied: zinc by 2.22 times; lead by 1.66 times; arsenic by 7 times.

Soil samples taken in the area of the Traktorny Zavod underground station also showed that the maximum permissible concentrations were exceeded: lead by 1.46 times; zinc by 1.7 times; arsenic by 6.1 times.

The obtained results may be due to the fact that the microdistricts Kamennaya Gorka - 4 and Brilevichi were built relatively recently and the anthropogenic load has not yet led to critical soil pollution. The city center and the industrial area near the Traktorny Zavod underground station, on the contrary, were built a long time ago. Intensive car traffic, a large number of people living there or visiting there for other reasons, and a long period of stay in such conditions are the reasons for the deterioration of soil quality.

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ENVIRONMENTAL FACTORS AND ECZEMA IN CHILDREN IN MINSK

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Atopic dermatitis is a chronic allergic disease that often occurs in the early years of life. It is believed that the symptoms of eczema in children are seasonal and have a complex trigger mechanism determined by environmental conditions. Also, the harmful effects of various pollutants on the skin of children can affect the development of atopic dermatitis depending on climatic conditions or the type of weather. The aim of the work was to study the role of meteorological factors in the manifestation of atopic dermatitis in 2-year-old children in an urban environment. The obtained results may be important for assessing the risks of early development of the disease, provided that year-round monitoring of cases of atopic dermatitis in young children is carried out.

Keywords: atopic dermatitis, childhood eczema, temperature, relative humidity, primary incidence.

Atopic dermatitis is a chronic relapsing disease, the prevalence of which has increased over the past four decades. A characteristic symptom is persistent itching of the skin. The occurrence of itching is based on organized interactions between keratinocytes, the immune system and non-histaminergic sensory nerves. In addition, emotional stress, lack of sleep and alcohol consumption can increase itching in patients.

A further increase in the incidence of the disease is observed, which is presumably associated with environmental pollution. Outdoor air pollutants in cities and their combination with meteorological conditions can affect the occurrence of eczema in both sexes. In economically developed countries, the incidence of atopic dermatitis is 15-20% per 1000 population, and among children the figure reaches 10-20%.

Atopic dermatitis is, as a rule, the earliest and most common allergic disease in children of the first years of life. It is no coincidence that the skin of a young child becomes the "target organ" of an allergic reaction. This is due to the nature of the skin's immune response to the effects of environmental antigens in newborns and infants. According to WHO experts, about 10-15% of children under 5 years of age and about 15-20% of schoolchildren suffer from this disease.

The relevance of the work is determined by the significant prevalence of atopic dermatitis in children, the growth of severe cases of the disease, including among young children, leading to a violation of the general condition, a decrease in the quality of life, and psychosocial adaptation.

Various climatic factors affect the postnatal development of the functional parameters of the skin. Early postnatal life is a period of active functional reorganization and physiological adaptation of the skin to the extrauterine environment.

The study used data from the Minsk City Clinical Dispensary for Skin and Venereal Diseases (MCCDSVD). The MCCDSVD data cover visits to pediatric clinics in Minsk and for the study, the selected cases with a diagnosis of "atopic dermatitis" were anonymized, excluding direct contact between researchers and patients.

The study focused on 603 cases of children under 2 years of age for the period 2005-2016, in order to analyze the seasonality of the primary detection of eczema and identify the association of morbidity with meteorological factors: air temperature and relative humidity.

It was found that outdoor climatic conditions affect the prevalence of childhood eczema. In particular, a significantly lower prevalence of eczema was found in areas with higher relative humidity, higher average temperatures, less precipitation, and fewer days requiring heat.

An increased risk of the first manifestations of atopic dermatitis in children under 2 years of age was found in the autumn period, which is probably closely related to the characteristics of the postnatal period under the influence of environmental factors of a seasonal nature (for example, an increased level of plant allergens).

A comparatively low incidence of atopic dermatitis was observed in the summer, which is consistent with a comparatively high air temperature and moderately low relative humidity.

A decrease in the relative risk was found with a high average monthly temperature, as well as an increase in the relative risk with high relative humidity.

Further studies aimed at clarifying the relationships between changes in climatic and microclimatic parameters with early atopic skin reactions will allow more effective control of the clinical manifestations of eczema in young children.

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EPIDEMIOLOGICAL FEATURES OF STOMACH CANCER PREVALENCE IN MINSK REGION

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This work is devoted to studying prevalence and mortality from stomach cancer in Minsk region. The work analyzes epidemiological data over the past 30 years and highlights the current situation with the incidence of stomach cancer among the population of the region. The main attention is paid to statistical aspects, such as the incidence of stomach cancer among age groups, place of residence, as well as gender distribution.

Keywords: Gastric cancer, malignant neoplasms, oncology, epidemiology, morbidity, mortality.

The territorial and temporal features of spread of malignant neoplasms serve as the basis on which multiple studies in the field of analytical epidemiology of oncopathology are based.

During the study period of time, namely from 1991 to 2021, favorable dynamics were observed to reduce the proportion of stomach cancer incidence in the population of the Republic of Belarus.

It was noted that during the study period the proportion of stomach cancer incidence in the male population decreased by 2.6 times, and in the female population by 3.25 times.

It was noted that stomach cancer in men in 1991 occupied the third ranking place (6.2%), and in 2021 it moved to fourth (6.3%). In women, stomach cancer dropped from second rank to sixth and its share in 2021 was 4%.It was also noted that the highest incidence of gastric cancer was recorded among the population of older age groups, namely 75-79 and 80-84 years.

The analysis of the incidence of stomach cancer in the male population of the region also revealed a steady decrease in the incidence of stomach cancer; the incidence of the female population was characterized by a moderate downward trend over the study period.

The incidence of stomach cancer in the male population during the observed period was on average 1.5 times higher than the incidence rate in the female population.

Based on the results of studying the dynamics of the annual rate of increase/decrease in the incidence of stomach cancer among the population of Minsk region, it was revealed that for the period 1991-2021. There were annual fluctuations in the incidence of the population with periods of growth and decline.

In the dynamics of gastric cancer incidence rates for the period 1991-2021 of the rural population of Minsk region, a trend towards a steady decrease in morbidity was revealed.

When analyzing the morbidity of the urban population, no pronounced changes in the direction of increase or decrease in morbidity were noted.

It should also be noted that incidence rates for 1991-2021. The rural population decreased by 2 times, while the indicators among the urban population decreased by 1.5 times. During the analyzed period, there was a tendency to reduce the gap between morbidity rates among the rural and urban populations.

The level of detection of gastric cancer in patients in the early stages is average and remains almost on par with later detection of the disease.

The mortality rate of the male population due to stomach cancer during the observed period was on average 1.8 times higher than that for the female population.

Mortality due to stomach cancer in the male population of Minsk region during the study period decreased by 1.8 times, in the female population the rates decreased by 2 times, in both sexes the rates decreased by 2 times.

Based on the results of studying the dynamics of the annual rate of increase/decrease in mortality due to stomach cancer in the population of Minsk region, it was revealed that for the period 1991-2021. There were annual fluctuations in mortality with periods of growth and decline.

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THE EVALUATION OF ANTIMICROBIAL PROPERTIES OF ANTIBIOTIC DRUGS AGAINST CLINICALLY SIGNIFICANT MICROORGANISMS

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Microbial resistance now accompanies the use of every significant class of antibiotics. The presence of bacterial pathogens with multiple resistances has become common practice in healthcare settings worldwide. Resistance

mechanisms typically involve modification of the bacterial cell wall structure, effects on the ability of bacteria to develop biofilms, expression of genes responsible for the activity of efflux pumps, alteration or emergence of new targets, and enzymatic modification of the antibiotic structure itself.

Keywords: microorganisms, resistance, antibiotic, infection, cell, mechanism of action.

Antibiotic resistance is the resistance of microorganisms to antimicrobial chemotherapeutic agents. At least four biochemical mechanisms responsible for the development of antibiotic resistance in bacteria are currently known: antibiotic detoxification; decreased permeability of the microorganism wall for antibiotics and/or pumping it out of the cell; structural changes in molecules that are targets for antibiotics; production of alternative targets for antibiotics [1, 2].

Various methods are used to detect antibiotic resistance. They are divided into phenotypic (traditional) and molecular genetics. Phenotypic methods include: disk diffusion method; combined E-test, serial dilution method [3]. All phenotypic methods are based on the principle of MIC - the minimum concentration of an antibacterial drug required to suppress the visible growth of a microorganism in vitro. The MIC is measured in μg/ml or mg/l [4].

The aim of the work was to develop methods for assessing the antibiotic resistance/sensitivity of microorganisms and to identify the antimicrobial properties of widely known antibiotics against clinically significant microorganisms. The objects of the study were bacterial cultures *E. coli, St. aureus, P. aeruginosa, B. subtilis*.

Antibiotic resistance/sensitivity was assessed using the disk diffusion method for all study objects and the serial dilution method for *St. aureus*. All studied bacterial cultures showed sensitivity to antibiotics, namely, to ciprofloxacin, amikacin and gentamicin. The E. coli culture showed high sensitivity to amikacin and gentamicin and low sensitivity to ciprofloxacin. A similar situation was observed for *St. aureus*. The *B. subtilis* culture, on the contrary, turned out to be the most sensitive to ciprofloxacin and showed lower sensitivity to amikacin (insignificantly) and gentamicin. In *P. aeruginosa*, equally high sensitivity to ciprofloxacin and gentamicin was observed, and sensitivity to amikacin was lower. The obtained results of the study allow us to evaluate the effectiveness of the fight against one or another ABP with the corresponding microorganisms. Thus, for the treatment of infectious diseases of the gastrointestinal tract associated with E. coli, the most appropriate is supposed to be amikacin and gentamicin, for the treatment of staphylococcal infection it is effective to use amikacin and gentamicin, and for the treatment of *Pseudomonas aeruginosa* - ciprofloxacin and gentamicin.

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IMPACT OF ECOLOGICALLY SUSTAINABLE MATERIALS ON HUMAN HEALTH

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This work presents current data on the degradation process of bioplastics based on gelatin, agar-agar, corn starch, and spirulina, as well as their potential impact on human health through the release of micro-particles and additives, such as glycerol, capable of causing inflammatory reactions and metabolic disorders upon prolonged exposure [1].

Keywords: biodegradable materials, impact on human health, micro-particles, glycerol.

The use of biodegradable materials such as gelatin, agar, corn starch, and spirulina in bioplastics is an environmentally safe alternative to traditional plastics [2]. However, during their degradation, micro-particles are released, which can enter the human body through food or air, causing inflammatory reactions [3].

The degradation of such bioplastics in soil and water has been studied, demonstrating their effective degradation (Fig. 1) [4]. Nevertheless, there is an influence of these particles on health. Glycerol, often used as a plasticizer to enhance the flexibility of bioplastics, may pose risks due to its ability to disrupt cell membrane integrity and metabolic processes when absorbed into human tissues. Prolonged exposure may lead to systemic inflammation or metabolic disorders [5].

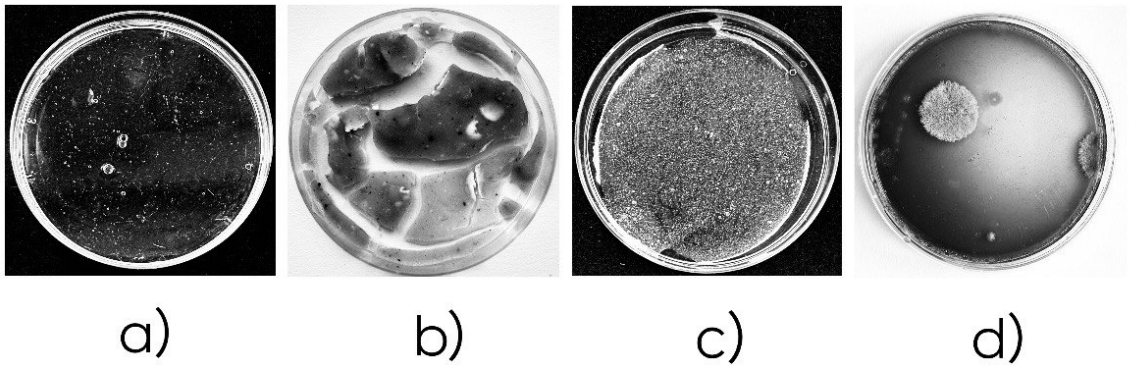

Fig.1 - Results of the degradation of bioplastics made from gelatin (a), starch (b), agar (c), and spirulina (d)

Despite the fact that bioplastics demonstrate more effective degradation in natural environments compared to traditional plastic materials, the impact of the released micro-particles on human health and ecosystems remains significant.

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COMPARATIVE ASSESSMENT OF CHANGES IN THE NUTRITIONAL STATUS OF RATS DURING CONSUMPTION OF SUNFLOWER AND VEGETABLE OIL MIXTURE

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Vegetable oils are a necessary component of a balanced human diet, as they have high nutritional value. The presence of essential components in many vegetable oils makes them important products in the diet. Together with them, the body receives a number of physiologically important substances: phosphatides, essential polyunsaturated fatty acids, vitamins, sterols.

Keywords: sunflower oil, energy value, nutritional value, nutritional status, body mass index, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, biochemical parameters.

Sunflower oil is the most common of the vegetable food oils used in Belarus, so the analysis of the effects of its long-term consumption is relevant. It is important to assess the effects of oil precisely in the case when its share in the diet is significant.

The studies were conducted on mature male rats (6-8 months) weighing 300±15 grams. The animals were kept in the vivarium of the Institute of Physiology of the National Academy of Sciences of Belarus in accordance with established standards.

In the control group, the body weight changed most smoothly: the animals gained an average of 10-20 g per week. A similar picture was also noted in the sunflower oil group. In this case, in the case of using the mixture, a tendency for the indicator to increase was noted by the middle of the experiment. The weight of the rats when consuming the vegetable oil mixture was significantly higher than the control values only after the 5th week - by an average of 9%. Despite the visible differences, the indicators leveled off with the values of the sunflower oil group and the control group by the end of the observation period. It is important to note that in the mixture group, 2 rats out of 8 died during the chronic stage of the experiment on the 2nd and 3rd weeks of feeding. Autopsy of the animals showed a large amount of bile in the almost empty intestine, as well as pale liver.

The body mass index of animals, despite the general tendency to exceed, did not differ significantly from the control in the experimental groups. For a more in-depth analysis, the Lee body mass index, which is more applicable to rats, was used. In all experimental groups, a general tendency towards higher values of this indicator was noted. However, only in the case of sunflower oil (+4%) were these differences reliable. In two groups, a slight growth retardation was also noted - by 2.5-5% in relation to the control. This picture may indicate possible metabolic disorders, which ultimately leads to weight gain and a decrease in growth rate. There are no reliable differences in the Lee body mass index in the case of consuming vegetable oil mixture, which may indicate fewer negative effects than in the case of consuming pure refined and deodorized oils.

The pattern of changes in body mass index and body weight dynamics may indicate possible metabolic disorders, which ultimately leads to weight gain and a simultaneous decrease in the growth rate in the middle of the experiment. No significant differences in the body mass index were found in the case of consuming vegetable oil mixture, which may indicate fewer negative effects than in the case of consuming pure refined and deodorized sunflower oil.

When assessing the biochemical parameters of mixed blood, it was shown that the consumption of sunflower oil and a mixture of oils does not lead to a significant change in carbohydrate and protein metabolism. In turn, when sunflower oil is introduced into the diet, there is a significant decrease in the level of high-density lipoprotein cholesterol compared to the control group.

Thus, long-term consumption of both sunflower oil and vegetable oil mixture generally has a negative effect on the nutritional status of rats, which is expressed in fluctuations in body weight dynamics, growth retardation at certain stages, as well as changes in biochemical processes associated with lipid metabolism. At the same time, by the end of the experiment, in the case of the vegetable oil mixture, probably due to compensatory processes, changes in the nutritional status and biochemical indicators did not differ significantly from the control values, from which it can be concluded that these changes are not so negative for the body. In the case of sunflower oil, statistically significant differences were noted both in the change in body mass index and in biochemical indicators, in particular high-density lipoprotein cholesterol, in relation to the control group, which indicates reliable negative consequences of long-term consumption of sunflower oil, and to a lesser extent - a mixture of oils.

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THE EFFECT OF SCHISTOSOMIASIS ON THE HUMAN BODY

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The paper presents conclusions about the actions of flatworms of the family Shistosomatidae on the human body. Today schistosomal dermatitis is registered in many countries and is a global problem. Research is underway to develop measures to combat this infestation, but there is no universal method of treatment, but in most cases the drug praziquantel is used. Further research on schistosomiasis is needed to develop a universal control method.

Keywords: parasitic invasion, schistosomiasis, cercariosis

Schistosomiasis are biohelminthoses caused by sexually separated trematodes, haematophagous, living in the adult stage mainly in the venous vessels of the circulatory system of humans and some mammals and developing in the larval stage in freshwater molluscs [1].

Schistosomiasis still remains an urgent and serious global health problem. The helminthiasis is registered in more than 70 countries, in which the number of infected people exceeds 250 million [1].

There are 3 stages of disease development: early stage (phase of cercariae penetration through the skin with their subsequent migration in the blood), stage of developing invasion (stage of larval dissemination) and late stage (stage of complications and irreversible changes).

The early stage is manifested by itchy skin lesions, localised urticaria - schistosomatid dermatitis. This is a dermatological disease of parasitic nature, caused by infection of the skin with schistosome larvae. The symptoms of this condition are skin itching, the appearance of red spots and papules on the skin, urticaria and allergic oedema. In rare cases, there is fever, dry cough, and dizziness.

Cercariae are most often found in warm shallow water bodies with fresh, stagnant water. A prerequisite is the presence in the lake of some species of molluscs, which act as intermediate hosts for trematodes - in their organism the transformation of miracidia into cercariae takes place.

Humans are infected by contact: when bathing in fresh water containing larvae, there is contact with unprotected skin and the parasite larvae first attach to the surface of the skin, and then with the help of gnawing apparatus penetrate into its thickness. Children and adolescents who like to play in water are particularly vulnerable.

These parasites, despite the fact that they can cause diseases of the intestine and urinary system, the cause of schistosomatid dermatitis in humans is rare. Cercariae of trematodes parasitise in the organism of waterfowl, and man acts as an ‘accidental host’. The peculiarity of the course of schistosomiasis in humans is due to the fact that trematode larvae are not adapted to parasitism in this organism.

Symptoms of primary infection include an inflammatory reaction. This is due to the fact that trematode larvae secrete hydrolytic enzymes into the body to penetrate deeply into the host tissue. These enzymes have strong allergic and immunogenic properties. This is the reason for the marked inflammatory response. As stated above, man is not the definitive host for schistosomes. Therefore, trematode larvae die in the thickness of the skin. The inflammatory reaction is intensified by the fact that there are decomposition products of cercariae. This reaction is observed in the final stages of the disease, after which the person recovers.

During secondary infection, the disease becomes more pronounced, and various general symptoms are added. This is due to the fact that the primary infection sensitises the body to the decomposition products of the cercariae, which gives the secondary infection a rapid allergic reaction and more severe symptoms.

Schistosomal cercariasis is a problem in water bodies in almost all countries of the world. However, no universal method of pathogen and vector control has yet been developed due to the large number of factors involved in transmission of the infestation.

There is an urgent need for new drugs against this disease, because the treatment of all species forms of schistosomiasis currently depends entirely on one drug - praziquantel, a pyrazinoisoquinoline derivative, which is available as 600 mg tablets. It is an effective, safe and inexpensive antihelminthic drug. Continuous use of this drug increases the risk of resistance development and requires increased monitoring of drug ineffectiveness. Therefore, further study of schistosomiasis is an important public health objective worldwide to reduce the incidence of the disease and to improve and create new methods of controlling this infestation [2].

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STRUCTURE AND FUNCTIONS OF LACTOFERRIN

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The aim of this work is to study the biochemical properties and functions of lactoferrin from literary sources and its practical application in medicine.

Keywords: lactoferrin, functions, biochemical properties of lactoferrin.

Lactoferrin (known as lactotransferrin, LF) with a molecular weight of about 80 kDa is (Figure 1) a functional glycoprotein that contains about 690 amino acid residues. It was first isolated from cow's milk by Sorensen in 1939 and was first isolated from human milk by Johansson in 1960 [1, 2].

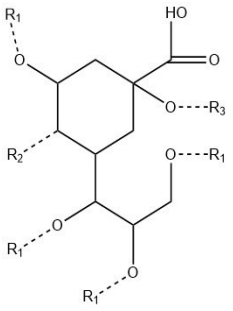

Fig. 1 - Structure of lactoferrin

Lactoferrin acts not only as an endogenous and chelating compound, but also performs the function of an endogenous immunomodulator and adaptogen. The immunomodulatory function manifests itself as anticarcinogenic and antipathogenic activity. Lactoferrin accelerates the maturation of T-cells, induces the synthesis of interleukin-18 and interferon gamma, reduces the inflammatory process. It has a positive effect on the intestinal microflora, normalizes it after the use of antibiotics, activates metabolic processes, reduces the level of glucose, cholesterol and low-density lipoproteins with an increase in testosterone levels. Also, purified recombinant lactoferrin is effective in stopping the effects of neurodegenerative processes.

According to literary sources, lactoferrin is used in pediatric practice for the treatment of sepsis in newborns, for the enrichment of nutritional mixtures, in sports nutrition as a safe alternative to doping, for antibiotic resistance, in obstetrics and gynecology, as an immunomodulatory agent for respiratory and intestinal infections, for the prevention of nosocomial infections in children's hospitals. Goat recombinant human lactoferrin has broad prospects for use in the food, pharmaceutical and agricultural industries.

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PROGNOSTIC INDEX AS A TOOL FOR PREDICTING THE PREVALENCE OF BLADDER CANCER IN THE REPUBLIC OF BELARUS

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The paper provides an assessment of the prognostic index of the population of the Republic of Belarus in 1991 – 2021. The prognostic index for bladder cancer of both sexes, male and female population of the Republic of Belarus since 2004 maintains good and relatively good prognoses. During the studied period, there is a pronounced tendency to decrease the prognostic index for bladder cancer among both sexes, male and female population of the Republic of Belarus.

Keywords: bladder cancer, prognostic index, trend.

Prognostic index is an indicator indicating the level of development in diagnostics and treatment of oncopathologies. The prognostic index reflects the probability of dying from a particular form of oncopathology; the closer its value is to one, the worse the prognosis for a given localization. Based on this ratio, the most common localizations of malignant neoplasms can be divided into three groups: localizations with a good prognosis (the ratio is 0,3 or less), with a relatively good prognosis (from 0,3 to 0,5), with a poor prognosis (0,5 or more).

Based on data on morbidity and mortality in dynamics by year from 1991 to 2021. A prognostic index for bladder cancer was calculated for the male population, the female population and both sexes. During the studied period (1991 – 2021), a tendency towards a decrease in the prognostic index for the male population of the Republic of Belarus was noted, which indicates a favorable prognosis for this localization. Its value in the period from 1991 to 2003 is characterized by a poor prognosis (from 0,5 and more). However, since 2004, the prognostic index has become relatively good (from 0,3 to 0,5) and in 2011, 2013 – 2019 it is characterized by a good prognosis. The most favorable prognosis was observed in 2013 and reached a value of 0,25. It is worth noting that the probability of mortality due to bladder cancer among the male population decreased by 0,63 times (the value of the prognostic index in 1991 was 0,57, in 2021 – 0,36).

At the beginning of the observation period in 1991, the value of the prognostic index among the female population was 0,64, in 2021 – 0,30. It is worth noting that a good prognosis was observed in 2007 – 2019 and 2021. The best value of the prognostic index was achieved in 2008, and it was 0,18. Thus, during the studied period, a pronounced tendency towards a decrease in the prognostic index for the female population of the Republic of Belarus was noted. Among the female population, the prognostic index for bladder cancer decreased by 0,47 times compared to 1991. It can be noted that the values of the prognostic index of the female population were more favorable than for the male population.

The prognostic index for bladder cancer in the population of the Republic of Belarus in the period from 1991 to 2021 also has a pronounced downward trend. From 1991 to 2003, it is characterized by a poor prognosis (from 0,5 and more). However, the value of the prognostic index for bladder cancer among both sexes of the population of the Republic of Belarus reached a good prognosis in 2008, 2011 – 2019. The lowest value of the prognostic index was observed in 2013 and amounted to 0,24. There was a pronounced tendency towards a decrease in the prognostic index for both sexes of the population of the Republic of Belarus. The probability of mortality due to bladder cancer among both sexes of the population of the Republic of Belarus decreased by 0,60 times (the value of the prognostic index in 1991 was 0,58, in 2021 – 0,35).

Thus, currently, the Republic of Belarus is experiencing a decrease in the prognostic index values. On the one hand, this may indicate the development of treatment and diagnostic methods, thanks to which cases are detected at an earlier stage and with greater treatment effectiveness, on the other hand, this may be due to the greater prevalence of this disease due to the aging of the population and the rejuvenation of the pathology.

THE ROLE OF ENVIRONMENTAL FACTORS IN THE DEVELOPMENT OF PERINATAL PATHOLOGY

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The article examines the influence of environmental factors in the development of perinatal pathology of the population of the Republic of Belarus.

Keywords: ecology, environmental factors, newborns, perinatal period, perinatal pathology, dysembriogenesis.

Perinatal pathology is a disease and conditions that occur in the fetus or newborn during the perinatal period covering the time from the 22nd week of pregnancy to the first 7 days of the newborn's life. Perinatal pathology includes congenital anomalies, birth trauma, asphyxia and other disorders affecting the viability and health of the child.

Among the possible causes and risk factors for perinatal abnormalities, a special place should be given to environmental pollution, which contributes to the emergence of various pathological processes in the human body. At the same time, the complex of environmental factors is extremely diverse, has territorial features, and is determined by the presence of active and potentially dangerous agents that can cause dysembriogenesis and contribute to the growth of abnormalities in the perinatal period.

Pollutants accumulate in significant concentrations in environmental objects, especially in atmospheric air, soil, sediments and water bodies. They enter food and drinking water through trophic chains. The influence of environmental factors on human health, especially during critical periods of its development, is one of the topical topics in modern medicine and biology. Polluted air, water and soil may contain toxic chemical compounds, heavy metals, pesticides and other harmful substances that can enter the body of a pregnant woman and affect the developing fetus. Issues related to the environmental impact on perinatal health are of particular importance for urban regions with a high degree of pollution, where pregnant women and newborns are at greater risk.

One of the key directions in solving the problem of perinatal pathology is prevention. Early diagnosis, prenatal and the perinatal care play a key role in reducing the risk of these pathologies and improving the prognosis for the health of newborns. Improving prenatal screenings, monitoring the health status of a pregnant woman, and organizing timely and high-quality medical care at all stages of pregnancy and childbirth are crucial factors in reducing morbidity and mortality among newborns.

In this regard, it remains relevant to search for the most informative risk factors that allow predicting the likelihood of this pathology and planning preventive measures to prevent the birth of children with birth defects. To reduce the negative impact of environmental factors, comprehensive measures are needed, including improving the environmental situation, raising public awareness of possible risks and developing preventive programs aimed at protecting the health of pregnant women and their children. It is important to note that the prevention and early diagnosis of perinatal pathologies caused by adverse environmental factors requires an interdisciplinary approach, including close cooperation between environmentalists, physicians and public health specialists. Improving the quality of medical care, expanding preventive programs and interdisciplinary interaction of specialists can significantly reduce the risk of developing perinatal pathology and ensure a healthy future for newborns.

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LUNG CANCER INCIDENCE TRENDS IN THE RECHITSA DISTRICT

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Lung cancer is currently an important problem for all mankind. The disease has been leading both in the number of cases and mortality rates among all oncologic diseases for a number of years already. The aim of the study is to examine the dynamics of lung cancer incidence in Rechitsa district and the Republic of Belarus, as well as their relationship with global trends in the development of this disease.

Keywords: lung cancer, lung cancer morbidity, statistics of lung cancer morbidity

Every year, about 2.2 million cases of lung cancer are diagnosed worldwide, or 11.4% of all detected malignant neoplasms, which puts it in second place after breast cancer. In men, lung cancer ranks first and accounts for 14.3% of all cases of tumor diseases. Among women, it is less common - 8.4% and ranks third in prevalence after breast and colon cancer. On average, by the age of 74, 4 out of 100 men and 2 out of 100 women will face lung cancer worldwide. Men get sick several times more often than women, which is due to the popularity of smoking among men.

The conducted analysis of statistical data on the number of lung cancer cases among patients in the Rechitsa district for 2018-2023 indicates that in recent years there has been a tendency towards a decrease in the incidence of lung cancer. The determination coefficient of this indicator was 0.93. The highest incidence rates of lung cancer were observed in 2019 and amounted to 0.71 cases per 1000 population, and the lowest in 2021 - 0.38 cases and 2023 - 0.36 cases per 1000 population, which may be due to the COVID - 19 pandemic. Mortality from lung cancer also decreased over the studied period of time (determination coefficient $R2 = 0.53$). In 2019, it was maximum - 0.62 cases per 1000 population and minimum in 2021 - 0.27 cases and 2023 - 0.29 cases per 1000 population.

It should be noted that lung cancer cases are highly detected during routine examinations. However, from 50% to 70% of cases were detected only at stages 3-4 of the disease, which indicates too late diagnosis and determines high mortality rates. In total, this means that the strategy of routine medical examinations shows very low efficiency. Lung cancer differs from other forms of oncopathology by a high degree of metastasis, caused by the migration of malignant cells from the pulmonary circulation through the arterial system throughout the body. Often, these metastases develop much faster than the primary tumor. The problem is complicated by the impossibility of detecting the tumor in the early stages and its detection already in the late stages, when the first symptoms appear, which causes a severe course of the disease and high mortality. We also studied the distribution of patients in the Rechitsa district with lung cancer by age. Global trends indicate that the main incidence of lung cancer occurs in the period from 55 to 80 years, and the peak is noted in the age groups of 60-64 and 65-69.

In the Rechitsa district, for the period studied from 2019 to 2022, there was a decrease in the incidence in the age groups of 55-59, 75-79, 80-84, and a stable increase in the incidence in the age group of 65-69 years, which may indicate demographic aging of the population. In addition, it is possible to note the emergence of cases of the disease in the age groups of 45-49 and 50-54, which may indicate that the incidence of lung cancer is “getting younger”.

When studying the age structure of patients with lung cancer, a large number of cases can be noted in the group of 60-64 years (23.7%) and 65-69 (21.5%) years, and the smallest in the groups of young people 45-49 years (2.7%) and> 85 years (3.2%) and is probably associated with a smaller number of people in these age groups.

Thus, in the Rechitsa district in recent years there has been a tendency towards a decrease in the incidence of lung cancer. The average age of patients is in the range from 55 to 75 years. At the same time, for the period 2019-2022,

there has been an increase in the incidence of lung cancer in the age group of 65-69 years. It is also possible to note the global trend in the average age of patients in the range from 50 to 80 years. The system of medical examinations allows to detect up to 70% of lung cancer cases. Nevertheless, lung cancer does not give any symptoms for a long time and spreads metastases very quickly, therefore, most of the detected cases are at stages 3-4, which is associated with low operability and resectability rates, which means that the medical examination strategy is not effective enough. All of the above raises the question of the need to study and implement new methods for diagnosing lung cancer.

KIDNEY MORBIDITY ANALYSIS OF THE POPULATION OF MOGILEV

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The article analyzes statistical data on the incidence of chronic pyelonephritis and chronic glomerulonephritis in the population of Mogilev city for 2019-2023.

Keywords: glomerulonephritis, pyelonephritis, kidneys, statistics.

The kidneys are the main organ of excretion of the end products of nitrogen metabolism, and the organ that maintains the constancy of physicochemical conditions, osmotic pressure and alkaline acid equilibrium in the body. This basic role of the kidneys cannot be replaced by any other extreme excretory system. The loss or abrupt impairment of kidney function in humans in some pathological conditions leads to death.50 million people worldwide suffer from various kidney diseases. Chronic kidney disease (CKD) causes 2.4 million deaths per year and Acute Kidney Damage (AKD), an important cause of subsequent development of CKD, affects 13 million people worldwide [1].

1. The average annual growth rate of rough intensive indices of chronic pyelonephritis morbidity in the population of Mogilev city is 5.18%, chronic glomerulonephritis morbidity in the population is 1.73%.

The morbidity of chronic glomerulonephritis of the population of Mogilev is characterized by a moderate tendency to growth, and chronic pyelonephritis by a tendency to decline.

2. In 2019, the first place in the structure of primary morbidity of the population of Mogilev is occupied by respiratory diseases (40%), the second place - injuries and poisonings (18%), the third place - diseases of the cardiovascular system (7%).

The contribution to the structure of primary morbidity of the population of Mogilev in 2023 diseases of the genitourinary system of the system amounted to 4%.

In 2019, the first place in the structure of primary morbidity of the population of Mogilev city is occupied by diseases of the respiratory system (43%), the 2nd place - injuries and poisonings (17%), the 3rd place - diseases of the cardiovascular system (8%).

The contribution to the structure of primary morbidity of the population of Minsk in 2023 diseases of the genitourinary system amounted to 5%.

3. During the work it was concluded that the incidence of chronic pyelonephritis for the study period is higher among the female population of Mogilev, and 6 times, and chronic glomerulonephritis for the study period is higher among the male population of Mogilev, and 2.5 times.

The study also found that the incidence of chronic pyelonephritis during the study period is higher among people in the age category 51-60 years and 61 years and above. And the incidence of chronic glomerulonephritis during the study period is higher among persons in the age category 0-18 years and 19-30 years and above.

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BIOLOGICAL ACTIVITY OF PURINES

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Purines are complex heterocyclic organic nitrogenous substances that are part of nucleotides and nucleosides. They are important structural elements of nucleic acids (DNA, RNA), energy sources (for example, ATP), enzymes (NADP, NAD, FAD).

These substances are necessary for the storage, transcription and translation of genetic information, cell growth and division, energy storage, and signal transmission. In the human body, endogenous synthesis of purines occurs, the mutual conversion of nucleosides and nucleotides and their catabolism. The end product of purine metabolism is uric acid. If the content of purines in the human body significantly exceeds the norm, this interferes with their normal excretion and leads to a deterioration in well-being.

Keywords: purines, uric acid, purine metabolism

About 30 disorders of various stages of purine and pyrimidine metabolism have been described, but only 17 of them are clinically manifested. The main laboratory signs of these diseases are changes in the level of purines and pyrimidines in biological fluids. The first signs may appear both in early childhood and in old age, and the symptoms may be of varying severity. Most often, disorders of purine and pyrimidine metabolism affect the nervous system (developmental delay, autism, epileptic seizures), hematopoietic tissue and kidneys (nephropathy, urolithiasis). A classic example of an acquired disorder of purine metabolism is gout, a disease in which the level of uric acid in the blood rises and deposits of urates form in the tissues. However, it should be borne in mind that elevated uric acid levels in people over 40 years of age may be associated not only with hereditary factors, but also with nutrition, alcohol consumption and impaired kidney function. At a younger age or in childhood, elevated uric acid levels and gout are most often associated with hereditary defects [1].

The lack of adenosine deaminase and purine nucleoside phosphorylase leads to problems not only with the nervous system, but also with the immune system, manifested in the form of frequent severe infections.

Gout is based on a violation of purine metabolism. Purines are nitrogen–containing compounds that come from food and are synthesized in the body. A large amount of purines is found in animal products. In the body, they are broken down to uric acid and in this form are excreted from the body through the kidneys. Disorders of purine metabolism lead to deposits of uric acid in various organs and tissues, mainly in joints. (The joint located at the base of the big toe is most often affected.) These joints tend to become inflamed, which is expressed in their redness, swelling and severe pain [2].

It is important to know how to reduce the level of uric acid in the blood and maintain it at a normal level. The first step in dealing with elevated uric acid levels is to become aware of your lifestyle and diet. Proper nutrition plays a key role in this process. Avoid foods rich in purines, such as salads, peas, mushrooms and beans.

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EVALUATION OF ANTIBACTERIAL ACTIVITY OF TURMERIC EXTRACTS OF DIFFERENT MANUFACTURERS

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A comparative analysis of antibacterial activity of turmeric extracts from different manufacturers was carried out on the example of spices from India, Uzbekistan and Russia. The work is based on the method of disc-diffusion analysis.

Keywords: turmeric, disc diffusion assay, Staphylococcus aureus, Escherichia coli.

Curcuma (Curcuma longa) is a plant belonging to the ginger family (Zingiberaceae), which originated in India and is now cultivated among other parts of the world, including South-East Asia, China and Latin America.

The various parts of the plant (rhizomes, leaf, stem, flower and herbaceous material) are mainly used in traditional medicine, but the most important appears to be the root stem. Studies have shown that the chemical composition of the rhizome depends on various factors, including the climatic conditions in which turmeric grows. [1]

The object of the study is turmeric from 3 different manufacturers (Russia, Uzbekistan, India). a 0.5 gram weight of turmeric was dissolved in 5 ml of ethyl alcohol. The ratio of extract-gent: solvent (1:10) was chosen according to the methodology of preparation of turmeric extracts, with further preparation of discs with prepared samples. [2]

In the disc diffusion assay, the anti-antibiotic sulfamethoxazole/trimethoprim was used as a control disc. This antibiotic has sensitivity towards both Gram-positive and Gram-negative strains of bacteria.

The following relationships exist between the degree of sensitivity of the microbe to antibiotics and the size of the no-growth zone: sensitive (S), with a no-growth zone diameter of ≥16 mm; moderately resistant (R/S) with a no-growth zone diameter of 11 to 15 mm; resistant (R) with a no-growth zone diameter of ≤10 mm.

The following cell cultures were selected for the study of antibacterial activity of turmeric alcohol extracts: Staphylococcus aureus and Escherichia coli.

The alcoholic extracts of turmeric showed varying degrees of antibacterial activity against E.coli and St.aureus depending on the manufacturer.

The highest antibacterial activity was shown by turmeric extract produced in India. Against Staphylococcus aureus, the zone of inhibition was 13 mm in diameter. With respect to Escherichia coli, the zone of inhibition was 12 mm. This indicates moderate antibacterial activity against both Gram-positive and Gram-negative microorganisms.

The extract of Uzbek turmeric showed antibacterial activity against E.coli. The zone of inhibition of growth was 12 mm in diameter. St.aureus was found to be resistant to Uzbek turmeric powder.

Russian turmeric extract showed the least antibacterial activity against E.coli (zone of inhibition was 9 mm). Staphylococcus aureus was found to be resistant to shop powder (zone of inhibition 6 mm in diameter).

The study, the results of which are presented in this paper, are aimed at investigating the antibacterial properties of alcoholic extracts of turmeric from different manufacturers, which in future may be used as antibacterial agents in medicine and various industries such as, for example, food and chemical industries.

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HOUSEHOLD DUST AND ITS ALLERGIC EFFECT ON THE HUMAN BODY

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The article examines the study of the problem of house dust and its effect on the human body. Despite the fact that epidemiologists are extensively studying the problem of allergic diseases to dust, the frequency of immune reactions to household dust is increasing, even in places with low prevalence. Tick-borne sensitization accounts for 1-2% of people worldwide by 2023. And it is registered in 50-90% of patients with allergic pathology. Nevertheless, due attention to household sensitization and sources of household allergens is not noted, even with confirmed allergic diagnoses.

Keywords: allergens of household dust, household dust, household sensitization, dust mites.

Dust is small and solid particles of organic or mineral origin, with a diameter ranging from fractions of a micron to 0.1 millimeters. About 70% of the dust that settles on the ground is natural dust, and human waste products account for 30%. The dust consists of 35% mineral particles, 12% paper and textile fibers, 19% epidermis scales, about 7% flower pollen and 3% smoke and soot particles. The remaining 24% is of unknown origin, suspected cosmic dust. The organic part of the dust is an excellent substrate for the development of fungi, bacteria and house mites. It is known that about twenty kilograms of dust accumulate in an apartment every year. It has been proven that most of the dust enters the house with air, and not because of dirty shoes or clothes [1].

Dust mass is a living, well—organized microbiome of successfully interacting bacteria. Dutch Professor R.Voorhorst and the Japanese researcher S.Oshima identified mites of the Pyroglyphidae family in the dust collected in different houses. An aqueous salt extract from the dust containing these mites gave positive dermatological reactions in patients with hypersensitivity to household dust. It has been proven that the presence of these mites in the dust creates a strong allergenic background in the environment of patients with a genetic predisposition to atopy. From that moment on, intensive study of the fauna, biology, ecology and medical significance of house dust mites began all over the world. However, in rural areas, dozens of other species of mites of this family and subclasses of Acari can be found in house dust.

The main habitat of house dust mites is a sleeping place, the number reaches approximately 30,000 individuals per 1 gram of dust. Mattresses, especially seams and buttons, are frequent places of their accumulation. The largest population of mites is located at the head of the bed. Allergenic to humans are living and dead mites, products of their vital activity. At the same time, most of the allergens are contained in their excrement [2].

In order to reduce the number of mites and the amount of dust, you can reduce dust-collecting things, regularly carry out wet cleaning of premises, store things only in closed cabinets, replace pillows and blankets with natural filler with synthetic fillers, use a vacuum cleaner with high-purity filters and change the dust collector at least twice a week, regularly ventilate the room, wash bed linen 1 time in 7-10 days at a temperature of at least 60 ° C, treat mattresses and upholstered furniture with a steam cleaner or a hot iron with steam. Those things that cannot be washed can be frozen at a temperature no higher than -18 ° C for at least 2 hours.

For a person suffering from allergies, it is recommended to maintain a relative humidity of 30-50% in the room. In case of detection of mites in the examined room, acaricidal agents are used, they are carried out for medical reasons [3].

From an environmental point of view, dust is a factor that affects human health, sanitary and epidemiological situation. Dust has different origins and differs in its physico-chemical properties: specific gravity, flammability and other characteristics. Cellulose, cotton, wool fibers, hair, human epidermis, mold spores, bacteria, animal hair, insect particles, synanthropic mites, and plant pollen are found in the organic component of household dust. In residential areas, most of the dust collects in carpets, upholstered furniture and books. House dust mites are more harmful to health, they are the cause of allergies and asthma. Thorough wet cleaning, the use of cleaning vacuums, regular wiping of furniture reduces the level of dust in the apartment.

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SENSITIVITY OF BACTERIA OF THE GENUS STAPHYLOCOCCUS TO ANTIBACTERIALS PREPARATES

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The condition of the skin is one of the indicators of the well-being of the body, since the skin is closely connected with all organs and systems, being a barrier between the environment and the internal environment. The skin microbiome plays an important role in maintaining health and protecting the body from pathogenic microorganisms. If the balance of the skin microbiome is disturbed, problems such as acne, eczema and other inflammatory skin diseases can occur. The leading role in the etiology of these diseases is played by bacteria of the genus *Staphylococcus.*

Keywords: Skin diseases, antibiotic drugs, *Staphylococcus aureus*.

The normal microflora of the skin plays an important role in preventing the colonization of the skin by opportunistic and pathogenic microorganisms. Its composition may change in chronic dermatoses (eczema, psoriasis, atopic dermatitis), undergoing dysbiotic changes and characterized by a significant variety of species composition, which is represented by microorganisms of the following families: *Micrococcaceae* (genus *Staphylococcus), Streptococcaceae, Enterobacteriaceae*, etc.

The genus *Staphylococcus* includes 35 different species. Due to the ability to produce coagulase, the genus is divided into coagulase-positive and coagulase-negative. The most common representatives are *Staphylococcus aureus* and *Staphylococcus epidermidis.*

The *S. aureus* bacterium exacerbates skin inflammation and allergic reactions by rejecting both adaptive and innate immune responses through a variety of mechanisms. A microorganism from the skin of subjects with atopic dermatitis secretes staphylococcal enterotoxin B, which acts as a superantigen and causes inflammation, causing uncontrolled activation of lymphocytes and macrophages [1].

The species composition and abundance of microorganisms in these diseases differ in the replacement of normal members of the microbiocenosis with representatives of the transient flora. The total number of strains isolated from eczematous sites was 244, the proportion of staphylococci was 72.1%, of which *S. aureus* was 46% (81 strains). In atopic dermatitis, 88.23% (45 strains) accounted for cocci flora, of which *S. aureus* accounted for 31.3%, which is 2 times more than in psoriasis. 167 strains of various microorganisms were isolated from the surface of psoriatic papules and plaques, staphylococci accounted for 77.84% (130 strains), and 23.1% of them were *S. aureus* [2].

To combat them, penicillin antibiotics were most often used as the main antibiotic drug, however, uncontrolled use of antibiotics, non-compliance with norms and rules of personal hygiene led to the appearance of resistance in microorganisms. In staphylococci, this led to the formation of two resistance mechanisms: the presence of penicillin-binding protein and the production of β-lactamases.

The problems of expanding the spectrum of infectious diseases, the growth of resistance of pathogens to antibiotics, and the high incidence of the population contribute to the search for alternative drugs with a wide range of antimicrobial effects.

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EPIDEMIOLOGICAL ASSESSMENT OF RESPIRATORY ORGAN MORDABILITY IN OSTROVETSKY DISTRICT

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The paper examines the dynamics of respiratory morbidity among the population of the Ostrovets district for 2018-2022. In the research, it was found that during the period 2018-2022 there was a steady trend of increasing incidence among the entire adult population. The highest incidence rates during this period are acute respiratory infections of the upper respiratory tract; lower rates – chronic bronchitis of the lungs.

Keywords: respiratory diseases, chronic obstructive pulmonary disease, pneumonia, asthma, acute respiratory infections of the upper respiratory tract, epidemiological assessment

Pulmonary diseases represent one of the biggest threats to human health. Over the years since the beginning of the century, it has not been possible to reverse the situation with pulmonary diseases, and their impact is likely to remain at the same level for several more decades. Lung diseases lead to disability and premature death, which in turn are associated with huge costs for medical care, hospitalization and medications. In addition, the damage caused by people losing their ability to work is significant. About 5.4 million people lose their ability to work each year due to asthma [1]. Respiratory diseases are a large group of diseases of various etiologies and pathogenesis with localization of the pathological process in the respiratory tract, which are one of the most common diseases among the population. According to official statistics, the respiratory system accounts for about 40% of all cases of morbidity, which exceeds the incidence rates of other classes of diseases. In the structure of reasons for seeking medical care, their share in various territories ranges from 29.2% to 43.5% among adults and from 65.4% to 83.8% among children. [2].

The aim of the work was to analyze the dynamics of respiratory morbidity among the adult population for 2018-2022 in the Ostrovetsky district.

The study found that for the period 2018-2022 there was a steady upward trend in respiratory diseases among the adult population. From 2019 to 2022 there was growth in both general and primary respiratory morbidity, and by 2022 the overall morbidity rate increased up to 28,907,1 people per 100,000 population; primary incidence to 24878, 5 people per 100,000 population.

In 2022, the main contribution to the structure of general (29.5%) and primary (57.1%) morbidity of the entire population was made by respiratory diseases. In the structure of general morbidity among the population of 18 years of age and older, the first ranks were occupied by diseases of the circulatory system (30.9%), and diseases of the respiratory system (21.5%), but in the structure of primary morbidity, respiratory diseases were in first place (49.4 %).

Thus, over the studied period of time, it was found that acute respiratory infections of the upper respiratory tract have a high incidence rate, and chronic bronchitis has a lower incidence rate. Based on all the data provided, the study shows that the incidence of all respiratory diseases has an increasing trend. At the same time, respiratory diseases occupy the first place in the structure of primary and general morbidity for the analyzed period. In connection with the increase

in morbidity rates, it is necessary to carry out further work with the population aimed at promoting a healthy lifestyle, timely vaccination, and medical examination of certain groups of the population for the purpose of early detection of diseases.

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EPIDEMIOLOGICAL ANALYSIS OF THE BEREZINO POPULATION MORBIDITY

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Morbidity is the level and frequency of the spread of the disease(s) among the population. Morbidity rates are calculated both for all diseases taken together and for each one individually. The purpose of studying morbidity is to characterize the health status of the population, plan the activities of medical services, develop preventive measures and evaluate the effectiveness of measures [1]. According to the morbidity of the population, its health is assessed, which is influenced by socio-economic conditions and lifestyle factors, environmental conditions and factors, biological conditions and factors, conditions and factors of the health system and services [3].

Keywords: health, morbidity, non-infectious pathology, respiratory diseases, circulatory system diseases, musculoskeletal system diseases, digestive diseases, eye diseases, neuropsychiatric diseases, injuries, mortality.

In the whole world, and especially in developed countries, there is an onset of chronic diseases and a retreat of acute, mainly infectious and parasitic. Non-epidemic, chronically occurring diseases have come out on top not only in the structure of mortality, but also in morbidity. Moreover, their prevalence, unlike acute infectious and parasitic diseases, has increased significantly. A similar situation is observed in the Republic of Belarus. In almost all classes of diseases, there is an increase in morbidity and, characteristically in the growing pathology, the predominance of chronic forms.

The purpose of this work was to calculate and analyze the morbidity rates of the Berezino population in the period 2017-2023, to analyze the dynamics of morbidity in the population as a whole and for certain classes of diseases, to identify the main trends [2].

Diseases of the cardiovascular system were the most common in the general morbidity of the population of Berezino, respiratory diseases were in second place, diseases of the musculoskeletal system were in third place, followed by diseases of the digestive system, as well as injuries, poisoning and other external influences. In 2017, diseases of the cardiovascular system accounted for 36% of the total morbidity, respiratory diseases 21%, diseases of the musculoskeletal system 15%.

By 2023, there was a decrease in the proportion of diseases of the cardiovascular system (34%), musculoskeletal system (14%), digestive system (8%), but there is an increase in the proportion of respiratory diseases (24%), genitourinary system (6%) and neoplasms (5%).

In the dynamics of the general morbidity of the adult population of Berezino, Minsk region, in the period from 2017 to 2023, there is a steady downward trend (R2 = 0.70). The average annual incidence rate is A0 = 13782.3%oo. The incidence decreased from 16026.7% of oo in 2017 to 11599.6% of oo in 2023. The largest decrease in the number of diseases was registered in 2021 to the level of 9961.8 cases of diseases per 10 thousand people of the adult population. Over the entire period of observation, the incidence of adult population in Berezino and Berezinsky district of Minsk region decreased by 27%. The average annual rate of decline was -3.78%.

A moderately pronounced growth trend is observed in the dynamics of the general morbidity of the adult population of Berezino with respiratory diseases (R2=0.53). The average annual value of the morbidity index A0=2727.1%oo. The

incidence increased by 21%. A steady decrease of 28% was found in the incidence of diseases of the digestive system in the population (R2=0.75). A0=1090.4%oo. The uncertain nature of the trend is noted in the dynamics of morbidity in the population of the city. Berezino diseases of the circulatory system (R2=0.06, A0=3868.3%oo), diseases of the musculoskeletal system (R2=0.13, A0=1586.7% oo) and in the dynamics of injuries (R2=0.001, A0=3868.3%oo).

The analysis of morbidity and its results are the basis for the development of preventive measures to improve public health, thereby influencing population mortality and life expectancy.

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THE IMPORTANCE OF ENVIRONMENTAL FACTORS ON RESPIRATORY DISEASE - BRONCHIAL ASTHMA

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By analyzing the literature, environmental factors that influence the respiratory disease, bronchial asthma, have been studied. Understanding these factors helps in developing effective prevention and treatment strategies for bronchial asthma, including trigger avoidance and comprehensive disease management.

Keywords: bronchial asthma, respiratory disease, environmental factors, triggers, air, tobacco smoke, nutrition

The study of environmental factors and their influence on bronchial asthma is necessary to understand the development and progression of the disease, as well as to find effective treatments for the disease. By studying the effects of air pollution, allergens, climate change, and other environmental influences, scientists and clinicians can effectively identify risk factors for bronchial asthma, develop preventive measures, and refine treatment strategies for patients with the disease [1].

Bronchial asthma is a chronic inflammatory disease of the airways involving many cells and cellular elements, characterized by the presence of respiratory symptoms such as wheezing, dyspnea, chest congestion and cough, which vary in time and intensity, and manifest together with variable airway obstruction [2].

Considering the etiology of the disease, the environment plays a significant role. Environmental factors affecting the development and manifestations of bronchial asthma:

1. Allergens.

Allergens such as house dust mites, pets, cockroaches, fungal, plant pollens are the main triggers for symptoms for chronic inflammatory airway disease.

2. Infections.

Respiratory infections, especially viral infections, can trigger or contribute to asthma exacerbation.

3. Air pollution.

Inhaled pollutants such as smoke, smog, exhaust fumes, and industrial emissions can irritate the airways and worsen asthma.

4. Tobacco smoke.

Exposure to second-hand smoke is a major risk factor for asthma development and exacerbation. Analyzing the occurrence of bronchial asthma in people, we can say that people exposed to second-hand smoke have a higher risk of developing the disease, as opposed to those who have not experienced exposure to tobacco smoke.

5. Nutrition.

Nutrition plays an important role in the management of bronchial asthma. While there is no single diet, certain foods and nutrients can either worsen or improve symptoms. For example, a diet rich in fruits, vegetables, and omega-3 fatty acids can reduce inflammation and improve lung function. Conversely, processed foods, sugary drinks, and certain allergens such as dairy products and nuts can trigger or worsen asthma attacks [3].

Reducing the risk of bronchial asthma involves a multifaceted approach. Identifying and avoiding triggers is critical. Maintaining a healthy lifestyle with regular exercise, a balanced diet and proper hygiene strengthen the body's resistance. Early diagnosis and treatment are essential to control inflammation and prevent exacerbations. Regular check-ups with a health care professional ensure suitable management of bronchial asthma, including medication adherence and monitoring of lung function. By taking these proactive measures, people can significantly minimize the impact of bronchial asthma on their daily lives.

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BIOELEMENT STATUS OF SCHOOL-AGE CHILDREN OF ZHLOBIN DISTRICT OF THE REPUBLIC OF BELARUS

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The bioelement status of children aged 10-15 years of the Solonoe's school of Zhlobin district has been determined. The average and median concentrations of Zn, Fe, Cu, Cr, Cd, and Pb are within the reference norms. The contents of Se, Cd, and Hg in the hair of children of Zhlobin district do not differ from other regions. Se and Ca deficiency was observed in more than 17% of the surveyed, Fe, Zn, Cu, Cr, Mn – in 50-87%, Se, Zn, Cu, Mn, Pb, Ca – in 10-23%, Sr – in 63.33%.

Keywords: environmental pollution, bioelement status, production waste, deficiency and excess of elements, environmental monitoring.

Due to morphofunctional immaturity, the child population is characterized by increased sensitivity to insufficient or excessive intake of chemical elements from the outside. The sources of excessive intake of chemical elements into the body are unfavorable environmental conditions, increased concentrations of chemical elements in air, water, soil and plants. There are 20 industrial enterprises in the territory of Zhlobin district of the Republic of Belarus, one of the leading industries is ferrous metallurgy: the Belarusian Steel Works and the Zhlobinsky Mechanical Plant "Dnepr". Based on this, it can be assumed that the city and the surrounding area are potentially contaminated with heavy metals.

The aim of the research was to assess the levels of accumulation of chemical elements in the hair of school-age children living in Zhlobinsky of the Republic of Belarus. To achieve this goal, the following tasks were solved: 1). Determining the concentrations of macro- and microelements in the hair of children; 2). Assessing the compliance of the content of chemical elements in children's hair with reference values; 3). Performing a comparative analysis of the mineral composition of the hair of the children of Zhlobin with the mineral composition of the hair of children from other places of residence of the Republic of Belarus on the basis of literary data; 4). Determining the prevalence of deficiency and excess of chemical elements in the hair of children of the studied region.

Chemical elements play an important role in the human body, affecting its health and functioning [1]. The object of the study was the hair of children (12 girls, 11 boys) aged 10-15 years of Solonoe's school of Zhlobin district. The following research methods were used: review-analytical, statistical, X-ray fluorescence analysis.

Macro- and microelements (Ca, Zn, Se, Fe, Cu, Mn, Cr, Sr, Cd, Pb, Hg) in the hair of children living in Zhlobin district of the Republic of Belarus were studied. After comparison with the reference values, it was found that the average

and median concentrations of Zn, Fe, Cu, Cr, Cd, and Pb are within the normal range. The median Mn content in both groups of children is lower than the reference values, and the median values of Ca and Sr in girls' hair are significantly higher than the reference values. According to the results of a comparative analysis of the mineral composition of children's hair, compared with other regions of the Republic of Belarus, it was found that the content of Se, Cd and Hg in the hair of children of Zhlobin district does not differ from other regions, and the deficiency of trace elements such as Se, Zn, Fe, Cu and Mn is a common problem [2]. In general, the levels of accumulation of chemical elements in the hair of children in Zhlobin district correspond to the reference values. Se deficiency is observed in 20%, Ca – in 17.39%, Fe – in 71.67%, Zn – in 50%, Cu – in 61.67%, Cr – in 86.67%, Mn – in 73.33%. An excess of Se occurs in 16.67%, Zn – in 16.67%, Cu – in 15%, Mn – in 10%, Pb – in 23.33%, Sr – in 63.33%, with an excess of Ca – 27.54%. Statistically significant differences in the frequency of deficiency/excess of Ca, Se, Fe, Cu, and Sr were noted between boys and girls ($p < 0.05$), while no differences were found for Zn, Cr, Mn, Pb, and Cd ($p > 0.05$).

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INTELLECTUAL DEVELOPMENT OF SCHOOL-AGE CHILDREN IN THE REPUBLIC OF BELARUS

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The intellectual development of children is an important condition for the development and realization of the country's intellectual potential. Intellectual potential is the ability to reproduce old and generate new ideas, master knowledge, accumulate experience, participate in creative activities for their use in social production. The aim of the study was to analyze the level of intellectual development of school-age children in the Republic of Belarus.

Keywords: intellectual development, children, testing, median

At present, intellectual development is one of the factors in the formation and development of the country's intellectual potential. There are standard methods and tests for assessing intellectual development that are widely known and applicable in modern conditions.

16 settlements were selected on the territory of the Republic of Belarus. In which an assessment of intellectual development was conducted among children aged 9-12 years. The assessment of children's intellectual development was carried out using a questionnaire based on the intellectual potential test - a screening non-verbal monometric test of general intelligence, designed for children aged 7 to 18 years, developed at the Bekhterev Scientific Research Institute based on the P. Rzhichan intelligence test.

Table

Level of intellectual development of school-age children in the Republic of Belarus

Settlement	Number of children examined	Intelligence Quotient, Me	Intelligence level
Bereza	50	115	Majority level
Telekhany	104	67	Very low
Verkhnedvinsk	52	110	Majority level

Lepel	50	105	Majority level
Vetka	50	105	Majority level
Korma	50	113	Majority level
Narovlya	50	97	Reduced
Slonim	50	105	Majority level
Ostrovec	50	96	Reduced
Oshmyany	50	79	Very low
Myadel	50	100	Majority level
Luban	50	105	Majority level
Cherikov	50	107	Majority level
Slavgorod	67	110	Majority level
Shklov	50	100	Majority level

Based on the results of the assessment of the level of intellectual development among school-age children in the regions of the Republic of Belarus, it was established that the median IQ of children from the settlements of Telekhany and Oshmyany corresponds to a very low level of intelligence. In the cities of Narovlya and Ostrovets, the median IQ showed a reduced level of intelligence. Among other surveyed settlements, the level of intelligence corresponds to the level of the majority. The highest value of the median of the coefficient of intellectual development was observed in the city of Bereza - 115 points, and the lowest in the city of Telekhany - 67 points.

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THE EFFECT OF ELECTRONIC CIGARETTES ON THE HUMAN CIRCULATORY SYSTEM

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The purpose of this article is to clarify the effect of electronic cigarettes (vapes) on the human circulatory system.

Keywords: Electronic cigarettes (vapes), circulatory system, cardiovascular diseases.

Electronic cigarettes are rapidly gaining popularity as an alternative, safer way for the body to consume nicotine. However, the question of the safety of their use for the circulatory system remains open.

The objectives of the study were as follows: to describe the real risks associated with the use of electronic cigarettes (increased blood pressure, vasoconstriction, endothelial damage, etc.); to show the link between vaping and an increased risk of developing cardiovascular diseases; to emphasize the importance of giving up vaping to preserve health.

Let's look at the main risks of using vapes.

Increased blood pressure and tachycardia. Nicotine contained in vapes stimulates the release of adrenaline, which leads to increased blood pressure and increased heart rate [1].

Deterioration of blood circulation. Nicotine narrows blood vessels, which makes it difficult to deliver oxygen to tissues and organs.

Increased risk of developing cardiovascular diseases. Studies show that vaping is associated with an increased risk of heart attack, stroke, atherosclerosis and other diseases of the cardiovascular system.

Vascular endothelial damage. Vapes contain free radicals that can damage the walls of blood vessels, making them more vulnerable to thrombosis [2].

The risk of thromboembolism. Vaping can increase the risk of blood clots, which can lead to blockage of blood vessels and the development of thromboembolism.

A high level of permeability contributes to the leakage of blood vessels. This negatively affects their function and increases the risk of developing diseases of the cardiovascular system. Scientists have found that the blood of smokers of electronic cigarettes and tobacco causes a much greater decrease in the production of nitric oxide by blood vessel cells than the blood of non-smokers. It is noteworthy that it was also found that the blood of e-cigarette smokers also causes a more significant permeability of blood vessel cells than the blood of both tobacco cigarette smokers and non-smokers at all. The blood of e-cigarette smokers also contributed to a greater release of hydrogen peroxide by blood vessel cells than the blood of those who do not smoke [3].

Using special measurements of arterial flow, the group of scientists showed that damage to blood vessels does not seem to be caused by a certain component of tobacco smoke or electronic cigarette vapor. According to the researchers, this is caused by irritation of the respiratory tract, which activates biological signals in the vagus nerve, which leads to damage to blood vessels. This may be due to an inflammatory process [3].

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ADSORPTION CHARACTERISTICS OF IMMUNOGLOBULIN-TYPE MOLECULES FOLDING ON THE SURFACE OF SILVER NANOFILMS COATED WITH POLYELECTROLYTE PDADMAC

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A study was conducted on the influence of the polyelectrolyte polydiallyldimethylammonium chloride on the sorption capacity of immunoglobulin molecules on the surface of silver nanofilms during immunofluorescence analysis.

Keywords: polydiallyldimethylammonium chloride, silver nanofilms, fluorescence intensity.

To register plasmonic enhancement of fluorescence, the distance between the fluorophore and silver nanoparticles is essential; the thickness of the polyelectrolyte layers on the surface of the silver nanofilm used to adsorb protein molecules should not exceed 1.4-3.3 nm.

This spatial limitation is due to the presence of two layers of immunoglobulin molecules and a layer of antigen molecules in the used immunochemical structure, which are quite large in size. [1]

To study the contribution of the polycationic electrolyte monolayer to the processes of immobilization of immunoglobulin molecules on the surface of polystyrene and silver nanofilms, as well as the subsequent formation of

polyvalent immune complexes, the following variants of solid phase formation were used: polystyrene coated with PDADMAC; silver nanofilm coated with PDADMAC.

It is known that the process of immobilization of protein macromolecules on a polycationic surface is determined mainly by the sum of electrostatic interactions at short distances, while the process of formation of hydrogen bonds or hydrophobic interactions do not play a decisive role.

This can lead, on the one hand, to an increase in the number of immobilized molecules on the solid phase, and, on the other hand, to stabilization of the protein structure and contribute to an increase in the recorded signal.

The use of a polystyrene surface coated with a layer of polydiallyldimethylammonium chloride (PDADMAC) as a substrate for immobilization of antiPSA-MAT led to a statistically significant increase in the interaction constants by 1.3 times ($p<0.05$) compared to the control.

A highly charged surface of a large area ensures, on the one hand, the stability of the "PDADMAC-protein molecule" complexes in space, and, on the other hand, can promote such a change in the conformation of immobilized antibody molecules, in which the maximum affinity of binding of antigen determinants in the antigen-binding centers of antibodies is achieved, which leads to an increase in the values of the antigen binding constants.

The constant of interaction of the antiPSA-FITC conjugate with the antigen statistically significantly increases by 5 times compared to the control (polystyrene) and by 3.9 times compared to the immobilization of antiPSA-MAT1 on the surface of polystyrene coated with a monolayer of PDADMAC.

Obviously, such an increase in the value of the interaction constant, indicating an increase in the amount of bound monoclonal antibodies antiPSA-FITC with the antiP-CA-MAT1-PSA complex on the solid phase is the result of not only an increase in the ability of the solid phase to bind antibody molecules due to the presence of a monolayer of PDADMAC, but also reflects the effect of a highly charged polycationic electrolyte on the conformational dynamics of antibody molecules in a polyvalent complex with the antigen.

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THE INFLUENCE OF POLYELECTROLYTE POLY-L-LYSINE ON THE SORPTION CAPACITY OF IMMUNOGLOBULIN MOLECULES ON THE SURFACE OF SILVER NANOFILMS

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The study of the interaction between polyelectrolyte and protein molecules remains one of the most important areas of research in the field of biotechnology. It is well known that proteins and polyelectrolytes can form complexes and coacervates under certain conditions caused by non-specific and non-covalent interactions, primarily electrostatic ones.

Keywords: silver nanofilms, immunofluorescence analysis, polyelectrolyte, poly-L-lysine, monoclonal antibodies

Compared with specific binding between biomolecular pairs with complementary epitopes such as biotin-avidin or antigen-antibody, protein-polyelectrolyte complexation is a promising area of research for the creation of bioanalytical systems of various designs.

The key issue in studying the effect of polyelectrolytes on the structure and functions of proteins is to determine the physicochemical mechanism that underlies their effect on the conformational mobility of the molecule during the formation of protein complexes and to determine the environmental parameters that affect the efficiency of the formation of such complexes [1].

By selecting components and changing their concentrations, it is possible to obtain a wide range of systems with different properties.

The diversity of protein and polyelectrolyte complexes in solution determines a wide range of practical applications of these systems used as biocatalysts, biosensors, for the separation and purification of proteins, and targeted drug delivery.

In the experiments, a polycationic polyelectrolyte was used - poly-L-lysine in two concentrations C1 and C2. The coating of the solid phase with a polyelectrolyte layer was carried out once, for 20 minutes at room temperature in a volume of 150 μl.

As an immobilized protein, a model conjugate of a monoclonal antibody IgG with fluorescein isothiate - IgG-FITC was chosen in concentrations of 500 ng per sample and 1000 ng per sample. Coating the polystyrene surface with a layer of poly-L-lysine at a concentration of C1 contributed to an increase in the fluorescence intensity of the immobilized protein conjugate by 1.3 times at a conjugate concentration of 500 ng in the sample, and by 1.5 times with an increase in the IgG-FITC concentration to 1000 ng compared to the fluorescence intensity of the conjugate immobilized on intact polystyrene.

Since in this case there is no metallized film on the polystyrene surface, we can assume that this result indicates an increase in the sorption capacity of the cell due to the presence of a poly-L-lysine layer on its surface.

A 2-fold increase in the covering concentration of the polyelectrolyte resulted in a slight increase in the signal by 1.2 times at an IgG-FITC concentration of 500 ng in the sample and a decrease in the fluorescence intensity of the sorbed protein conjugate to control values at an IgG-FITC concentration of 1000 ng in the sample.

This effect can be explained by the presence of a fluorescence quenching effect when the number of immobilized fluorophore molecules exceeds a certain concentration limit. After incubation of the IgG-FITC conjugate in wells coated with AgC1 - poly-L-lysine C2, the fluorescence intensity increased 3-fold at an IgG-FITC concentration of 500 ng in the sample and 3.3-fold at an IgG-FITC concentration of 1000 ng in the sample compared to the signal obtained upon immobilization of the conjugate in wells with intact polystyrene and 2.3-fold (500 ng in the sample and 1000 ng in the IgG-FITC sample) compared to the signal obtained in polystyrene - poly-L-lysine C1 wells.

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THE EFFECT OF IONIZING RADIATION ON THE DEVELOPMENT OF ONCOLOGY

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Ionizing radiation is a form of energy released by atoms in the form of electromagnetic waves (gamma and X-ray radiation) or particles (neutrons, beta and alpha particles). The spontaneous decay of atoms is known as radioactivity, and the excess energy resulting from this is a form of ionizing radiation. Radionuclides are unstable elements formed during decay and emit ionizing radiation.

Keywords: ionizing radiation, oncology, brain tumors, leukemia.

A person is exposed to natural and artificial radiation on a daily basis. Natural radiation has many sources, including more than 60 natural radioactive substances that are present in soil, water and air. The main source of natural radiation

is radon, a natural gas that is released from rocks and soil. Radionuclides are inhaled daily by humans from the air and enter the body through food and water [1].

A person can be exposed to ionizing radiation in different situations: in everyday life or in public places (exposure in public conditions), at the workplace (occupational exposure) or while receiving medical services (medical exposure). Radiation exposure can occur both internally and externally. Internal exposure to ionizing radiation occurs when radionuclides are inhaled, enter the digestive system, or enter the bloodstream, for example, due to injections or injuries.

Let us consider one of the most common forms of the human body's response to exposure to elevated doses of AI. Radiation sickness is a pathological condition of the body that occurs under the influence of ionizing radiation in doses exceeding the maximum permissible (1-10 grams or more). The maximum permissible dose is no more than 5 rem (0.05 Gy) – irradiation within this dose, although it exceeds the radiation load from the natural radioactive background, does not cause human disorders of the general condition and functions of hematopoiesis. Symptoms that occur under the influence of radioactive radiation in doses of 0.1-1 Gy are regarded as preclinical stages of the disease.

Radiation sickness occurs as a result of a single exposure to high intensity or prolonged exposure to low doses of radiation. Short-term severe damage occurs in man-made disasters at nuclear power plants, tests or the use of nuclear weapons, as well as in the treatment of cancer and blood diseases. Chronic disease can be occupational (it develops in medical workers of radiology and therapy departments). In addition, it can develop in patients who often undergo X-ray and radioisotope examinations [2].

Ionizing radiation: a deadly threat hiding in invisible rays.

Ionizing radiation, invisible to the eye, is fraught with danger, recognized by the International Agency for Research on Cancer as a carcinogenic factor that can reliably cause cancer in humans. In particular, its effect is directly related to the risk of developing leukemia - malignant neoplasms of the blood.

The terrifying reality of this impact became apparent back in the 40s of the last centuries, when Ulrich M.D. noticed a tragic increase in mortality from leukemia among radiologists, whose work was closely related to constant contact with X-rays.

However, the true picture of the scale of this threat became clear after the tragic bombing of Nagasaki and Hiroshima. Epidemiological studies have shown frightening results: residents of these cities who were exposed to the atomic bomb had a sharply increased risk of developing leukemia; 11-18 times higher than normal.

Not only the adult population suffered from the effects of radiation. Children who were in the womb during the bombing also faced an increased risk of developing leukemia. This is merely a part of a larger and more issue: radioactive exposure, whether it is X-ray radiotherapy for the treatment of various diseases, or even chronic exposure to low doses of radiation for a long time, invariably leads to an increased risk of leukemia [2].

Ionizing radiation is a serious risk factor for cancer. However, by following safety rules and taking preventive measures, the risk can be reduced. Early detection and timely treatment are also important to increase the chances of recovery.

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UTILIZING THE LINEAR-QUADRATIC MODEL FOR OPTIMIZING RADIATION THERAPY IN CLINICAL PRACTICE THROUGH A WEB APPLICATION

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The study presents the development of a web application aimed at optimizing radiotherapy using the linear-quadratic model. The application automates the calculation of biologically equivalent doses and simplifies the selection of fractionation schemes. Clinical validation based on data from 40 patients demonstrated high accuracy of the calculations and their alignment with actual clinical outcomes, making the tool valuable for treatment planning and personalized therapy.

Keywords: Linear-Quadratic Model, Radiation Therapy, Web Application, Personalized Treatment.

Modern approaches to radiation therapy aim to maximize therapeutic effectiveness while minimizing side effects. One tool used for modeling cellular response to radiation is the Linear-Quadratic (LQ) model. It allows for calculating the biologically effective dose and assessing the impact of various fractionation schemes on treatment outcomes. However, despite its widespread use in theoretical research, practical application in clinical settings is often limited due to the complexity of calculations. Our study addresses these limitations by developing a web application that automates calculations based on the LQ model, assisting in clinical decision-making.

The primary objective of the study is to develop and implement a web application that enables medical physicists and radiation oncologists to easily use the LQ model for calculating and optimizing fractionation schedules in radiation therapy. The study also aims to evaluate the impact of this application on clinical outcomes and the efficiency of professionals' workflows.

A specialized web application was developed to integrate the LQ model for calculating equivalent doses and assessing the risk of toxicity to healthy tissues. The key parameters considered in the development included α/β ratios for various tumor types and normal tissues, treatment duration, number of fractions, dose per fraction, and total cumulative dose.

To validate the application in clinical practice, a study was conducted involving the treatment schemes of 40 patients undergoing radiation therapy. Equivalent doses were calculated for each treatment scheme, taking into account treatment interruptions. The results from the web application were compared with actual clinical outcomes.

The web application streamlined the dose calculation process and simplified the selection of optimal fractionation schemes. The application demonstrated high accuracy in dose calculations and correlations with clinical outcomes, proving to be a valuable tool for optimizing RT. Its use significantly reduced the time spent on therapy planning, improving the efficiency of medical specialists [1,2].

This study shows that a web application utilizing the LQ model can become a powerful tool for individualizing radiation therapy, which is crucial given the growing need for personalized oncology treatments. The application allows the consideration of unique biological characteristics of both tumors and healthy tissues, enhancing the chances of successful treatment while reducing the likelihood of side effects. It also enables rapid testing of various fractionation schemes, allowing professionals to choose the best treatment regimen with minimal time investment. Future plans include enhancing the application's functionality, adapting it for other cancer types, and expanding its capabilities for modeling combined treatment methods.

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ANALYSIS OF ARVI MORBIDITY AMONG CHILDREN IN THE VILLAGE OF NOVOSELKI, BORISOVSKY DISTRICT IN 2018-2022

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One of the most socially significant, widespread and leading in the structure of infectious pathologies worldwide are acute respiratory viral infections. The analysis of the morbidity of ARVI in the child population of the village of Novoselki, Borisovsky district in 2018-2022 showed that acute respiratory viral infections constitute the main specific weight in the structure of infectious diseases. For the period under study, there is an increase in the incidence of ARVI in preschool children (with the major increase in 2021) and a decrease in the morbidity of school-age children.

Keywords: acute respiratory viral infections, morbidity, trends.

One of the most socially significant, widespread and leading in the structure of infectious pathologies worldwide are acute respiratory viral infections. The relevance of ARVI at the present stage is beyond doubt, given the rapid spread of viruses among the population, their ability to overcome in a short time significant distances and infect simultaneously large groups of the population, with the severity of clinical symptoms and the frequent occurrence of secondary complications. ARVI occupies a leading place in the structure of morbidity worldwide and for many years the number of cases surpasses all other infectious diseases [1, 2].

Based on the data on the number of cases of acute respiratory viral infections, we assessed the morbidity rate of ARVI in the child population of the village of Novoselki, Borisov district, ARVI in 2018-2022.

The analysis of the morbidity rate of ARVI in the child population of the village of Novoselki in Borisov district in 2018-2022 showed that acute respiratory viral infections make up the main specific weight in the structure of infectious diseases.

Over the period under study, the proportion of morbidity among school-age children was 78.9-92.4%, while the proportion of morbidity among preschool-age children was 66.6-90.9%. Over the period analysed, there was an increase in the morbidity of acute respiratory viral infections among preschool-age children. The morbidity rate of young children increased from 33333.3 cases per 100,000 population in 2018 to 48275 cases per 100,000 population in 2022. However, there is a 39.8% decrease in the incidence rate of school children.

Analysis of the yearly rate of increase/decrease in the incidence of ARVI showed that for the period 2018-2022, there were annual swings in the morbidity of the population with periods of growth and decline. For the period 2018-2022, the greatest decrease in the incidence of ARVI among school children was recorded in 2021 - -16.4 % and the greatest increase in the incidence of preschool children in 2021 and it was 47.7 % respectively. The average annual rate of increase/decline was T = -11.5% for school children and T = 14.2% for preschool children.

The intra-annual dynamics of ARVI morbidity among schoolchildren was analysed according to the registered cases. The incidence of ARVI corresponded to the annual dynamics in the periods November - January, May - August. Indicators in some months (September, November, February, March) significantly exceeded the average annual incidence rates in 2019 and 2022. During the analysis, it can be noted that the rise in the incidence of acute respiratory viral infections in children begins in autumn (September), during the return of children to educational institutions after summer holidays, vacations, where infections can be easily transmitted from one to another. Then the second rise occurs in winter, namely in February, due to lower air temperature and accumulation of people indoors, which also contributes to the rapid spread of viruses and at a high level in the spring period (March, April), this is due to the resumption of activities of children outdoors and warm weather conditions.

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A FAMILIAL CASE OF A PREVIOUSLY UNDESCRIBED GERMLINE MUTATION IN THE MODY CANDIDATE GENE

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The paper presents the results of a molecular genetic study of a group of 25 patients aged 1 to 18 years with phenotypic manifestations of MODY type monogenic diabetes mellitus. In addition to pathogenic, likely pathogenic mutations, as well as substitutions with uncertain clinical significance, a familial case of a previously undescribed germline heterozygous mutation NM_000162.5: c.554T>C of the *GCK* gene was identified in two brothers and their mother. This single nucleotide substitution was investigated using Ensembl Variant Effect Predictor (VEP) genetic variant analysis software and met pathogenicity criteria.

Keywords: MODY, mutations, Sanger sequencing, gene.

MODY (*maturity onset diabetes of the young*) is a genetically heterogeneous inherited disease caused by mutations in various genes. The greatest diagnostic interest from 16 currently known MODY candidate genes is represented by 4 genes: *GCK*, *HNF-1A*, *HNF-4A*, *HNF-4B*, which account for up to 90% of all identified mutations in patients with this type of diabetes. The spectrum of mutations is quite diverse, the most common are missense mutations, there are also partial or complete gene deletions. Currently, the classification of MODY subtypes is based on the name of the gene whose mutations are associated with monogenic diabetes [1].

MODY is a monogenic disease, usually manifests <25 years of age, has an autosomal dominant type of inheritance and a variable clinical pattern. Monogenic diabetes is characterised by the absence of autoantibodies specific for type 1 diabetes, preservation of endogenous insulin secretion, and absence of metabolic syndrome.

Although the most common MODY subtypes are well known, cases of monogenic diabetes remain unverified and are misclassified as type 1 diabetes mellitus. This causes irreparable harm to the health of patients, as in MODY, specific therapy has a number of peculiarities. In most cases, patients diagnosed with MODY do not require insulin therapy.

Identification of diabetes variants such as MODY is only possible through molecular genetic testing (MGT) [2,3].

In this study, 25 patients with MODY phenotypic manifestations underwent MGT by Sanger sequencing in the clinical diagnostic laboratory of the Centre for Paediatric Oncology, Haematology and Immunology. The age of the patients at the time of the study ranged from 1 to 18 years (Median - 12). There were 17 male patients (68%) and 8 female patients (32%).

Pathogenic and probably pathogenic heterozygous missense mutations associated with MODY were detected in the *GCK* gene in 10 (40%) probands, including 8 boys and 2 girls. However, no statistical difference by sex was found (p=0.861). Heterozygous single nucleotide substitutions with uncertain clinical significance were detected in the *HNF-1A* gene in 3 (12%) patients. In the *HNF-4A* and *HNF-1B* genes only genetic variants with benign and probably benign status were detected.

In the studied sample, new, previously undescribed variants with unclear influence on the structure and function of the studied protein in the *GCK* gene were detected in 4 (16%) cases. It should be noted that the heterozygous genetic variant NM_000162.5: c.554T<C of the *GCK* gene was described in two brothers. This substitution was also found in their mother, which may indicate the association of this genetic variant with the development of GCK-MODY. In this case, the amino acid leucine is replaced by the amino acid proline, which leads to a change in protein structure. The probability of pathogenicity of the identified substitution was estimated using Ensembl Variant Effect Predictor (VEP) genetic variant analysis software. The substitution met the pathogenicity criterion (SIFT, 0.0; PolyPhen, 1.0). It should be noted that the use of pathogenicity predictors alone is not sufficient to conclude the association of this substitution

with MODY diagnosis. It may lead to both false positive and false negative results. In order to draw valid conclusions about the pathogenicity of the substitution variant and its association with the development of GCK-MODY, it is necessary to determine the frequency in the population, which requires large screening studies. In addition, scientific experiments, functional analysis of mutations on cells or animal models are required to fully confirm the pathogenicity of previously undescribed mutations.

Thus, during this study, in addition to mutations with pathogenic status, likely pathogenic and with uncertain clinical significance, a new, previously undescribed heterozygous substitution in the *GCK* gene was identified in two brothers and their mother.

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OPTIMIZATION OF RECONSTRUCTION OF INDIVIDUALIZED EXTERNAL EXPOSURE DOSES

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The reconstruction of individualized external exposure doses of persons living in the contaminated area was carried out using two methods: "Instructions for use" approved by the Ministry of Health of the Republic of Belarus and a new method for reconstructing individualized external exposure doses. A comparative analysis of reconstructed doses with data from individual dosimetric control showed that the proposed new method makes it possible to optimize the reconstruction of individualized external exposure doses, while allowing for indirect dose-forming factors to be taken into account and the reduced estimation error ~ 4 times.

Keywords: external exposure dose, individual dosimetric control, individualized dose, reconstruction, employment group.

To the conduct research into the medical and biological consequences after the Chernobyl accident and assessment of the exposure effects on human health and the population as a whole, it is necessary to pay attention to the reconstruction of individualized exposure doses [1].

To ensure such a research, a sufficient amount of individual dosimetric control data (IDC-data) is necessary. And in their absence, there is a need to apply appropriate “adequate” doses reconstruction methods. But since most methods are ultra-conservative (It don't take into account all dose formation factors) and as the result arises uncertainty assessment 300 % and more.

Previously, we developed a new method for reconstructing individualized external exposure doses of persons living in contaminated areas with radionuclides [2]. Since the "Instructions for Use" [3] (used today in the Republic of Belarus) don't take into account the occupation of individual which directly influences on the formation of the individual external exposure dose [4].

The aim of the research is to reconstruct individualized external exposure doses of the population living in a contaminated territory with radionuclides using the above method. Thereby to show that taking into account the occupational of the population ensures a reduce the dose estimation error.

A sample (225 people) was formed of young and middle-aged people according to the WHO-classification, living in settlements with approximately the same level of contamination by ^{137}Cs in the Mogilev region, for 2005 and 2006.

It was found that the reconstructed individual external exposure doses for the entire sample according to the "Instructions for Use" differ from the IDC-data, while the estimation error is ~ 42%. On the contrary, the reconstructed doses using the new method have a high correlation with the IDC-data (Spearman's correlation coefficient R is 0.77), and the estimation error is ~4 times lower (9-10%) than that of the analogue.

Thus, we can conclude that the developed new method for reconstructing individualized external exposure doses complies with the "Instructions for Use" in applied in the Republic of Belarus. The new approach, taking into account dose-forming factors, allows us to optimize the method for reconstructing individualized external exposure doses. And with high accuracy, reconstruct doses for residents permanently residing in areas contaminated with radionuclides for each post-accident year.

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ROUTINE ULTRASOUND STUDY IN PREGNANT WOMEN IN MODERN GYNECOLOGY

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The research paper analyses the dynamics of conducting scheduled ultrasound studies in pregnant women in the Health care institution «Mozyr City Maternity Hospital» carried out in 2020-2023. The study relates to official statistical data on quantities of Health care institution for the period 2020-2023 in the Health care institution «Mozyr City Maternity Hospital». Statistical processing of the results obtained from the study was used. The study revealed that from 2020 to 2023, the number of women registered for pregnancy at 12 weeks due to coronary infection is decreasing. There is a positive trend in the increase of the total number of studies conducted in routine ultrasound studies in pregnant women.

Keywords: ultrasound examination, diagnosis, method of diagnosis, pregnancy.

Ultrasound examination is a non-invasive method, ideal for obstetricians and gynecologists and the most available of all known today's techniques [1]. The importance of ultrasound in maternal and child health is hard to overestimate. It is no exaggeration to say that the significant improvements in perinatal outcomes, which have occurred in recent years, medicine owes to the application of ultrasound diagnostics in obstetrics [2, 3].

In the Health care institution «Mozyr city maternity hospital» the most common pathology in percentage ratio is the violation of uterine-placental blood flow, which represents 2,2% of all pathologies of pregnant women. The second most common pathology was fetal retardation syndrome, which was 1,6%. Hydronephrotic transformation of the kidney is the third most common cause of pregnancy and represents 1,3%. For the diagnosis of other pathologies in Health care

institution «Mozyr city maternity hospital» a number of US-studies are conducted. Of all the pathologies, the highest rate has a malignant plasmatic blood flow, which requires timely diagnosis and treatment.

The priority area of the department is fetal ultrasound diagnosis of genetic defects. Highly sensitive equipment, experience and specialization of the employees of the department allow to identify defects in the development of the fruit of complex situations and at various stages of pregnancy (including the earliest).

The department is equipped with ultrasound diagnostic scanners, which allow to diagnose any gynecological diseases, complications of pregnancy.

The study included 30 pregnant women, of which 10 in the period 38-39 weeks, 10 in the period 39-40 weeks and 10 in the period 40-41 weeks of pregnancy.

In this connection, the aim of this work is to study the number of planned ultrasound studies in pregnant women in Mosyr. for 2020-2023.

The study was conducted on the quantities of US for the period 2020-2023 in the Health care institution «Mozyr City Maternity Hospital».

To determine the dynamics of conducting routine ultrasound studies in pregnant women in Health care institution «Mosyr City Maternity Hospital» used the method of calculating intensive and extensive indicators.

The study showed that there has been a positive trend in the increase of the total number of studies conducted in routine ultrasound studies in pregnant women. The most common pathology revealed during the US-study is a violation of uterine-placental blood flow 2,2%), followed by the following pathologies according to frequency of occurrence: uterine myoma and polygyny (2,6%).

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PROSPECTS AND FEATURES OF VERTICAL GREEN WALLS IN THE INTERIORS OF PUBLIC AND PRIVATE SPACES IN MINSK

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The paper considered the issue of vertical green walls as one of the modern landscaping technologies used in urban conditions. The main principles of their design, various types of plants suitable for vertical landscaping, as well as the advantages of such solutions for the ecological and aesthetic components of the urban environment were analyzed. The paper considered the examples of successful implementations of green walls in the city of Minsk.

Keywords: vertical gardening, structures, plants, phytowall.

Since industrial and transport facilities are concentrated in cities, there is a great deal of anthropogenic pressure on people and ecosystems. Given that more than 72 percent of the population of Belarus lives in cities and urban-type settlements, the organization of an ecologically safe and socially balanced structure of the landscape and recreational complex, the effective implementation of the functions of sanitation and sanitary, recreation, protection of soil, water, noise protection and environmental protection is one of the main tasks of sustainable nature management, urban planning and management.

The ecological potential of the urban landscape largely depends on the structure of vegetation, its species composition, integrity, the age of forest stands, their condition and resistance to urban environmental factors.

Recreational potential depends on the area of recreational facilities available for use, their attractiveness, the level of improvement and aesthetic qualities.

The vegetation of the city of Minsk is represented by green spaces, which play an important role in the formation of an optimal urban environment, performing sanitary and hygienic, recreational, aesthetic, noise and soil protection, water protection and environmental functions. Organization of an ecologically balanced structure of the urban landscape and leisure complex is one of the main tasks in determining a comfortable living environment for the citizens living in it.

Vertical gardening, enriching and complementing the architectural appearance of buildings and their complexes, makes it more expressive. The speed of growth, variety of shapes and colors of flowers, leaves, fruits and the ability of climbing plants to easily be formed opens up unlimited possibilities for their use in landscaping. Climbing plants are widely used for landscaping fences, retaining walls, slopes, various outbuildings, canopies, vases and other small forms of landscape architecture. Vines can also be used where the placement of trees and shrubs is not possible due to lack of space.

In this regard, the purpose of this work is to study the role of vertical gardening in the interiors of public and private spaces in the city of Minsk.

The object of the study was vertical gardening of the urban environment of Minsk, including existing projects of green walls, building facades. Over the past decade, many experiments have been conducted, which has led to the creation of many modifications of "living walls", from simple modular systems with manual maintenance to high-tech complexes. The study shows that this technology continues to develop.

Landscape architecture and landscaping - an integral part of human economic activity - have enormous aesthetic, educational and sanitary-hygienic significance.

An important role in the improvement of a modern city is played by vertical landscaping, using a large arsenal of plants. These are trees and shrubs, but the main role belongs to vines.

As a result of the study of vertical green walls, their numerous advantages and potential for improving the urban environment were revealed. Vertical green walls not only help to improve the aesthetic perception of buildings and public spaces, but also have a significant impact on the microclimate, helping to reduce air temperature and improve its quality by filtering pollutants.

Thus, vertical green walls are a promising tool in landscape design that can significantly increase the sustainability of urban areas and improve the quality of life of their residents.

DYNAMIC CHANGES IN PERIPHERAL BLOOD CELLULAR PARAMETERS DURING TREATMENT IN PATIENTS WITH ISCHEMIC HEARTDISEASE

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In this study, we analyzed the results of peripheral blood cell counts in 13 patients with ишемической ischemicю heart disease before treatment and after completion of specialized therapy. In the course of our study, we found that during treatment, patients with c showed a slight ($p>0.05$) decrease in the total content of red blood cells, the content of total hemoglobin, the total content of white blood cells, the relative content of lymphocytes, as well as an increase in the total content of platelets and the relative content of monocytes, which tended to the reference values.

Keywords: Coronary heart disease, red blood cells, hemoglobin, platelets, white blood cells, eosinophils, lymphocytes, monocytes, ESR, therapy.

Coronary heart disease (CHD) is a condition caused by a chronic lack of oxygen supply to the heart muscle cells (hypoxia) and nutrients. The most common cause of this is the accumulation of atherosclerotic plaques in the coronary arteries [1]. CHD is the leading cause of death worldwide according to WHO data for 2019. Diagnosis includes determining the form of the disease, assessing the general condition of the patient's body, identifying concomitant

pathologies, and prescribing clinical and laboratory examination methods, most often a general and biochemical blood test, which reflect the state of homeostasis of patients [2].

In the course of the study, we studied the dynamics of cellular reactivity of homeostasis in terms of peripheral blood parameters, the development of biochemical shifts in homeostasis, and the assessment of the severity of endogenous intoxication syndrome in 13 patients with CHD. The study group included patients with an average age of 70 years CI [35; 93].

Analyzing the total content of red blood cells in the peripheral blood of patients suffering from CHD, we found that before the start of treatment, this indicator was $4.59\times^{10-12}$/l [CI 4.11; 4.79]. After completion of treatment, the red blood cell count tended to the reference values ($3.7\text{-}4.1\times^{10-12}$/l) and statistically significantly decreased by 1.03 times ($p_{(Wilcoxon)}$ =0.388187), and amounted to $4.71\times^{10-12}$/l [CI 4.3; 4.82] As a result of treatment in patients with CHD, the total hemoglobin content in the peripheral blood, it slightly increased ($p_{(Wilcoxon)}$ = 0.575063) by 1.02 times and amounted to 144 g/l [131; 150]; before the start of treatment – 141 g/l [131; 150]. This indicator in patients of the study group during therapy was within the reference values (120-155 g / l). When analyzing the total platelet count in patients with CHD, it was found that before starting treatment, this indicator was $199\times^{109}$/l [CI 173; 237] and was within the reference values ($180\text{-}320\times^{109}$/L). After completion of treatment in patients, this indicator tended ($p_{(Wilcoxon)}$ =0.952765) to decrease the test parameter by 1.02 times and amounted to $194\times^{109}$/l [CI 170; 214]. When analyzing the total platelet count in patients with CHD, it was found that before starting treatment, this indicator was $199\times^{109}$/l [CI 173; 237] and was within the reference values ($180\text{-}320\times^{109}$/L). After completion of treatment in patients, this indicator tended ($p_{(Wilcoxon)}$ =0.952765) to decrease the test parameter by 1.02 times and amounted to $194\times^{109}$/l [CI 170; 214]. As a result of the study, the dynamics of the total content of leukocytes in the peripheral blood of patients suffering from CHD was studied. Prior to treatment, this indicator was 8.95 $\times^{109}$/l [CI 6.78; 10.58] and was at the upper limit of the reference values ($4\text{-}9\times109^{9}$/L). After completion of therapy, this indicator tended ($p_{(Wilcoxon)}$ = 0.972125) to decrease by 1.05 times and amounted to $8.51\times^{109}$/l [CI 7.12; 9.11]. When analyzing the relative content of eosinophils, it was found that at the beginning of treatment of patients, this indicator was 1.4 % [CI 1.0; 1.9] – it was within the normal range (0-5%). After the end of therapy, the study parameter did not change and amounted to 1.4 % [CI 1.1; 1.7]. No statistically significant differences were found in the course of therapy ($p_{(Wilcoxon)}$ =0.463072). The relative lymphocyte count before the start of therapy was 22.3 % [CI 19.2; 29.3], which was within the reference values (18-40%). After completion of therapy, this indicator was 22.5 % [CI 20; 30] and slightly increased by 1.009 times ($_{Wilcoxon's\ p}$=0.124176). In the course of the study, the dynamics of the monocyte count in patients of the analyzed group was studied. Before starting treatment, the indicator was 7.9 % [CI 4.9; 9.1] - it was within the reference values (2-9 %). After completion of therapy, this indicator decreased by 1.05 times and amounted to 7.5 % [CI 5.7; 9.6] and was also within the reference values. In a group of patients, studies on ESR indicators were conducted. Prior to treatment, the index was 21 mm / h [CI 14; 28] and was higher than the normal value (2-15 mm / h). After completion of therapy, this indicator decreased by 1.05 times ($p_{(Wilcoxon)}$ =0.382353), but was also higher, and amounted to 20 mm/h [CI 15; 29].

Thus, in the course of our study, we found that during the treatment of patients with CHD, the content of red blood cells and white blood cells slightly decreased by 1.05 times, and the following indicators were also reduced: platelets by 1.02 times; ESR by 1.05 times; monocytes by 1.05 times. Other indicators increased-hemoglobin by 1.02 times; lymphocytes by 1.009 times. The content of eosinophils remained unchanged.

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CHARACTERISATION OF DENDRITIC CELLS IN SINONASAL TUMOURS

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The article presents the results of comparative analysis of the relative number of dendritic cell (DC) population and subpopulations depending on the nature of the disease course: malignant, benign and on the stage of the tumor process.

Keywords: tumor tissue, dendritic cells.

The aim of our work was to investigate the peculiarities of dendritic cell characteristics in tissues of sinonasal tumors to identify potential markers for diagnosis and treatment of this type of tumor. In the course of the study, the following objectives were fulfilled: 1) to investigate the influence of sinonasal tumors on the functional activity of DCs; 2) to establish a possible correlation between the course of the disease and the relative number of DCs.

The analysis of the results of the study of tissues of patients with malignant nasal cavity neoplasm showed that despite the increase of the total DC content in the tumour tissue, there was a tendency to decrease the relative number of myeloid dendritic cells CD11c+ by 64% in comparison with the tissue taken from patients with benign neoplasm.

However, during comparative analysis of lin-DR+ subpopulations depending on the stage of the disease, a direct correlation between the increase in DC content and the progression of the disease stage was observed. The percentage of DC content in patients with stage III-IV increased by 192% in relation to patients with stage I-II

($p < 0.05$) (Fig. 1).

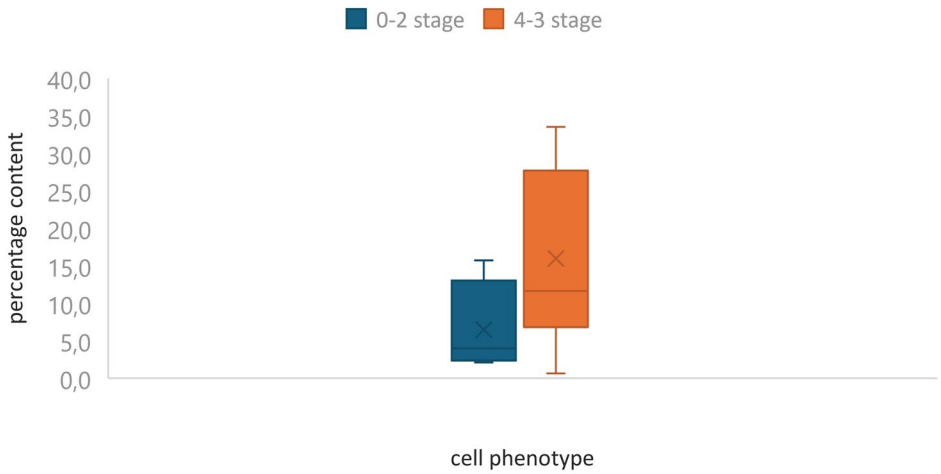

*Fig. 1 - Dependence of the percentage of lin-DR+ cells on the stage of nasal disease. Note: * - $p < 0.05$.*

Based on the obtained data, it can be assumed that there is a direct dependence of the increase in the relative number of lin-DR+ DCs on the course and stage of development of the sinonasal cavity disease. The increase in the number of DCs is explained by their ability to activate T- and B-lymphocytes and initiate antitumour response, as well as with the increase in the number of pathologically altered DCs under the influence of tumour factors.

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IDENTIFICATION OF MICROORGANISMS IN THE ORAL CAVITY USING THE CAPABILITIES OF THE MICROSCOPIC METHOD

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Microscopic methods of studying microorganisms and methods of identifying gram-positive and gram-negative bacteria of the oral cavity were studied. Microscopic analysis of microbiological samples from the oral cavity was carried out, the composition and characteristics of the microbiota were studied.

Keywords: microscopic method, microorganisms, gram-positive, gram-negative, oral cavity.

The microscopic method of research involves studying microorganisms in a stained and unstained state using various types of microscopes. The method allows one to determine the shape, size, location, structural elements and the attitude of microorganisms to dyes (tinctorial properties). The Gram staining method of bacteria is based on the different ability of microorganisms to retain triphenylmethane dyes in the cell - crystal violet or gentian violet. The essence of the method is based on the difference in the chemical composition and structure of the bacterial cell wall [1, 2].

Microorganisms inhabiting the human oral cavity represent a unique extensive ecosystem. According to cultural and molecular biological research methods, the oral microbiome includes representatives of more than 700 bacterial species [3, 4]. Most of the presented bacterial species are transient microflora, since they are not capable of long-term survival in the special conditions of the oral cavity environment. Despite the enormous individual diversity in the composition of microflora among people, there are 50 to 200 species of microorganisms belonging to 15 genera that are found in almost every person. According to modern concepts, the microflora of the oral cavity can be the cause of the development of various diseases, including infectious diseases, cardiovascular diseases, and diabetes.

A study of the oral microbiome using students of different ages (a group of conditionally healthy individuals) showed that the microorganisms of the oral cavity are mainly represented by coccal flora: staphylococci, streptococci. In addition, enterobacteria, veillonella, bacteroids, actinomycetes, neisseria, etc. were detected. Representatives of the genus streptococci were most often sown - up to 60% of all microorganisms sown in this biotope. Representatives of the genus staphylococci occupied 22%, enterobacteria accounted for up to 15%. By microscopy and the use of atlases of microorganisms, the signs of bacteria of the genus Neisseria, as well as signs of the genera Enterococus and Actinomyces were identified. The results of the study of the qualitative composition of the microbiome showed the presence of lactic acid bacteria and bifidobacteria, as representatives of the normal flora of the oral cavity.

The data obtained are of practical importance for identifying microorganisms not only in the oral cavity, but also other representatives of the normobiome of the human body.

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CULTURAL-BIOCHEMICAL RESEARCH METHOD IN CHARACTERISTICS OF BACTERIA OF THE ENTEROBACTERIACEAE FAMILY

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The characteristics of coliform bacteria are presented using the culture method of research, which is one of the main methods for identifying these pathogens. Bacteria of the Enterobacteriaceae family have high biochemical activity - they ferment glucose, lactose, maltose, arabinose, galactose, and mannitol with the formation of acid and gas. A characteristic feature is the fermentation of lactose (lactose-positive and lactose-negative are distinguished). Lactose-containing media are used as differential diagnostic media for isolation.

Keywords: cultural method, biochemical method, Hiss media, *Escherichia coli, Enterobacter, Enterococcus*, bacteria of the *Enterobacteriaceae* family.

Recently, the understanding of the importance of bacteria of the Enterobacteriaceae family in human life has expanded. Representatives of this family are widespread in nature and most of them are normal microflora of the gastrointestinal tract. However, among these microorganisms there are pathogenic variants that can cause both independent diseases and various inflammatory processes [1].

Hiss medium is designed to identify enterobacteria cultures isolated from clinical material and environmental objects by their ability to ferment carbohydrates or polyhydric alcohols. Hiss medium is a classic differential diagnostic medium for identifying enterobacteria by a fermentation test of one of the carbohydrates (the so-called «variegated row»). Hiss medium contains the indicator bromocresol purple, which changes color from purple to yellow when the medium is acidified (pH ≤ 5.2). Agar, which is part of the Giss medium, allows visual registration of gas formation, detected in the form of bubbles or ruptures in the thickness of the medium [2, 3].

As a result of the conducted studies, it was established that bacteria, representatives of the genus *Escherichia* (*E. coli*) grow preferentially on media containing glucose, maltose and lactose, which is in good agreement with the literature data. These sugars are well fermented by bacteria of this genus, and preference is always noted by good growth on a medium with lactose. We visualized this in the first hours of culturing bacteria on Giss media (the color of the indicator in the test tube with lactose changed first). Bacterial growth on media with mannitol and sorbitol was not noted. Bacteria, representatives of the genus *Enterococcus* grow preferentially on media containing glucose, maltose and sucrose, growth on a medium with lactose was not noted, which indicates the absence of enzymes that ferment this sugar. Active change of indicator color was recorded on the medium with sucrose, which indicates the preference of this sugar during cultivation. There was also no growth of bacteria on the media with mannitol and sorbitol. It was shown that bacteria, representatives of the genus *Enterobacter*, prefer media containing glucose and lactose for growth, which indicates the presence of classic enzymes for bacteria of the coli group. There was no growth of bacteria on the media with mannitol and sorbitol, with maltose and sucrose.

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THE EFFECT OF SODIUM ACETATE ON INTESTINAL HOMING RECEPTOR CCR9 EXPRESSION ON T-LYMPHOCYTES

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The study characterizes CCR9 expression on γδT-lymphocytes in acetate-stimulated cultures what may be used to identify the relationship between the effects of microbial metabolites and the functional activity of lymphoid cells.

Keywords: short-chain fatty acids, gut microbiota, C-C chemokine receptor 9, γδ T-lymphocytes, flow cytometry.

The intestinal T-lymphocytes represent a specific population of cells involved in the maintenance of epithelial homeostasis, barrier integrity, damage repair, and rapid compartmentalization of microbial pathogens via immune response development. γδT-cells function as innate immune cells to restrict microbial pathogens from systemic spreading and then shape early adaptive immune responses through the recruitment of neutrophils and activation of phagocytes and dendritic cells [1]. Gut homing of lymphoid cells is regulated by several key factors including expression of the C-C chemokine receptor type 9 (CCR9), the increase of which is associated with exposure to short-chain fatty acids (SCFAs) produced by microbiota in the intestinal tract. Three major SCFAs are acetate, propionate, and butyrate and each has multiple described effects that play a crucial role in maintaining host health [2].

The aim of the study was to characterize CCR9 expression on γδT-lymphocytes in cultures with sodium acetate.

The material was peripheral blood mononuclear cells (PBMCs) isolated from peripheral blood of healthy donors (n=3) using a Roti®Sep 1077 density gradient centrifugation (Carl Roth, Germany). PBMCs were cultivated in the presence or absence of sodium acetate (10 mM, Riedel-de Haën, Germany) in RPMI-1640 culture medium (Sigma, Germany) supplemented with 10% fetal bovine serum, 1% antibiotic-antimycotic (Gibco, USA) and 1% L-glutamine (Gibco, UK) for 3 days in a humidified atmosphere with 5% CO_2 at 37 °C. After the incubation samples were stained with monoclonal antibodies γδTCR-FITC, CD3-PC7 (Elabscience, China) and CCR9-APC (BioLegend, China). The results were estimated on 10000 $CD3^+$lymphocytes using a CytoFlex flow cytometer (Beckman Coulter, USA). Statistical data processing was done using the STATISTICA 8.0 program.

The numbers of T-cells were on the similar level in both cultures with sodium acetate and in the control samples (68,6 (65,3÷71,9) % and 66,8 (61,4÷72,1) %, respectively) while the percent of γδT-lymphocytes in the presence of acetate (6,0 (5,7÷6,4) %) was higher as compared to ones without stimulation (5,0 (4,6÷5,3) %, p=0,04). Herewith, $CD3^+CCR9^+$ cells tended to increase (9,7 (9,4÷9,8) %) in cultures with acetate in contrast with the baseline levels of CCR9 expression (7,5 (6,4÷8,5) %, p=0,08). Meanwhile, the significant elevated level of CCR9 expression on γδT-lymphocytes was detected in stimulated samples (37,0 (35,0÷38,9) %) as compared to the control cultures (19,7 (17,3÷22,0) %, p=0,04).

These results may be correlated with the previous observations on the upregulation of CCR9 in activated by SCFAs B cells [3]. At the same time, there is also evidence of negative impact SCFAs on CCR9 expression on the lymphoid cells, for example, butyrate and propionate has been shown to inhibit the expression of the CCR9 on T-cells [4]. Overall, there is limited data describing the effect of SCFAs on the intestine homing of lymphoid cells and in particular of γδT-lymphocytes that explains the need for further work in this area.

Thus, the number of γδT-lymphocytes and the expression of CCR9 on γδT-cells significantly increase in cultures in the presence of sodium acetate as compared to the control samples what may indicate a possible mechanism of microbial metabolite influence on γδT-lymphocytes proliferation as well as intestine homing and should be further investigated.

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CLINICAL AND DIAGNOSTIC SIGNIFICANCE OF DETERMINING THE LEVEL OF TOTAL IMMUNOGLOBULIN E IN ALLERGIC DISEASES

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Immunoglobulin E (IgE) plays a primary role in the pathogenesis of allergic diseases. Total immunoglobulin IgE was determined by quantitative immunochemical method in patients with clinically and diagnostically confirmed forms of urticaria, urticaria with angioedema, allergic and non-allergic forms of bronchial asthma. An increase in the total IgE level was diagnosed in 29.5% (23 patients) of patients with allergic diseases with an average value of 231.7±15.3 IU/ml. A high level of total IgE (1012.7±28.6 IU/ml) was detected in patients with acute forms of urticaria and bronchial asthma. In patients with bronchial asthma during the period of exacerbation of the disease, the total IgE level varied from 564.9 to 2500 IU / ml.

Keywords: urticaria, angioedema, bronchial asthma, total immunoglobulin E

Allergic diseases are one of the globalых health problems. According to multicenter studies, allergic diseases affect more than 2% to 40% of the world's population. Allergic diseases occupy leading positions in the structure of morbidity in all age groups of the population [1]. Urticaria with angioedema is a life-threatening systemic hypersensitivity reaction, which is characterized by acute changes in hemodynamics and disorders of the bronchopulmonary system [2]. Bronchial asthma is characterized by the presence of various phenotypes and when the course of the disease worsens in severe refractory forms, patients need emergency care and intensive care. Timely diagnosis and implementation of therapeutic and preventive measures and medical examinations of these categories of patients can reduce the risk of exacerbations and complications, reduce the number of hospitalizations in inpatient specialized departments, and improve the quality of life of patients.

Assessment of the level of total and specific immunoglobulins E is of diagnostic and prognostic importance in determining the pathogenesis of the disease and choosing the tactics of special treatment [3].

The object of the study was the clinical data of 78 patientssuffering from urticaria and bronchial asthma (BA). The subject of the studyется is the content of total immunoglobulin E (IgE) in peripheral bloodIgE).

This study was performed at the Minsk Regional Clinical Hospital for the Disabled of the Great Patriotic War named after P. M. Masherov. The patients included in the study received special treatment in the Department of Allergology and Immunology. All patients received informed consent to participatee in this study.

Total IgE levels IgE were measured in a clinical diagnostic laboratory using a Cobas e 411 automatic immunochemical analyzer411 (Germany) using reagent kits, controls, and calibrators manufactured «by ROCHE Diagnostics GmbH, Germany.

The reference value for total IgE is 0-100 IU / ml.

Statistical processing of the study results was carried out using the Microsoft Excel XP software package, and the average values and their errors (M±m) were determined. The significance of differences between the average values of the indicators was evaluated by tStudent's t-test and univariate analysis of variance. The differences were considered statistically significant at $p<0.05$.

The study of the quantitative content of IgE in peripheral blood IgEwas performed in 49 patients with allergic and non-allergic forms of bronchial asthma, patients with urticariay – 10, urticaria with angioedema-19. Ingeneral, the age of patients suffering from ADranged from 21 to 72 years, and theaverage age was 50.7±16.5 years. The age composition of patients with urticaria ranged from 18 to 69 years, the average age was 43.55±8.3 years. The comparison group consisted of people who did not have this pathology at the time of examination.

Studies have shown that urticaria and urticaria with angioedema were diagnosed in 79.3% of women and 20.7% of men. Allergic and non-allergic forms of bronchial asthma were found in 55.1% of women and 44.9% of men.

The results of comparative studies showedthat in 50% of patients with allergic diseases, the total IgE level was within the normal range (0-100 IU / ml) and amounted to 44.9±8.7 IU / ml. The level of total IgE within the reference values was determined in 16.7% of patients with urticaria and urticaria with angioedema, bronchial asthma-33.3%. Analysis of the obtained data showed that an increased total IgE content in the range from 100 to 400 IU / ml was detected y in 29.5 % (23 patients) of patients with allergic diseases with an average value of 231.7±15.3 IU/ml. The high level of total IgE (400-2500 IU/ml) in peripheral blood IgE was 1012.7±28.6 IU / ml.

A comparative analysis of the dependence of the increased level of total IgE from 100 to 400 IU / ml on the nosological form of the disease was revealed in 14% of patients with urticaria and urticaria with angioedema, in patients with allergic and non-allergic forms of bronchial asthma in 15.4% of cases. An increase in the total IgE content over 400 IU / ml was diagnosed in 6.4% of patients with urticaria and 14.00% of patients with bronchial asthma. It should be particularly noted that in patients with bronchial asthma, the minimum total IgE content ranged from 564.9 to 2500 IU / ml.

Conclusion

1. OLimiting the content of total immunoglobulin IgE is of great clinical and diagnostic importance in the diagnosis of allergic hypersensitivity reactions Iof type I.

2. The level of total IgE exceeds the reference values in patients with urticaria and angioedema, allergic and non-allergic forms of bronchial asthma. A high level of total IgE is diagnosed mainly in patients with bronchial asthma during the period of exacerbation of the disease.

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CURRENT DATA ON THE ACCUMULATION OF RADIONUCLIDES ^{137}CS AND ^{90}SR IN THE FAUNA OF THE POLESIE STATE RADIOECOLOGICAL RESERVE

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The relevance of studying the accumulation of radionuclides in the components of ecosystems affected by radioactive contamination is increasing every year. The Polessky State Radiation and Ecological Reserve (PSRER), created as a result of the Chernobyl disaster to monitor and preserve the unique nature in conditions of constant

radioactive contamination, has become the object of a review study. The main purpose of this work is to analyze the accumulation of 137Cs and 90Sr in the fauna of the reserve, as well as to assess the potential impact on the ecosystem and human health.

Keywords: radioactive contamination, PSRER, fauna, isotopes 137Cs and 90Sr.

To study the accumulation of 137Cs in PSREC birds, animal capture and biomaterial collection activities were carried out between 2008 and 2012. Two bird species were studied, selected in accordance with their ecological characteristics and role in the ecosystems of the reserve [2].

Grouse (*Lyrurus tetrix*) – a representative of the arboreal and shrubby ecological complex. This bird leads a sedentary lifestyle, living within a radius of about 5 kilometers from the nesting site. During the five-year observation period, it was recorded that the level of 137Cs in grouse was 21-174082 Bq/kg, which is the highest indicator among the studied species. This indicates that sedentary birds with limited habitats are more susceptible to the accumulation of radionuclides, as they constantly interact with a polluted environment.

Woodcock (*Scolopax rusticola*) – a representative of the forest ecological complex. Unlike black grouse, woodcock is a migratory species, which explains its lower accumulation rate of 137Cs (35-11907 Bq/kg). During his short stay at PSRER, woodcock manages to accumulate radionuclides, but its migratory nature allows it to avoid significant accumulation. This highlights the importance of migration as a factor influencing the level of radiation pollution in birds.

Thus, the observed difference in the accumulation of 137Cs in grouse and woodcock can be explained both by the sedentary lifestyle of the former and the migratory habits of the latter species. Data on radiation pollution of these birds are important not only for understanding ecosystem changes, but also for assessing their potential impact on human health through the food chain.

From the point of view of monitoring radioactive contamination of reservoirs, data on the content of radionuclides in the tissues of commercial fish species included in the human diet are of particular importance. As a result of the Chernobyl accident in 1986, a significant part of the radioactive fallout fell on the catchment area of the Pripyat River, where the pollution levels of 137Cs and 90Sr vary from 200 to 4000 kBq/m2 and from 5.5 to 400 kBq/m2, respectively. This level of pollution can pose a danger not only to the ecosystem, but also to human health, consuming fish from these reservoirs [3].

From 2013 to 2018, the accumulation of 137Cs and 90Sr was studied in 11 species of fish (Roach (*Rutilus rutilus*), perch (*Perca fluviatilis*), pike (*Esox lucius*), rudd (*Scardinius erythrophthalmus*), crucian carp (*Carassius*), tench (*Tinca tinca*), ide (*Leuciscus idus*), chehon (*Pelecus cultratus*), bream (*Abramis brama*), Walleye (*Sander lucioperca*), Asp (*Leuciscus aspius*), living in PSRER reservoirs. Fishing was carried out in the Khoiniksky section of the reserve, where the greatest accumulation of radionuclides was noted in the closed lake Perstock. Absolute maxima of 137Cs and 90Sr content in fish muscles (6-7 kBq/kg in perch and pike) were recorded here, and all samples of fish muscle tissue from this reservoir did not comply with the RDU-99 standards (no more than 370 Bq/kg).

Interspecific differences in the accumulation of 137Cs in fish demonstrate the following order: tench (*Tinca tinca*)< rudd (*Scardinius erythrophthalmus*) < roach (*Rutilus rutilus*) < crucian carp (*Carassius*) < pike (*Esox lucius*) < perch (*Perca fluviatilis*). Predatory fish species such as pike and perch have a significantly higher level of accumulation of radionuclides, due to their place in the food chain. This highlights the need to assess not only pollution levels, but also the potential impact on human health, especially those who eat these fish [1].

This situation requires special attention to the ecosystem of the reserve and the need to develop recommendations for the safe use of resources, such as fish in the human diet. Moreover, studies show that the level of radiation pollution in reservoirs can significantly affect the structure and dynamics of fish populations, which has long-term environmental consequences.

According to monitoring data, birds and fish living in PSRER are exposed to different levels of radiation depending on the species and habitat. Woodcock, being a migratory species, has lower radiation doses compared to sedentary grouse, which confirms the importance of migration as a mechanism that reduces the accumulation of radionuclides.

As for fish, predatory species such as pike and perch show the highest levels of accumulation of radionuclides, which makes them less safe to eat. This poses a problem for local residents and authorities to ensure food safety and the

need to inform the public about the possible risks associated with the consumption of fish from polluted reservoirs in the region.

Studies of the accumulation of radionuclides in the fauna of the Polessky State Radiation and Ecological Reserve show significant differences in the level of radiation pollution between different species of animals. The black grouse, which leads a sedentary lifestyle, accumulates 137Cs in significantly larger quantities compared to the woodcock, which, due to its migratory nature, is less affected by radiation pollution.

Fish, especially predatory species, exhibit higher levels of radionuclide accumulation due to their place in the food chain. These studies emphasize the need for constant monitoring of the radiation situation in nature reserves and their impact on fauna, as well as the importance of developing recommendations for the safe use of resources such as fish in the human diet.

In general, the situation with the accumulation of radionuclides in the PSRER fauna indicates the need for an integrated approach to the study and protection of ecosystems affected by radiation pollution and the development of strategies aimed at minimizing the risk to human health and preserving natural heritage.

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THE MAIN METHODS FOR TREATING MALIGNANT SKIN NEOPLASMS

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A retrospective analysis was conducted among patients with the following forms: "Notification of a patient with a newly established diagnosis of skin cancer or another malignant skin neoplasm," the medical record of an outpatient, and the medical record of a hospitalized patient. The clinical-epidemiological study was conducted at the Minsk City Clinical Oncology Center. The study object was a cohort of 45 primary patients with malignant skin neoplasms aged 31 to 91 years, with a mean age of 67.04±0.77, including 53 men (35.8%) and 95 women (64.2%). The diagnosis of malignant skin neoplasm was based on complaints, medical history data, and pathomorphological diagnostic methods, including cytological and histopathological examination of the surgical material.

Keywords: neoplasms, prevention, treatment, melanoma, diagnosis, tumour, cancer.

Malignant skin neoplasm is a neoplastic disease characterized by the uncontrolled division of abnormal cells, leading to the formation of tumours. These tumours can be invasive, capable of growing into surrounding tissues, and can also metastasize to distant organs. The most common types of malignant skin neoplasms include melanoma, basal cell carcinoma, and squamous cell carcinoma [1, 2].

Ultrasound examination and computed tomography of the orbit were performed as indicated. The oncological examination included biomicroscopy, perimetry, visual acuity testing, direct and reverse colposcopy. During biomicroscopy, the degree of vascularization and the boundaries of the tumour were assessed. The size of the neoplasm was measured in millimeters using a ruler to determine the largest diameter and height (depth). The localization was determined considering the following anatomical zones: patients with skin cancer of the eyelids – upper and lower eyelids, skin of the inner and outer corners of the palpebral fissure, and skin of the periorbital area. If two or more anatomical zones were affected, or adjacent structures were involved, the localization was considered widespread. Regional lymph nodes, including preauricular, submandibular, and cervical nodes, were examined by palpation.

Analysis among the patients revealed that basal cell carcinoma predominated in the structure of malignant skin neoplasms (58%), while melanoma (28%), squamous cell carcinoma (9%), and adenocarcinoma (5%) were diagnosed less frequently.

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EFFECT OF CHANGING THE TEMPERATURE AND TIME MODE OF MILK WHEY PROTEIN HYDROLYSIS ON ITS ANTIOXIDANT ACTIVITY

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A comparative study of antioxidant activity (AOA) of 7 samples of whey milk proteins was carried out. Native and heat-treated milk proteins were subjected to hydrolysis using bacterial alkaline protease Protozyme at 50 and 600C for different times - 2 and 3 hours. Dependences of fluorescein fluorescence intensity on the logarithm of concentration of all samples were obtained, from which IC50 values were determined graphically, which ranged from 20.93-153.25 μg/ml. The highest AOA was obtained for native whey protein after its hydrolysis at 500C for 2 hours.

Keywords: antioxidant activity, milk whey protein hydrolysate, fluorescein.

The value of dairy products lies in the fact that the biologically active peptides (BAPs) they contain have hypotensive, immunomodulatory, antioxidant, antimicrobial, antimutagenic [1]. BAPs are formed as a result of the effect of digestive enzymes of the gastrointestinal tract on milk proteins, during technological treatment with purified proteases, and fermentation by lactic acid bacteria [2].

The antioxidant activity of 7 samples of whey proteins of milk was investigated, which are presented in Table 1. All samples were subjected to hydrolysis using bacterial alkaline protease Protozym. Hydrolysis was carried out at two temperatures of 50 and 600C for different times of 2 and 3 hours. The temperature and time regime of hydrolysis was changed to optimise the technological process of obtaining milk whey protein hydrolysate with a deeper degree of hydrolysis. According to the data of electrophoretic analysis in polyacrylamide gel under denaturing conditions, application of preliminary heat treatment of proteins and temperature increase up to 600C allows to split all whey proteins into intermediate peptides with molecular mass less than 10 kDa.

Table 1

Milk whey protein samples

№	Sample	Protein, mg/ml	Notes
1	nWP	50	Native whey protein
2	tWP	50	Heat-treated whey protein
3	nWH-P5%-50^0C-2h	50	Hydrolysate nWP, Protozym enzyme 5%, 500C-2 hr
4	nWH-P5%-60^0C-2h	50	Hydrolysate nWP, Protozym 5% enzyme, 600C-2 hr
5	tWH-P5%-60^0C-2h	50	Hydrolysate tWH, Protozym 5% enzyme, 600C-2h

6	nWH-P5%-60^{0}C-3h	50	Hydrolysate nWP, Protozym 5% enzyme, 600C-3h
7	tWH-P5%-60^{0}C-3h	50	Hydrolysate tWP, Protozym 5% enzyme, 600C-3h

The method of determining the AOA in relation to activated oxygen species is based on measuring the fluorescence intensity of fluorescein and its decrease under the influence of free radicals.

When fluorescein interacts with free radicals, its fluorescence is extinguished, which can be restored by adding substances with antioxidant properties to the system [5]. Seven samples of milk whey proteins were taken as such substances. During the study of inhibition of free radical reactions generated in the Fenton system, the dependences of fluorescence intensity of fluorescein (A) on the logarithm of concentration of all milk samples were obtained, from which the main indices of antioxidant activity of the samples were graphically determined, presented in Table 2: Amax - fluorescence intensity corresponding to maximum free radical inhibition, Cmax - sample concentration at which Amax is reached and IC50 - sample concentration at which 50% free radical inhibition is reached.

Table 2

Indicators of antioxidant activity of milk whey protein samples

№	Sample name	A_{max}, %	C_{max}, mg/ml	IC_{50}, μg/ml
1	nWP	75	0,5	153,25
2	tWP	51	0,1	95,69
3	nWH-P5%-50^{0}C-2h	99	0,5	20,93
4	nWH-P5%-60^{0}C-2h	85	0,5	28,06
5	tWH-P5%-60^{0}C-2h	88	0,25	31,7
6	nWH-P5%-60^{0}C-3h	83	0,5	29,28
7	tWH-P5%-60^{0}C-3h	78	0,5	32,82

The highest AOA was obtained for native whey protein after its hydrolysis at 500C for 2 hours. Heat treatment before hydrolysis leads to an increase in AOA values compared to native milk protein, however, further hydrolysis at 600C for 2 and 3 hours has no significant effect on the change in AOA values. Changing the hydrolysis temperature regime from 50 to 600C for native milk protein leads to deterioration of AOA values. Increasing the hydrolysis time from 2 to 3 hours for both native and heat-treated milk protein has no significant effect on the change in AOA.

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PRENATAL METHODS OF DIAGNOSING DOWN SYNDROME IN THE REPUBLIC OF BELARUS

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Down syndrome is the most common genetic pathology that causes characteristic mental and physical abnormalities in children with the condition.

Keywords: genetic pathologies, prenatal diagnosis, chromosome misalignment.

Down syndrome is a chromosomal disorder caused by abnormal cell division resulting in an extra full or partial copy of the 21 chromosomes

The disease occurs due to chromosome misalignment in the first meiotic division (66% of cases in the mother, 14% in the father), as well as due to chromosome misalignment in the second meiotic division. The main complex of pathology is associated with segment 22 of the long arm of the 21st chromosome [2].

According to the World Health Organisation recommendations, the following diagnostic methods are used:

Non-invasive prenatal testing - detects the presence of chromosome number abnormalities (aneuploidy) in the foetus. The study is possible from 9 weeks of singleton pregnancy. The technique is based on the quantitative analysis of DNA, carried out by mass parallel full-genome sequencing, which gives the most complete information about the genetic changes encountered.

Screening of maternal serum factors: Alpha-fetoprotein, an increased amount of which in the blood may indicate congenital malformations; chorionic gonadotropin (deviation from the norm indicates chromosomal abnormalities, fetal abnormalities in development); unconjugated estriol, an increased level of which indicates chromosomal abnormalities of the fetus. It is performed at 15-20 weeks of gestation.

Amniocentesis with subsequent examination of amniotic fluid - puncture of the amniotic membrane of the amniotic bladder for the purpose of taking amniotic water and subsequent analysis of fetal cells. The term is 16-19 weeks of gestation.

Chorion and placenta biopsy is a method of taking chorion villi and then counting the number of chromosomes in its cells. Timing is 9-11 weeks of gestation.

Cordocentesis is an examination of umbilical cord blood from the 18th week of gestation. The most accurate method of diagnosis.

The use of modern methods of prenatal diagnostics makes it possible to diagnose pathology at early stages of gestation, which makes it possible to make a timely decision on foetal elimination.

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CURRENT STATUS OF *PASSERIFORMES* BIRDS IN MINSK: SPECIES COMPOSITION, SEASONAL DYNAMICS AND SPATIAL DISTRIBUTION

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The paper presents the results of studies of the current state of passerine birds (*PASSERIFORMES*) in Minsk: species composition, seasonal dynamics and spatial distribution. According to the results carried out in 2022-2024, it was found that the dominant species of passerines in Minsk are forest birds (44.2%) and shrub birds (20.9%). During the study of the seasonal dynamics of passerines, it was revealed that in the summer, the species diversity of birds in the park complexes of Minsk is high (71 species) with a predominance of forest birds nesting in tree crowns. The biodiversity of passerine birds is influenced by the ecological conditions of their habitat.

Keywords: passerines, species, ornithocomplex, nesting species.

An analysis of the current state of passerines in Minsk showed that the passerine capital is currently represented by 86 species, which is 28% of the total number of all bird species found on the territory of Belarus and more than half of the passerine species known for the republic as a whole [2].

Of the 86 species of passerine birds typical for the city of Minsk, nesting has been established for 71 species.

Ten species – woodlark (Lullula arborea), wood accentor (Prunella modularis), redwing (Turdus iliacus) , mistle thrush (Turdus viscivorus), barred warbler (Sylvia nisoria), red-breasted flycatcher (Ficedula parva), nutcracker (Nucifraga caryocatactes), common finch (Fringilla montifringilla), common crossbill (Loxia curvirostra) and snow bunting (Plectrophenax nivalis) – are found in the urban landscapes of Minsk only during migration [1, 2].

Changes in habitat conditions in any area of the territory are adequately reflected in the state of ornithocomplexes in the form of degradation of some and progression of others. This in turn reflects the quality of various types of lands for species or ornithocomplexes as a whole.

The relative importance of passerines is not the same in different ecological complexes and landscape types. The wetland and ornithological complex of open spaces are generally poor in them. And, conversely, in the forest and shrub complexes they prevail over other bird groups: both in the number of species and in the number of individuals encountered per unit area. Therefore, it is advisable to dwell in more detail on the analysis of the structure of Minsk biodiversity of this species composition of birds, the basis of which is 71 nesting species.

The forest and shrub complexes of the city have been greatly transformed by (anthropogenic) human economic activity, however, areas of natural pine forests, spruce forests, floodplain alder forests and forest parks have been preserved in it. Numerous parks preserved within the city, old orchards, shrubby areas along the banks of reservoirs, as well as cemetery groves, squares and boulevards, courtyard plantings and others form the structure of forest and shrub ecological complexes. These ornithocomplexes account for 38 and 18 bird species, or 44.2% and 20.9%, which is 56 or 65.1% of all birds recorded in the forest and shrub complexes in Minsk. Of these, 26 and 16, or 36.6% and 22.5%, respectively, of all nesting passerine birds in Minsk nest [2].

Thus, the biodiversity of passerine birds in Minsk is relatively rich, which is explained by the diversity of their habitat conditions. However, the spatial distribution of birds in these conditions is extremely uneven and is closely dependent on favorable ecological niches – the age of fruit trees, the diversity and care of trees and shrubs, the presence of various housing structures, differences in lawn coverings and many other factors.

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RETROSPECTIVE ANALYSIS OF THE INCIDENCE OF THE POPULATION OF THE REPUBLIC OF BELARUS WITH DISEASES OF THE ENDOCRINE SYSTEM AND METABOLIC DISORDERS

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Abstract: the work presents a retrospective analysis of the incidence of endocrine system diseases and metabolic disorders in the population of the Republic of Belarus for the period from 2013 to 2022; dynamics were analyzed, growth rates were calculated and the main trends in population morbidity were identified based on available statistical data.

Keywords: diseases of the endocrine system and metabolic disorders, morbidity, growth rates, prevention.

The endocrine system is a system of information transfer between different cells and tissues of the body and regulation of their functions with the help of hormones. The endocrine system of the human body is represented by endocrine glands (pituitary gland, adrenal glands, thyroid gland, pineal gland), organs with endocrine tissue (pancreas, sex glands) and organs with endocrine function of cells (placenta, salivary glands, liver, kidneys, heart, etc.). A special place in the endocrine system is given to the hypothalamus, which, on the one hand, is the place of formation of hormones, and on the other hand, ensures interaction between the nervous and endocrine mechanisms of systemic regulation of body functions. Metabolism is a chemical process that ensures normal functioning of the body [1].

Analysis of the structure of primary morbidity of the population of the Republic of Belarus in 2013 showed that diseases of the endocrine system, eating disorders and metabolic disorders accounted for 0.9% and occupied the 13th rank place. In 2023, the proportion of diseases of the endocrine system, eating disorders and metabolic disorders increased slightly and took the 12th rank place.

When analyzing the long-term dynamics (2013-2022) of primary morbidity of the population of the regions of the Republic of Belarus with the endocrine system, eating disorders and metabolic disorders, a tendency towards growth was revealed, with the exception of: Minsk, Gomel and Mogilev regions, where the analysis did not reveal a significant change towards growth or decline.

The growth rates by regions and the city of Minsk were considered. The highest positive growth rate was shown by the city of Minsk – 58.1%, in second place is the Brest region with a positive growth rate of 41.6%, third place is occupied by Brest region with an indicator of 23.7%, fourth and fifth places are shared between Gomel and Grodno regions, where the positive growth was 15.1%, in sixth place is Minsk region, the positive growth was 9.2%, seventh place is occupied by Mogilev region – 3.8%.

The average annual incidence rate of endocrine system diseases and metabolic disorders in the Republic of Belarus was 1010 cases per 100 thousand people. The rates in Minsk and Brest Oblast were higher than the national rate: 1658 and 1038 cases per 100 thousand people. The other regions were lower than the national rate, and the lowest rate was in Grodno region: 665 cases per 100 thousand people [2].

It is possible to reduce the likelihood of developing endocrine system diseases by complying with the following recommendations: eatproperly, lead an active lifestyle, give up bad habits, promptly treat infectious diseases and pathologies of other origin, and, if possible, avoid exposure of the body to harmful environmental factors.

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CONGENITAL DEFECTS OF ANTIBODY FORMATION. AGAMMAGLOBULINEMIA

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The study presents the results of the absolute and relative content of lymphocyte subpopulations, the humoral component of the immune system and an assessment of the number of differentiated T- and B-lymphocytes in patients with agammaglobulinemia and healthy donors.

Keywords: primary immunodeficiency, immunophenotype, B-lymphocytes, immunoglobulins.

The most severe in clinical presentation and prognosis are syndromes with total immunoglobulin deficiency (agammaglobulinemia) [1].

Agammaglobulinemia with B-cell deficiency (X-linked Bruton agammaglobulinemia and autosomal recessive agammaglobulinemia) is characterized by congenital disorders of antibody production (a sharp decrease or complete absence of all classes of serum immunoglobulins) and circulating B-lymphocytes. The incidence rate is from 1:100,000 to 1:500,000 population [1,2].

Patients with X-linked agammaglobulinemia are unable to produce antibodies due to a mutation in the Btk (Bruton tyrosine kinase) gene, localized on the X chromosome.

The aim of the study was to determine the phenotypic characteristics of lymphocytes in the peripheral blood of patients with agammaglobulinemia and healthy donors.

The study material was samples of peripheral blood of patients registered at the Republican Scientific and Practical Center for Children's Oncology, Hematology and Immunology. Blood was collected from a vein in test tubes with a preservative (K2 / K3 EDTA), preferably with a vacuum system for collecting material. The main method of work is the flow cytometry method, using a panel of monoclonal antibodies. As a result of the work carried out on the basis of the study of phenotypic characteristics of lymphocytes in the peripheral blood of patients with agammaglobulinemia and healthy donors, the following conclusions were made: it was established that patients with X-linked agammaglobulinemia completely lack B-lymphocytes in the peripheral blood, due to a differentiation block at the molecular genetic level in the bone marrow. The number of T-lymphocytes was significantly increased by 1.28 times compared to healthy donors ($p<0.05$), among which the number of T-helpers and T-killers was also increased by 1.28 times and 1.37 times, respectively, compared to the control group ($p<0.05$) without a violation of their ratio, due to the imbalance of the lymphocyte ratio. An increase in the CD3+HLA-DR+ indicator by 3.5 times ($p<0.05$) was also revealed, which indicates compensatory mechanisms in the development of the immune response.

During the study of the humoral link of immunity, extremely low values of all immunoglobulins in the peripheral blood were shown: IgA was reduced by 18.4 times, IgM by 0.9 times, IgG by 2.97 times, which is characterized by an extremely ineffective immune response in the peripheral blood, in tissues and mucous membranes, with increased sensitivity to infectious antigens.

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ANTIBIOTIC EFFECT OF GANODERMA LUCIDUM PROTEINS FOR GRAM-POSITIVE AND GRAM-NEGATIVE BACTERIA

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This work shows that proteins obtained from saprophytic fungus Reishi *Ganoderma lucidum* can be used to enhance the action of existing antibiotics against Gram-negative and Gram-positive bacteria, thus strengthening the antibiotic arsenal for fighting bacterial infections. *Escherichia coli* and *Staphylococcus spp.* was used as model microorganism for antibiotic activity effect.

Keywords: antibiotic activity, *E. coli*, *Staphylococcus spp.*, proteins, Gram-negative bacteria, Gram-postive bacteria.

There is a growing need to enhance our antibacterial arsenal given the rising incidence of antibiotic resistance and the emergence of new virulent pathogens. *Staphylococcus spp.* – is a group of Gram-positive bacteria that are among the most common infectious agents in humans. *Escherichia coli* is a species of Gram-negative bacilliform bacteria widely distributed in the lower intestine of thermophile animals.

Basidiomycetes are producers of a number of biologically active compounds: proteins, lipids, polysaccharides, organic acids, enzymes, vitamins, pigments and others. Many of these compounds are pharmacologically active and, compared to products of chemical synthesis, will be less toxic and more effective if used in medical practice. *G. lucidum* (reishi) fungi contains a unique complex of biologically active compounds: vitamins, proteins, fats, minerals, carbohydrates, antioxidants. Polysaccharides, which make up to 40% of the mushroom biomass, and terpenoids have high biological activity. Several fractions of peptidoglycans with proven efficacy in the prevention and treatment of cancer have been isolated from the fruiting bodies of *G. lucidum*. In biotechnology department we obtain total protein from fungal fruiting body. In our laboratory technology we use buffer solution extraction and further purification by dialysis.

To investigate direct influence of proteins obtained from saprophytic fungus Reishi *Ganoderma lucidum* we use antibiotic resistance test. Bacteria (*Staphylococcus spp, E. coli*) are streaked on dishes with white disks, each impregnated with a protein solution in different dilution (5%, 25%, 75%, 100%). Meat extract B Agar medium was used for both bacteria growths. Petri dishes are filled with agar, which feeds bacteria that are inoculated on the surface, incubated in the thermostat at 37 ℃.

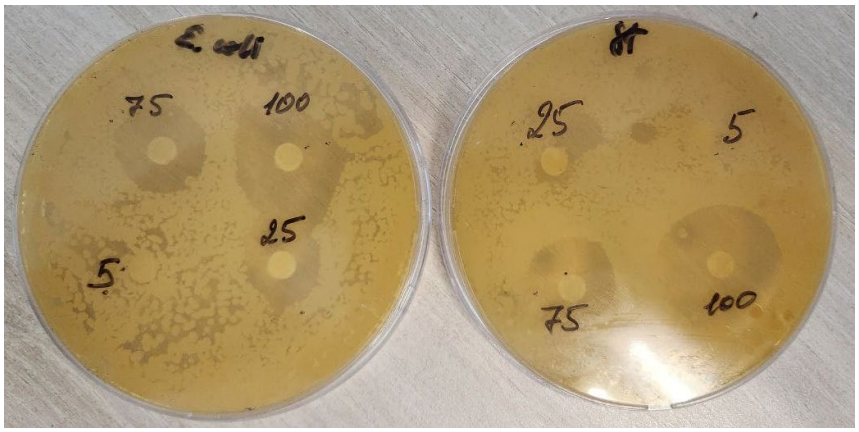

Fig.1 – Results of antibiotic resistance test with *Ganoderma lucidum* proteins

All concentration of obtained protein solution apart from 5% demonstrate antimicrobial activity against *Staphylococcus spp. and E. coli.* The zones of growth inhibition around 100% protein solution disks were 22 mm for *E. coli* and 27 mm for *Staphylococcus spp.*

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MULTIPLE SCLEROSIS: THE CURRENT STATE OF THE PROBLEM

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This article contains information about the problem of etiopathogenesis of multiple sclerosis, based on modern concepts.

According to the World Health Organization, the incidence of this disease is 100 cases per 100,000 people. In the Republic of Belarus, this frequency is 45 cases per 100,000 people, and the average age of onset of the disease ranges from 25 to 30 years.

Keywords: multiple sclerosis, etiopathogenesis, demyelination.

Multiple sclerosis (MS) is the most common form of demyelinating diseases of the central nervous system (CNS); it is a chronic autoimmune disease of the central nervous system, which is characterized by the destruction of myelin and damage to nerve fibers [2].

According to the theory of multifactorial etiology of multiple sclerosis, the development of the pathological process requires external influences such as viruses (herpes infection, retroviruses), intoxication (organic solvents, gasoline and its products, pesticides), nutrition (lack of vitamins D and E) and brain injury.

Currently, there is no accurate data on the features of hereditary transmission of MS, however, it is known that the patient's relatives have a risk of developing the disease 10-20 times higher than in the general population, which indicates a genetic predisposition to the development of MS. It is assumed that a combination of external factors acts on genetically predisposed individuals, causing chronic inflammation, autoimmune reactions and demyelination [3].

Infections act as triggers in genetically predisposed individuals [1].

The pathogenesis of MS has not been fully studied, but there is evidence indicating an autoimmune nature of the process. In MS patients, there are shifts in humoral immunity, mainly the disease develops due to disorders in the T-lymphocyte system. Autoimmune reactions are directed at the myelin sheaths of the axons of CNS neurons, which leads to demyelination and the formation of sclerotic plaques. Pathological processes in plaques occur sequentially with episodes of demyelination and chronization.

According to the clinical guidelines for MS approved in the Republic of Belarus, the course of MS is divided into remitting and progressive.

The remitting course is characterized by periods of exacerbations alternating with periods of remission and the absence of an increase in symptoms during periods of remission

The progressive course is divided into two main types: primary progressive (PPMS) and secondary progressive (VPMS). In the primary progressive type of the disease, from the very beginning, there is an increase in the severity of symptoms for at least a year without any improvement. In the case of a secondary progressive course of the disease, there is a gradual increase in symptoms for at least 6 months without any signs of stabilization or improvement after remission (RMS). Progression is possible with or without exacerbations.

Multiple sclerosis is a complex, chronic disease that requires a comprehensive approach to treatment and management. Despite the fact that the causes of MS have not yet been fully studied, modern medicine offers a variety of therapeutic methods aimed at slowing the progression of the disease, relieving symptoms and improving the quality of life of patients.

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SLEEP DEPRIVATION FROM A MEDICAL POINT OF VIEW

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Healthy sleep is the key to the full functioning of the body, good and cheerful well-being of a person, which is also important for a student. However, most students fail to maintain a stable daily routine. Stress and chronic sleep-wake disorders, characteristic of modern society, have become one of the key factors in accidents and catastrophes. Industrial activities and the educational process require compliance with the rules of sleep hygiene, while the lifestyle of students often does not correspond to this. The study of the relationship between the mechanisms of stress and sleep will help in solving this problem.

Keywords: sleep, lack of sleep, insomnia, students, stress, healthy sleep.

There are two types of sleep deprivation: selective sleep deprivation, which is a regular restriction of sleep duration; and total sleep deprivation, which is sleep deprivation for a full day or more. Total sleep deprivation for several days can cause symptoms similar to those of acute psychosis and delirium (a state of confusion). People suffering from total or partial sleep deprivation demonstrate impairment of neurocognitive and motor functions. Sleep deprivation also leads to a significant increase in anxiety levels, negatively affects mood, reduces emotional arousal to negative and positive stimuli, and can lead to hyperalgesia (increased sensitivity and reaction to pain). According to research, after 24-28 hours of total sleep deprivation, the electrical activity of the brain decreases, and the electroencephalography becomes approximately the same as when falling asleep. People deprived of sleep are able to maintain productive activity only for a short period of time; in case of prolonged work, they make a large number of mistakes, especially under time constraints.

Patients with sleep deprivation syndrome do not get enough sleep during the night and cannot remain alert after waking up. This can be caused by various social or work-related reasons. The sleep deprivation syndrome subsequently disappears after a longer period of sleep.

There are physical causes that can disrupt normal sleep and provoke sleep deficiency. These factors include painful conditions and uncomfortable conditions (for example, arthritis, cancer, or herniated disc), which is especially aggravated if movement causes additional pain. This leads to frequent awakenings and a general loss of sleep quality. The solution to the problem lies in the treatment of the underlying disease and the mitigation of concomitant symptoms, such as, for example, the use of analgesics before bedtime on the recommendation of a doctor.

Sleep deprivation can be a reaction to long-term use of central nervous system stimulants, hypnotics, other sedatives, antimetabolite chemotherapy, dopamine agonists, antiepileptic drugs, methyldopa, propranolol, thyroid hormone preparations, and alcohol abuse. Sleep deprivation can also occur during withdrawal of central nervous system depressants, tricyclic antidepressants, monoamine oxidase inhibitors, or illicit substances. Sudden withdrawal of sleeping pills and sedatives can cause nervous excitement, tremors and convulsions [1].

Under the influence of strong external stimuli, the body's resistance increases after a short period of restructuring and adaptation. However, after a period of more or less prolonged external influence, in the absence of any additional

conditions, this period suddenly gives way to a phase of exhaustion, and resistance drops sharply. After the positive effect of stress, mobilizing the body's resources, stress turns to its opposite effect.

These data indicate the importance of adequate and regular sleep, which is an integral part of the daily life of a healthy person.

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ANALYSIS OF DISORDERS IN THE COMPLEMENT SYSTEM IN PATIENTS WITH CHRONIC RELAPSING URTICARIA AND ANGIOTHECA

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The study revealed that in 61.5% of patients with chronic relapsing urticaria the content of C3 and C4 components of complement was within the normal range and amounted to C3 - 124.8±10.2 mg/dL, C4 - 26.8±5.7 mg/dL. The analysis of the obtained data showed that in 38,5% of patients suffering from urticaria with angioedema there was diagnosed a decrease in the content of C4 component of complement from 19,9 to 2,94 mg/dL, the average content of C4 component of complement was 16,39±+6,9 mg/dL ($p \leq 0,05$) in relation to the norm. In the investigated group of patients an increase (6 times in relation to the norm) in the level of total immunoglobulin E was diagnosed.

Keywords: chronic relapsing urticaria, angioedema, complement components, diagnosis

Chronic spontaneous urticaria is a disease characterized by the appearance of urticarial rash elements and/or angioedema. Chronic urticaria develops in 20-40% of patients who have had acute urticaria, twice as often in women.

The complement system plays an important role in type II (cytotoxic antibodies) and type III (immunocomplex pathology) allergic diseases. Deposition of complement components as part of immune complexes on biological membranes initiates the development of immunopathology as a result of attracting macrophages and other effectors of immune inflammation to the focus of the lesion. Activation of the classical pathway of complement can lead to the development of periodic urticaria syndrome, Quincke's edema, and eosinophilia [1]. By mechanisms of development, urticaria is a polycomponent, heterogeneous group of diseases with outwardly similar clinical manifestations, but cardinally differing in true pathogenetic directions from atopic forms to infectious or inflammatory diseases [2]. In this regard, the study of individual complement components together with clinical, instrumental-diagnostic data allows to carry out differential diagnosis of urticaria (immune and non-immune) from other forms of diseases, individualize the tactics of treatment of patients and increase its effectiveness.

The object of the study was anamnestic, clinical, instrumental-diagnostic data of patients with chronic recurrent urticaria and angioedema. The subject of the study was the determination of C3 and C4 complement components in peripheral blood.

The present study was carried out in Minsk Regional Clinical Hospital of Invalids of the Great Patriotic War named after P.M. Masherov". The patients included in the study received special treatment in the department of allergology and immunology. Informed consent for participation in this study was obtained from all patients. Determination of C3

and C4 complement components was performed in the clinical diagnostic laboratory on an automatic biochemical analyzer Humastar 600 (Germany) by immunoturbidimetry using reagent kits and controls produced by "HUMAN", Germany. Reference values of complement components were C3 - 90-180 mg/dL, C4 - 20-50 mg/dL. Statistical analysis was performed by methods of nonparametric statistics. Descriptive statistics was analyzed by mean values and mean error (M±m). The Mann-Whitney test was used to calculate the significance level (p). Differences were considered statistically significant at $p \leq 0.05$.

The study of quantitative content of C3 and C4 complement components in peripheral blood was performed in 23 patients with chronic recurrent urticaria and angioedema in anamnesis. The age of the patients ranged from 21 to 74 years, the mean age was 53.5±18.9 years. The comparison group consisted of persons who did not have this pathology at the time of examination. The studies revealed that urticaria with angioedema was diagnosed in 84.6% of women and 15.4% of men.

The results of the studies showed that in 61,5% of patients with chronic relapsing urticaria the content of C3 and C4 components of complement was within the normal range and amounted to C3 - 124,8±10,2 mg/dL, C4 - 26,8±5,7 mg/dL. Comparative analysis of the obtained data showed that in 38,5% of patients suffering from urticaria with angioedema there was diagnosed a decrease in the content of C4 component of complement from 19,9 to 2,94 mg/dL, the average content of C4 component of complement amounted to 16,39±+6,9 mg/dL ($p \leq 0,05$) in relation to the norm.

It is known that the consumption of complement components is directly related to the activation of the classical pathway of the complement system with a decrease in the level of its individual components and leads to the development of recurrent urticaria syndrome, angioedema and eosinophilia [3]. The sharp decrease in the content of C4 component of complement to 2.94 mg/dL against the background of normal level of total immunoglobulin E 48.0 ME/mL (normal up to 100 ME/mL) in a patient with acute relapsing idiopathic urticaria and angioedema attracts attention.

The analysis of the performed studies showed that the predominant majority of patients with relapsing urticaria and angioedema showed increased content (6 times in relation to the norm) of total immunoglobulin E with the average value of 604,4±23,5 EM/mL ($p \leq 0,05$).

Thus, in patients suffering from chronic relapsing urticaria and agioneurotic edema, an increased consumption of complement components was found, which is characterized by a significantly significant ($p \leq 0.05$) decrease in the content of C4 component of complement (16.39±+6.9 mg/dL). The results of the conducted studies showed that this group of patients with chronic relapsing urticaria and angioedema showed IgE-mediated form of urticaria with increased content (6.0 times in relation to the norm) of total immunoglobulin E in peripheral blood.

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EFFECTS OF CHLORPYRIFOS ON THE DEVELOPMENT OF CHRONIC LIVER AND NERVOUS SYSTEM DISEASES: ENVIRONMENTAL AND MEDICAL ASPECTS IN THE CONTEXT OF CONTINUING INCREASE IN AGRICULTURE USE

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Chlorpyrifos is widely used to protect agricultural crops from insect pests, as well as in household and sanitary applications for insect control. This insecticide was banned in the United States for most food crops in 2021. Following a legal decision in late 2023, the Environmental Protection Agency (EPA) reinstated its use for 11 crops. Debate about its safety continues in the scientific community.

Keywords: chlorpyrifos, pesticides, acetylcholinesterase, ecotoxicants, neurotoxicity, hepatotoxicity.

Chlorpyrifos is an organophosphorus insecticide classified as the diethyl ether of 3,5,6-trichloro-2-pyridylphosphorothioate.

Chlorpyrifos-oxon is the main active metabolite formed in the liver as a result of enzymatic oxidation by cytochrome P450. Chlorpyrifos-oxon is significantly more toxic than chlorpyrifos itself, as it effectively inhibits acetylcholinesterase, which disrupts the transmission of nerve impulses and leads to neurotoxicity. The end products of chlorpyrifos metabolism after the oxidation stage with the intermediate product chlorpyrifos-oxon are 3,5,6-Trichloro-2-pyridinol (TCP), diethyl thiophosphate and diethyl phosphate. The end products are less toxic and are excreted in the urine, and TCP is used as a biomarker to assess the impact of chlorpyrifos on the body. Under the influence of chlorpyrifos, a violation of antioxidant protection occurs in the liver, which leads to damage to the cell membranes of hepatocytes. As a result of this process, the enzymes alanine aminotransferase and aspartate aminotransferase are released from cells into the bloodstream and lead to their increased concentration in the blood. This indicates damage to organs, in particular the liver. Such disturbances manifest themselves as inflammatory and destructive processes in hepatocytes, which can lead to hepatitis and liver fibrosis.

In ecology, the restoration of chlorpyrifos use is a significant threat to biodiversity, ecosystem services and sustainable agricultural development. Alternative, safer methods of pest control that will minimize environmental damage and preserve natural resources should be a priority.

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ANALYSIS OF MORBIDITY AND MORTALITY FROM TUBERCULOSIS IN THE REPUBLIC OF BELARUS

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Tuberculosis remains a significant public health problem in the Republic of Belarus, despite the measures taken to control and prevent it. This disease is insidious, since in the early stages it does not have any specific symptoms that make it possible to clearly distinguish this disease from any other. The purpose of the work: to analyze the morbidity and mortality from tuberculosis in the Republic of Belarus. The mortality rate from tuberculosis in the Republic of Belarus is increasing and this is of concern to phthisiological services. It is known that some patients who become ill with pulmonary tuberculosis for the first time die during the first year of follow-up.

Keywords: tuberculosis, population, Republic of Belarus, risk factors, bacteria, mortality, morbidity, prevention.

Tuberculosis is an infectious disease caused by the bacterium Mycobacterium tuberculosis. It primarily affects the lungs, which is why this disease is dangerous to human health. However, tuberculosis can also affect other organs such as the kidneys, bones, and brain. The disease is usually transmitted by airborne droplets when an infected person coughs or sneezes. Its main symptoms include prolonged cough, weight loss, night sweats, fatigue and fever.

Tuberculosis remains a significant public health problem in the Republic of Belarus, despite the measures taken to control and prevent it. This disease is insidious, since in the early stages it does not have any specific symptoms that make it possible to clearly distinguish this disease from any other.

Thus, we can say that every year about 10 million people in the world get sick with tuberculosis, about 2 million people die from this disease. This disease mainly affects adults of working age, but the disease is registered in all age and social groups of the population. The task of preventing the disease has acquired special importance in the 21st century. This is because the types of pathogen resistant to the main anti-tuberculosis drugs have become widespread.

The analysis of the epidemiological situation of tuberculosis was carried out according to such indicators as morbidity, mortality, infection, morbidity and risk of infection each year. The research was conducted on the basis of the Minsk regional tuberculosis dispensary. The analysis period is 10 years (2013-2023). The basic indicators of our study are the frequency of primary morbidity (the number of cases of this disease, first registered in a certain year, x 100,000 – the average annual number of people); the frequency of general morbidity (the number of people who have the disease today, x 100,000 is the number of the population at a given time); detection of patterns of non–epidemic morbidity over time and in individual territories.

In total, about 5,000 people in Belarus suffered from tuberculosis in 2018 (they were registered). Less than 4 thousand (bacterial isolators) were dangerous, all of them were under supervision and, if necessary, were sent for compulsory treatment. The analysis of the incidence of tuberculosis with bacilli in Belarus by region over 10 years is as follows: 11% of people were ill in 2013, 28% in 2014 (as the virus spreads quickly enough), 25.3% in 2015 (the percentage decreased), 50.1% in 2016 (increased because people did not comply with the basic sanitary standards), 2017 – 50,6 %, 2018 – 52,3 %, 2019 – 58 % (peak of coronavirus), 2020 – 52.7% (people have learned to cope with ailments by preventing disease), 2021 – 55.5% (the second peak of coronavirus), 2022 – 56 %, 2023 – 50 %.

In the long–term dynamics of the incidence of all forms of active tuberculosis over the past 10 years, there has been a pronounced tendency to decrease the incidence (growth rate - 14.24%). In Belarus, 76.9% from 2013 due to the fact that there were no high-quality drugs and good equipment yet) by 2023 (32.4% of the population per 100,000 people), progress in curing the disease is visible.

In the structure of patients, the proportion of women was 34%, men – 66%. In the age structure, the highest incidence rates were recorded in the groups of 50-59 years, 70-79 and 70 years and older. However, it is necessary to take into account the small number of the age group of 80 years and older, that is, this age group was not considered to be epidemiologically significant. The risk group is mainly considered to be men from 50 to 79 years old [1].

The mortality rate from tuberculosis in the Republic of Belarus is increasing and this is of concern to phthisiological services. It is known that some patients who become ill with pulmonary tuberculosis for the first time die during the first year of follow-up. The immediate causes of death of patients for this period were: pulmonary heart failure, pulmonary bleeding, as well as concomitant nonspecific complications.

To date, it is difficult to determine at an early stage whether a person has tuberculosis or not, since this disease does not have specific symptoms inherent exclusively in this disease. BCG vaccinations, population screening, diagnostics, and so on are carried out for the prevention and control of the well-being of the sick person. Thus, an effective fight against tuberculosis requires an integrated approach, including both medical measures and social programs aimed at improving the living conditions and health of the population.

EVALUATION OF CYTOKINE-PRODUCING ACTIVITY OF FUNGAL SUBSTANCES DEPENDING ON THEIR EXTRACTION METHODS

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The effect of polysaccharide-containing aqueous and ethanol extracts from the fruiting bodies of medicinal mushrooms *Lentinus edodes* (shiitake), *Ganoderma lucidum* (reishi) and *Phallus impudicus* (fiddlehead mushroom) on the spontaneous secretion of immunoactive molecules (cytokines) by normal (lymphoid) human cells and in the supernatants of activated tumor culture K562 was studied. The extracts, when cultivated with unstimulated and PHA-induced cell cultures, contributed to a statistically significant increase in the concentration of IL-2 and IFNγ cytokines compared to the control.

Keywords: mushroom substances, extracts, polysaccharides, tumor culture, cytokines.

The immunostimulatory effect of polysaccharides is prophylactic in nature and refers to a non-invasive form of treatment aimed at preventing infectious diseases and tumor metastases. These molecules do not directly attack pathogens associated with cancer cells, but achieve their antitumor effect indirectly, through the activation of various protective immune cells and reactions [1, 2]. Cytokines provide a relationship within the immune system between specific immunity and the non-specific protective reaction of the body, between humoral and cellular immunity. Rational approaches to the clinical use of cytokines include the development of prolonged dosage forms of cytokine preparations, the creation of drugs for local use and methods of personalized cytokine therapy [3].

An assessment was made of the ability of mushroom extracts to modulate in vitro the secretion of immunoactive molecules (cytokines) by normal (lymphoid) human cells. The studied substances: PI-1 and PI-2 – ethanol extracts of stinkhorn fruiting bodies, GL-1 – aqueous extract of reishi fruiting bodies, LE-1 – aqueous extract of shiitake fruiting bodies. It was shown that the addition of mushroom extracts to PHA-induced cell cultures resulted in a statistically significant increase in the concentration of IL-2 and IFN-γ compared to the control. The concentration of IL-2 in PHA-activated PBMC compared to the control was: 10.54 (8.64÷13.82), 18.3 (16.0÷21.33), 17.9 (15.0÷20.03) and 19.4 (17.2÷19.65) for mushroom extracts PI-1, PI-2, GL-1 and LE-1, respectively. The level of IFN-γ production under phytohemagglutinin stimulation was 1750 (1240÷2030) mg/l, for PI-2 – 1700 (1200÷2100) mg/l, for GL-1 – 1690 (1200÷2100) mg/l, for LE-1 – 1810 (1200÷2100) mg/l. As a result of joint cultivation of fungal extracts with unstimulated MPC, a statistically significant increase in the concentration of IFN-γ was established, the production amounted to 19.8 (15.0÷21.6), 16.4 (14.0÷18.2), 9.4 (7.2÷12.8), 12.6 (9.0÷15.8) for PI-1, PI-2, GL-1 and LE-1, respectively. The ability of immunocompetent cells to respond to the effect of polysaccharide-containing mushroom extracts by increased production of IL-2 and INF-γ cytokines in the supernatants of the activated tumor cell line K 562 was revealed, which indicates the activation of natural links in the immune response. Thus, it can be assumed that therapy and prevention based on mushroom extracts will contribute to a favorable outcome in the development of tumorigenic processes.

The research was carried out within the framework of the research project «Assessment of the biological activity of basidiomycetes as potential substances with antitumor activity in model conditions in vitro», task 3.03.02 «Develop methods for increasing the adaptive capabilities of the body and reducing the negative impacts of anthropogenic and natural factors" State Public Research Institute «Natural Resources and environment» 2021-2025.

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THE EFFECT OF USING SPF PROTECTION ON THE CONCENTRATION OF VITAMIN D IN THE BODY

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Vitamin D (25-hydroxyvitamin D) plays a key role in the most important physiological processes. It stimulates an increase in the concentration of calcium and phosphorus in the blood serum, which contributes to the mineralization of the skeleton. With sufficient content in the body, it has a beneficial effect on the regulation of the growth of the parathyroid glands and the production of parathyroid hormone. Vitamin D also has a significant effect on the immune system and reduces the risk of developing cancer, as well as participates in the suppression of certain autoimmune diseases.

Keywords: vitamin D, hypovitaminosis, deficiency, optimal concentration, physiological processes.

The optimal concentration of vitamin D in the blood of an adult is 30-100 ng/ml, insufficiency is 20-30 ng/ml, deficiency is less than 20 ng/ml, pronounced deficiency is less than 10 ng/ml, and more than 100 ng/ml may have a toxic effect, and is determined by associations of endocrinologists from different countries.

Vitamin D deficiency and insufficiency can be caused by various factors. The climatic conditions of the Republic of Belarus do not provide the possibility of obtaining vitamin D from natural sources, since the geography of the country is described by the northern latitude with an acute incidence of sunlight, that is, an insufficient amount of UV rays for vitamin synthesis. Also, modern trends in the use of cosmetics with sun protection on the surface of the skin, indoor work, and movement by means of transport – all this has a negative impact on the amount of sunlight received.

The purpose of our study was to study the effect of spf-protection on vitamin D production. The study involved 58 students aged 17-22 years.

To assess the impact, a survey was conducted using Google Forms, the survey data was analyzed using additional literature and MS Excel.

It is recommended to use SPF protection with a UV index above 3. In the cold season, taking into account the peculiarities of the climate of the Republic of Belarus, this phenomenon is not observed, moreover, in summer it is recommended to apply sunscreen cosmetics between 12:00 and 18:00. At this time, the average UV index has a value of 5-7. The study showed that the majority of the surveyed students who monitor the concentration of vitamin D in the body have hypovitaminosis, regardless of the use of spf-protection (61%), however, the indicators in the overwhelming group of students (71%) who use sunscreen cosmetics on a regular basis, the vitamin D concentration values are slightly lower (about 2-4 ng/ml). Also, the majority of respondents use spf-protection on a daily basis, regardless of the values of the UV index and solar activity. Many students with vitamin deficiency noted symptoms such as mood deterioration, irritability, depression, loss of appetite, frequent colds, muscle weakness and periodic seizures.

In conclusion, it can be said that the use of spf-protection can reduce vitamin D levels in young people, especially in the climate of Belarus with limited solar radiation. The study showed that the majority of students demonstrate hypovitaminosis D, regardless of the use of SPF protection, however, those who constantly use sunscreen cosmetics have slightly lower vitamin D levels.

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DEFECTS OF THE MUSCULOSKELETAL SYSTEM

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The human musculoskeletal system is a complex system that provides support and movement of the body, supporting its weight and allows you to perform various tasks of a mechanical nature. At the same time, congenital malformations can disrupt the normal function of the musculoskeletal system, leading to significant health problems [1].

Keywords: malformations of limbs, musculoskeletal system, teratogens, embryogenesis, fetus.

According to the World Health Organization, about 8 million children are born annually in the world with congenital anomalies, of which 3 % are defects of the musculoskeletal system. Skeletal abnormalities include polydactyly, congenital clubfoot, clinodactyly, syndactyly, campomelia, amelia, ectrodactyly, brachydactyly, focolemia. The most common reducing limb malformations are amelia (1 in 10,000 newborns) and polydactyly (1 in 1,000 newborns) [2].

Congenital malformations of the musculoskeletal system are formed during fetal development. Reducing limb defects constitutes a diverse group of such anomalies. This group of defects is characterized by total hyperplasia or partial absence of skeletal limb structures. According to the classification used in international monitoring systems for congenital malformations of the musculoskeletal system, reductive limb malformations are divided into the following groups: proximal-intercalary defects; transverse terminal defects; longitudinal defects; splitting of the hand/foot. The critical periods of limb abnormality are 4–6 weeks of fetal development (peak limb formation). The main causes of limb malformations include exogenous causes (ionizing radiation, mechanical action, chemical factors, infectious agents) and endogenous factors (biological inferiority of germ cells, genetic pathology). Genetic predisposition affects the formation of limb defects in 15-30 % of cases: chronic maternal diseases (diabetes, thyroid diseases) – 10-20 %: hormonal changes in women – 10-15 %. In 50-70 % of cases, the etiology of the occurrence of defects of the musculoskeletal system cannot be established [2,3].

Defects of the musculoskeletal system can limit physical activity, cause chronic pain and lead to disability. In some cases, such defects require surgery or long-term rehabilitation. To reduce the likelihood of having children with defects of the musculoskeletal system, it is recommended to carry out periconceptual prophylaxis, which consists in creating optimal conditions for the maturation of germ cells, the formation of a zygote, its implantation and early fetal development. It is necessary to conduct medical and genetic counseling with an analysis of the pedigree, determination of the karyotype and HLA antibodies of the parents; diagnosis of the carriage of viral and bacterial infections [1,3].

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MORBIDITY OF GASTRIC CANCER IN THE REPUBLIC OF BELARUS

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The paper analyses the dynamics of gastric cancer morbidity in the Republic of Belarus for the period from 2014 to 2023. It is shown that the incidence of gastric cancer in general has a negative growth rate. Men are more susceptible to gastric cancer than women. The incidence among rural residents is higher than in the urban population. The highest incidence rate of gastric cancer in 2023 for the total population was observed in Minsk, while the lowest overall adult incidence rate was recorded in Mogilev region.

Keywords: gastric cancer, epidemiological assessment, prevalence, incidence, primary morbidity, epidemiology, population, malignant neoplasms

Gastric cancer (GC) is one of the most common localisation of malignant neoplasms in the world. Over the last few years, the incidence of gastric cancer has been decreasing in most countries, but despite this, it continues to occupy the leading positions in the structure of cancer morbidity and mortality due to late diagnosis. Among GI oncologies, gastric cancer ranks second in the Republic of Belarus in terms of frequency of occurrence.

Gastric cancer begins with lesions of the mucous membrane of the organ, and then quite quickly develop metastases, affecting the nearest organs, up to the lungs. More often this disease develops in men. Age also plays a significant role: the majority of patients are over 50 years old.

The first symptoms of gastric cancer are most often non-specific: they resemble gastritis or peptic ulcer disease. The patient is bothered by discomfort, a feeling of heaviness and bloating in the upper abdomen, rapid satiety after eating. At later stages, abdominal pain appears, the patient loses appetite, he loses a lot of weight. Sometimes there is hidden bleeding, which leads to anaemia. It manifests itself as weakness, pallor, headaches.

Patients with stage I gastric cancer have a high chance of complete recovery with adequate surgical treatment. The five-year survival rate is 80 per cent, of which 70 per cent are completely cured. At stage I, gastric cancer is detected very rarely and usually by chance. In patients with stage IV gastric cancer, the five-year survival rate is usually less than 5 % and the 10-year survival rate is 2.3 %. Of these, only 1.4 % are completely cured. Stage IV detection of gastric cancer occurs in 80% of patients and is the most common.

The study found that in 2023 in the Republic of Belarus, gastric cancer ranks fourth in the morbidity structure, with a downward trend in incidence.

In the structure of morbidity in 2023, the majority of morbidity is in the male population – 34.9 cases per 100,000 population, while the female population accounts for 19.1 cases per 100,000 population. That is, the incidence of malignant neoplasms of gastric cancer among men is 82.72% higher than among women, and increases sharply after 60 years of age, reaching a peak in the age categories of 75-85 years.

In the structure of morbidity in 2023, the majority of morbidity is in the rural population – 32.9 cases per 100,000 population, while the urban population accounts for 24.6 cases. That is, the incidence of skin malignant neoplasms among the urban population is 32.55% higher than among the rural population.

A decrease in the incidence of gastric cancer in the Republic of Belarus was achieved through socio-economic conditions, nutrition, reduction in the consumption of substances with carcinogenic effects, and a decrease in the incidence of Helicobacter pylori associated gastritis.

BREAST CANCER IN FEMALE RESIDENTS OF MINSK UNDER 50 YEARS OLD

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Study deals with the analysis of breast cancer clinical and morphological characteristics, which diagnosed in women under the age of 50 living in Minsk.

Keywords: breast cancer, clinical and morphological characteristics, young adult.

It is over the last twenty years that the tendency of breast cancer to get younger is observed, once the factor of young age and associated disease features received closer attention [1]. The aim of this study was to analyze clinical and morphological characteristics of breast cancer diagnosed in women under the age of 50 years living in Minsk.

Materials and methods. Based on pathology reports for biopsy and surgical specimens, we analyzed data of 454 breast cancer patients under the age of 50 years who underwent examination and treatment at the Minsk City Clinical Oncology Centre.

Results. The average age of women, included in this study, was 41.8 ± 0.22 years (range: 25–49 years). The highest incidence of breast cancer was diagnosed in the following age groups: 118 (26%) cases in 44–45 years, 77 (17%) cases – in 40–41 years and 60 (13.2%) cases in 42–43 years. The tumor was detected both in the right breast (240/52.9%) and in the left breast (211/46.5%). In three cases (0.6%) bilateral breast cancer was diagnosed. The most common tumor location was the upper outer quadrant of the breast (207/45.6%). In the upper inner quadrant, lower outer quadrant, lower inner quadrant, and the center area of the breast were found 54 (12%), 34 (7.5%), 24 (5.3%), and 46 (10.1%) cases respectively. Breast cancer localized in more than one of the above locations was found in 87 (19.2%) cases. The tumor mass was detected in the axillary area of the breast in two women (less than 1%).

Histologically, the majority of breast cancers diagnosed in young adult women (under 50 years) were invasive ductal carcinoma (377/83%). Lobular carcinoma (28/6.2%) was the second most common histological type. Low-grade, moderate-grade and high-grade tumors were verified in 27.1%, 62.8%, and 10.1% of cases respectively. The majority of women had a hormone-positive (389/85.7%) and Her2-negative (369/81.3%) primary tumor.

A luminal A (43.2%) and luminal B (Her2-negative, 28.4%) were the most frequently diagnosed molecular biological cancer subtypes. Luminal B Her2-positive cancer was detected in 13% of cases., Her2-positive (non-luminal) cancer was found in 4.8% of women, a triple negative breast cancer – in 10.6% of cases.

Stage I (49.6%) and Stage II (30.4%) disease were most commonly detected. Metastatic lymph nodes and distant metastasis were found in 35.9% and 1.8% of cases respectively.

Conclusion. Breast cancer diagnosed in women under 50 years old in the city of Minsk demonstrated a variety of morphological and molecular biological characteristics. The tumor was located in various quadrants of both the right and left breasts. The predominant histological tumor type was moderate-grade infiltrating ductal carcinoma. The most frequently diagnosed cancer subtypes were luminal A and luminal B Her2-negative.

This study was carried out under the contract with the Belarusian Republican Foundation for Fundamental Research No.М23РНФМ-062 “Homologous DNA repair deficiency and breast and ovarian cancer predisposition: an analysis of new mutations in patients from Russia and Belarus” dated 03.11.2023.

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FLORAL PLANTING OF NEW LANDSCAPE AND RECREATIONAL TERRITORIES OF THE CITY OF MINSK

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The paper considers the issue of the state of flowering plants in the composition of plantings of magistral, streets and squares of recreational areas of Minsk and the proposal of forms of flower gardening for new landscape and recreational areas.

Keywords: plants, flowers, landscape, ecology, eco-greening.

The modern city is a natural and technogenic environment in which the balance of these components is necessary to create comfortable living conditions for people. The state of the green fund is a problem of ecological safety of the population. The widespread degradation of the environment in large cities makes us think about the inefficiency of existing methods of economic management and the need for a new strategy.

The search for new forms of urban greening is now considered as a tool to harmonize the human environment, as a special sphere of socio-cultural design. There is a formation of directions and concepts related to ecology, such as eco-greening, green architecture and so on. There is a growing interest in the history of gardening and park art and how ancient civilizations could create a comfortable, healthy and aesthetically pleasing human environment using the properties of plants and other natural elements without modern technical devices and additional energy.

Modern landscaping of urban areas is of particularly importance in the design of “green environment” in the education of urban ecologists as highly qualified specialists.

Minsk is a large city, on the territory of which there are many different enterprises, and there is a large flow of vehicles. As a consequence, the issue of local landscaping in the city is becoming more and more important. The city needs new landscape and recreational spaces, which determines the relevance of the development proposed by us for the study.

According to the current General Plan of the city the norm of provision of citizens with green spaces is 21 square meters per person. In the new General Plan this indicator is reduced by 20% - to 17 square meters. An exception is made for Maskouski and Frunzenski districts; here the norm will be 10 square meters of green spaces per one resident. The density of building in Minsk will increase, which makes it almost impossible to return to the old indicators.

In this regard, small open unbuilt territories that do not have the status of landscape-recreational can become especially demanded in the recreational plan. In the planning structure of each administrative district of Minsk there are open territories with significant recreational potential - these are vacant backyards, small non-status greened fragments adjacent to the city streets and highways, including along the city sections of railroads, the ring road, along the boundaries of municipal and industrial facilities. Not existing independently, these areas could be integrated into a single system, such as urban green routes.

This would allow introducing unused open spaces into the category of landscape and recreational spaces, creating on their territory convenient communication corridors for pedestrian and bicycle-pedestrian traffic, new linear parks, green alleys connecting yard spaces with existing parks, gardens, squares and embankments of the city. Thus, the problem of provision and accessibility of landscape and recreational territories for the residents of Minsk could be solved.

As a result of the research work the following was done: graphic models of planning solutions and schemes of arrangement of landscape gardens for the development of new landscape and recreational areas of Minsk were developed, the assortment of plants that constitute the aesthetic and ecological potential for landscaping adjacent to the highways of the territories of Minsk was selected.

IMPACT OF CLIMATE CHANGE ON HUMAN KIDNEY FUNCTION

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Climate change has a significant impact on various aspects of the environment and human health. One of the often underestimated aspects of this problem is the impact of climate change on the functioning of organs and systems, particularly on renal health. The renal system plays a key role in maintaining homeostasis, managing fluid and electrolyte levels, and in the process of eliminating toxic substances from the body.

With worsening climatic conditions such as rising temperatures, changes in rainfall patterns, the risk of kidney related diseases increases. This may be due to both increased stress on the kidneys under conditions of dehydration and increased disease due to infections and inflammatory processes that are exacerbated by changes in ecosystems. Exposure to extreme temperatures is also known to cause acute kidney injury, especially in vulnerable populations.

Keywords: elevated temperature, kidneys, climate, low temperature.

The kidneys are the organ that balances fluid in the body, so they are extremely sensitive to extreme temperatures. Regular sun exposure traumatizes the kidneys, and as a result, millions of people can develop chronic kidney disease (CKD) and be asymptomatic.

The increase in ambient and body temperature, however, increases the need for more fluids.

An increase in ambient and body temperature together increases a person's need for more fluids. With heavy water intake, the kidneys need to reorganize to excrete water. If they fail to eliminate fluids in a timely manner, severe swelling can develop, especially in people with kidney disease, hypertension, and cardiovascular disease. In addition, chronic diseases may become more acute. However, the lack of fluid in the cardiovascular system is accompanied by a decrease in renal perfusion. In extreme cases, insufficient blood flow to the kidneys can lead to so-called acute renal failure (ARF), a disorder of renal function [1].

Increased sweating and dehydration are thought to play a major role in the development of disease: the kidneys may be affected during heat waves due to a lack of body fluid or a decrease in extracellular fluid volume, which may be related to the action of the hormone vasopressin, which regulates urine excretion [1].

Cold winds, wet weather and a general drop in immunity can easily provoke an exacerbation of pyelonephritis and other diseases related to the urinary system. With hypothermia may occur cystitis. True, it is not the cold itself that causes it, but a decrease in immunity, which at some point ceases to fight infection. As a result, inflammation of the bladder occurs. The kidneys are connected to the bladder, so a complication may occur and pyelonephritis may develop [2].

Kidney “cold” diseases arise primarily due to the cooling of the lumbar region, as well as the soles of the feet, where the bioactive point R1 of the kidney energy meridian is located. Through this point the cold “enters” the meridian and, rising to the kidneys, “settles” in them [2].

Climate change is a serious threat to human health, and the kidneys, a key organ for maintaining homeostasis, are particularly vulnerable to its effects. Changes in climate, such as rising temperatures, droughts and changes in rainfall patterns, can have multifaceted effects on kidney function.

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INFLUENCE OF ELECTROMAGNETIC RADIATION ON THE HUMAN BODY

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The impact of electromagnetic radiation (EMR) on humans is a complex and multifaceted topic that is still being studied by scientists. There is no clear answer to the question of how exactly it affects us, but data has accumulated indicating potential risks.

Keywords: electromagnetic radiation, consequences, world, influence, research.

Since the beginning of the technological era, humanity has plunged into an invisible "ocean" of electromagnetic radiation. We are surrounded by various forms of radiation: radioactive, ultraviolet, infrared, X-ray, as well as magnetic and electromagnetic.

The impact of electromagnetic radiation on the body has become especially relevant in recent decades. Unbeknownst to us, everyday life has turned into constant interaction with electrical appliances: smartphones, tablets, televisions, computers, Wi-Fi routers, microwave ovens. Modern children spend most of their time in the virtual world, immersed in the world of gadgets. Professions associated with long-term work at the computer are becoming more and more common [1].

Scientific and technological progress has undoubtedly brought us many benefits, but at the same time it has created an invisible threat. Electromagnetic radiation penetrates our body, accumulates and can cause negative health effects. It is important to understand that we live in a world where electromagnetic radiation has become an integral part of our lives. The danger lies in its invisibility and insufficient public awareness of the potential harm [2].

But often we do not think about its impact on our health. Research shows that EMF can have serious consequences:

1. Sleep disorders: EMF suppresses the production of melatonin, a hormone responsible for regulating the sleep-wake cycle. This can lead to insomnia, chronic fatigue, decreased concentration and even an increased risk of depression.

2. Cardiovascular diseases: Long-term exposure to EMF can cause high blood pressure, irregular heartbeat and increase the risk of heart attack.

3. Oncology: Some studies have linked EMF to an increased risk of developing brain cancer, leukemia, and other types of cancer.

4. Nervous disorders: In addition to sleep disorders, EMF can cause headaches, dizziness, irritability, depression, memory loss, and other nervous disorders [3].

Basic prevention methods:

1. Limit exposure time: Minimize the time you spend with your phone in your hands, use headphones for calls and listen to music, and do not hold your phone near your body while sleeping. Take regular breaks while working at the computer, watch your posture and distance from the screen.

2. Create "safe zones": remove all electrical appliances from the bedroom, including mobile phones, routers, cordless phones, laptops. Create a computer workspace that minimizes EMF exposure.

3. Change your lifestyle: Spend more time outdoors. Physical activity strengthens the immune system and helps the body better cope with EMF exposure.

Prevention of EMF is a comprehensive approach that requires a conscious attitude to the use of electronic devices and to your lifestyle. By combining the correct use of technology with healthy habits, we can reduce the risks to our health.

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METHOD OF ISOLATION OF STEM CELLS FROM ADIPOSE TISSUE OF RAT

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A method of isolation of mesenchymal stem cells obtained from adipose tissue of rats by liposuction of subcutaneous fat is proposed. Adipose tissue stem cells (ATS) are the main component of the stromal-vascular fraction (SVF), capable of self-renewal and multipotent differentiation.

Keywords: adipose tissue stem cells, stromal-vascular fraction, phenotype

Adipose tissue stem cells (ATS) are obtained by enzymatic method using proteolytic enzymes (collagenase and/or neutral protease) for dissociation of lipoaspirate. The obtained stem cells have fibroblast-like morphology and characteristic cell phenotype CD34+, CD73+, CD105+, CD90+. The relevance of obtaining and studying adipose tissue stem cells is due to their wide application in regenerative medicine and cell therapy. They have the ability for symmetrical and asymmetric division, high proliferative potential, adhesive properties, and pronounced differentiation potential. Under the influence of certain factors in vitro, SCFT can differentiate into many types of cells of mesodermal, ectodermal, and endodermal origin, including endothelial cells, cardiomyocytes, hepatocytes, and neural cells, which opens up wide possibilities for their application in regenerative medicine. The use of adipose tissue allows obtaining significantly larger amounts of primary culture and first passage cellular material in a shorter period, which characterizes adipose tissue as an alternative source in terms of rapid and cost-effective MSC growth. This type of stem cells is used in clinical trials for the treatment of skeletal diseases, gastrointestinal diseases, nervous disorders, autoimmune diseases, diabetes mellitus, lung, and heart diseases. Another advantage is that this type of cells can be isolated from adipose tissue in the laboratory and directly administered to the same patients or cryopreserved for many years.

To obtain adipose tissue stem cells, we used the method of Zuk et al., [2001] using collagenase type II for digestion of adipose tissue and subsequent washing with NH4CL solution. This method was used by Raposo et al., [2017] with the highest yield of stem cells (9.06x105 cells per 100 ml of adipose tissue) with maximum viability (up to 99%).

INFLUENCE OF VAPING AND CIGARETTE SMOKING ON BUCCAL EPITHELIUM

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This article examines the influence of vaping and cigarette smoking on the buccal epithelium. A comparative analysis of the buccal epithelium of electronic cigarette users is presented alongside traditional cigarette smokers and non-smoking volunteers. The methodology and results of the analysis are described.

Keywords: smoking, vape, cigarettes, buccal epithelium.

Vaping and smoking traditional tobacco cigarettes are widespread phenomena among modern youth. While the harm caused by traditional cigarettes is well-established in evidence-based medicine, the level of negative impact from electronic cigarettes is still under investigation. The buccal epithelium plays a particularly important role in this context,

as it is the first to encounter vapor from e-liquids and tobacco smoke, and it has significant potential for clinical and laboratory diagnostics [1].

The study involved 30 students from the A.D. Sakharov International State Ecological Institute aged 18 to 21 years. There were 12 non-smokers, 10 regular electronic cigarette users, and 6 tobacco smokers. The smallest group consisted of 2 students who used both types of smoking.

The material for the study consisted of cytological preparations of buccal epithelium samples. Participants were required to sign consent forms for material collection. Questionnaires were also developed and filled out by the study participants.

The material was collected using a disposable sterile swab with a cotton tip. Food consumption was prohibited for 3 hours prior to sample collection. Participants rinsed their mouths thoroughly with water or saline before sample collection. After applying the biological material to glass slides, the preparations were stained using the Romanowsky-Giemsa method within 30 minutes.

Microscopic examination of the buccal epithelium samples from traditional cigarette smokers (group 1), vape users (group 2), and non-smokers (control group) revealed differences between the control group and groups 1 and 2, with no significant differences found between the latter two groups. As a result of damaging factors (smoking), the number of pathological cells exhibiting changes such as chromatin condensation, karyorrhexis, karyolysis, binucleation, anucleation, and the presence of micronuclei in groups 1 and 2 was nearly twice as high as in the control group [2]. Additionally, an increase in unidentified cells was observed in the smoking groups.

Thus, cytological indicators of buccal epithelium reveal that vaping is practically equivalent to traditional cigarette smoking. However, due to effective marketing, there is a growing trend in the number of people using electronic cigarettes. The positioning of these devices as safe and harmless to health is fundamentally incorrect, and their accessibility, including to minors, represents a serious social problem [3].

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PREVALENCE OF COXARTHROSIS AND FRACTURES OF THE PROXIMAL FEMUR AMONG THE POPULATION OF SOLIGORSK AND SOLIGORSK DISTRICT

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The prevalence of coxarthrosis and fractures of the proximal femur is an urgent topic of our time. This article analyses the incidence of coxarthroses and fractures of the proximal femur and the number of total hip endoprosthesis replacements among the population of Soligorsk and Soligorsk district for 2019-2023. The object of the study was statistical data on the number of fractures of the proximal femur and on surgical work in the inpatient traumatology department of the Institute of Medical Service "Soligorsk CDH" for the period 2019-2023, as well as data on other types of operations of the traumatology department of this Institute of Medical Service.

Keywords: fracture of the proximal femur, coxarthrosis, total hip endoprosthesis replacement.

In the structure of musculoskeletal system injuries, fractures of the proximal femur account for 3.9 to 18% of all tubular bone fractures. As the life expectancy of the population increases, the proportion of elderly people, including

those with chronic somatic pathology, increases, respectively, the number of registered fractures of the proximal femur increases. Low-energy fractures of the femur occur, as a rule, because of a fall from a height on the side of the body and are found predominantly in people aged over 60 years [1].

According to world, statistics, by the end of the 20th century, up to 1.7 million cases of proximal femur fractures were registered annually. By 2050, if the main demographic trends continue, the number of proximal femur fractures is predicted to increase to 6300000 cases annually [2]. The expected number of proximal femur fractures in the Republic of Belarus is 6373 cases per year; by 2050, the number of proximal femur fractures among people over 60 years of age is expected to increase by 25.8%.

To determine the incidence of coxarthrosis and fractures of the proximal femur among the population of Soligorsk and Soligorsk district, the method of calculating intensive, extensive and visibility indicators was used.

Fractures of the proximal part of the femur are most often found because of traumas in people over 60 years old, which is associated with the problem of osteoporosis leading to increased bone fragility. In the city of Soligorsk and Soligorsk district among patients who underwent surgery on the proximal femur, for 2019-2023, on average 11.21% more women than men, this can be explained by the peculiarity of the pelvic structure of women and more pronounced hormonal changes in them, for example, during menopause.

If we consider the age of patients operated on for proximal femur fractures, we can observe that the number of patients aged 65-75 years and older is much higher than that of patients aged 50-65 years, but we can also observe a steady tendency for the number of both patients to increase every year. If we compare the place of residence of the patients, in terms of cases of proximal femur fractures and coxarthrosis, we can observe a significant predominance of persons of urban population as opposed to rural population, for 2019 - 2023 the average number of urban population is 73.5% and rural population is 26.5% respectively.

There is also a steady increase in coxarthrosis, so, from 2019 to 2023, the number of hip arthrosis requiring surgical intervention has increased 4 times. To solve this problem, total hip endoprosthesis replacement is actively and successfully applied.

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A NEW TECHNOLOGICAL METHOD OF IODIZING FOOD PRODUCTS IN MODERN ECOLOGICAL CONDITIONS BY INTRODUCING NEW IODINE-CONTAINING FUNCTIONAL ADDITIVES

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It should be emphasized that iodine-131 accounted for 25% of the total amount of radionuclides released from the reactor as a result of the Chernobyl accident. The levels of radioactive contamination with short-lived iodine radionuclides were so high that the radiation they caused is classified as the period of the "iodine-neptunium strike". In some areas of Belarus, the activity of 131I in the soil reached 37,000 kBq/m2. Being a β- and γ-emitter, iodine-131 in an aerosol state dealt the main blow to the thyroid gland of people with iodine deficiency. 131I easily penetrates into vegetables, berries, milk and therefore poses a particular danger to humans [1].

Keywords: iodine-131, cyclodextrins, α-d-glucopyranose, food, radionuclides, starch.

Currently, the most promising method of enriching food products with microelements is the use of microelement complexes with cyclodextrins as enriching ingredients. Cyclodextrins are cyclic non-reducible oligomers of α-D-

glucopyranose, which are formed as a result of starch transformation by specific bacteria, such as Bacillus macerans. Their main types include α-CD, which are formed from six glucopyranose fragments, β-CD, which are formed from seven of its residues, and γ-CD, which consist of eight glucopyranose fragments (Table 1). These cyclic carbohydrates have a cavity with a diameter of 0.5-0.8 nm, capable of accommodating 6-17 water molecules.

Scanning electron microscopy (SEM) was used to determine the structure of iodine complexes with cyclodextrins (CD). SEM is widely used to determine the surface structure of macromolecules and also allows determining the elemental composition and bond forms of samples [5]. The surface morphology of the samples was studied using a JSM-6700F scanning electron microscope (JEOL, Japan). Beforehand, a platinum coating with a film thickness of 100 Å was applied to the surface of the samples to drain the electric charge. The shooting was performed at an accelerating voltage of 5 kV and a probe current of 0.65 nA.

In the course of the research, complexes of α- and β-cyclodextrin with iodine were synthesized and the structure and properties of these substances were studied. Thus, Figure 1 shows scanning electron micrographs of α-CD complexes with iodine (α-CD-I5⁻), Figure 2 shows the surface structure of β-CD complexes with iodine (β-CD-I7⁻). Table 1 presents data on the iodine content in samples of cyclodextrin complexes with iodine.

Table

Iodine content in samples of cyclodextrin complexes with iodine

View of the complex	SAM	Titration
α-SD-I_2	18,0±0,01	15,0±0,1
β-SD-I_2	16,82±0,01	18,6±0,1
β-SD-I_2 (1 год)	15,42±0,01	16,6±0,1

The stability of the complex is achieved through hydrogen bonds, van der Waals forces and electrostatic interactions [6]. The ability to form strong hydrogen bonds also affects its solubility. It is moderately soluble in water, relatively inexpensive and is capable of forming inclusion complexes with iodine. In essence, in this case we are dealing with the molecular design of food ingredients. In the “classic example”, the stoichiometric ratio of “guest:host” is 1:1. Therefore, the most common complex is one in which the CD and “guest” molecules exist in a 1:1 ratio [6].

The results obtained allow us to draw the following conclusions:

1. The reproducibility of the method for synthesizing α- and β-CD complexes with iodine has been confirmed.

2. It has been shown that the iodine content in these complexes can be measured using iodometric titration, which does not require expensive equipment, which is important when using these complexes in food product

formulations enriched with this microelement.

3. It has been revealed that consumption of a cooked sausage product enriched with the developed complex in the recommended amount of daily iodine requirement significantly increases the iodine status, which is manifested by the results of ioduria in the level of thyroid hormones. The results of the conducted studies of the "guest-host" complex between β-CD and iodine show that the additive may be promising for enriching food products with iodine in modern environmental conditions.

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EFFECT OF LOW-INTENSITY LASER RADIATION ON SEED GERMINATION

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The effect of combined laser radiation on the dynamics of seed germination and biometric indicators of cress sprouts was discovered. During the work, an assessment was given to trained experimental groups, and statistical data processing was performed.

Keywords: watercress, laser radiation, germination, germination energy.

The use of laser radiation is one of the urgent problems of modern radiobiology. The use of low-intensity lasers to improve the quality of seed is an ecological method of pre-sowing treatment, implying a multifactorial effect on a biological object [1-6]. The symbiosis of bactericidal, stress and photoresonance theories explains the positive effect of the impact. Moreover, the effects of over-irradiation and after-effects of seed irradiation discovered in recent years expand the scope of research [3]. It has been established that coherent light is a universal factor that allows obtaining greater biomass, growth rate, and also stabilizes adaptation and reparation processes. This may be due to the formation of highly active radiotoxins that activate a number of oxidative enzymes, including peroxidase, polyphenol oxidase, catalase [2].

Each experimental group included 100 seeds. Irradiation was carried out in the dose range of 0.9-4.5 J, infrared pulse-modeled radiation with a frequency of 12500 Hz was used, the wavelengths of the red spectrum were 620-700 nm. Irradiation was carried out in an aluminum container (S=4 cm2) using the quantum therapy device "Vityaz" (Republic of Belarus). The control group was not exposed to irradiation. Germination was carried out for 7 days on a gauze base in Petri dishes.

Table 1 shows the values of germination energy and final germination of seeds in the control and experimental groups. As can be seen from the table, the best indicators are demonstrated by the group irradiated with 0.9 J.

Table 1

Germination energy and viability indicators in the studied groups

	Study group					
Indicator	co	0.	1.8	2.7	3.6	4.5 Дж
E_g, %	73	75	70	64	58	68
Germinati	83	89	83	71	67	77

Table 2 shows the total, average values of sprout lengths and the percentage ratio of values. It is evident from the table that the dynamics of length changes with increasing dose load changes in a wave-like manner, the maximum values are 2980 mm at 0.9 J and 2471 mm at 4.5 J, which is an increase of 64.27% and 36.21%, respectively.

Table 2

Total and average lengths of sprouts in the studied groups

	Study group					
Indicator	con-	0.9	1.	2.	3.6	4.5
Total length of sprouts,	1814	298	19	17	1163	2471
Average length of	21.85	33.	23	20	17.35	31.3
Ratio of values	100%	164	10	95	64.11	136.

Table 3 shows the wet and dry mass values.

Table 3

Wet and dry mass values in the study groups

	Study group					
Indicator	control	0.9	1.8	2.7	3.6	4.5
Wet weight,	0.970	1.398	1.121	0.82	0.73	1.124
Dry weight,	0.177	0.140	0.155	0.160	0.148	0.112

In the group with the maximum wet mass value (0.9 J), the greatest difference between wet and dry mass is also observed – 9.99 times, for comparison, in the control group this ratio is 5.48. This fact confirms the effect of laser radiation on transpiration processes, strengthening the capillary effect and osmotic pressure in cells.

For statistical testing of total lengths in experimental groups, the Kruskal-Wallis criterion was chosen – a nonparametric analogue of variance analysis. Based on the testing results, the hypothesis of statistically significant differences in large samples at $p \leq 0.01$ (h.emp.=90.781) was accepted.

Thus, in the course of the work, the effect of low-intensity laser radiation in the range of 0.9-4.5 J on some biometric and sowing parameters of cress seeds was discovered; the optimal dose load (0.9 J) was identified. The obtained results suggest further research, including in the range of low radiation doses.

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THE EFFECT OF COBALT ON THE HUMAN BODY

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The article shows how cobalt affects the vital activity of the body, how vitamin B_{12} deficiency affects the quality of life. It was also considered what ailments a person experiences with an imbalance of bioelements.

Keywords: System, vitamin B_{12}, cobalt, trace element, disease, analysis, deficiency.

Cobalt is a significant trace element that has an important effect on the functioning of the human body. It is necessary for the synthesis of vitamin B_{12}, which is necessary for the normal functioning of the nervous system, the formation of red blood cells and metabolism. This vitamin, in turn, is key for DNA synthesis and the formation of red blood cells. A lack of cobalt can lead to vitamin B_{12} deficiency, which can cause various diseases such as megaloblastic anemia and neurological disorders.

A lack of cobalt in the body can lead to various consequences, including anemia, depression, chronic fatigue, metabolic problems and neurological disorders. Therefore, it is especially important to closely monitor the level of cobalt in the body, especially in the presence of factors that may contribute to its deficiency. [1]

Let's take a closer look at how cobalt affects human health:

1. Cobalt plays a significant role in the formation of vitamin B_{12}, which is extremely important for maintaining the health of the nervous system. Deficiency of this vitamin, caused by a lack of cobalt, can lead to neurological problems, including depression, memory impairment and coordination problems.

2. This trace element also promotes the renewal of skin and hair cells. Its participation in metabolic processes forms elastic, radiant and healthy skin and hair.

3. Cobalt significantly affects the immune system, contributing to the synthesis of antibodies necessary to protect against infection and disease. The lack of this element can weaken the body's immune defenses. [2]

4. Studies also show a possible link between cobalt and the prevention of cardiovascular diseases. It helps to reduce cholesterol levels, improves blood circulation and supports the health of the cardiovascular system.

To prevent anemia, cobalt must enter the body with food. Foods rich in protein contribute to their better absorption. An imbalance of trace elements, including cobalt, in children can lead to delays in mental, physical and sexual growth, as well as a decrease in immune function and the development of chronic diseases. Medications with cobalt can promote better iron absorption and positively affect the body's immune response. [3]

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IDENTIFICATION OF NASOPHARYNGEAL MICROORGANISMS USING A MICROSCOPIC METHOD

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Identification of nasopharyngeal microorganisms in people with confirmed chronic tonsillitis was performed using a microscopic method with subsequent comparison with a microbiological atlas.

Keywords: microorganisms, nasopharynx, Gr+, Gr- bacteria.

The species composition of the microflora of the nasopharyngeal mucosa is the individual microbiocenosis of each person. Microorganisms can be non-pathogenic, opportunistic and pathogenic [1].

In the course of this work, material was collected from the throat of the study group, consisting of 7 people with confirmed chronic tonsillitis. Sowing was performed with a cotton swab on a nutrient medium.

As a result of the culture sowing, colonies were obtained, which we transferred to new media, then made smears, performed Gram staining and analyzed under a microscope.

Thus, 18 colonies were obtained from 7 people with confirmed chronic tonsillitis using the culture method, from which smears were made and stained according to Gram. According to the species, Gr- bacteria were detected in 4 smears and Gr+ bacteria in - 14.

Among 18 smears, the following microorganisms were identified (Table):

Table

Isolated microorganisms

Microorganisms	Quantity
Gr+ cocci	6
Gr+ rods	5
Gr- rods	4
Gr+ spore rods	3

Based on the appearance of the grown colonies, their characteristics, species and morphological affiliation, bifido- and lactobacteria, which are non-pathogenic microorganisms, were presumably identified. Bacteria belonging to the group of opportunistic pathogens were also identified; presumably these are Staphylococcus aureus, Streptoccocus salivarius, Clostridium perfringens, Haemophilus influenzae and Enterobacteriaceae.

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CLINICAL CHARACTERISTICS AND DIAGNOSIS OF TRANSIENT ISCHEMIC ATTACK

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A transient ischemic attack (TIA) is a temporary disturbance of cerebral circulation that results in a short-term deficit of brain function. A transient ischemic attack is characterized by the sudden onset of neurological symptoms that completely disappear within 24 hours.

Keywords: transient ischemic attack, neurological symptoms, cardiovascular diseases, stroke

It is diagnosed retrospectively based on the complete regression within 1 hour of suddenly occurring neurological symptoms corresponding to ischemia in the corresponding area of arterial blood supply. Symptoms occur suddenly, usually last from 2 to 30 minutes, and then completely disappear. Patients may have several TIAs daily, or only 2 or 3 over several years. Despite the short duration of manifestations, a transient ischemic attack is a serious warning of a high risk of developing a full-blown stroke.

In the Republic of Belarus, about 15% of all cases of cerebrovascular accidents are registered annually in the form of TIA, which is equivalent to 15-20 thousand people per year. Risk factors for TIA are the same as for ischemic stroke. The main etiologic factors of transient ischemic attack are atherosclerosis and associated thrombus formation, as well as arterial embolism caused by cardiogenic and non-cardiogenic factors, hemodynamic changes, including vascular spasms and atherothrombotic processes, play a key role in the pathogenesis of TIA. Irremovable risk factors include a history of stroke, old age, family history of stroke, male gender. Sometimes TIA occurs in children with severe cardiovascular diseases leading to the formation of emboli, or with very high hematocrit due to chronic hypoxemia. Clinical symptoms include: sudden weakness or paralysis of one half of the body, speech disorders, loss of coordination and vision. These symptoms completely regress within a short time, which complicates diagnosis and requires immediate medical intervention to confirm the diagnosis. Neuroimaging techniques such as computed tomography (CT) and magnetic resonance imaging (MRI), carotid ultrasound, and transcranial Doppler are used to exclude other causes of neurological impairment and to confirm the temporary nature of the symptoms of a transient ischemic attack. Electrocardiography (ECG) and echocardiography are needed to identify cardiac sources of emboli. All patients who have had a TIA require CT angiography, magnetic resonance angiography (MRA), or diffusion-weighted MRI of the carotid arteries and cerebral arteries.

Treatment is aimed at preventing stroke and includes drug therapy with anticoagulants and antiplatelet agents, as well as correction of risk factors such as hypertension, hyperlipidemia, and diabetes. Identification and elimination of risk factors such as hypertension, diabetes, high cholesterol, and smoking can significantly reduce the likelihood of recurrent TIAs and strokes. Preventive measures include lifestyle changes, stopping smoking, losing weight, engaging in regular physical activity, and eating a diet rich in vegetables, fruits, and fiber.

Transient ischemic attack (TIA) is an acute condition that requires immediate diagnosis and treatment to prevent serious consequences. It is necessary to raise awareness among both the public and health care professionals about the symptoms and risk factors of TIA in order to promptly identify, reduce the risk of stroke, and treat it.

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ECOLOGICAL AND BIOLOGICAL CHARACTERISTICS AND RATE OF ANTARCTIC TARDIGRADE REVIVAL IN THE EXPERIMENT

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During the 14th Belarusian Antarctic Expedition, experiments were conducted in installations commonly referred to as open-top chambers (Open Top Chamber (OTC). All OTC installations were located in moss biotopes at different distances from the Belarusian Antarctic Station "Mount Vechernyaya" and with different levels of development. One of the objectives was to identify the impact of possible climate change on microinvertebrates inhabiting terrestrial biotopes of East Antarctica. The main quantitative indicators of microinvertebrate representatives were determined in the OTC experimental installations and in the control, outside the installations. The greatest diversity of microinvertebrates was found for the upper moss layer, while only a few were noted at depth. It was shown that the rate of revival of tardigrades previously frozen at -18 ^{0}C varied from 9 to 35 minutes. Tardigrades, rotifers and nematodes frozen at -68 ^{0}C began to revive after 6-8 minutes [2].

Keywords: Antarctica, climate, terrestrial ecosystems, adaptations, prokaryotes, microinvertebrates.

Despite the fact that the species composition of the Antarctic flora is extremely poor, and its habitats are strictly limited in space, microcenoses that form in association with vegetation, on the contrary, are rich and diverse. These communities consist of several groups of microscopic invertebrates (tardigrades Tardigrada , rotifers of the subclass Bdelloidea , nematodes Nematoda), as well as various bacterial groups, the most interesting of which are those living directly in plants (endophytic organisms) and inhabiting the upper layers of soil in the area of root and rhizoid systems (rhizosphere organisms) [1].

tardigrades (Latin: Tardigrades) are a type of microscopic invertebrates, close to arthropods) live in moss, both in the Arctic and Antarctic. Unlike freshwater tardigrades, intermediate species of eutardigrades, living in soils, are characterized by very short legs with small claws and reduced or no back claws at all.

For typical soil tardigrades, the habitat needs to be well ventilated (tardigrades are sensitive to low oxygen conditions) and also have good food conditions.

Tardigrades are known to be highly resilient and can withstand severe hypothermia. When unfavorable conditions occur, they can fall into a state of suspended animation for years, and when favorable conditions occur, they can quickly revive.

We conducted a series of experiments to determine the rate of revival of Antarctic tardigrades and their ability to continue to exist after prolonged freezing at -18 ^{o}C (up to 2 years).

The material for the research was collected from soils and mosses from experiments with OTS installations with microinvertebrates living in them, including tardigrades.

Individual moss samples from the experimental setups were frozen on site (in Antarctica) and stored in this form until Minsk. Here, moss samples of a certain weight were placed in water at room temperature, defrosted, and tardigrades and other invertebrates were removed. Observation was conducted under a binocular microscope. A group of still immobile tardigrades was selected from the sample and the time it took for them to come to life was recorded. During the experiment with OTS, results were obtained on the quantitative and qualitative characteristics of the main groups of microinvertebrates of the studied biocenoses. The greatest diversity of microinvertebrates was characteristic of algal, moss, and mixed biocenoses.

The main group of animals found in the studied substrates were tardigrades. Their number in the moss was hundreds and even thousands of individuals per 1 g of substrate. Rotifers were also found in these samples, but they were not used in the experiments.

It has been shown that tardigrades are capable of reviving after defrosting after only 9 minutes, at a temperature of about 22-25 ^{o}C. In the experiments conducted, the reviving process was maximal within 35 minutes.

A moss sample from the OTC-5 setup (control, 05.02.2024) was frozen at -18 ^{0}C for 6 months and then transferred to -68 ^{o}C (for 7 days). After thawing the sample (moss at -68 ^{o}C), tardigrades, rotifers and nematodes began to revive after 6-7 minutes, which indicates their super- adaptability, allowing them to withstand sharp temperature fluctuations in Antarctica and ensure existence in such extreme conditions.

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EPIDEMIOLOGY OF MYCOPLASMA PNEUMONIA IN CHILDREN IN THE CONDITIONS OF COVID-19 INFECTION

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This article analyses the impact of the COVID-19 pandemic on the incidence of pneumonia of mycoplasma etiology in the child population of Minsk in the period from 2016 to 2023.

Keywords: Mycoplasma pneumoniae, atypical pneumonia, children, epidemiology, pandemic COVID-19, post-pandemic period.

The aim of the study was to assess the impact of the COVID-19 pandemic on the incidence of pneumonia of mycoplasma etiology in the child population of Minsk, hospitalised and treated in the Health Care Institution «City Children's Infectious Diseases Hospital» (CCIDH).

We found that during 8 years of follow-up from 2016 to 2023, out of 693 cases of Mycoplasma pneumoniae pneumonias (MP-pneumonia) in children under 17 years of age reported in CCIDH, 534 or 77.1±1.6% of children were hospitalised from 2016 to 2019 and 159 or 22.9±1.6% were hospitalised during the pandemic and subsequent circulation of SARS-CoV-2 virus from 2020 to 2023. Thus, the proportion of pneumonias caused by Mycoplasma pneumoniae decreased in the covid period (+COVID-19) compared to the pre-covid period (-COVID-19) by 3.4 times, $p < 0.05$. At the same time, in the total structure of bacterial pneumonias, their specific weight was 75.3+1.6% (534/709) and 56.8+3.0% (159/280) in 2016-2019 and 2020-2023, respectively, i.e. during the -COVID-19 and +COVID-19 periods, MP-pneumonias consistently ranked first among all pneumonias of bacterial etiology.

The incidence of MP-pneumonia among children hospitalised in CCIDH during different periods of observation changed significantly. While in the 4-year period before the pandemic (2016-2019) there were 56.0±2.4 cases of lung lesions due to Mycoplasma pneumoniae per 1000 hospitalised children with pneumonia, in the four years in the pandemic and subsequent circulation of SARS-CoV-2 virus (2020-2023) there were 1.8 times fewer or 31.6+2.5 cases, $p < 0.05$.

At present, based on the results of surveillance of pneumonia cases in hospitalised children in 2024, there is a trend towards intensification of the epidemic process of pneumonias of mycoplasma etiology, which is comparable to epidemiological surveillance data in other countries. It is necessary to continue further study of clinical and epidemiological features of respiratory mycoplasma infections among the country's population in the postpandemic period of COVID-19, as well as molecular and biological characteristics and resistance to macrolides of the current circulating population of Mycoplasma pneumoniae, in order to better understand the mechanisms of pathogen prevalence and further improve prevention and treatment programmes for respiratory mycoplasma infections in children at the national level.

SPECTRUM OF BACTERIAL PATHOGENS IN THE DEVELOPMENT OF ACUTE OTITIS MEDIA IN CHILDREN

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The spectrum of isolated and identified bacterial strains in children with acute otitis media (AOM) clinical picture was assessed. The etiological significance of such bacterial pathogens as Streptococcus pneumoniae, Haemophilus influenzae, Staphylococcus aureus in the development of AOM in hospitalized patients in Minsk was established. The obtained results are of interest to practical health care specialists in terms of organizing and conducting prevention and etiopathogenetic therapy of AOM in children at the present stage.

Keywords: acute otitis media, children, bacterial etiologic agents, Streptococcus pneumoniae, Haemophilus influenzae, Staphylococcus aureus.

The purpose of the research is to study the spectrum of bacterial pathogens that cause acute purulent otitis media (AOM) in children hospitalized and treated at the Children's City Infectious Clinical Hospital in Minsk in 2023.

It was established that of 296 strains of microorganisms isolated from 213 children with symptoms of acute middle ear infection (biomaterial - discharge from the ears, pus), 43 isolates or 14,5% (95% CI 10,5-18,5) were Streptococcus pneumoniae, 27 strains or 9,1% (95% CI 5,7-12,5) – *Haemophilus influenzae*, 20 microorganisms or 6,8% (95% CI 3,8-9,8) – *Staphylococcus aureus*. The total proportion of etiologically significant bacterial pathogens *Streptococcus pneumoniae, Haemophilus influenzae* and *Staphylococcus aureus* in the development of acute respiratory infections in children in 2023 amounted to 30,5% (95% CI 25,1-35,9) of microorganisms. At the same time, statistically significant differences in the etiological prevalence of *Streptococcus pneumoniae* compared to *Staphylococcus aureus* were observed with a difference of 1.6 times, $p < 0.05$, while there were no differences in the proportion of detected *Streptococcus pneumoniae* and *Haemophilus influenzae*, as well as *Haemophilus influenzae* and *Staphylococcus aureus*, $p > 0,05$.

The proportion of Staphylococcus aureus isolated from biological material of patients with exudative and purulent AOM did not differ - 10 strains or 50% (95% CI 27,6-7,4), respectively. Streptococcus pneumoniae and Haemophilus influenzae caused a purulent course of AOM and were isolated in 43 or 100% of samples and in 26 or 96,3% (95% CI 89,1-103,5) of samples, respectively.

Of the 43 strains of Streptococcus pneumoniae, isolates obtained during 2 otitis accounts for 74,4% (95% CI 61-87,8) or 32 strains, while those obtained during 1 otitis account for 11 or 25,6% (95% CI 12,2-39,0) isolates, i.e. 2,9 times less often, $p < 0,05$. A similar pattern was observed for Haemophilus influenzae, the proportion of isolation of which in ear samples from children with 2 otitis was observed 3 times more often, $p < 0,05$, compared with patients with 1 lesion, amounting to 20 or 74,1% (95% CI 58-91,6) of strains and 7 or 25,9% (95% CI 9,1-42,7) of microorganisms, respectively.

Thus, the etiologically significant bacterial pathogens in the development of AOM in children hospitalized in 2023 were Streptococcus pneumoniae, Haemophilus influenzae, causing a purulent nature of otitis in almost 100% of cases, and Staphylococcus aureus, causing a purulent and exudative inflammatory process in equal proportions, which is important to take into account when organizing and conducting prevention and etiopathogenetic therapy of AOM in children at the present stage.

ANALYSIS OF THE SENSITIVITY OF MICROFLORA ISOLATED FROM WOUND EXUDATE TO ANTIBACTERIAL DRUGS IN VITRO

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This article shows that isolated strains of 9 clinically important bacteria showed sensitivity to all tested antibiotics. The resistance of microorganisms to III-IV generation cephalosporins and macrolides is increasing, which is probably a consequence of the wide and not always rational use of these antimicrobials. Analysis of antibiotic resistance of microflora isolated from wounds showed that the drugs of choice for the treatment of synegus infection: ciprofloxacin, gentamicin retain their activity. Ceftriaxone, ciprofloxacin, amikacin are active in the treatment of infections caused by E. coli. Sensitivity to ciprofloxacin, ceftriaxone, was revealed with respect to S. aureus.

Keywords: Microflora sensitivity, wound exudate, antibacterial drugs, in vitro.

Today, the problem of antibiotic resistance is extremely relevant worldwide. The most important reason for the spread of antibiotic-resistant strains is the irrational use of antibiotics in medical practice [1]. Drug resistance is caused by inappropriate use of antimicrobials in humans, and the emergence of so-called “superbacteria” or multidrug-resistant strains is a public health problem. The main purpose of assessing (determining) the sensitivity of microorganisms to antimicrobial agents (drugs) is to predict their effectiveness in treating infections in specific patients. Sensitivity determination is also performed when monitoring the spread of resistance among microorganisms and in the process of studying new drugs [3]. In our studies it was shown that according to the type of wounds in patients the following predominate: wound channel abscess - (40%); phlegmon - (16.7%); purulent fistula - (10%); incised wound - (16.7%); postoperative wound - (10%); carbuncle - (6.6%).

The causative agents of purulent-inflammatory processes can be representatives of various genera, most of which are opportunistic microflora. Microorganisms can cause and maintain purulent process both in monoculture and in association. In our study, 10 strains of microorganisms were isolated: 36.1% Gram-positive cocci; 63.9% Gram-negative bacteria [2,3]. Gram-positive flora was represented by staphylococci and streptococci. S. aureus has a high specific weight in gram-positive flora - 74.4%. E. coli dominates in the structure of gram-negative clinically significant bacteria, Pseudomonas aeruginosa, Citrobacter, Proteus, Klebsiella, Enterobacter were also detected.

Thus, 10 types of different microorganisms are present in the structure of wound discharge microflora: S. aureus predominates among Gram-positive bacteria - 74.4%, in Gram-negative flora E. coli - 50%, P. aeruginosa - 27.3% [1]. Pathogenic bacteria Staphylococcus, Streptococcus and Enterobacteriaceae play a major role in the development of purulent-inflammatory diseases in surgical patients. The sensitivity of isolated pathogenic isolates to antibiotics was determined. The data on sensitivity to 7 β-lactam antibiotics, 3 aminoglycosides, 3 glycopeptides, 1 tetracycline, 1 macrolide and 1 lincosamide were obtained. Proteus isolates showed sensitivity to ciprofloxacin and doxycycline 76.7% and 85.5%, respectively.

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COMPARATIVE CHARACTERISTICS OF LOW DOSES OF GAMMA RADIATION AND LOW-INTENSITY LASER RADIATION ON MEDICINAL PLANTS

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Although both low-dose gamma radiation and low-intensity laser radiation can stimulate plant growth and development, they differ in their mechanisms of action, effects on plant physiology and potential applications.

Keywords: gamma radiation, plants, laser radiation.

Low-dose gamma radiation and low-intensity laser radiation are two forms of non-ionizing radiation that have been studied for their effects on plant growth and development.

Although both types of radiation have been proven to have a stimulating effect on plants, there are clear differences in their mechanisms of action, effects on plant physiology, and potential applications. Gamma radiation is a form of ionizing radiation that can cause DNA damage and mutations.

However, at low doses, gamma radiation can stimulate plant growth by increasing the production of reactive oxygen species (ROS), which can activate signaling pathways that promote cell division and differentiation.

Laser radiation has physicochemical characteristics different from gamma rays and, accordingly, excellent mechanisms of action on living organisms.

Both types of radiation can be used to stimulate the growth and increase the yield of medicinal plants. However, there are some differences between them, for example, gamma radiation doses are usually much higher than laser radiation doses. This can lead to a stronger effect on plants and more pronounced changes in their metabolism.

Laser radiation has a more precise and directed dosage, which allows it to more effectively affect certain parts of the plant or certain processes in its body. Gamma radiation can cause mutations in the genetic material of plants, which can lead to changes in their properties. Laser radiation usually does not cause such mutations. Gamma radiation may be more affordable and cheaper to use than laser radiation.

Thus, the choice between gamma radiation and low-intensity laser radiation depends on the potential risks and side effects of each method.

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THE EFFECT OF LOW DOSES OF GAMMA RADIATION ON MEDICINAL PLANTS

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Small doses of gamma radiation can be used to stimulate the growth and development of medicinal plants, however, rules and precautions must be followed when using it.

Keywords: gamma radiation, medicinal plants, dose.

Gamma rays are ionizing radiation and interact with atoms or molecules to form free radicals in cells. These radicals can damage or modify important components of plant cells, depending on the level of exposure. These effects include changes in the cellular structure and metabolism of plants, for example, the expansion of thylakoid membranes, changes in photosynthesis, modulation of the antioxidant system and the accumulation of phenolic compounds.

According to literature sources, a large number of medicinal plants exposed to low or high doses of radiation are considered to enhance or suppress germination, germination growth and other biological reactions.

In experiments, gamma radiation in all doses used, including small doses, led to inhibition of plant growth parameters 6 days after irradiation. The most sensitive growth parameter to gamma radiation is the length of the roots, which decreased by almost 3 times compared to the control with an increase in the absorbed dose. The damage sustained by seedlings and seeds during irradiation at doses of 0.1–2.5 Gy was not critical, and the restoration of normal growth occurred 10 days after the cessation of irradiation. At absorbed doses of 2.0–2.5 Gy, the stimulating effect of gamma radiation on plant growth was revealed.

Studies using transmission electron microscopy have shown that the structure of chloroplasts has clearly changed, and the membranes of cellular organelles have swollen and collapsed under high-dose irradiation. However, relatively low doses (1-2 Gy) of gamma radiation had a positive effect on morphological changes in plant cells and tissues.

Thus, small doses of gamma radiation can have a positive effect on medicinal plants. Further research in this area has the potential to develop new plant treatment methods and create more effective medicines based on them.

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THE EFFECT OF LOW-INTENSITY LASER RADIATION ON MEDICINAL PLANTS

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The energy of laser radiation probably causes a conformational rearrangement of the most important biomolecules and a change in the dynamics of plant development. This is expressed in a more active mitotic cell division in irradiated

plants, leading to an acceleration of their growth and development during ontogenesis, this is diagnosed by calculating the mitotic index and conducting other cytogenetic tests.

Keywords: laser, plants, ultraviolet light.

Lasers have been widely used in the field of biology along with the development of laser technologies, but the mechanism of the bioeffect of lasers is not clear. The stimulating effect of optimal doses of laser radiation during pre–sowing irradiation of plant seeds is one of the topical issues of modern radiobiology. To date, no clear correlation has been determined between the frequency, exposure of radiation and bioactivation in plants.

According to literature sources, after irradiation with a 1000 Hz laser for 25, 45 and 60 minutes, seed germination was more than 90%, while irradiation for 10 minutes gave germination of 84%, and control germination was 75%. Pre-sowing treatment of seeds in the field increased their germination rate to 99%. As a result, the activation of growth processes during the growing season increased the content of nutrients.

The use of a laser partially reduced the harm from environmental factors, such as ultraviolet radiation, since the germination rate and growth of shoots of the studied plants were increased along with the development of roots. Moreover, plants damaged by UV radiation treated with laser radiation recovered faster after exposure to B-band UV radiation.

However, laser radiation did not have a restorative effect on damage caused by higher levels of UV radiation. With the use of low-intensity laser radiation, the chlorophyll content, expression and activity of the pods increased. The height of the seedlings and the biomass of the shoots increased compared to the control.

The results showed that low-intensity laser irradiation has a long-term positive physiological effect on plant growth.

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THE SPECTRUM OF MUTATIONS IN BELARUSIAN PATIENTS WITH OSTEOGENESIS IMPERFECTA

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The study involved molecular genetic analysis of mutation spectrum in the protein-coding sequence of type I collagen genes in Belarusian patients with *osteogenesis imperfecta*. Novel pathogenic mutations that had not previously been described in other populations were identified.

Keywords: Osteogenesis imperfecta (OI), collagen type 1 genes COL1A1 and COL1A2.

Osteogenesis imperfecta (OI) is a rare hereditary disease caused in the vast majority of cases (80-90%) by mutations in *COL1A1* and *COL1A2* genes responsible for the synthesis of collagen type 1, which leads to the development of multiple bone fractures and progressive skeletal deformities. OI occurs at an incidence of 1:15000-20000, with equal frequency in both sexes, among different races and ethnic groups [1]. Both genetic and environmental factors (climate, physical activity, diet, treatment) can influence the phenotypic features of the disease. Since type I collagen is not only the most abundant protein in bone tissue, but is also present in ligaments, tendons, dentin, skin, sclera, and blood vessels, a decrease in the quantity and/or quality of its synthesis leads not only to increased bone fragility, but also to associated disorders in these structures in people with OI [2].

It is known that the disease does not affect fertility, and in dominantly inherited forms associated with collagen mutations, the chance of having a sick child is 50% in every pregnancy [3]. Approximately 35% of affected children live in healthy families and develop the disease as a result of a new, spontaneous mutation [4].

The *COL1A1* gene consists of 18 thousand nucleotide pairs, contains 51 exons, in which more than 600 different mutations have been found. *COL1A2* gene consists of 38 thousand nucleotide pairs, 52 exons, in which more than 400 mutations are described. Sequencing of *COL1A1* and *COL1A2* genes allows to verify up to 90% of cases of OI. This approach is currently used in many laboratories around the world and is the primary strategy for diagnosing OI [5,6].

Over the last 20 years, devices for densitometric studies that allow to diagnose bone loss with an accuracy of 2-6% in different parts of the skeleton were developed. Isotopic methods (mono- and two-photon absorptiometry), X-ray methods (mono- and two-energy X-ray absorptiometry, quantitative computed tomography), and ultrasound methods are used for this purpose. Practically important is the fact that the same mutations can manifest phenotypically in different ways: from mild severity to lethal effect. This indicates a complex relationship between mutation and disease manifestation. Despite the significant progress made in understanding the molecular-genetic basis of OI, a number of key questions concerning the pathogenesis of this disease remain open.

In the Republic of Belarus, the Ministry of Health has approved a number of orders and instructions for use that regulate the provision of medical care to patients with OI, and a system for providing such care has been established and is successfully functioning. These documents also regulate the need to perform molecular genetic testing in the process of complex diagnostics of the disease in this category of patients.

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THE IMPORTANCE OF CONDUCTING FURTHER RESEARCH ON HUMAN CORONAVIRUSES

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This work deals with current information about human coronaviruses, their classification, symptoms and pathogenesis, the data collected and conclusions about the prospects and importance of further research on coronaviruses.

Keywords: coronavirus, SARS-CoV-2.

Infectious pathogens play a key role in the overall morbidity statistics, accounting for about 22% of all deaths annually [1]. Notable among them is the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes a disease called COVID-19 that has captured the world's attention [2]. This pandemic, the third major coronavirus outbreak in the last two decades, had very significant socio-economic consequences and was the first to sweep the world in the 21st century [3].

According to the current classification, the 39 species of CoV are divided into 27 subgenera, 5 genera and 2 subfamilies. Coronaviruses form the largest group of viruses in the suborder Nidovirales, which includes the families Coronaviridae, Roniviridae, Arteriviridae and Mesoviridae [4]. The first strain of coronavirus capable of infecting humans was discovered in 1965. Currently, there are 7 known coronaviruses capable of infecting humans: HCoV-229e, HCoV-OC43, Hcov-NL63, Hcov-HKU, SARS-CoV-1, MERS-CoV, SARS-CoV-2. SARS-CoV-2 mainly affects the lower respiratory tract. In mild cases, symptoms include fever, muscle aches, fatigue, runny nose, and cough. In severe cases, the disease can cause septic shock and multi-organ failure, which can be life threatening. This type of coronavirus is also characterized by loss of sense of smell. In about 57% of patients, at least one of the symptoms such as chest pain, dyspnoea, cognitive impairment and muscle pain may persist for several months after recovery [5].

The study of human coronaviruses is important because of their tendency to recombine rapidly, leading to the emergence of new strains with altered virulence. This contributes to new public health risks. In addition, coronaviruses have the ability to bypass the body's antiviral defense system by attacking the humoral immune system [6].

The coronavirus pandemic has challenged populations and economies around the world, highlighting the weaknesses of health systems and emphasizing the importance of developing effective strategies to combat infectious diseases. The promotion and funding of scientific and medical research must remain a focus of national and international health programs. However, attention must also be paid to global pandemic response systems to ensure that such crises are better managed in the future.

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ASSESSMENT OF NUTRITION OF PRESCHOOL CHILDREN ATTENDING NURSERY SCHOOL

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Abstract: the paper presents a quantitative assessment of the nutrition of preschool children in the preschool educational institution No. 4 in Smorgon.

Keywords: children, nutrition, assessment

A comprehensive hygienic assessment of the actual nutritional status of children aged 3-7 years in the preschool educational institution No. 4 in Smorgon was carried out. An analysis of nutrition for 2023 from January to December was carried out by studying the menu layouts and cumulative statements.

An analysis of the structure of food products included in the 10-day menu showed that the main food products for children in preschool institutions are milk and dairy products (33%), cereals (15%), vegetables (12%), potatoes (5%),

fruits (3%), juices (7%), wheat bread (7%), rye bread (5%), sugar (5%), fish (2%), meat (4%), poultry (1%). The conducted studies indicate that in preschool institution No. 4, in comparison with the natural nutritional standards for preschool institutions, there is a deficit in the consumption of some food products, as well as an overconsumption of some food products. The chemical composition of food products included in the daily rations of children was estimated by the calculation method for the main nutrients (proteins, fats, carbohydrates) and the energy value of the rations.

The obtained data on the content of basic nutrients and caloric content were compared with the recommended values for children of a preschool institution in accordance with the methodological recommendations. During statistical processing of the results it was established that the distribution of the obtained values is within the norm, however, the conducted studies show that in the State Educational Institution "Nursery - kindergarten No. 4 of Smorgon" there is a discrepancy with the requirements for the caloric content of one of the three meals, namely - afternoon snacks, in full.

Additionally, to assess the nutrition of children, a questionnaire was conducted among the parents of the pupils. 50 parents of pupils aged 3 to 6 years attending the State Educational Institution "Nursery - kindergarten No. 4 of Smorgon" were interviewed.

It was established that the majority of parents are satisfied with the quality of food, their number is 54%. This is explained by the fact that in the preschool institution, food products are always fresh and are prepared several hours before the pupils eat. However, 34% of parents are partially satisfied with the quality of food and 12% are not satisfied at all.

The menu, according to which meals are organized in the preschool, suits 58% of parents. This is due to the fact that the menu-requirement is made daily, and all the dishes are varied. 12% of parents are not satisfied with the way the menu is organized, and 30% are not fully, but partially satisfied.

Most parents, namely 90%, are informed about the organization of meals in the preschool institution, 2% are not informed and 8% have partial information about the organization of children's meals.

Only 10% of the surveyed parents are familiar with the concept of "natural norms", 60% do not have information and 30% are partially familiar. Such a low percentage of parental awareness of basic concepts in the field of child nutrition can be a prerequisite for conducting introductory lectures and discussions on this topic with parents of preschoolers, posting information on information boards, as well as on the website of the educational institution.

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COMPARATIVE ANALYSIS OF TLR4 EXPRESSION ON MONOCYTES IN INTERACTION WITH ISOLATES OF KLEBSIELLA PNEUMONIAE ISOLATED

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TLR4 is the main recognition receptor of *K. pneumoniae*, as it is able to recognize lipopolysaccharide present in the cytoplasmic membrane. Comparative analysis of TLR4 expression on immune cells when cultured with microorganisms will allow the relative pathogenic potential of the isolates to be assessed. This study presents the results of evaluation of the effects on monocytes of *K. pneumoniae* isolated from clinical material and environmental objects

Keywords: K. pneumoniae, monocytes, TLR4, flow cytofluorimetry.

Klebsiella pneumoniae is a species of Gram-negative facultative-aerobic bacilliform immobile bacteria capable of causing a wide range of infections. *K. pneumoniae* is responsible for 0.5-5% of all cases of pneumonia, usually resulting in a high incidence of complications and increased mortality [1].

TLR4 are expressed both in cells of hematopoietic origin and in stromal cells, including lung epithelium. When *K. pneumoniae* enters the lungs, bacteria-specific TLR4 on epithelial cells are activated, resulting in the release of cytokines and chemokines. This attracts and activates monocytes, which phagocytize the bacteria. Activation of TLR4 by lipopolysaccharide stimulates the production of proinflammatory cytokines and chemokines, which determine the intensity of the inflammatory response and, consequently, the pathogenicity of the microorganism [1,2].

The aim of the study was to compare the pathogenic potential of two isolates of *K. pneumoniae* isolated from clinical material and environmental objects by flow cytofluorimetry.

We evaluated differences in the ability of isolates to activate TLR4 to characterize the pathogenic potential of isolates.

The model immune cells were monocytes isolated on a density gradient from peripheral blood mononuclear cells obtained from a healthy donor. The monocytes were incubated with *K. pneumoniae* suspensions for 24 hours. The main experimental evaluation was performed by flow cytofluorometry using a panel of specific monoclonal antibodies (MAB). Antibodies to TLR4 were used as MABs for monocytes.

The baseline TLR4 expression in the negative control was 94.9%, while in the positive control it was 82.6%. When cultured with the clinical isolate of *K. pneumoniae*, the TLR4 expression levels were: 89.6% for the concentration (10^3), 91.1% (10^4) and 90.3% (10^5). For the isolate obtained from the environment, these values statistically decreased to 83.1% (10^3), 77.2% (10^4) and 80.4% (10^5).

Based on the statistical analysis of the obtained results, reliable differences in the levels of TLR4 expression on monocytes were established during interaction with the clinical isolate of *K. pneumoniae* and the isolate of *K. pneumoniae* isolated from the environment (p=0.001894). Thus, the obtained data indicate a more pronounced ability of the isolate of *K. pneumoniae* from clinical material to activate TLR4-mediated mechanisms of innate immunity, which indicates its greater pathogenicity compared to the isolate from the environment.

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ANTIBACTERIAL ACTIVITY AND CHEMICAL COMPOSITION OF SAUSSUREA COSTUS

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This paper presents data on the chemical composition and antibacterial activity of extracts from *Saussurea Costus* roots. The activity was studied on such bacterial strains as *Staphylococcus aureus*, *Bacillus subtilis, Bacillus cereus, Streptococcus mutans and Escherichia coli*. Gram-positive bacteria were more sensitive to the effects of the extracts. Further study of *Saussurea Costus* will enable its use in the development of new drugs.

Keywords: *saussurea costus*, biological activity, sesquiterpene lactones, antibacterial properties

Saussurea Costus has diverse biological activities including anti-inflammatory, antitumour, antioxidant and antibacterial activities. Extracts of this plant are used to determine the composition and evaluate the antibacterial activity. Extraction of active compounds from the powder of *Saussurea Costus* roots is carried out using aqueous, alcoholic and hexane chloroform extracts. The roots of this plant contain a wide range of phytocomponents. The main classes of chemical compounds that make up *Saussurea Costus* are: phenolic compounds, flavonoids, and sesquiterpene lactones. The compounds of these classes found in *Saussurea Costus* and their properties are presented in Table 1:

Table

Chemical structure of *Saussurea Costus*

Class	Compound names	Properties
Sesquiterpene lactones	Costunolide	Antibacterial, anti-inflammatory
	Dihydrodehydrocostus lactone	Imunomodulator, antibacterial
Phenolic compounds	Gallic acid	Antibacterial, anti-inflammatory
	Cinnamic acid	antibacterial
Flavonoids	Quercetin	Antibacterial, antioxidant
	Catechins	Antioxidant, antibacterial

Saussurea Costus has moderate to strong antibacterial activity against Gram-positive bacteria, which include: Staphylococcus aureus, Staphylococcus epidermidis, Streptococcus mutans, Bacillus subtilis, Bacillus cereus, Streptococcus pneumonia. Aqueous, methanol, ethanol and hexane extracts were used to determine the antibacterial activity. Gram-positive bacteria were more sensitive to the effects of ethanol, methanol and hexane extracts of Saussurea Costus roots as these extracts contained almost twice as many compounds as the aqueous extract. This is due to the fact that some active substances may be soluble in organic solvents and insoluble in water [1].

The antibacterial activity of Saussurea Costus is due to the content of such compounds as: sesquiterpene lactones, gallic and cinnamic acids, quercetin and catechins.

Sesquiterpene lactones (SLs) have antibacterial effects against bacteria such as Staphylococcus aureus, Escherichia coli and Streptococcus pneumoniae. Gallic and cinnamic acids, quercetin and catechins have strong antibacterial action against various pathogenic bacteria including Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa, Streptococcus pneumoniae, Streptococcus mutans. The pathway of action of these compounds on bacteria may include destruction of the cell membrane, inactivation of important enzymes necessary for bacterial growth and multiplication, or inhibition of bacterial protein synthesis [2].

To detect and confirm that these compounds are contained in extracts, a variety of chemical analysis techniques are used: qualitative and quantitative - thin-layer, gas and high-performance liquid chromatography, mass spectrometry or UV spectrophotometry. Characteristic reactions for catechins are the reaction with ferric chloride solution, which gives a black-green colouring and the reaction with vanillin solution in hydrochloric acid, which results in a reddish-maline colour. For the recognition of sesquiterpene lactones, aqueous solutions of alkalis are used, which lead to the formation of salts, for example azulenes, which are coloured blue, violet and sometimes green.

Saussurea Costus can be considered as a potential natural source for the creation of various antibacterial preparations and the use of its extracts as a substitute for antibiotics because of the high content of a variety of chemical compounds capable of inhibiting and destroying the reproduction of a wide range of microorganisms, including antibiotic-resistant pathogens.

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THE EFFECT OF NITROGEN OXIDES IN THE AIR ON THE OCCURRENCE OF RESPIRATORY DISEASES

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The action of nitric oxide is mediated by its concentration. Low physiological concentrations of NO ($<10^{-6}$ M), which accompany the functioning of constitutive endothelial and neural isoforms of NOS, have cyto- and neuroprotective effects. Its non-toxic levels have pronounced anti-apoptotic activity. It has been shown that in high concentrations it induces apoptosis of certain types of cells – macrophages, thymocytes, pancreatic islet cells, some neurons and tumor cells. DNA damage by active nitrogen radicals leads to the accumulation of p53, which is considered an indicator of NO-mediated apoptosis [1].

Keywords: nitric oxide, nitrogen dioxide, diseases of the respiratory system.

High concentrations of nitric oxide, which occur during iNOS operation, cause cytotoxic, antibacterial, antiviral, antifungal effects, as well as activate the inflammatory process. It has been shown that NO, reacting with iron- and thiol-containing sites of mitochondrial respiration enzymes, DNA replication of infectious agents, exhibits a direct bactericidal effect. It inhibits many viral proteinases and transcription factors necessary for viral replication, and also enhances the antiviral effect of interferon-γ. NO reduces or prevents the reproduction of the HIV virus.

Inhalation of nitrogen dioxide in very high concentrations leads to the rapid development of nitrite shock, often resulting in the death of victims. It is based on the massive formation of methemoglobin in the blood and a chemical burn of the lungs. In the case of predominance of nitrogen monoxide in the gas mixture, the so-called reversible form of intoxication develops. The lesion is accompanied by shortness of breath, vomiting, and a drop in blood pressure due to the vasodilating effect of NO.

Inhaled NO2 is absorbed in the respiratory tract and penetrates to the level of bronchioles (the main absorption site) and alveolar passages, where it affects alveolocytes, which are highly sensitive to this pneumotoxicant. Type 2 alveolocytes are the main target of nitrogen dioxide, which induces apoptosis of these cells. The pathological effects are manifested in the fact that NO2 makes a person more susceptible to pathogens that cause respiratory diseases. People exposed to high concentrations of nitrogen dioxide are more likely to have catarrh of the upper respiratory tract, bronchitis, croup and pneumonia. In addition, nitrogen dioxide itself can cause respiratory diseases. Once in the human body, NO2, upon contact with moisture, forms nitrogenous and nitric acids, which corrode the walls of the alveoli of the lungs. In this case, the walls of the alveoli and blood capillaries become so permeable that they pass blood serum into the lung cavity. There is a solution in this liquid [2].

Air with a high concentration of NO2 can irritate the respiratory tract in the human respiratory system. Such short-term exposure can worsen respiratory diseases, especially asthma, leading to respiratory symptoms (such as coughing, wheezing, or difficulty breathing), hospitalization, and emergency room visits.

Longer-term exposure to elevated NO2 concentrations may contribute to the development of asthma and potentially increase susceptibility to respiratory infections. People with asthma, as well as children and the elderly, tend to be at greater risk of NO2 exposure to health.

People suffering from chronic respiratory diseases (pulmonary emphysema, asthma) and cardiovascular diseases may be more sensitive to direct effects of NO2. They develop complications more easily (for example, pneumonia) with short-term respiratory infections [3].

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THE ROLE OF HEALTH IN THE PREVENTION AND TREATMENT OF OBSTRUCTIVE PULMONARY DISEASE

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Chronic obstructive pulmonary disease (COPD) is a common lung disease that causes restriction of airflow in the airways and makes it difficult to breathe. It is sometimes referred to as emphysema or chronic bronchitis.

Keywords: chronic obstructive pulmonary disease, smoking, pollution

The pathologic process begins in the bronchial mucosa: in response to the impact of external pathogenic factors there is a change in the function of the secretory apparatus, infection joins, and a cascade of reactions develops, leading to damage to the bronchi, bronchioles, and adjacent alveoli. Violation of the ratio of proteolytic enzymes and antiproteases, defects in antioxidant protection of the lungs aggravate the damage. The greatest role in COPD is played by tumor necrosis factor α, interleukin 8, leukotriene-B4. They can destroy lung structure and maintain neutrophilic inflammation. The damage they cause further stimulates inflammation by releasing chemotactic peptides from the intercellular matrix. Often, COPD remains a major public health problem in countries with low sociodemographics. So, 212.3 million people in 2019, and 3.3 million patients died. Factors contributing more to DALYs were smoking (46%), particulate pollution (20.7%), occupational exposure to particulate matter, gases and smoke [1].

COPD is incurable, but its symptoms can be alleviated by quitting smoking, eliminating exposure to air pollution, and getting vaccinated to prevent infections. COPD treatment methods: inhaled medications that widen the lumen of the airways. The most important drugs for treating COPD are inhaled bronchodilators. They relax the muscles of the airways, allowing them to allow air to pass through. Also, steroids in pill form and antibiotics, oxygen therapy, and surgery. Lifestyle changes help relieve symptoms. Smoking cessation is the most important step. Avoiding secondhand smoke, smoke coming from a fire source. Maintaining physical. In addition to regular treatment, you can also reduce shortness of breath by exercising and strengthening your muscles, so they work better. Breathlessness during exercise can cause fear. It may be tempting to avoid the types of activities that you think are causing your shortness of breath. If you are not active, you will lose shape and your muscles will atrophy. This means that they will lose strength and become sluggish, and you will find it harder to endure physical activity. As a result, you will need to breathe even more frequently, making it difficult to perform the simplest activities. This can also affect your mood and lead to depression. If you remain physically active, your lungs and muscles will work as well as they can, and your health will deteriorate much more slowly. In addition to being good for your overall health, keeping active will also help reduce shortness of breath on exertion, reduce leg fatigue, increase energy, strengthen your muscles and immune system, and boost your self-esteem and mood.

COPD is currently one of the most significant respiratory diseases that will take years to treat. But modern medicine is looking for solutions.

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THE IMPORTANCE OF PEDAGOGICAL VALEOLOGY IN DISEASE PREVENTION

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Education of a harmoniously developed personality and formation of a healthy lifestyle as a fundamental life position.

Keywords: valeology, health, healthy lifestyle

Man as the most important enigma that emerged in the process of evolutionary development of nature will always raise many questions for researchers from various fields of sciences both natural (such as biology and chemistry) and social (history, psychology, philosophy). We try to understand our own essence through numerous studies. One of the fundamental aspects of the vital activity of the human organism is health. Recently, the idea of health has become particularly relevant. The difficulty, however, is that a unified methodology of health has not yet been developed. This is not surprising, as until recently there was no science of health itself.

One of the founders of health science is the Russian scientist I.I. Brekhman, who introduced the term 'valeology' (from Latin valeo - 'health', 'to be healthy') in 1980. This term is still in common use, not only in Russia, but also abroad. As a scientific discipline, it is a body of knowledge about health and healthy lifestyle [2].

The central problem of valeology is the attitude to individual health and education of healthy lifestyle culture in society. The subject of study is also human health. The object of study is a practically healthy person, as well as a person in a state of pre-disease. The method of study is all kinds of research into methods of improving human health. The main tasks for valeology are quite extensive: research and quantitative assessment of health and health reserves of a person, formation of an attitude to a healthy lifestyle, preservation and strengthening of health and health reserves of a person through the initiation of a healthy lifestyle.

Pedagogical valeology studies the issues of training and educating a person who has a strong attitude to health and healthy lifestyle at different age stages of development. Valeological training is the process of forming knowledge about the regularities of formation, preservation and development of human health, mastering the skills of preserving and improving personal health, assessing the factors that shape it. The main attention today is paid to the issues of disease prevention [1].

Prevention is a system of measures (collective or individual) aimed at preventing or eliminating the causes of disease, which differ in nature [3].

According to the World Health Organisation, to date, for humanity as a whole, about 200 different environmental factors that have a negative impact on human health have been identified. Particular attention is paid to the first three: hypodynamia (lack of movement), improper nutrition (and above all excess weight) and bad habits (use of alcohol, nicotine, drugs and other chemicals). The fourth factor on the list is unfavourable environmental conditions. While the fourth factor depends on the efforts of many countries at once or is a national problem, the first three factors will depend directly on the culture, behaviour and outlook of a particular person. This means that a healthy lifestyle is a life stance. Therefore, it is extremely important that the teacher conducts classes on such topics as: the basics of rational nutrition, organisation of work and rest regime, motor activity and development of physical qualities, as well as environmental factors damaging health.

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INFLUENCE OF CELLULAR PHONES ON HUMAN HEALTH

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The article shows how a cell phone affects human health and how dangerous it is. It also considered what ailments a person experiences when using it frequently. After all, using a cell phone is an integral part of life for some people.

Keywords: Cellular communication, hazard, radiation, exposure, body, health, telephone.

With the advent of mobile phones, the world has undergone significant changes. Today, almost every adult and child has their own device. The convenience and advantages of wireless communication have become undeniable, and the number of users continues to increase every year. In this regard, the question of the impact of mobile phones on health, especially children, is becoming increasingly relevant.

Cellular communication provides many benefits, including increased communication capabilities, the ability for parents to track the location of children, access to new knowledge via the Internet and the presence of many built-in functions such as a calculator, alarm clock, clock, flashlight, camera and others that can be used at any time.

Effect on brain activity: In our daily research, various electronic devices such as televisions, computers and microwave ovens are used, which emit electromagnetic waves. However, among all electronic devices, it is mobile phones that have the greatest impact on a person. Research shows that the radiation from gadgets can slightly slow down in those areas of the brain that provide learning, memory and coordination of movements. Radio frequency signals interact with biological mechanisms as we understand it, which leads to the activation of the production of stress proteins. Usually, such proteins are synthesized in response to high temperature or serious illness, but in this case, their level is already ensured by the usual use of a mobile phone.

The results obtained by Norwegian and Danish studies show that users of mobile devices often note symptoms such as increased sleepiness, irritability and headaches. [2]

Hearing and vision assessment: the nature of the impact of screen sound from mobile phones, it should be noted that it is insignificant. However, the small size of the display can be adjusted for difficulty for the eyes. Human eyes function better when illuminated by large objects, and working with miniature screens imposes additional strain on the eye muscles. This, in turn, can lead to fatigue and deterioration of vision. Studies show that regular use of mobile devices for two hours a day can reduce vision quality by 12-14% per year. In addition, long conversations on the phone can increase the temperature in the ear and eardrum, which can affect thinner tissues and even affect parts of the brain. Frequent wearing of headphones can accelerate the aging of hearing by 2-3 times, creating false sound effects and distorting the perception of the surrounding sound environment. It has also been recorded that the risk of developing tumors in the ear to which the mobile phone is pressed increases by 3.9 times compared to the opposite ear. [1]

Cardiovascular research: Electromagnetic waves emitted by mobile phones can affect the functioning of the heart, especially if the device is in a parallel position to the body, for example, in a pocket on the chest or on the neck. These waves can not only increase the temperature of the heart muscle, but also disrupt its normal rhythm, which can negatively affect health. Moreover, research by Swedish scientists from Linköping University shows that electromagnetic radiation can damage red blood cells (erythrocytes), increasing their aggregation.

Thus, a mobile device can both be useful and harmful to human health. In the conditions of modern reality, it is almost impossible to fully utilize mobile communications, however, by following simple recommendations, you can significantly reduce potential health threats. To minimize possible harm to health, you should: limit children's access to cellular communications; keep the screen at least 30 cm away from your eyes; take regular breaks when working with the phone; reduce the time spent talking on the phone to 15 minutes; do not bring the phone to your ear until the subscriber has picked up the receiver; Do not carry the device in your breast pocket; turn off the phone at night or place it at least 1 m away from your head.[3]

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QUANTITATIVE AND QUALITATIVE COMPOSITION OF INTESTINAL MICROBIOCENOSIS IN PATIENTS WITH DYSBIOSIS

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According to modern data, the gut microbiome is a large symbiotic ecosystem, the so-called “microbiome organ”, which is characterized by genetic heterogeneity and complex coordinated relationships. Over the past decade, it has become increasingly obvious that the intestinal microbiota is of great importance in maintaining intestinal homeostasis, regulating the normal functional activity of the immune system and the gastrointestinal tract [2].

Keywords: microbiome, gastrointestinal tract, social stress, lymphocytes, immune system.

The epithelial barrier is the point of contact between the immune system and the intestinal microbiota and a key site where a genuine dialogue takes place between the host's immunity and bacteria. The intestinal microbiota containing 1014 microorganisms could quickly take over the host's body if peaceful coexistence had not been established during human evolution. The intestinal barrier is the main component that ensures this coexistence: intestinal epithelial cells secrete thick mucus, from which bacteria in the intestinal lumen receive nutritional resources, unable to cross this barrier in the absence of pathology [1].

Social stress is an integral part of modern life. Even in peacetime, about 80% of the population lives in conditions of chronic high- and medium-level social stress (CSR). Stress-induced immune dysregulation is a trigger for the development of many pathological conditions, including autoimmune diseases, inflammatory bowel diseases such as Crohn's disease and ulcerative colitis, infections and tumors. In addition, HC is increasingly recognized as one of the leading factors modulating the composition of microorganisms living in the gastrointestinal tract. Several studies have shown that both CSF itself and the use of antibiotics against the background of CSF dramatically change the composition of the intestinal microbiota in humans and laboratory animals [1].

The largest collection of lymphoid tissue in the body — GALT — provides a dynamic immunological barrier throughout the gastrointestinal tract. Changes in the functional activity of immune cells, epithelial cells, the secretion of antimicrobial peptides and other integral mediators within this immunological barrier can directly alter the composition and functions of the intestinal microbiota [4].

Morphologically, GALT distinguishes inductive (where antigens stimulate "naive" lymphocytes) and effector zones (immune response, production of secretory immunoglobulin A) formed by diffusely located or organized lymphoid formations, some of which are also species-specific. The first formations include intraepithelial lymphocytes and lymphocytes in their own plate of the mucous membrane, the second — compactly placed clusters of lymphocytes in the form of grouped lymphoid nodules (Peyer's plaques), isolated lymphoid nodules and villi filled with lymphocytes. Peyer's plaques are located in the small intestine, mainly in the walls of the ileum in its own mucosal plate and in its submucosal base. They are lymphoepithelial formations with the participation of a specialized follicle-associated epithelium with M cells. Important functional areas of Peyer's plaques are the subepithelial zone (dome), where direct induction of the immune response, antigen processing, priming of antigen-specific T and B lymphocytes, and lymphatic follicles with germinal centers in which somatic hypermutation and recombination take place. These processes ensure the switching of the synthesis of antibodies of different classes and the maturation of activated B lymphocytes [3].

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ROLE OF DKK3 IN MODULATION OF IMMUNE RESPONSE AND CHONDROGEN DIFFERENTIATION OF PREDISPOSING CELLS

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The study presents algorithms, evaluating the role of Dkk3 in modulating the immune response and chondrogenic differentiation from precursors.

Keywords: Dkk3, Dickkopf (Dkk) family, Wnt signaling pathway, immunomodulation, CD8 T cells, chondrocytes, cell culture, culturing, collagenase, mRNA expression, PCR.

Dkk3 (Dickkopf WNT Signaling Pathway Inhibitor 3) is a gene encoding a protein that is a member of the dickkopf family. The secreted protein contains two cysteine-rich regions and is involved in embryonic development through interaction with the Wnt signaling pathway, which distinguishes this protein from other Dkk members. This protein has a variety of biological roles. Dkk3 has additional functions in humans related to cartilage degradation [1]. A study by Snelling et al. demonstrated that incubation of primary human chondrocytes or chondrosarcoma cells with recombinant Dkk3 protects against cartilage degradation in vitro by enhancing signalling via TGF-β, and that Dkk3 expression is regulated by both injury and inflammatory cytokines [2].

Dkk3 is actively studied by immunologists as a modulator of the immune system. Dkk3 is expressed at the highest levels in immunoprivileged organs, which is compatible with a role for Dkk3 in their immune tolerance. Dkk3 was found to play a vital role in establishing peripheral tolerance of CD8 T cells in the transgenic T cell receptor (TCR) system. This is supported by the observation that Dkk3 expression is upregulated in tolerant CD8 T cells, and this contributes to a decrease in overall CD8 T cell reactivity in vitro. In vivo, abrogation of Dkk3 function results in impaired tolerance, leading to destruction of tumors expressing the target antigen and rejection of autologous skin grafts. Dkk3 has been shown to play a complex role in cancer development, acting either as a tumor suppressor or as an oncogene. The secreted Wnt antagonist bound to Dkk3 becomes the most important regulator of human cancer [1].

The aim of the study was to develop an algorithm to evaluate the role of Dkk3 in modulating the immune response and chondrogenic differentiation from progenitor cells and mesenchymal stromal cells.

The algorithm for assessing the role of Dkk3 in chondrogenic differentiation is based on the use of cartilage tissue from the knee joint of the Wistar rat lineage. It is necessary to isolate chondrocytes from the cartilaginous tissue using the mechanoenzymatic method. Isolate the femur, fibula, tibia, and patella and place them in a physiological solution with an antibiotic (1-2 %). Remove the tissues, take off the periosteum and cartilage. Grind the purified cartilaginous tissue into pieces 1-3 mm^2 in size, then add diluted (1µl Stock and 49 µl Hanks' Balanced Salts, with Ca & Mg) type II collagenase to Petri dishes (30 Ø) and place in a CO2-incubator for 24 hours. After incubation, rinse the Petri dish with chondrocytes 5 times with physiological solution. Cultivate the cells using the DMEM/F12 medium. Assess the morphology of the cell cultures using an inverted microscope. After culturing, assess Dkk3 in the cell suspension. The supernatant should be collected and immunoassayed for the presence or absence of Dkk3.

The algorithm for assessing the role of Dkk3 in the modulation of immune response consists in obtaining human peripheral blood mononuclear cells followed by in vitro co-culture of the obtained mononuclear cells with tumour antigens. Expression of Dkk3 mRNA was performed by real-time PCR according to the manufacturer's protocol. PCR products were visualised on 2% agarose gels under UV light illumination. Quantification of Dkk3 in the supernatants was performed by enzyme-linked immunosorbent assay.

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STUDY OF ANTIBIOTIC RESISTANCE OF MICROORGANISMS ISOLATED FROM THE NASOPHARYNX OF PERSONS WITH CONFIRMED CHRONIC TONSILLITIS

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Nowadays, when antibiotics are widely used, forms of microorganisms resistant to antibiotics are very common. Therefore, for successful treatment with antibiotics, it is necessary to determine the antibiotic resistance of pathogenic microbes before prescribing them and try to overcome the drug resistance of microbes.

Keywords: chronic tonsillitis, microorganisms, Petri dish, Gram stain, growth inhibition zones, sensitivity, resistance.

Nasopharyngeal swabs were obtained from 7 volunteers with confirmed chronic tonsillitis. A sample was taken from the pharynx, namely, discharge from the mucous membrane of the nasopharynx. Next, inoculation was carried out on meat-extract salt agar.

From the colonies of microorganisms grown from the throats of 7 people, 19 with abundant growth were selected, from which suspensions of microorganisms were prepared according to the turbidity standard.

The prepared bacterial solutions were added to Petri dishes with Mueller-Hinton medium and distributed with a cotton swab using sterile tweezers over the surface of the medium. No later than 15 minutes after inoculation, disks with an antibacterial drug are applied to the surface of the nutrient medium. The discs were applied using sterile tweezers. After application of the disks, the Petri dishes were placed in a thermostat upside down and incubated at a temperature of 35°C for 18–24 hours.

Previously, smears of microorganisms were made from isolated colonies and stained with Gram to study the morphological properties and identify their gram affiliation.

Cultures isolated from the nasopharynx of volunteers with chronic tonsillitis are characterized by both high resistance and high sensitivity to various antibacterial drugs: ampicillin/sulbactam, metronidazole, tobramycin, cephaperazone, which act on various targets of the bacterial cell [1].

As a result of the studies, the following microorganisms were identified in 7 people with chronic tonsillitis: gram-positive coccal infection, gram-negative bacillary infection, gram-positive bacillary infection, gram-positive bacilli with spores.

Using the disk diffusion method, we identified different diameters of growth inhibition zones of identical microorganisms belonging to different people, which depends on the individual characteristics of different individuals.

It has been established that:

• Ampicillin/Sulbactam exhibits the highest bacterial activity among the studied antibiotics against both gram-positive coccal infections and gram-positive and spore microorganisms, however, resistant strains were found among gram-negative bacillary infections.

• Metronidazole exhibits high resistance to spore microorganisms, as well as to gram-positive, gram-negative bacilli and gram-positive coccal infections.

• To bramycin, in most cases, gram-positive coccal microorganisms, gram-positive and gram-negative rods showed sensitivity in 57%, 85%, 80%, respectively. Spore microorganisms are sensitive in all samples.

• Microorganisms exhibit both sensitivity and resistance to cefaperazone. Gram-positive coccal infection is resistant in most cases. Gram-positive and gram-negative bacilli showed sensitivity, resistance and intermediate sensitivity. Spore microorganisms are sensitive in all samples [2].

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METHODS OF DIAGNOSTICS AND ETIOLOGICAL CHARACTERISTICS OF CORONAVIRUS INFECTION OF CATS IN VETERINARY PRACTICE

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The study presents the dependence of the degree of FeCoV infection in cats on population density.

Keywords: feline coronavirus, feline viral infections, diagnosis, treatment of feline coronavirus infection, spread of feline coronavirus infection, vaccines.

While feline coronavirus (FeCoV) is relevant and widespread in the cat population, the incidence of feline infectious peritonitis (FIP) remains low. FeCoV is an enteric pathogen of cats that is often endemic in shelters and other multi-cat environments. FeCoV infection is typically acquired via the fecal-oronasal route, most commonly through shared litter boxes contaminated with the virus. In some cases, more virulent strains of FeCoV result in more severe FECV-associated disease or an increased likelihood of mutation to FIPV. The present study examined the nomenclature, taxonomy, and molecular organization of feline coronavirus (FeCoV), clinical presentation, diagnostic and treatment methods for feline coronavirus infection, and reviewed available vaccines against feline coronavirus infection. The dependence of FeCoV infection on sex, age, free-ranging status, and population density was also reviewed. The most effective diagnostic methods for coronavirus infection were identified [1, 2].

The aim of the study was to analyze the diagnostics and etiological characteristics of coronavirus infection in cats in veterinary practice.

The study used the results of diagnostic studies of 1052 animals, of which 674 animals had no pronounced clinical signs of disease and 378 animals had clinical signs of digestive disorders. Blood samples and fecal samples were used for laboratory diagnostics. The following research methods were used during the analysis: real-time polymerase chain reaction, polymerase chain reaction, enzyme immunoassay, immunochromatographic analysis.

Population density is essential for the spread of coronavirus among cats. Studies were conducted in places where one animal lives and out of 575 cats examined, the percentage of infected was 22%. Studies were also conducted in populations with 2-3 animals and out of 326 cats examined, 11% of FeCov positive animals were detected. In populations with 5-6 animals and 10 animals or more, the coronavirus pathogen was detected in 15% of the 94 cats examined and in 31% of the 57 cats examined. As can be seen from the presented results, the presence of several animals

living in the same area increases the risk of infection with FeCoV and the probability of infection is directly dependent on the number of animals. The data obtained were statistically significant.

FeCoV is widespread throughout the world among domestic and wild cats. The virus is endemic, especially in places where many cats are kept together in a small space (cattery, shelter, pet store). There is practically no family with several cats where there would be no endemic FeCoV. At least 50% of cats in the USA and Europe have antibodies against coronaviruses. In Switzerland, 80% of breeding cats and 50% of free-roaming cats tested positive for antibodies. In the UK, 82% of cats at shows, 53% of cats in breeding establishments and 15% of cats in single-cat households had antibodies.

FeCoV is relatively rare in free-roaming stray cats because stray cats are usually solitary and do not have close contact with each other. Most importantly, they do not use the same places to eliminate their faeces, which is the main route of transmission in multi-cat households.

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POPULATION MORBIDITY AS AN INDICATOR OF PUBLIC HEALTH: A RETROSPECTIVE ANALYSIS OF THE MINSK REGION (2009-2022)

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Population morbidity is the most important indicator of public health, a criterion for assessing the quality and effectiveness of health-improving work, and the most objective and sensitive indicator of medical and social well-being. A retrospective analysis of primary morbidity indicators was conducted in the Minsk region for the period 2009-2022. There has been a decrease in primary morbidity rates among the region's population. During the study period, primary morbidity rates in the population of the Minsk region are lower than those in the region.

Keywords: primary incidence, dynamics, trends, growth rates, structure.

Population morbidity is a crucial indicator of public health, serving as a benchmark for evaluating the efficacy and quality of health-promoting initiatives, as well as a sensitive and objective measure of medical and social well-being. Morbidity indices provide a comprehensive picture of the prevalence, structure, and dynamics of registered diseases within a population or its subgroups, enabling the identification of problematic areas and informing targeted interventions to protect and improve public health on a national scale.

This study aimed to analyze the primary morbidity rate of the population in the Minsk region from 2009 to 2022. A retrospective analysis of primary incidence was conducted using official data, examining the dynamics and determining the main trends.

The results revealed a decline in primary morbidity rates among the region's population. The average annual primary incidence rate (A0) for the entire population was 749,2 per 1,000, with an annual trend indicator (A1) of -4.4 per 1,000. The average annual rates for primary morbidity in adults and children were 617,7 per 1,000 and 1,225.8 per 1,000, respectively. Over the study period, the average annual rate of decline in primary incidence in the Minsk region was -1,2%. Notably, the child population exhibited a more pronounced decline of -6,7%, whereas the adult population showed a modest increase of 1%.

In recent years, the primary morbidity rates in the Minsk region have surpassed those of the broader region. The pathology structure of the population was characterized by a predominance of respiratory diseases (47,7% in 2022), followed by certain infectious and parasitic diseases (15,7%), and injuries and poisonings (5,3%). A decrease in the

incidence of respiratory diseases, skin and subcutaneous tissue diseases in children, and injuries was observed. Conversely, an increase in infectious morbidity was noted in the adult population over the study period.

These findings highlight the importance of continued monitoring and analysis of population morbidity to inform evidence-based public health strategies and interventions.

EPIDEMIOLOGICAL ASSESSMENT OF THE INCIDENCE OF MALIGNANT NEOPLASMS OF THE FEMALE GENITAL ORGANS

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The work considers the dynamics of the incidence of malignant neoplasms of the female genital organs in the HCI "Stolin Central District Hospital" in the city of Stolin and Stolin District, Brest Region, Republic of Belarus for 2019-2023. The study found that over the period 2019-2023, there is a tendency for an increase in cancer of the body of the uterus and ovaries. At the same time, the incidence of cervical cancer is decreasing, which amounted to -156.8 in 2020; 154.2 in 2021; 2023 - 154.0 per 100 thousand population. An increase in the incidence of GPO cancer was observed in 2022 and amounted to 514.2 people per 100 thousand population. In the same year, a spike in the incidence of cancer of the uterine body and ovaries in women was noted, which amounted to 359.8 people per 100 thousand population. The highest incidence rate for this period is observed for cancer of the uterine body in 2023 and amounted to 524.0 people per 100 thousand population.

Keywords: cancer of female genital organs (GPO), medicine, etiology and pathogenesis, treatment and prevention of cancer.

In the Republic of Belarus, malignant tumors of the female genitalia account for up to 18% of all types of oncology, of which the largest number falls on the cervix, and the incidence of ovarian cancer and uterine body varies in different countries within 4-5%. At an early stage, these types of cancer are curable, the recurrence rate is low, and at a late stage, treatment approaches are significantly limited [1]. Among malignant neoplasms of the reproductive system of women worldwide, cervical cancer (CC) ranks 2nd after breast cancer and 1st among gastrointestinal tract tumors, and 3rd in mortality (after breast and lung cancer). In recent years, there has been a gradual increase in the incidence of CC in women worldwide. Over the past 50 years, the incidence of CC in women aged 25–29 has increased by 5.1 times. In Belarus, 720 to 1,000 women are diagnosed with cervical cancer every year (the incidence rate is 18.3 per 100,000 women), and 300–350 patients die annually (the mortality rate is 6.2 per 100,000 women). The prognosis for oncological diseases of any localization directly depends on the stage and timeliness of the treatment. At stage 1a of the disease it is 95-100%, at stage 1b - 75-90%, at stage 2 - 75-90%, at stage 3 - 35-63%, at stage 4 - 7.8% [2].

The causes of gynecological cancer and factors contributing to the transformation of cells into a tumor are considered to be hormonal imbalance. The causes of development of cervical cancer and the influence of the human papillomavirus (HPV) of individual strains are separately identified. It penetrates into cells, integrating into DNA, triggering the process of formation of cells that have transformations. The process of tumor development from the moment of appearance to tumor development can last up to 5-10 years or more. If diagnostics reveals cancer at an early stage, successful and complete cure is possible.

The aim of the work was to analyze the dynamics of the incidence of cancer of the female genital organs for the period 2019-2023 in the HCI "Stolin Central District Hospital" in Stolin, Brest Region. Based on all the data presented in the study, it is shown that the incidence of all types of GPC cancer has a rather spasmodic trend and depends on many factors: timely treatment and examination, medical examination and immunity of the female population.

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MAIN ASPECTS OF NEUROPROTECTIVE PROPERTIES OF MESENCHYMAL STROMAL CELLS

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Mesenchymal stromal cells (MSCs) are a population of multipotent cells present in adult tissues that have the ability to divide and, if necessary, differentiate into highly specialized cells, making them of interest as a promising tool for cell therapy.

Keywords: mesenchymal stromal cells, neurogenic differentiation, neuroprotection

For using in cell therapy, MSCs most often considered are those obtained from gestational tissues such as placenta, fetal membranes, umbilical cord, Wharton's jelly and amniotic fluid, which can be obtained in large quantities and do not require complex invasive procedures and do not raise ethical issues. Other advantages of these tissue types include their low immunogenicity and high proliferative capacity associated with a very low tumor formation potential. MSCs used for therapeutic purposes must meet the criteria of the International Society for Cellular Therapy: adhesion to plastic; positive expression of CD73, CD90 and CD105 markers and negative expression for CD34, CD45, HLA-DR, CD14, CD19; ability to differentiate in vitro into adipocytes, chondrocytes and osteoblasts. The neurorestorative and neuroprotective effects of MSCs can be mainly characterized by several main mechanisms of action:

1. Secretion of neurotrophic factors, including fibroblast growth factor (FGF), epidermal growth factor (EGF), nerve growth factor (NGF), brain-derived neurotrophic factor (BDNF), glial cell-derived neurotrophic factor (GDNF), which have a paracrine effect on nerve and glial cell regeneration.
2. Immunomodulatory properties of MSCs. Perinatal stem cells are not immunogenic and are in a state of immune tolerance, due to the absence of surface markers such as HLA-DR, costimulatory molecules CD40, CD80 and CD86 required for T cell activation. In addition, they express HLA-G, a non-classical MHC class I molecule that inhibits the proliferation of natural NK cells and CD8 + T cells.
3. Neurogenic differentiation of MSCs with replacement of damaged cells. At present, it is believed that MSCs can exhibit a migratory effect similar to that of leukocytes, the ability to transendothelial migration and have the potential to differentiate into neuronal and glial cells.

MSCs themselves are not capable of differentiating into cells of the neuronal lineage. Before transplantation, MSCs are pre-programmed in vitro in order to improve their survival and increase their ability to differentiate into nerve cells.

The morphological and functional properties of differentiating MSCs are associated with changes caused by the absorption and secretion of environmental components. The effect of substances such as neurotrophins (brain-derived neurotrophic factor (BDNF), nerve growth factor (NGF) and neurotrophin (NT-3) on the cell culture, as well as growth factors such as epidermal growth factor (EGF), fibroblast growth factor (FGF), platelet-derived growth factor (PDGF), glial cell-derived neurotrophic factor (GDNF) and vascular endothelial growth factor (VEGF) allow MSCs to be committed in the desired direction.

To confirm the neurogenic differentiation of MSCs, it is customary to evaluate the expression of neural markers. The synthesis of mRNA of the following genes is detected: nestin (NES), neuron-specific enolase (NSE), choline acetyltransferase (CHAT) and microtubule-associated protein (MAP). A group of different methods is used to detect the expression of markers, among which the real-time PCR method is most often used. Changes in cell morphology are also noted as an additional evaluation factor: cells can moderately elongate, acquire a triangular shape and change their arrangement in the form of a medium-cell network. The above functional properties of fibroblasts, obtained and

confirmed in various preclinical studies, represent MSCs as a type of multipotent cells with great potential in the treatment of neurodegenerative diseases.

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THE RELATIONSHIP BETWEEN HORMONAL CHANGES IN THE FEMALE BODY AND DOPAMINE SYNTHESIS IN THE BRAIN

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Currently, the literature contains a number of works on the relationship between the hypothalamic-pituitary-gonadal and dopaminergic systems, however, they mainly concern experimental or clinical studies.

Keywords: Menopausal transition, climacteric syndrome, dopaminergic system.

The increase in the number of the elderly population determines the emergence of new questions related to the study of age-associated diseases. In the female body, the entry into the menopausal transition is the beginning of the "aging" of the reproductive function, which, in turn, leads to a decrease in the levels of sex hormones. A direct connection has been revealed between disturbances in the ratio of estrogens, progesterone, androgens and the cognitive activity of women.

Throughout the various stages of life, women experience significant changes in the levels of sex hormones: estrogens, progesterone, androgens, from menarche to menopause. These changes have a significant impact on the entire body, including the central nervous system, and can cause changes in mood, performance, behavior, and cognitive abilities.

Numerous different forms of estrogen receptors have been found in the brain, which are especially widely represented in areas responsible for memory and executive cognitive function and differ greatly in the manifestation of effects. An interesting opinion is that some authors believe that memory impairment and cognitive dysfunction occur not only due to a decrease in the number of estrogen receptors of a particular isoform, but also due to disturbances in the ratio of these receptors.

In modern gynecological endocrinology, issues of various disorders accompanying the onset of menopause are widely discussed, especially climacteric syndrome and the possibility of its relief using various pharmacological agents. The problem is complicated by the fact that with pronounced metabolic disorders and a tendency to thrombosis, hormone replacement therapy drugs are contraindicated for such patients.

The climacteric period is a period of woman's life when productive and menstrual functions cease are, changes hormonal homeostasis of the body. Currently, there is an age-related restructuring of the hypothalamic centers that regulate the secretion of gonadotropic hormones, the level of estrogens and gestagens in the blood decreases. Very often, climacteric the period is accompanied by neurovegetative, psycho-emotional, cardiovascular, motor disorders, such as hot flashes, sweating, palpitations, arrhythmia, increased blood pressure, irritability, aggressiveness, impulsiveness, dyskinesia. The peak of borderline mental states in women also occurs during the climacteric period. The restructuring of the main physiological processes occurs under the control of the nervous system and dopaminergic.

The dopaminergic system is one of the monoaminergic systems of the brain. Its main mediator is the precursor of norepinephrine – dopamine. Dopamine is a biogenic amine. Along with norepinephrine and adrenaline, it is part of the catecholamine group and plays an important role in brain activity, like norepinephrine, adrenaline and serotonin, as a mediator of dopaminergic neurons of the central nervous system. Age-related changes in plasma dopamine concentrations have been of interest to many researchers. However, the data presented in the literature are somewhat

contradictory to each other. each other and do not allow us to draw a clear conclusion about the dynamics of dopamine with age. Researchers have shown that there is no dependence of the content in blood DOPA from age.

MECHANISMS OF UNSTABLE COURSE OF ANGINA PECTORIS

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In the modern world, cardiovascular mortality-vascular diseases are one of the most common. The average age of those affected is currently approaching 40 years, with more and more cases of the disease beginning at 30 years of age, which leads to high levels of disability in patients.

There is currently no generally accepted definition of the term "unstable angina". However, the number of publications on patients with acute coronary circulatory disorders is growing every year, united to the group of patients with unstable angina.

Unstable angina - this is a period of destabilization of coronary heart disease, accompanied by a high risk of developing necrotic changes in the myocardium and sudden cardiac death. It occupies an intermediate position between stable angina and myocardial infarction.

Stable and unstable angina are two different clinical conditions that differ in their manifestations, mechanism of occurrence and risks of complications. Stable angina is based on atherosclerosis of the coronary arteries, in which a gradual narrowing of the lumen of the vessel by atherosclerotic plaques occurs.

The underlying mechanism of unstable angina - rupture or erosion of an atherosclerotic plaque, leading to the formation of a thrombus and partial occlusion of the coronary artery. Unlike stable angina, where the lumen of the artery is stably narrowed, unstable angina is characterized by a dynamic deterioration in blood flow due to thrombus formation, inflammatory processes and possible vasospasm.

The main pathogenetic mechanisms of destabilization of angina pectoris are associated with the formation of a platelet aggregate. The development of coronary artery thrombosis is preceded by damage to the vascular wall by atherosclerotic plaques, with their subsequent rupture. Lipid formations that have an extensive mobile growing core are most often subject to it. Such a plaque usually contains a significant number of lymphocytes and macrophages that can quickly initiate an inflammatory reaction. The rupture is facilitated by a critical mass of the plaque, oxidation of its contents, high blood pressure and physical exertion. Unstable angina can also develop against the background of coronary spasm, caused by a disruption of endothelial function and an increase in its sensitivity to vasoconstrictive substances.

Spasm of the coronary arteries also plays a significant role in the pathogenesis of unstable angina. It has been proven that Spontaneous attacks of angina, which are very typical for unstable angina, are often not caused by an increase in the "metabolic demands" of the myocardium that exceed the capacity of the coronary reserve; in addition, these attacks sometimes occur in patients without angiographically visible lesions of the coronary arteries and. Coronary artery spasm may occur in both significantly affected coronary vessels, and in normal ones.

Patients with NSC at a young age have the same risk factors as patients with NSC at an older age. Unstable angina is more common in patients with severe coronary atherosclerosis. Risk factors include hypertension, dyslipidemia, diabetes, smoking, obesity, and a sedentary lifestyle. Elevated levels of inflammatory markers, such as C-reactive protein, may also indicate an increased risk of unstable angina. Young patients have been concomitant pathologies, which could also fire aggravate the course of the disease.

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COMPARATIVE ASSESSMENT OF ANTIOXIDANT ACTIVITY OF BETA-LACTAMASE INHIBITORS

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This study presents theoretical calculations of the total energy, molecular HOMO-LUMO and bandgap for common beta-lactamase inhibitors and draws conclusions about their antioxidant properties.

Keywords: beta-lactamase inhibitors, clavulanic acid, sulbactam, tazobactam, antioxidant activity.

Beta-lactamase inhibitors are drugs that block the activity of certain beta-lactamases and are combined with beta-lactam antibiotics. These include: clavulanic acid, sulbactam, tazobactam and others [1].

ChemDraw 19.1 was used to build the 2D structures of the main beta-lactamase inhibitors. Then the structures were transferred to Chem3D 19.1 and optimized using the MM2 molecular dynamics method. After optimization of the molecules, the total energy and molecular HOMO-LUMO were calculated [2].

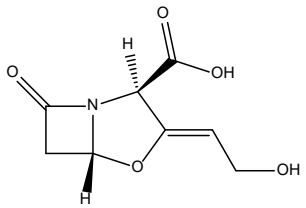
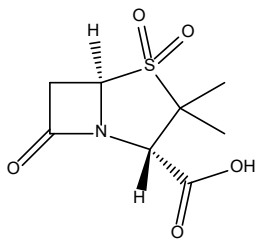
To calculate the band gap of molecules, the following formula was used:

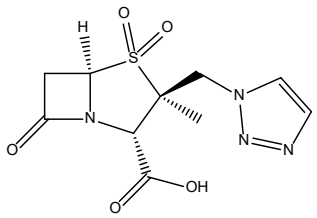
Band gap (Eg) = $E_{LUMO} - E_{HOMO}$ (eV).

The results of calculations of physicochemical properties are shown in table.

Table

Physicochemical properties of beta-lactamase inhibitors

Structure	E_{LUMO}, eV	E_{HOMO}, eV	E_g, eV	Total energy, kcal/mol
Clavulanic acid 	0.360	-8.889	9.249	59.2378
Sulbactam 	0.391	-9.067	9.458	237.4626

Tazobactam 	0.433	-7.435	7.435	252.0689

The molecule has strong antioxidant properties if the band gap is <7 eV. On this basis, the tested beta-lactamase inhibitors do not possess strong antioxidant activity.

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EFFECT OF COMPLEX FORMATION OF WHEY PEPTIDES AND TRYPTOPHAN WITH CHITOSANS ON THEIR ANTIRADICAL PROPERTIES

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Nutrition plays the most important role in human life. It determines physical condition, as well as physical and mental development, improves immunity, etc.

Milk is a complex dispersed system containing more than a hundred organic (proteins, fats, carbohydrates, enzymes, vitamins) and inorganic (water, mineral salts, gases) substances. The chemical composition of milk varies slightly for different species and breeds of animals, and may vary depending on the feeding conditions of the animals.

The most valuable component of milk is proteins, which make up about 3.2%, including casein - 2.7%, albumin - 0.4%, globulin - 0.12%. Casein is present in the form of calcium salt (calcium caseinate); it is a complex protein phosphoprotein and gives milk its white color. In fresh milk, casein forms a colloidal solution; in an acidic environment, lactic acid splits calcium from the casein molecule, free caseinic acid precipitates, and a lactic acid clot is formed.

After casein has precipitated from skim milk, whey proteins and some other components remain in the whey. Whey proteins, in terms of the content of deficient essential amino acids (lysine, tryptophan, methionine, threonine), are the most biologically valuable part of milk proteins, important for food purposes. The main ones are lactalbumin and lactoglobulin, which have a high content of growth and protective substances. In cow's milk, these proteins make up 18% of the total protein, in goat's milk there are twice as many [1]. BAPs are formed as a result of the action of digestive enzymes of the gastrointestinal tract on milk proteins, during technological processing with purified proteases, and fermentation with lactic acid bacteria [2]. After enzymatic hydrolysis of the main milk protein allergens (β lactoglobulin, casein), hypoallergenic peptides are formed, which is associated with the cleavage of sites of antigenic determinants in the corresponding proteins [3]. The use of various proteolytic enzymes and probiotic microorganisms ensures the production of hydrolyzed and fermented milk proteins with a specific protein-peptide profile and characteristic biologically active properties [4]. It is known that the AOA of peptides is determined by the reducing properties of the amino acid radicals of tryptophan, tyrosine, methionine and cysteine. According to the literature, polysaccharides chitin, chitosan and their derivatives also have antioxidant properties.

Keywords: antioxidant activity, whey hydrolyzate, tryptophan, chitosan, fluorescein. The purpose of creating the complexes is to study the effect of complexation on the functional properties of peptides, in particular, on the antioxidant activity of hydrolyzed milk proteins and tryptophan. The work is devoted to studying the effect of complexation of whey

protein hydrolysates and tryptophan with chitosans on the antioxidant activity. It should be noted that the biocomposites of hydrolysate and tryptophan with oligochitosan have a higher antioxidant effect, while the interaction of GSB and Trp with the succinylated form of the polysaccharide is less effective. The antioxidant activity (IC50) of oligochitosan is 2.5 times higher than that of succinylated chitosan. The antioxidant activity (IC50) of the GSB-OKHT complex is 1.7/1.3 times higher than that of GSB-SCHT in dry matter/protein. The antioxidant activity (IC50) of the Trp-OCT complex is 1.1 times higher than that of Trp-SCHT in terms of dry matter and tryptophan.

Succinylated chitosan exhibits antioxidant activity 3.4/7.5 times lower than that of GSB/Trp and 3.7/5.7 times lower than that of GSB-SCHT/Trp-SCHT complexes. However, the addition of succinylated chitosan has a positive effect on the AOA of GSB-SCHT and Trp-SCHT complexes. The antioxidant effect (IC50) based on protein/tryptophan increases by 1.4-1.5 times.

Oligochitosan exhibits antioxidant activity 1.4/3 times lower than that of GSB/Trp and 1.5/2.5 times lower than that of GSB-OCHT/Trp-OCHT complexes. However, the addition of oligochitosan also has a positive effect on the AOA of the GSB-OKhT and Trp-OKhT complexes. The antioxidant effect (IC50) calculated for protein/tryptophan increases by 1.7-2 times.

Complexes of whey protein hydrolysate and tryptophan with oligochitosan showed a higher antioxidant effect than their complexes with succinylated chitosan.

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ANALYSIS OF DIABETES MELLITUS INCIDENCE IN THE POPULATION OF THE REPUBLIC OF BELARUS

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According to WHO, the prevalence of diabetes mellitus in the world is about 2.1%. The number of deaths due to diabetes in 2019 totals 4.2 million, which is 11.3% of all deaths in the world. Diabetes mellitus ranks first among all endocrine disorders. The widespread, destructive effect on many body systems, leading to a very noticeable deterioration in the quality of life of patients, puts diabetes mellitus on a par with diseases of the cardiovascular system [1].

Keywords: diabetes mellitus, insulin-dependent diabetes mellitus, insulin-independent diabetes mellitus, morbidity, structure, dynamics, trends, prevention.

Diabetes mellitus, according to WHO experts, ranks 1st among diseases leading to disability and 3rd among deaths. Patients with diabetes mellitus are 2-3 times more likely to die from heart disease and strokes, and lose their eyesight ten times more often than the rest of the population. The number of patients with diabetes mellitus in the Republic of Belarus has increased more than 3 times over the past 15 years [2]. Prevention of diabetes mellitus boils down to the following: proper nutrition, daily reasonable physical activity, avoidance of stressful situations, prevention of infectious diseases, regular medical examinations [3].

The purpose of this work was to analyze the morbidity rates of the population of the Republic of Belarus with diabetes mellitus for the period from 2018 to 2022, to identify the current trends in dynamics in general and by types of pathology.

For the period from 2018 to 2022, a steady growth trend has been revealed in the dynamics of the incidence of diabetes mellitus in the Republic of Belarus (R^2=0,909). The average annual incidence rate was A_0=4061,32 cases of diseases per 100 thousand people; indicator A_1=5275‰. From 2018 to 2022, the incidence of diabetes mellitus in the Republic of Belarus increased from 3942,90‰ – in 2018 г. to 4242,38‰ – in 2022 г. or by 7,6%.

Structural analysis has shown that the largest proportion among the nosological forms of diabetes mellitus is occupied by insulin-dependent diabetes mellitus. There is a change in the dynamics of extensive indicators. The proportion of insulin-dependent diabetes mellitus increased from 88,50% in 2018 to 93,85% in 2022. The proportion of insulin-dependent diabetes mellitus in 2018 and 2022 has the same value – 5,13%.

The analysis of the dynamics of morbidity indicators of the population of the Republic of Belarus according to nosological forms of diabetes mellitus was carried out.

During the period from 2018 to 2022, the incidence of the population of the Republic of Belarus with insulin-dependent diabetes mellitus had a steady growth trend (R^2=0,9282). The average annual rate of total morbidity was A_0=3765,71 cases of diseases per 100 thousand population; trend indicator A_1=8901‰. From 2018 to 2022, the incidence of insulin-dependent diabetes mellitus in the population of the Republic of Belarus increased from 3489,35‰ – in 2018 г. to 3981,30‰ – in 2022 г. or by 14,10%.

A steady growth trend has been revealed in the dynamics of the incidence of the population of the Republic of Belarus with insulin-dependent diabetes mellitus (R^2=0,89). The average annual incidence rate was A_0=207,82 cases of diseases per 100 thousand population; trend indicator A_1=253‰. From 2018 г. to 2022 г. The incidence of insulin-dependent diabetes mellitus in the Republic of Belarus has increased since 202,18‰ – in 2018 г. to 217,81‰ – in 2022 г. or by 7,73%.

Based on the analyzed statistical data, it can be concluded that among people with diabetes mellitus, an insulin-independent type of pathology prevails.

The incidence of insulin-dependent and insulin-independent diabetes mellitus in 2018-2022 has a steady tendency to increase. The differences in morbidity rates at the end of the study period in relation to the initial year of the study are statistically significant.

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ASSESSMENT OF THE MODERN AMPHIBIAN BIODIVERSITY OF RESIDENTIAL AREAS OF MINSK AND ITS SURROUNDINGS

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The paper analyses the current state of the taxonomic composition and distribution of batrachofauna in the urban areas of Minsk and its environs. Data on the impact of urbanization pressure on biodiversity and reproductive capabilities of amphibians are provided.

Keywords: batrachofauna, frogs, toads, residential areas, urban landscapes.

The study of amphibians in urban landscapes has received increasing attention from both Russian [1, 2] and domestic [3] batrachologists in the late 20th and early 21st centuries. The works of batrachologists of this period provided a fairly comprehensive study of the species composition of amphibians, their spatial distribution in large cities, reproduction patterns, and other population parameters. However, such studies were conducted relatively long ago, and little attention was paid to such a key problem as amphibian reproduction in urban conditions.

The aim of the study is to assess the degree of influence of anthropogenic load on the biodiversity of amphibians during the most vulnerable period of their life – the breeding season.

In the course of this study on the modern taxonomic composition of amphibians in Minsk, it was established that the territory of our capital is inhabited by the same 9 species of amphibians belonging to the anurans (red-bellied fire-bellied toad – *Bombina bombina L.,* common spadefoot – *Pelobatus fuscus Laur.,* green toad – *Bufo viridis Laur.,* common toad – *Bufo bufo L.,* grass frog – *Rana temporaria L.,* sharp-nosed frog – *Rana arvalis Nill.,* pond frog – *Rana lessona Cam.,* lake frog – *Rana esculenta Pall.)* and tailed (common newt – *Lissotriton vulgaris),* which were indicated by A.V. Khandogim et al. (2016).

The modern specificity of the batrachofauna of Minsk is determined by its high species diversity and the instability of most species to anthropogenic impact. This leads to the absolute dominance of the ecologically flexible species – the grass and marsh frogs.

The heterogeneity of the urban environment is reflected in the population characteristics of amphibians: a decrease in abundance, changes in reproductive and morphological characteristics, and features of the sex and age structure (sex ratio, life expectancy, and age of first reproduction).

The average values of the morphometric characteristics of the grass frog, such as length, body weight, and limb length, significantly decrease as the anthropogenic load increases. Adults exhibit clear sexual dimorphism: males are significantly larger than females. The fatness coefficient of females is also significantly lower than that of males.

The frequency of occurrence of morphological anomalies of the grass frog is significantly higher in the multi-story, industrial and floodplain zones of the Svisloch River than in the control population. These deviations in frogs can vary from 11 to 45% of frogs.

The color polymorphism (by the number of morphs) of the grass frog population in the capital is similar to that in the suburban area (Shchemyslitsy village), but the distribution of color morphs in all areas of the city differs significantly from the control population, and the proportion of animals with the maculata morph in urban conditions is statistically significantly higher than in the suburban area.

Thus, the greatest adaptive potential is possessed by the marsh frog, which lives in most water bodies. Of the land amphibian species, the grass frog shows signs of synanthropization, but its distribution and population density of this species depend entirely on the availability of water bodies suitable for reproduction.

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GALACTOSEMIA AS A RARE FORM OF HEREDITARY DISEASES IN CHILDREN

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In Belarus, as in other countries with a high level of medical care and low neonatal and perinatal mortality, congenital and hereditary pathology (primarily congenital malformations, chromosomal diseases and hereditary metabolic diseases) occupies one of the leading places in the structure of childhood morbidity, disability and mortality.

Galactosemia is a rare hereditary disease with an incidence rate of 1:30 000–60 000 of the population. According to the WHO classification, diseases with an incidence rate of less than 1:2000 are considered rare.

Keywords: galactosemia, galactose, genetic pathology, hereditary diseases.

Galactosemia is an inherited disorder of galactose metabolism that results from a deficiency of the enzymes galactokinase, galactose-1-phosphate uridyltransferase (Gal-1-PUT) or uridine diphosphate galactose-4-epimerase. The disease is inherited in an autosomal recessive manner. The gene responsible for the development of the disease is located on the short arm of chromosome 9 (region 9p13).

The most common form of the disease, classical galactosemia, is caused by a deficiency of galactose-1-phosphate uridyltransferase (GALT). Galactose is an aldohexose that is necessary for galactosylation of endogenous and exogenous proteins, ceramides, myelin sheath metabolism and energy production [1].

The main pathway for converting galactose into glucose is the Lelois pathway. The first stage is the phosphorylation of galactose in the liver, brain, and erythrocytes. This reaction results in the formation of galactose-1-phosphate, the further conversion of which requires the specific enzyme galactose-1-phosphate uridyltransferase. With a deficiency of galactose-1-phosphate uridyltransferase, further metabolism of galactose-1-phosphate to UDP-galactose is impossible. Accumulation of galactose-1-phosphate leads to the disease [2].

Galactosemia is characterized by CNS damage, mental retardation, and behavioral problems due to hypoxia and severe metabolic acidosis.

The disease usually manifests itself in the first days to weeks of life, progresses rapidly, and is life-threatening if untreated. From the first months of life, children develop biconvex cataracts.

Without treatment, renal dysfunction (renal failure) occurs. At the end of the neonatal period, classical galactosemia manifests itself as damage to the central nervous system in the form of diffuse muscle hypotonia and progressive delay in psychomotor development.

Types of galactosemia:

- Type I, resulting from GALT deficiency;
- Type II, resulting from GALK deficiency;
- Type III, resulting from GALE deficiency;
- Type IV, resulting from GALM deficiency.

Newborn screening for galactosemia is performed using a neonatal galactose transferase (GALT) kit designed for the semi-quantitative determination of galactose-1-phosphate uridyl transferase (GALT) activity in blood samples. The time frame for testing is the first week of life based on the results of a newborn screening analysis.

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ANTIVIRAL ACTIVITY OF PYRIMIDINE

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Pyrimidines are a hexagonal aromatic cycle with two nitrogen atoms at positions 1 and 3. This unique structure allows pyrimidines to interact with a number of molecules, which makes them vital for cell processes. Compounds of this group have a variety of pharmacological activity, which leads to interest in pyrimidine as a potential component for the creation of new biologically active substances. They ensure the stability of genetic information and support cellular function. The pyrimidine core in the composition of nitrogenous bases makes it possible to create analogues of nucleotides that include

Keywords: pyrimidine, acyclovir, pharmacological activity, nucleotide.

Pyrimidine derivatives have found themselves most widely used in practice as antiviral agents. This is mainly due to the fact that the structure of pyrimidine contains a residue of purine and pyrimidine-2,4-dione, which explains their similarity to nucleotides [1]. Acyclovir was used as an example of studies of antiviral activity. It was developed in the late 1970s and has since become one of the most popular tools in its category.

Acyclovir belongs to the group of synthetic analogues of guanosine, a purine nucleoside that is part of DNA. Guanosine exhibits high selectivity and is often used against viral activity, in particular herpes viruses.

The results of the studies show that acyclovir copes well against the Herpes simplex virus- Herpes simplex type 1 and type 2. And also this substance works well against the Varizella zoster Varicella zoster virus. In the case of high concentrations of acyclovir, it is able to inhibit the Epstein-Barr virus. At moderate concentrations, the compound is active against cytomegalovirus. The drug can be prescribed both for the treatment of acute conditions and for the prevention of relapses in patients with chronic forms of diseases. It is also used to prevent infections in patients with weakened immune systems, for example, after organ transplantation or HIV infection.

The mechanism of action of acyclovir is simple. It is based on the phosphorylation of a molecule. When used, acyclovir is converted to monophosphate under the action of thymidine kinase, which is then converted with the participation of a number of cellular enzymes into acyclovir diphosphate and acyclovir triphosphate.

Acyclovir triphosphate is both an inhibitor and a substrate for herpesvirus DNA polymerase. Although cellular α-DNA polymerase in infected cells can also be inhibited by acyclovir triphosphate, however, this occurs at a higher concentration than the concentration inhibiting herpesvirus-specific DNA polymerase [2]. This embedding leads to blocking of DNA synthesis. As a result, the virus cannot reproduce, which helps to reduce the viral load in the body and accelerates recovery.

Acyclovir is available in various forms: tablets, ointments and injections. The choice of form depends on the severity of the disease and the patient's condition. For example, in the case of severe infections or in patients with a weakened immune system, intravenous administration of the drug may be required, whereas topical application of ointment is sufficient for the treatment of mild forms.

Acyclovir is actively used in medical practice. It is well tolerated by patients. However, acycalovir has its own side effects. These include gastrointestinal disorders such as nausea and vomiting [3]. Less often, disorders of the central nervous system include headache and dizziness. In rare cases, more serious reactions may develop, such as allergic reactions or impaired renal function. Therefore, it is important to follow the doctor's recommendations and not exceed the recommended dosage.

Acyclovir is registered for use by its population. Further investigation of pyrimidine structures will help in the study of various medical properties. The study of antiviral activity makes sense when creating new pharmacological agents. Acyclovir has become an important achievement in the field of medicine, allowing you to effectively fight herpes viral infections. Its use has significantly improved the quality of life of patients suffering from these diseases.

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THE CHARACTERISTICS OF CIRCULATING AND RESIDENT T-LYMPHOCYTES IN MICE WITH NEUROBLASTOMA

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The study presents the level of T-cell subsets in peripheral blood and secondary lymphoid organs in mice with neuroblastoma.

Keywords: T-lymphocytes, secondary lymphoid organs, flow cytometry, neuroblastoma.

The predominant role of T-lymphocytes in tumors is mediated by effector mechanisms, the production of cytokines and the regulation of other immune cells. Along with the main T-cells subsets ($CD3^+CD4^+$T-helpers and cytotoxic $CD3^+CD8^+$T-cells) double negative $CD3^+CD4^-CD8^-$T-cells constitute a rare population of peripheral T-cells and are of interest due to their poor investigated role in malignancies. DN T-cells possess both innate and adaptive immune functions differing from conventional $CD3^+CD4^+$ and $CD3^+CD8^+$T-cells, produce IFN-γ, TNFa, IL-4, perforin and granzyme B mediating the effect of destruction in malignant neoplasms [1].

The aim of the study was to characterize circulating and tissue resident T-lymphocytes in mice with neuroblastoma and control group.

The study materials were peripheral blood, spleen, lymph nodes and tumor tissue obtained from A/J mice with an experimental neuroblastoma model (group 1, n=5) and healthy mice (group 2, n=5). An experimental model of neuroblastoma was induced by subcutaneous injection of $1\text{-}2\times10^6$ cells of the NXS2 line and animals were euthanized on day 25-30 using a 2% solution of sodium thiopental. Immune cells were isolated from the spleen and lymph nodes by mechanical disaggregation followed by separation on a density gradient (ρ=1.087 g/cm^3, Carl Roth, Germany). Tumor-infiltrating lymphocytes (TIL) were obtained using automated mechanical dissociator for the preparation of cell suspensions (RWD, Russia) and TIL isolation kit (Miltenyi Biotec, Germany). The subpopulation composition of T-lymphocytes was evaluated by flow cytometry using mouse monoclonal antibodies CD3-FITC, CD45-PE, CD4-PC5, CD8-APC (Elabscience, China) and CytoFLEX S flow cytometer (Beckman Coulter, USA). Statistical data processing was carried out in STATISTICA 8.0 program.

Using flow cytometry analysis four subpopulations of circulating and tissue-resident T-lymphocytes were identified: $CD3^+CD4^+$T-helpers (Th), cytotoxic $CD3^+CD8^+$T-lymphocytes (CTL), double positive $CD4^+CD8^+$T-lymphocytes (DP) and double negative $CD4^-CD8^-$T-lymphocytes (DN). The number of T-cells subsets in investigated group is presented in table.

The number of T-lymphocytes in peripheral blood, spleen, lymph nodes and TIL in mice with neuroblastoma and control group, median (25÷75 percentiles)

Subsets	Groups	Peripheral blood	Spleen	Lymph node	TIL
$CD3^+CD4^+$Th, %	1	56.95 * (55.78÷6743)	60.91 * (59.94÷64.34)	53.20 (53.05÷55.63)	10.48 (4.70÷37.87)

	2	47.52 (33.90÷55.42)	46.00 (44.97÷57.17)	48.83 (40.43÷62.13)	
$CD3^+CD8^+$CTL, %	1	30.72 * (29.31÷41.20)	29.04 (20.33÷29.57)	28.57 (22.58÷42.90)	8.50 (7.05÷20.88)
	2	43.49 (33.57÷53.44)	27.49 (2382÷29,.20)	30.34 (14.98÷46.20)	
$CD4^+CD8^+$DP, %	1	0.24 (0.18÷0.99)	021 (0.16÷0.50)	0.76 (0.23÷0.97)	0.94 (0.06÷235)
	2	0.32 (0.15÷0.65)	0.46 (0.37÷0.78)	0.92 (0.69÷1.17)	
$CD4^-CD8^-$DN, %	1	2.83 * (2.61÷3.21)	10.34 * (7.88÷14.21)	11.62 * (3.72÷17.53)	81.00 (41.48÷85.63)
	2	10.69 (7.48÷15.39)	25.08 (17.67÷26.03)	6.44 (4.64÷29.78)	

Note: * - statistical significance of $p<0.05$ as compared with group 2.

The dominated subsets were $CD3^+CD4^+$Th in all investigated groups. The ratio of $CD3^+CD4^+$T-lymphocytes and $CD3^+CD8^+$T-lymphocytes (immunoregulatory index) was elevated in mice with neuroblastoma as compared with control group in the both peripheral blood (1.84 vs 1.09, $p<0.05$) and secondary organs: in the spleen (2.09 vs 1.67, $p<0.05$) and in lymph nodes (1.86 vs 1.61, $p<0.05$) that may indirectly be due to an increase in regulatory cells. While TIL composition in mice with neuroblastoma included only 10.48 (4.70÷37.87) % of $CD3^+CD4^+$Th and 8.50 (7.05÷20.88) % of $CD3^+CD8^+$CTL.

A statistically significant decrease of DN T-lymphocytes number in peripheral blood and spleen was found relative to the comparison group ($p<0.05$). At the same time, the analysis of lymph node cell suspension and TIL revealed an increase of DN T-lymphocytes relative to the control group ($p<0.05$). Herewith, the cellular composition of TIL in mice with neuroblastoma was consisted almost entirely of DN T-cells 81.00 (41.48÷85.63) % significantly differed from the level of DN T-cells in peripheral blood, spleen, lymph nodes ($p<0.05$). According to Zhiheng Wu et al., DN T-cells may secrete IL-10 with suppressive potential within mouse glioma and melanoma. The presence of DN TIL has also been demonstrated in lymph node metastases of melanoma patients, and a significant increase in DN TIL was found in the lymph nodes of melanoma patients who had disease progression compared to patients without it resulting in the hypothesis of DN TIL contribution to metastatic tumor progression [2].

Thus, the changes in circulating and tissue resident T-cells subsets composition in mice with neuroblastoma were revealed characterizing the predominance of DN T-cells among TIL and indicating their close relation to tumor formation and development.

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REGULATION OF MITOCHONDRIAL ACTIVITY BY INCLUSION COMPLEXES OF AMINOPHENOLS AND ANTIMETABOLITES WITH B-CYCLODEXTRINS

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As a by-product of normal metabolism (endogenous sources) and because of exposure to environmental compounds (exogenous sources), reactive oxygen species (ROS) are formed in all living organisms. Endogenous ROS are largely formed during oxidative phosphorylation in the mitochondria and, therefore, mitochondrial DNA (mtDNA) is at particularly high risk of ROS-induced damage. Mitochondria are essential for cell viability, and oxidative damage to mtDNA has been implicated as a causative factor in a wide variety of degenerative diseases, and in cancer and aging.

Keywords: cyclodextrins, antimetabolites, nanomedicine, polyphenols.

Physiological conditions, oxidative phosphorylation (OXPHOS) produces more than 95% of cellular energy in the form of ATP. This process involves five different protein complexes, complexes 1-5.

OXPHOS directly involves 91 polypeptides, including cytochrome c. These polypeptides are encoded by the nuclear and mitochondrial (mt) genes. Additional proteins are also required for effective OXPHOS, including those for mtDNA stabilization, replication, and transcription; mitochondrial ribosomes; proteins that synthesize heme, flavin, and non-heme iron cofactors, and a variety of proteins involved in the assembly of various complexes.

In general, nearly 300 proteins are required for effective OXPHOS activity. The entire process of oxidative phosphorylation is tightly controlled by the regulation of DNA transcription, RNA translation, substrate feedback inhibition, and the effects of post-translational modifications, including phosphorylation and acetylation, on stability.

Ineffective electron transfer through complexes 1-4 can lead to human disease due to loss of energy metabolism and the generation of toxic ROS following damage to multiple enzymes (especially complexes 1, 2, and 3). Complex V deficiency is also one of the causes of mitochondrial dysfunction.

Compounds containing a purine or pyrimidine ring have a wide spectrum of biological activity: anticancer, antiviral, antiplatelet, analgesic and anti-inflammatory [1-2].

In order to specifically and safely deliver physiologically active substances to target cells, reduce toxicity, increase bioavailability and stability, and prevent degradation, various transport systems are being developed: liposomes, micelles, nanogels, and dendrimers. Cyclodextrins are considered as promising encapsulating polysaccharides. The structure of cyclodextrins, which have an internal hydrophobic cavity, ensures their effective complexation with various drug compounds, which allows the creation of nanoconjugates for the effective delivery of drugs and biologically active compounds to target cells as part of the development of new approaches for the treatment of human diseases ("personalized nanomedicine"). Aminophenols, antimetabolites, and their inclusion complexes with cyclodextrins can act as effector molecules in mitochondrial dysfunction due to their antioxidant and regulatory activity. The relative autonomy of mitochondria, their plasticity and the decisive role in the processes of cellular life activity makes it possible to study a number of metabolic functions and parameters at the level of the cellular subsystem convenient for the researcher, makes it attractive to use mitochondria to elucidate the mechanisms of the purposeful corrective effect of natural substances on metabolically significant processes in the cell.

Despite numerous studies, many patterns and molecular mechanisms of the interaction of polyphenols with cellular components, the structure, physicochemical properties, pharmacological activity of aminophenols and antimetabolites and their complexes with cyclodextrins, the possibility of using complexes to regulate the functional activity of cells, remain unclear.

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A NOVEL METHOD OF MULTI-OMICS ANALYSIS IN METHYLMALONIC ACIDEMIA

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Methylmalonic acidemia (MMA) is a rare genetic metabolic disorder characterized by elevated levels of MMA in the body [1]. In recent years, with the rapid advancement of multi-omics technologies, an increasing number of studies have employed multi-omics analysis methods to investigate the pathogenesis of MMA, identify diagnostic biomarkers, and explore potential therapeutic targets.

Keywords: methylmalonic acidemia, multi-omics analysis, transcriptomics, proteomics, metabolomics.

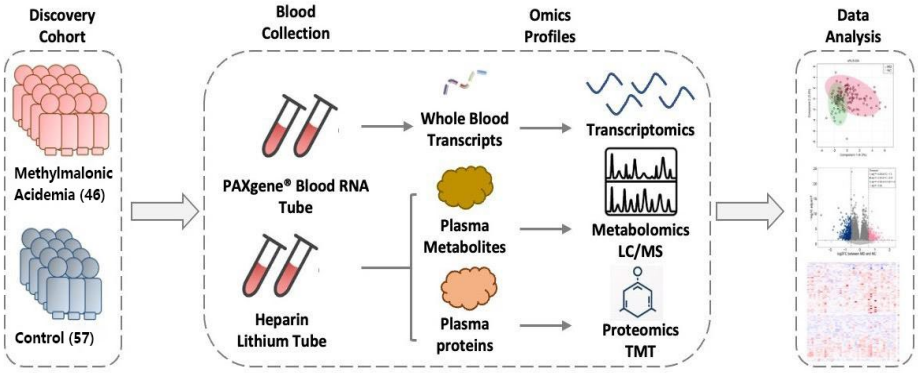

Fig. 1 - Overview of MMA cohort for omics analysis. Study design.

Integrating data from multiple omics levels has deepened our understanding of MMA. Transcriptomic studies have revealed dysregulated gene expression patterns, highlighting potential molecular pathways involved in MMA development. Proteomic investigations have identified disease-specific protein signatures and networks, shedding light on the molecular mechanisms of MMA. Metabolomic profiling has facilitated the detection of altered metabolic pathways and potential biomarkers for diagnosis and monitoring. The integration of multi-omics datasets has been invaluable in MMA research, enabling a comprehensive analysis of the intricate molecular networks driving the disorder. This approach has the potential to identify novel therapeutic targets and personalized treatment strategies [fig 1].

We firstly introduce the disease characteristics and pathogenesis of MMA, followed by a detailed discussion of various multi-omics analysis methods in MMA research. By integrating data from different omics levels, we can gain a comprehensive understanding of the pathophysiological processes underlying MMA, identify molecular markers associated with the disease, and provide novel insights and approaches for the diagnosis and treatment of MMA.

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THE CRITICAL ROLE OF ADENINE NUCLEOTIDE TRANSLOCASE 4 (ANT4) IN MALE REPRODUCTIVE FUNCTION: INSIGHTS FROM A MOUSE MODEL

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Adenine nucleotide translocator 4 (ANT4) is an ATP/ADP transporter crucial for male fertility, yet its comprehensive role in reproductive function remains unclear. This study utilized ANT4 knockout mice to elucidate the effects of ANT4 deficiency on male reproduction. We observed that ANT4 deficiency led to infertility and impaired testicular development. Further investigation revealed significant alterations in testicular oxidative stress, autophagy, and inflammation. Specifically, ANT4 loss resulted in an imbalance between oxidation and antioxidants, affected autophagic flux and the AKT-AMPK-mTOR signaling pathway, and increased pro-inflammatory factor expression. These findings underscore ANT4's importance in regulating oxidative stress, autophagy, and inflammation in testicular tissues, providing a nuanced understanding of its significance in testicular development and male fertility.

Keywords: adenine nucleotide translocator 4 (ANT4), male reproduction, oxidative stress, autophagy, inflammation, mitochondrial function, spermatogenesis, mouse model.

Spermatogenesis is an intricate process requiring coordinated support from multiple biological pathways. Central to this complex development is the availability of adequate energy and a homeostatic environment within the seminiferous tubules [1]. Adenine nucleotide translocator 4 (ANT4), an ATP/ADP transporter expressed in the early phases of spermatogenesis, has been identified as crucial for male fertility. Previous studies have shown that male mice lacking ANT4 exhibit early meiotic arrest at the leptotene spermatocyte stage, increased germ cell apoptosis, and complete infertility. However, the mechanisms through which ANT4 regulates testicular development and germ cell quality control remain to be fully elucidated [2].

This study aims to delineate the effects of ANT4 deficiency on male reproduction by focusing on three key aspects: oxidative stress, autophagy, and inflammation. These interconnected processes are critical for maintaining the optimal environment for spermatogenesis and are likely influenced by ANT4's role in mitochondrial function and energy metabolism.

The results of our study on ANT4 knockout mice revealed a comprehensive impact on male reproductive function. $ANT4^{-/-}$ male mice exhibited complete infertility, accompanied by significantly reduced testicular weight and size, and a dramatic decrease in sperm count in the caudal epididymis. Histological examination using H&E staining showed severe atrophy of seminiferous tubules and extensive damage to the germinal epithelium structure, with a marked reduction in spermatogenic cells. Ultrastructural analysis via TEM uncovered significant mitochondrial abnormalities in $ANT4^{-/-}$ mouse testes, including swelling, loss of cristae, and accumulation of autophagosomes. The knockout mice also displayed increased oxidative stress, evidenced by elevated levels of reactive oxygen species (ROS) and hydrogen peroxide (H_2O_2), along with altered expression of oxidative stress markers such as SOD1, CAT, and GPX1. Autophagy dysregulation was apparent through changes in the expression of autophagy-related proteins (LC3B, P62) and disruption of the AKT-AMPK-mTOR signaling pathway. Furthermore, an enhanced inflammatory response was observed, characterized by increased expression of pro-inflammatory factors (IL-6, IL-1β) and activation of the NF-κB signaling pathway. Proteomic analysis complemented these findings by revealing differential expression of proteins involved in peroxisome and glutathione metabolism in $ANT4^{-/-}$ mice [fig 1]. Collectively, these results demonstrate the crucial role of ANT4 in maintaining testicular homeostasis and proper spermatogenesis, highlighting its importance in regulating oxidative stress, autophagy, and inflammation in male reproductive tissues.

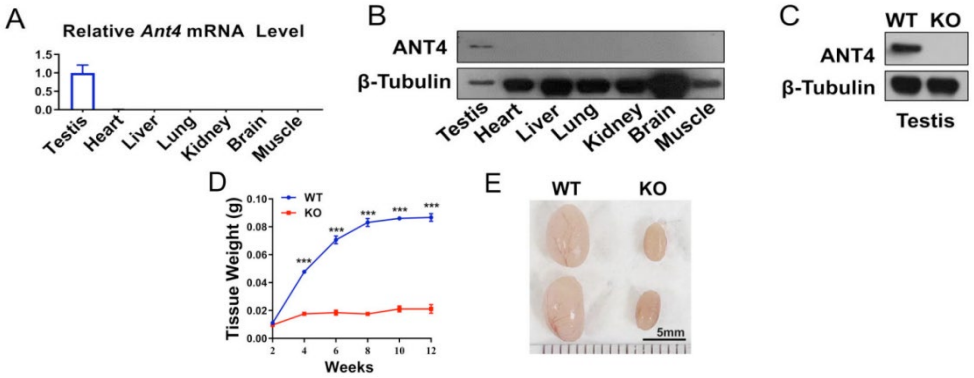

Fig.1 - Loss of Ant4 results in male sterility. A, mRNA expression of Ant4 in different tissues (n=3). B, Protein expression of ANT4 in different tissues. C, Protein expression of ANT4 in testes of wild type (WT) and Ant4$^{-/-}$ knockout (KO) mice. D, Testicular growth curves (n=3). E, testis size

Conclusion: Our study demonstrates that ANT4 plays a multifaceted and essential role in male reproductive function. By coordinating cellular energy metabolism, protein quality control, redox balance, and inflammatory responses, ANT4 ensures the optimal environment for spermatogenesis. The loss of ANT4 leads to a complex interplay of disrupted cellular processes, ultimately resulting in severe impairment of male fertility.

These findings not only advance our understanding of the molecular mechanisms underlying male reproductive function but also provide potential new targets for the diagnosis and treatment of male infertility. Future research should focus on elucidating the specific molecular interactions of ANT4 with key regulators of oxidative stress, autophagy, and inflammation in testicular tissues.

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RETROSPECTIVE ANALYSIS OF THE HIV INFECTION INCIDENCE IN THE POPULATION OF THE REPUBLIC OF BELARUS

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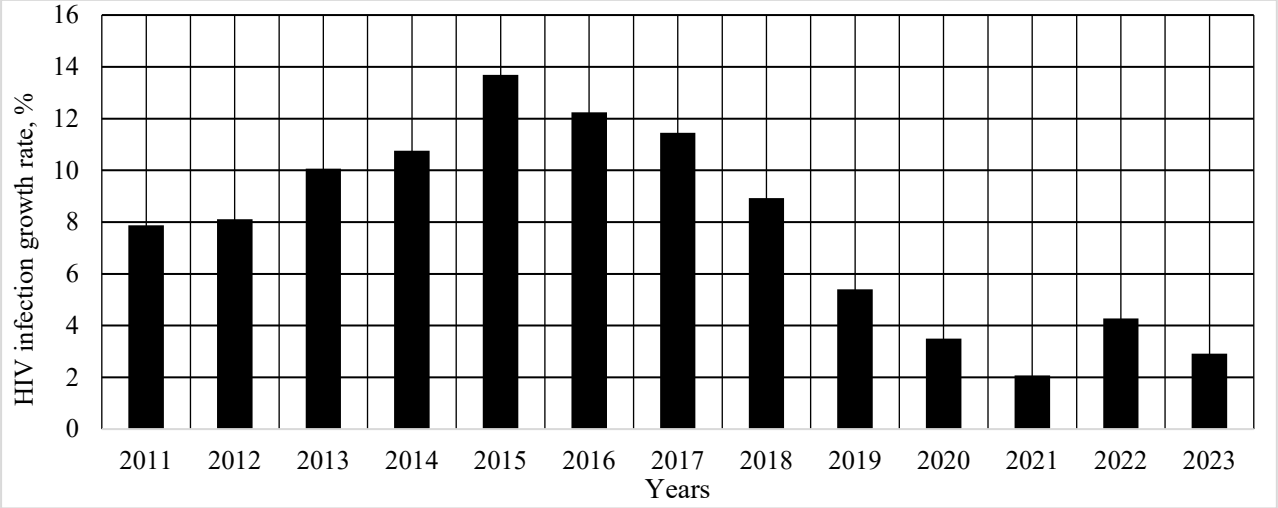
The article presents the spread of the HIV-infection among the Republic of Belarus population, with focus on the 2010-2023 period, and how successful were the measures to its containment. As of 2023, 1463 new cases of HIV infection have happened, there were 35104 HIV-infected people cumulatively, and 25038 of them were alive on January 1, 2024.

Keywords: Human immunodeficiency virus, infection, risk factors, morbidity, epidemiology, prevention

There is a great downfall in the infection spread since 2015, which is kept low despite even the economic problems caused by the Covid-19 pandemic.

WHO-proposed «90-90-90 treatment target» is getting closer to fulfillment (as of now, it's 81,6-82,1-80,1). In the overall structure of HIV-infected people, men predominate (60.7%), while the share of women is 39.3%, also the vast majority of new HIV infections occur in people over 30 years of age, approximately equally between the 30-39 and over 40 age groups. New HIV infections are becoming less common among young people. Heterosexual contacts always remain the leading source of HIV transmission. In second place is the parenteral route, which, however, is kept at a lower level than in the last decade. The incidence of HIV infection in the PWID group is experiencing a surge and has not yet fallen to the level of 2013, which probably prevents a decrease in the role of parenteral transmission of HIV infection; also, PWID remain to be the most HIV-infected group, while WSR is rapidly growing in the HIV spread. The share of homosexual contacts in the spread of HIV infection is growing quite steadily (although it is more related to the holding spread in the absolute numbers). An important task for the further research seems to be to track the contribution of sexual contacts specifically on the part of WSR.



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INCIDENCE OF DIGESTIVE SYSTEM DISEASES IN THE POPULATION OF THE REPUBLIC OF BELARUS

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Abstract: the paper presents a retrospective analysis of the primary incidence of digestive diseases in the population of the Republic of Belarus for the period from 2013 to 2022; the dynamics are analyzed, the growth rates are calculated and the main trends in population morbidity are identified.

Keywords: diseases of the digestive system, morbidity, growth rate, prevention.

Digestive diseases are a complex of characteristic, constant or periodically occurring symptoms that signal disturbances in the functioning of the digestive system or a separate organ of this system, having a certain dependence on exogenous, endogenous and genetic factors. Diseases of the digestive tract are distinguished by the diversity of their clinical and morphological signs. They include independent primary diseases, as well as other, secondary ones, which are a manifestation of a number of diseases of infectious and non-infectious nature, acquired or hereditary origin.

An important role in diseases of the gastrointestinal tract is played by methods of examination of the patient. Methods of clinical examination of the patient include: questioning the patient, general examination, X-ray examination, radioisotope methods of examination, laboratory methods of examination - examination of blood, urine, feces. The main and most important prevention of diseases of the digestive organs, and not only them, is maintaining a healthy lifestyle [1].

Analysis of the structure of primary morbidity of the population of the Republic of Belarus in 2013 showed that diseases of the digestive system accounted for 2.7% and occupied the 8th rank. In 2022, the share of morbidity of the digestive system occupies the 10th rank.

When analyzing the long-term dynamics (2013-2022) of morbidity with diseases of the digestive system in the population of the Republic of Belarus by regions, the following results were obtained: a downward trend in morbidity was observed in Vitebsk and Gomel regions, while upward trends were observed in Brest and Mogilev regions, as well as in the city of Minsk. In Minsk and Grodno regions, no significant change in morbidity towards growth or decline was noted.

The growth rates by regions and the city of Minsk were considered. The highest positive growth rate was shown by Brest region - 12.1%, the city of Minsk is in second place with a positive growth rate of 4.2%, the third place is occupied by Vitebsk region with an indicator of 3.8%, the fourth place is occupied by Minsk region, where the positive growth was 3.0%, the fifth place is occupied by Gomel region, the positive growth was 1.9%, the sixth place is occupied by Mogilev region - 0.5%, the last place is occupied by Grodno region, where the growth was negative and amounted to -15.7%.

The average annual incidence rate of diseases of the digestive system in the Republic of Belarus was 2452 cases per 100 thousand population. The rates in the city of Minsk and Minsk region were higher than the national rate: 3469 and 2467 cases per 100 thousand population. The other regions were lower than the national rate, and the lowest rate was in Vitebsk region: 1569 cases per 100 thousand population [2].

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DEMENTIA AND ITS CONNECTION TO EATING HABITS

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The paper describes the results of research into the connection between dietary habits and the development of dementia. Dementia is a complex disease characterized by the death of brain cells due to the accumulation of pathogenic protein. The exact mechanisms of its development haven't been fully elucidated, but it is known that metabolism and nutrition play an important role.

Keywords: risk of development, research, relationship, diet, health.

Long-term studies indicate a direct correlation between consumption of processed red meat (sausages, frankfurters, bacon) and an increased risk of dementia. Data from 130,000 health care workers followed for 43 years supports this conclusion. Study participants who consumed two servings of processed meat per week had a 14 per cent higher risk of developing dementia compared to those who ate it less frequently. Scientists attribute this to the high levels of sugar, salt and saturated fat in processed meat, which can lead to obesity, diabetes, arterial hypertension, and consequent damage to blood vessels in the brain. The increased risk of stroke caused by the above factors may subsequently lead to cognitive impairment [1].

Studies also emphasise the importance of a balanced diet for brain health. Observations of elderly people in Japan have shown that skipping breakfast, frequent snacking, excessive salt intake and nutrient deficiencies in the diet increase the risk of dementia [2].

Particular attention has been paid to the effects of fibre on brain health. Analysis of 35 years of data, from 1985 to 2020, and laboratory experiments on mice have shown that insoluble fibre found in fruits, vegetables, including potatoes, can reduce neuroinflammation and reduce the risk of dementia.

In addition, research from Rush University in Chicago shows an association between regular consumption of whole-grain foods such as quinoa, cereal, and even popcorn, and improved brain function and reduced risk of dementia [3].

A study at the University of Minnesota found a possible correlation between long-term use of proton pump inhibitors (heartburn medications) and an increased risk of dementia. Analysis of data from 5712 people showed that those who took these drugs for more than 4.4 years had a 33% higher risk of dementia than those who never took them [4]. But it should be noted that more research is needed to confirm this association.

The list of possible factors that increase the risk of dementia also includes excessive coffee consumption, meaning more than six cups per day. A study using data from the British Biobank found a non-linear connection between the amount of coffee drunk and the risk of developing dementia or stroke. People who consumed more than six cups of coffee per day were 53% more likely to develop dementia [5]. The exact mechanisms determining the connection between coffee and brain health are not yet fully understood, so it is recommended to maintain adequate hydration and to moderate coffee consumption.

Thus, all of the above studies emphasize the importance of a healthy diet in preserving cognitive function and reducing the risk of dementia. It is recommended to limit consumption of processed red meat and include more fruits, vegetables and fibre-rich foods in your diet, and limit coffee consumption to no more than 2 cups per day. If these recommendations are followed, the risk of developing dementia will be reduced.

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THE ROLE OF PROBIOTIC BACTERIA IN POULTRY FARMING

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This work includes consideration of the effects of probiotic bacteria on the use of nutrients, growth and productivity of broiler chickens. The role of probiotics as a healthy alternative to antibiotics is shown.

Keywords: birds, probiotics, bacteria.

Probiotics are live microorganisms that, when administered in adequate amounts, provide beneficial effects to the host organism. The use of probiotics in poultry farming has increased in recent years due to the growing demand for antibiotic-free poultry. The addition of probiotics can have the following effects: modification of gut microbiota,

stimulation of the immune system, reduction of inflammatory reactions, prevention of pathogen colonization, improvement of growth performance, changes in digestibility in the ileum and overall digestibility ratio, reduction of ammonia and urea excretion [1-3].

Probiotics promote the growth of bacteria of certain genera. When broilers exposed to Salmonella enteritidis were fed a diet containing Bacillus coagulans, this diet promoted an increase in the number of Lactobacilli and Bifidobacterium and reduced the concentration of E. coli and Salmonella in the cecum. Additionally, it lowered Salmonella levels in the chickens' liver. The addition of probiotic Lactobacillus spp. to the feed increases the number of anaerobic bacteria in the ileum and cecum, as well as the number of lactic acid bacteria and Lactobacilli in the cecum. Moreover, all four probiotics generally reduce the number of enterobacteria in the ileum compared to control treatments [3].

An important feature of Lactobacilli is their ability for auto-aggregation and co-aggregation. Bacteria with a high auto-aggregation ability typically demonstrate good adhesion to the intestinal mucosa. The addition of the probiotic Propionibacterium acidipropionici in drinking water promotes the normal development of lactic acid bacteria and Bifidobacteria but slows the colonization of Bacteroides. Ultimately, this increases lactic acid production and reduces butyric acid production, leading to increased mucus secretion and enhanced protection against pathogens. A combination of Lactobacillus crispatus, L. johnsonii, Enterococcus faecalis, and Bacillus amyloliquefaciens reduces Salmonella colonization in the broiler gastrointestinal tract. Broilers treated with multi-species probiotics have higher serum lysozyme levels and more pronounced T-lymphocyte responses compared to control groups [3].

Probiotic bacteria can initiate gene exchange with gut microbiota and transfer genetic traits to surrounding bacteria. Their close cell contact with other bacterial inhabitants of the gut ecosystem increases the likelihood of plasmid exchange. This conjugation process transfers genes responsible for acquired antibiotic resistance from the probiotic microorganism to the natural symbiotic microbes of the intestine. Studies on human probiotics have revealed various antibiotic resistance determinants in the genomes of probiotic species of Lactobacillus, Bifidobacterium, and Bacillus, which have the potential to transfer resistance genes to other bacteria. However, there is currently no substantial cause for concern regarding the transfer of antibiotic resistance genes in poultry farming through probiotic supplementation [2].

Thus, probiotics may become a potential alternative to growth-promoting antibiotics in poultry production. However, factors such as poultry gut health, probiotic inclusion level, incubation conditions, and the quality of feed and water may influence the outcome.

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EPIDEMIOLOGICAL TYPING OF *LISTERIA MONOCYTOGENES* USING MALDI-TOF MASS SPECTROMETRY

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A method for the epidemiological typing of Listeria monocytogenes by means of MALDI-TOF mass spectrometry has been developed.

Keywords: Listeria monocytogenes, MALDI-TOF mass spectrometry.

The Autof MS1000 was used to work with Listeria monocytogenes isolates. The main principle of its operation is the matrix-activated laser desorption/ionization technology with time-of-flight mass spectrometry [1].

The working part of the instrument consists of two modules: a matrix-activated laser desorption/ionization ion source (MALDI) and a time-of-flight quality analyzer (TOF). The principle of MALDI is to use a laser to illuminate a co-crystallization film formed by samples and matrix on a sliding target. The matrix absorbs the laser energy and transfers it to the biomolecules. The ionization process consists of ionizing biological molecules by transferring protons to biological molecules or extracting protons from biological molecules [1].

It is a type of soft ionization technology for the determination of mixtures and biomolecules. The principle of TOF is that ions are accelerated in a fly-through tube under the influence of an electric field and the mass-to-charge ratio (m/z) of the measured ions is determined as a function of the transit time at the arrival detector. Then the signal is processed by a digital control system to produce a mass spectrum [1].

The basic principle is that the macromolecular samples to be measured are mixed in a certain ratio with a matrix solution of a small-molecule compound, which results in the measured macromolecules being dispersed as single molecules in the matrix; after natural vacuum drying with pulsed laser irradiation, the combination of sample and matrix leads to co-crystallization on the sample target, followed by energy absorption and desorption of the sample matrix and its ionization (usually matrix proton transfer to sample molecules) after irradiation with a laser pulse. The ions of the sample under the accelerating field receive the same kinetic energy and enter the ion detector after being focused by the electric field. By comparison with the information in the database, the appropriate cards are selected and identified and the identification results are obtained, thus identifying different genera, species and subspecies of bacteria [1].

The MALDI-TOF mass spectrometry results were entered into the STATISTICA program for further construction of an affinity scheme of Listeria monocytogenes isolates. The similar spectra were grouped by cluster analysis using Euclidean distance as the metric. The degree of similarity of the mass spectra was expressed as a value equal to the distance between the objects. A distance matrix was constructed taking into account the m/z value and intensity of each signal. The hierarchical clustering of the strains was presented as a dendrogram. The distance between clusters was determined by Ward's method, reflecting the association of subgroups characterized by the highest similarity [2].

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HEMOLYTIC DISEASE OF NEWBORNS

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The article discusses erythroblastosis or hemolytic disease of newborns (GBN) – a prenatal pathology due to incompatibility of fetal and maternal blood by Rho(D) antigen and AB0 system. In the mother's body, antibodies directed against the child's red blood cells cause hemolysis or a sharp inhibition of their formation. Hemolytic anemia of the fetus as a result of Rh factor incompatibility can lead to serious complications or death in the prenatal period. In this regard, the prevention and treatment of GBH in newborns requires a specialized approach. The urgency of the problem of hemolytic diseases of newborns is due to the frequency of development, the severity of the course and complications leading to the death of the fetus or newborn.

Keywords: erythroblastosis, Rh factor AB0, Rh-sensabilization, hemolytic disease, GBN.

Hemolytic disease of the newborn (GBN) is a prenatal disease that is caused by isoimmunization as a result of incompatibility of fetal and maternal blood. Hemolytic disease of newborns manifests itself in the antenatal period and is a severe pathology of the newborn period and causes spontaneous abortions and stillbirths. Types of GBN in newborns according to etiological factors: according to the AB0 system, according to the rhesus system, according to antigens of other blood systems [1].

The blood groups of the AB0 system were discovered by a scientist from Vienna, Karl Landsteiner, in 1900. A blood type is an individual feature of a person that begins to form in the early stages of embryonic development and never changes throughout life. Antigens A and B are found on erythrocytes, in fetal tissues, the amniotic membrane of the placenta, amniotic fluid and other secretions: salivary and lacrimal fluids, sweat, semen. Starting from the second month of embryonic development, AB0 antigens are found in fetal erythrocytes. The greatest sensitivity to antibodies is achieved by 3 years of life. Agglutinable activity in full-term newborns is 1/5 of the activity of an adult.

In 1940, as a result of experimental work by Landsteiner and Wiener, the Rh factor (Rh factor) was discovered. Positive Rh factor occurs in 85% of people, negative in 15%. During gestation, the Rh factor is of particular importance. Women with Rh sensitization have an 85% chance of having a successful childbearing with a Rh-positive man. Hemolytic disease of newborns occurs in about 1 in 3,000 live births [2].

The Rh factor is a whole system of antigens:

- antigen D (Rh) is found in the blood of 85% of people;
- antigen C (Rh) is found in the blood of 70% of people;
- the E (Rh) antigen is found in the blood of 30% of people.

In the presence of these antigens, a person is Rh-positive. Rhesus antigens, which are introduced into the blood with Rh-sensitization, cause the body to produce antiresus antibodies. This happens 3-5 months after the antigens enter the bloodstream. Sensitization in the human body increases with the duration of the action of antigens [3].

Types of hemolytic disease according to clinical and morphological forms: edematous (hemolytic anemia with dropsy), jaundice (hemolytic anemia with jaundice), anemia (hemolytic anemia without dropsy and without jaundice). The form of the disease depends on the transplacental transfer of antibodies to the fetus.

According to the presence of complications, the following forms of GBPiN are distinguished:

- Uncomplicated,
- With complications: bilirubin encephalopathy - nuclear jaundice, bile thickening syndrome, hemorrhagic, edematous syndromes, kidney, adrenal, heart, liver damage, hypoglycemia [4].

Prenatal diagnosis includes collecting an obstetric history, assessing the number of pregnancies and their intervals, the presence of hemolytic disease in existing children, and determining the titer of antibodies during pregnancy. Postnatal diagnosis includes: isolation of newborns at risk of developing GBN; assessment of possible clinical manifestations. In laboratory diagnostics, the blood group and Rh factor in newborns are determined; biochemical blood analysis. Over the past 5 years, 50 developmental histories of newborns with hemolytic disease have been taken for analysis. The incidence due to isoimmunological incompatibility of the rhesus and AB0 system during this period was 4.93 per 1,000 live births. All cases of GBN were divided by type of conflict: 15 children were born with GBN, isoimmunological incompatibility according to the Rh factor and 35 children with GBN, isoimmunological incompatibility according to the AB0 system.

Hemolytic diseases of newborns remain a significant medical problem. GBN develops due to the ingestion of Rh-D antibodies from the mother to the fetus. Antenatal prophylaxis includes monitoring and preservation of the first pregnancy in a woman with Rh-sensitized blood without sensitization phenomena; keeping records of fetal development parameters with detected GBN; selection of individual treatment for pathology in a pregnant woman. Specific prevention of rhesus isoimmunization is carried out by intramuscular administration of anti-Rh(D)-immunoglobulin to the newborn in the first 72 hours after birth. Preconceptual prevention includes a genetic examination of the future father and mother with the determination of the phenotype of the child's father's blood. In case of a heterozygous rhesus factor genotype (RHD+/RHD-), an in vitro fertilization program is recommended for the father of the child in order to transfer Rhesus–sensitized embryos into the uterine cavity.

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RETROSPECTIVE ANALYSIS OF THE INCIDENCE OF SKIN CANCER IN THE REPUBLIC OF BELARUS (2011-2021)

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Abstract: the paper presents a retrospective analysis of the incidence of skin cancer in the population of the Republic of Belarus for the period from 2011 to 2021 in temporal and territorial aspects and identifies the main trends.

Keywords: malignant neoplasms of the skin, morbidity, growth rate, prevention.

When analyzing the structure of the oncological morbidity of the male population, skin cancer occupied the third rank in both 2011 and 2021 and amounted to 13.1% and 12.8%, respectively. In the structure of the oncological morbidity in the female population in 2011, skin cancer occupied the first rank (21%), and in 2021 – the second (19.4%), after breast cancer.

The proportion of the incidence of skin cancer in the female population exceeds that among men by 1,5 times.

When analyzing the long-term dynamics (2011-2021) of the incidence in the population of the Republic of Belarus as a whole, both male and female, urban and rural populations of skin cancer, there was no marked change in the direction of an increase or decrease in the incidence, while the incidence of skin cancer in the female population exceeded the incidence in the male population by 1.4 times during the study period, and the incidence in the urban population exceeded the morbidity rate of the rural population by 13% during the study period.

When analyzing the average annual morbidity rates of the population of the regions of the republic for the period from 2011 to 2021, it was revealed that the morbidity rate of the population of Gomel region and Minsk exceeded the national average. The highest values of the morbidity index were registered in Minsk, and the lowest in Brest region.

The highest incidence of skin cancer was registered in the population of older age groups. In 2021, the incidence among the population aged 60-69 years decreased compared to the incidence in these age groups in 2011, however, in the groups of 70-74, 75-79, 80-84 and 85+ years, the incidence increased.

Thus, malignant neoplasms of the skin are one of the most common types of cancer, which in most cases appears on the areas of skin exposed to the sun. Mostly people over the age of 50 get sick. The problem of malignant skin neoplasms is one of the most urgent in modern dermatology and oncology. Over the past decade, skin cancer has occupied leading positions in the overall structure of oncological morbidity.

Among the key areas, it should be noted, first of all, the development of mechanisms for providing medical care and improving their rationality. Modern chemotherapy continues to improve survival rates for patients with late-stage disease. All types of skin cancer are diseases that can be prevented, detected early and effectively cured, so it is worth contacting specialists in a timely manner. Treatment often requires a team of experienced doctors, including surgeons, oncologists, and dermatologists. They work with the patient to create the safest and most effective treatment plan.

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INFLUENCE OF THE NERVOUS SYSTEM ON THE QUALITATIVE CHARACTERISTICS OF NOCTURNAL SLEEP

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Sleep is vital to the human body. It helps replenish wasted energy, maintain or increase overall alertness and activity levels. Getting enough sleep also helps reduce the risk of developing chronic diseases such as cardiovascular and neurological disorders. Sleep allows the body to adapt to natural cycles. During sleep, information about events that occurred during wakefulness is selected and organized.

Keywords: human nervous system, insomnia, sleep disorder, sleep cycles, polysomnography.

The need for sleep in each person is individual and differs from the needs of other people. Sleep disorders can be caused by various reasons, first of all - violations of the normal functioning of the nervous system. The purpose of our study was to investigate the influence of the tone of the central autonomic nervous system on the qualitative characteristics of night sleep of students of the A. D. Sakharov MSEI BSU. The study involved 67 students aged 17-20 years old. The Pittsburgh Sleep Quality Index (PSQI) questionnaire, Xiaomi fitness bracelet sleep quality monitor, and Apple Watch smart watch data were used to assess sleep quality. The state of the tone of the centers of the autonomic nervous system was assessed using continuous heart rate measurement in Xiaomi fitness bracelets.

The survey was conducted during one week. Statistical processing of the survey results was carried out using spreadsheets in MC Excel program.

The normal sleep of a person aged 17 to 20 years is 7 - 8 hours, and it is necessary to fall asleep within 30 minutes. The study showed that the majority of the surveyed students (71%) have problems with the duration and mode of sleep, and 82% consider the quality of their sleep as "poor". Disturbed sleep patterns and a reduction in total sleep time led to a reduction in the duration of the deep stage. Frequent awakenings and chronic illness also affected the reduction in the paradoxical sleep stage. Many students also noted symptoms such as headaches, syncopal states, decreased appetite, weight loss, impaired memory and concentration, nervous tics and depressed mental state.

In conclusion, we can say that violations of the qualitative characteristics of sleep are revealed in more than half of the surveyed students (71%). To a greater extent, there are violations of the mode and duration of sleep, which is reflected, first of all, in the orthodox phase, and as a consequence, in the general well-being of students. As a consequence, we can notice a decrease in concentration, lethargy, fainting spells.

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INCIDENCE OF GOUTY ARTHRITIS IN ONE OF BORISOV CITY DISTRICTS

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The article analyses the morbidity rate of gouty arthritis in the territory served by polyclinic No. 1 of Borisov city.

Keywords: gouty arthritis, statistical indicators, morbidity analysis.

Gouty arthritis is a relevant medical and social problem, as the disease is characterized by its prevalence, predominantly affecting middle-aged men, progressive nature, and high rate of complications. According to epidemiological studies over the past 20 years, the number of patients with gouty arthritis has doubled. Moreover, the increase in incidence is observed both in countries with a high economic standard of living, and in regions where gout was previously considered a rare disease. This phenomenon could be attributed to changes in dietary habits e.g. excessive consumption of meat, fatty food and alcohol abuse [1].

Nowadays, gout is considered a primary chronic systemic pathology, proceeding with constant formation and accumulation of microtophi deposits in various organs and tissues of the body. A distinctive feature of gout is its frequent combination with such diseases as arterial hypertension, metabolic syndrome, type 2 diabetes mellitus, all of which are characterized by a high risk of cardiovascular complications.

Gout leads to frequent temporary disability, restriction of professional activity, and disability, making this disease a pressing healthcare problem and a heavy social and economic burden for society, since the disease often leads to disability of the working age population [2].

According to statistical data, for the year 2022, 83 people suffering from gouty arthritis were registered in the territory served by Polyclinic No. 1 of Borisov city, including 2 people under 30 years (2.4%), 40 people aged 30 to 70 (48.2%), 17 people above 70 (20.5%), 24 people moved out of the service territory during the year (28.9%). The disease was newly diagnosed in 10 people (12%), where 8 were between 30 and 70 (80% of newly diagnosed and 20% of the total number of patients in this age group) and 2 people were over 70 years old (20% and 11.7%). Statistical data for 2023 indicate an increase in the incidence of the disease. Thus, in 2023, 98 cases were registered in the studied area, which is 18% more than in the previous reporting period. 2 people out of the 98 suffering from gouty arthritis were under 30 years old (2%), 65 people were between 30 and 70 years old (66.3%), 27 people were over 70 years old (27.6%) and 4 people moved out of the service area (4.1%). In 2023, there were 11 newly diagnosed cases of gouty arthritis (11.2%), with all patients belonging to the group of people over 70 years.

Based on the analysis of statistical data, it can be concluded that the incidence of gouty arthritis is increasing in the territory served by Polyclinic No. 1 of Borisov city. At the same time, the incidence among people in the age group from 30 to 70 has increased by 62.5% due to people arrived to the service area. The incidence in the group of people over 70 years has increased by 58.8%, with the absolute majority being newly diagnosed cases of gouty arthritis. The data obtained indicate the need to carry out health education work among the population in order to raise awareness about gouty arthritis. In addition, a more detailed statistical analysis is required, taking into account heredity, lifestyle and treatment regimens of patients, to identify patterns of morbidity and develop effective prevention algorithms.

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SECTION 3

PROBLEMS OF MODERN ENVIRONMENTAL SAFETY (BIO-MONITORING, BIOINDICATION, BIOREMEDIATION, RADIO-ECOLOGY AND RADIATION SAFETY, ENVIRONMENTAL MONITORING, MANAGEMENT AND AUDIT. INFORMATION SYSTEMS AND TECHNOLOGIES IN ECOLOGY)

ALLIUM-TEST AS A STANDARD IN ENVIRONMENTAL MONITORING

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The study aims to evaluate the toxic effects of soils from the exclusion zone of the Polessky State Radiation Reserve using the Allium cepa L. test system. The cytogenetic analysis revealed significant chromosomal aberrations in the root meristem cells of onion sprouts exposed to soil extracts from contaminated zones. Soils from Krasnoselye exhibited the highest levels of chromosomal damage. The findings suggest a direct correlation between soil contamination levels and mutagenic effects, demonstrating the utility of the Allium-test in ecological risk assessments.

Keywords: Allium-test, environmental monitoring, chromosomal aberrations, mitotic index, cytogenetic analysis.

The Allium-test is widely used in environmental monitoring to assess the effects of environmental pollutants on living organisms. It is an effective tool for detecting genotoxic and mitotic disturbances caused by soil contaminants. This research focused on soil samples collected from highly contaminated zones around the Polessky State Radiation Reserve, using onion root meristems to evaluate soil toxicity.

The cytogenetic method involved growing onion bulbs (Allium cepa L.) in water extracts of soil from Krasnoselye, Dronki, Babchin, and Masany. The study analyzed mitotic index (MI) and chromosomal aberrations (CA) to assess the extent of cellular damage. Microscopic examination was performed using the Nikon Eclipse 50i microscope, and statistical analysis was conducted using Excel.

The results showed a significant increase in chromosomal aberrations and mitotic disturbances in the samples from Krasnoselye, where the soil contained the highest levels of radioactive isotopes (Figure 1). The mitotic index for Krasnoselye was 27.2%, significantly higher than the control group (12.4%). Chromosomal aberrations, such as polyploidy and chromosomal bridges, were observed in 53% of the cells exposed to soil extracts from Krasnoselye.

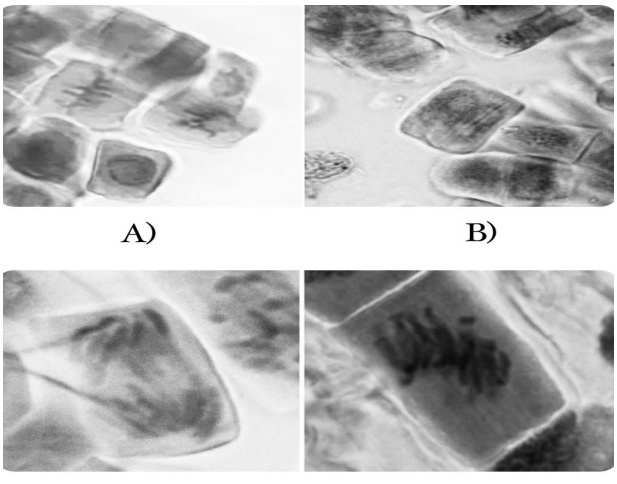

Fig. 1 - Detected aberrations in the root meristem of A. Stained with acetocarmine.

Magnification: 400x. a) anaphase lagging, b) polynucleation, c) double bridge, d) fragment

The Allium-test proved to be a reliable method for detecting environmental genotoxicity. The high levels of chromosomal damage in the soils from the exclusion zones suggest that contamination from radioactive elements is inducing significant mutagenic effects. The results highlight the need for ongoing environmental monitoring and the utility of bioassays in assessing ecological risks.

THE ANALYSIS OF BIOINDICATION PROPERTIES OF WILD PLANTS GROWING AT THE DEGELEN SITE

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Nowadays, one of the main ecological problems is the preservation of the environment, which has been polluted by various stress factors, with natural or anthropogenic origin. Previously conducted nuclear tests on the territory of the Semipalatinsk test site (SNTS) led to a significant radiation trail that still has a negative impact on all living organisms, including plants. Radiation exposure can lead to mutational processes and adaptive reactions in plant populations, increasing the risk of extinction and disturbing the ecological balance.

Modern technical instruments of environmental monitoring, developed primarily to assess the degree of pollution in industrial areas, represent only small part of the information about the real state of the natural environment. Bioindication, as an assessment method based on the study of the reaction of living organisms to environmental changes, is a complementary and actively developing tool for environmental monitoring. Therefore, the identification of plant species that react to radiation in various ways and their use as bioindicators is a key task in developing effective strategies for monitoring and minimizing the effects of radioactive contamination. The results of such a study will improve understanding of the effects of radiation exposure on the flora, as well as improve methods for detecting and reducing the effects of radiation contamination on the environment and humans. It is especially important to conduct such studies in the SNTS region, the territory of which has been exposed to radioactive contamination.

In order to understand the long-term consequences of these tests, it was decided to carry out the largest monitoring survey in the history of Kazakhstan, namely, a comprehensive environmental survey of the landfill. As part of this monitoring, an assessment of cytogenetic changes in plants growing at such sites as "Experimental Field", "4A", "Balapan" was carried out. However, no familiar studies were carried out at the Degelen site, where underground nuclear tests were conducted. Based on this, the purpose of our research was to analyze the bioindication properties of wild plants growing on the Degelen site. Two plant species were selected as the object of the study: rosehip (*Rosa spinosissima*) and wild rye (*Leymus angustus*), as the dominant species of the studied territory.

Samples of the seed progeny of the selected species were taken at 9 research sites (points) for rosehip (*Rosa spinosissima*) and at 10 points for wild rye (*Leymus angustus*). Each point represented a plot of 1 m^2. For radionuclide and elemental analysis, aboveground parts of plants and soil samples from under plants were used, which were obtained by injection. Preparation of the preparations and cytogenetic analysis were carried out in accordance with the standard Pauscheva technique [1, 2]. During the field work, measurements of radiation parameters were carried out: the equivalent dose rate (MED) and the density of the β-particle flux. In total, more than 500 preparations of the apical meristem of plant seed seedlings were analyzed using the Axioimager M2 microscope (Zess, Germany).

As a result of the study, it was found out that the detected violations are the result of prolonged exposure to internal γ- and β –radiation on the studied plants. In particular, the rosehip (*Rosa spinosissima*) has a frequency of cytogenetic disorders of 7.0%, while the wild rye (*Leymus angustus*) has 5.4%. This indicates that the wild rye (*Leymus angustus*) is more sensitive to chronic radiation exposure than the rosehip (*Rosa spinosissima*). Quantitative dose dependences of the output of chromosomal aberrations at various dose points of the Degelen site up to 1150 mcg/day were also obtained. A linear dose-effect relationship has been established for herbaceous and shrubby plant forms growing on the Degelen site.

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ANALYSIS OF PRODUCTION WASTE MANAGEMENT IN A CONFECTIONERY PRODUCTION ENTERPRISE

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The food industry is one of the important industries in the Republic of Belarus. It covers the production, processing and distribution of food products. The main role of the food industry is to provide the population with food products and maintain health, and develop the country's economy [1].

The food industry, like other industries, has an impact on the environment. The relevance of the topic of the impact of the food industry on the environment is due to the growth of population and consumption, which leads to the depletion of natural resources. Understanding this impact is important for developing sustainable production and consumption methods that can minimize damage to the environment.

Keywords: food industry, production, waste management, waste generation.

The impact of a food industry enterprise (confectionery production) on the environment of the Republic of Belarus is analyzed. According to the analysis, the total number of waste types is 72; the total number of production waste sources is 24. Mixed construction waste; spoiled, contaminated or unmarked food products; production waste similar to municipal waste; uncontaminated cardboard waste have the highest waste generation rates. Over the period from 2019 to 2023, the enterprise decreased the amount of production waste of various types by 9.7%. Thus, in 2019, 255.44 tons of production waste were generated, most of which was diverted (85.3%), an insignificant amount was neutralized, the share of landfilled wastes was 14.6% of the total waste generation. In 2023, the total waste generated at the enterprise amounted to 230.55 tons. The share of diversion increased to 88% of the total waste generated. There is a trend towards a decrease in waste disposal (12% of total generation).

According to the data on production waste diversion, it was determined that the most diverted wastes are: uncontaminated cardboard waste; mixed construction waste; spoiled, contaminated or unmarked food products. In 2019, mixed construction waste made up 25.1% of the total generation, while in 2023, this type of waste accounted for 8.9%. Particularly noteworthy is uncontaminated cardboard waste with a consistently high generation rate; in 2019, the amount of which was 70.44 tons, and by 2023 it came to 62.53 tons. It is found that the generation of spoiled, contaminated or unmarked food waste in 2019 amounted to 7.51 tons, while in 2023 their amount increased and totaled to 41.768 tons, that is, an increase of 5.8 times. The main facilities to treat food production wastes are ALC "Ekologiya Goroda" (spoiled, contaminated or unmarked food products), FLLS "REMONDIS" (impregnated and coated paper and cardboard waste), ALC "EKOPROMZHILSERVIS" (mixed construction waste), LLS "Datkom Stolitsa" (eggshell waste), LLS "Ekobelstandart" (uncontaminated cardboard waste, uncontaminated paper waste).

Production waste similar to municipal waste; impregnated and coated paper and cardboard waste, etc. have the highest rates of disposal, which amount decreased by 2.95% over the period from 2019 to 2023. It should be emphasized that the generation of impregnated and coated paper and cardboard waste increased by 1.8 times during this period. The enterprise's waste disposal facility is the Trostenetsky landfill of UP "Ekores".

It was found that the waste of the third hazard class, which includes 32 types and which comes to 44% of the total waste generation has the highest generation rate; then the fourth hazard class of 21 types goes, which makes up 29%; 14% is the percentage of non-hazardous wastes (10 types); the first hazard class wastes (9 types) accounts for 13% [2].

Taking into account the results of the study, it can be concluded that the confectionery production enterprise has a certain impact on the environment due to the generation and accumulation of production waste. The total number of

waste types is 72. The generation of production waste of various types during the period under review decreased by 9.74%. In 2023 the share of waste diverted was 88% of the total waste generation. An insignificant amount is disposed. There is a trend towards a decrease in waste disposal.

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GETTING GREEN PIGMENTS FROM SPENT NICKEL PLATING ELECTROLYTES BY PRECIPITATION OF NICKEL WITH SODIUM HYDROXIDE

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About 140 industrial enterprises with electroplating production are located on the territory of the Republic of Belarus. Nickel coatings are the second most common after zinc coatings. Spent nickel electrolytes are characterized by high concentration of nickel compounds, which have negative impact on human health and the environment.

Keywords: nickel, electrolytes, pigments, electroplating production

The purpose of the project: To study the possibility of obtaining green pigments from spent electrolytes of nickel plating by precipitation of nickel with sodium hydroxide.

The electrochemical method of applying a metal coating that prevents corrosion and oxidation of surfaces is industrial galvanization. This coating gives them an aesthetic appearance, increases wear resistance, hardness, and heat resistance, so it is widely used in various industries. Galvanic processes occur in electrolyte solutions after an electric current is passed through them. Nickel plating is the optimal method for making metals resistant to environmental influences. The nickel layer reliably protects the products from corrosion. Such parts are characterized by very high resistance to abrasion and mechanical damage.

First, the concentration of nickel ions in the electrolyte was determined. It was 25.6 g/dm3. Na $(OH)_2$ was chosen as the precipitator. Precipitation was carried out at various pH values. After that, the concentration of nickel ions in the filtrates was determined using the titrimetric method. After that, the washing of water-soluble salts took place. Next, the sludge was filtered and dried in a drying cabinet. As a result, a precipitate in the form of bright green crystals was obtained. It was ground in a mortar to a homogeneous powder. The possibility of using the obtained pigment to produce colored ceramic glazes was investigated.

Conclusion: the possibility of obtaining pigment from spent nickel plating electrolytes has been proven, which will allow replacing imported raw materials at Belarusian pigment production enterprises with waste from galvanic production, which in this case can be considered as secondary technogenic raw materials, as well as reducing the impact of galvanic production on the environment.

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ANALYSIS OF ENVIRONMENTAL SAFETY ACTIVITY OF THE CLOTHING INDUSTRY ENTERPRISE OF THE LIGHT INDUSTRY OF THE REPUBLIC OF BELARUS

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The environmental safety activity of the clothing industry enterprise of light industry for the period from 2017 to 2023 is analyzed. Based on the analysis of technical normative legal acts and enterprise standards, it is determined that the main environmental safety activity aspect of this enterprise is waste management. The most used types of waste are the following: miscellaneous fabric scraps from cutting; paper waste from cutting and stamping, paper and cardboard waste from office activities, polyethylene (film, trimmings). Production wastes similar to municipal wastes are characterized by the highest rates of disposal. The tendency to production waste generation reduction along with output volume maintenance is observed.

Keywords: environmental safety activities, waste management, recycling, air protection, water consumption and disposal, enterprise standards.

The analyzed enterprise produces clothing and sells it in specialized stores. The enterprise generates production wastes and affects the ambient air from mobile emission sources; water consumption and water disposal occur.

According to the research, enterprise water consumption for the analyzed period practically doesn't change: 8.20 thousand m^3 in 2017 and 8.16 thousand m^3 in 2023. Of the total volume of water consumed, approximately 19% (or 1,562 thousand m3) was used for production needs of the enterprise, 17% (or 1,372 thousand m3) was used for household needs, and 64% (or 5,226 thousand m3) was transferred to other organizations. The impact on the ambient air is caused by the enterprise due to the vehicle operation. As of 2023, the company has 6 vehicles, 2 of which have Euro-5 ecological class for motor vehicles, 2 - Euro-4 and another 2 - Euro-1 and below. The total volume of fuel used in 2023 amounted to 4,382 tons of AI-95 petrol and 28,652 tons of diesel fuel. Based on the established in the Republic of Belarus norms of values of specific pollutant content by ecological classes of motor vehicles depending on the type of fuel used, the pollutant masses entering the ambient air from mobile emission sources of the enterprise are calculated [1]. Thus, in 2023, the masses of the following substances were:

the carbon monoxide (CO)	about 95.85 kg
hydrocarbons	20.24 kg
nitrogen dioxide (NO_2)	393.36
particulate matter	7.56 kg
benzo(a)pyrene	0.0314×10^{-8} kg
sulfur dioxide (SO_2)	11.40 kg

The analysis of enterprise statistical data on waste generation rates shows that for the period of 2017 - 2023, there is a tendency to decrease in the volume of generated waste (222.57 tons in 2017 against 154.7 tons in 2023), which is due to the reduction in generation of production waste similar to municipal wastes, miscellaneous fabric scraps from cutting, paper waste from cutting and stamping, paper and cardboard wastes from office activities [2]. Thus, by 2023 the volume of generated waste decreased by 1.4 times (or by 67.87 tons).

In 2023, most of the production waste is of the following types: production wastes similar to municipal wastes (44% of total waste generation), miscellaneous fabric scraps from cutting (38% of total waste generation), waste paper and cardboard from office activities (7% of total waste generation). Comparing the above-mentioned data with the data of 2017, the volume of generation of production waste similar to municipal wastes decreased by 1.5 times (104.9 tons in 2017 vs. 68.89 tons in 2023), miscellaneous fabric scraps from cutting decreased by 1,5 times (90.68 tons in 2017 vs.

58.38 tons in 2023), paper waste from cutting and stamping decreased by 366 times (22.0 tons in 2017 vs. 0.06 tons in 2023), which is due to material cutting technology modernization. But the volume of paper and cardboard waste generation from office activities increased by 7.7 times (1.39 tons in 2017 vs. 10.72 tons in 2023).

The following types of waste are diverted the most: miscellaneous fabric scraps from cutting, paper waste from cutting and stamping, paper and cardboard waste from office activities, polyethylene (film, trimmings). In 2023 the share of waste diverted to third-party organizations was 55% (or 85.8 tons) of total waste generation. A similar situation is observed in 2017 - the share of waste diverted was 52% (or 116.52 tons) of total waste generation. Despite the change in total waste generation, the share of waste diverted practically didn't change.

In 2017, the company landfilled 104.9 tons of waste (or 47% of total generation), in comparison with 68.9 tons (or 44% of total generation) in 2023, which is 1.5 times less (or 35.8 tons less). Those were the production wastes similar to municipal wastes.

Based on the analysis of the company's activity, the plan of environmental safety measures for the period up to 2025 is developed and approved, including measures to control emissions during the operation of mobile emission sources, to control the waste disposal, to reduce both household and drinking water consumption to 100 liters per person per day.

Thus, the research shows:

1) The enterprise's water consumption for the analyzed period practically didn't change: 8.20 thousand m^3 in 2017 vs. 8.16 thousand m^3 in 2023.

2) In 2023, the carbon monoxide (CO), hydrocarbons, nitrogen dioxide (NO_2), particulate matter, benzo(a)pyrene and sulfur dioxide (SO_2) masses came to about 95.85 kg, 20.24 kg, 393.36 kg, 7.56 kg, 0.0314×10^{-8} kg, and 11.40 kg respectively.

3) The total volume of fuel used in 2023 amounted to 4.382 tons of AI-95 petrol and 28.652 tons of diesel fuel.

4) There is a trend of 1.4-fold decrease in production waste generation (222.57 tons in 2017 vs. 154.7 tons in 2023).

5) By 2023, the generation of production wastes similar to municipal wastes decreased by 1.5 times, miscellaneous fabric scraps from cutting decreased by 1.5 times, paper waste from cutting and stamping decreased by 366 times; the paper and cardboard wastes from office activities increased by 7.7 times.

6) The diversion rate in 2023 was 55% (or 85.8 tons) of the total waste generation.

7) During the analyzed period, the volume of waste landfilled decreased 1.5 times.

8) The share of waste landfilled in 2023 was 44% (or 68.9 tons) of the total waste generation, which meets the principle of priority of waste recycling over neutralization and disposal.

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BIOLOGICAL DOSIMETRY IN KAZAKHSTAN FOR EMERGENCY PREPAREDNESS AND RESPONSE

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The possibility of accidental overexposure of the population and professionals as a result of radiological incidents and history of last century nuclear events proves the need for improvement and development various methods of

biological dosimetry for radiation emergency preparedness and response. The electron paramagnetic resonances (EPR) methods, as well as cytogenetic analysis techniques, are the most advanced tools of modern biological dosimetry.

Keywords: biological dosimetry, physical dosimetry, electron paramagnetic resonance, chromosomal aberrations, emergency preparedness and response.

The threat of population radiation overexposure as a result of radiological incidents and nuclear events (Chernobyl, Fukushima, the activities of the Semipalatinsk test site) that occurred in the last century has actualized the issue of intensive study of a number of methods of emergency and retrospective dosimetry, as well as an adequate dose assessment.

Biological dosimetry based on cytogenetic analysis and physical dosimetry using biological objects, are the main tools for high quality dose assessment without the influence of temporary changes in blood tests or confounding factors such as chemicals or psychogenic reactions. Main assays of biodosimetry: dicentric chromosome analysis (DCA), cytokinesis blocking micronucleus test (CBMN) and translocation analysis using fluorescent in situ hybridization (FISH) have been successfully mastered in Kazakhstan biodosimetry toolkit. However, physical dosimetry, represented by the electron paramagnetic resonance (EPR) method, as the most effective analysis for high doses assessment, requires additional research.

In this study, the EPR spectroscopy approach was conducted for human tooth enamel (TE), taking into account the change in the shape of the radiation-induced signal in the EPR spectrum of irradiated enamel at high emergency doses, under conditions of emergency occupational exposure. Dental enamel samples from residents of Ust-Kamenogorsk who had not previously been exposed to radiation were used as dose indicators. 3 dose points were used: 0 Gy, 5 Gy, 15 Gy. The sample preparation and preparation of enamel samples was carried out mechanically (in accordance with the classical protocol of the method).

As a result of the experiment, an individual curve of the radiation sensitivity of tooth enamel was constructed, proportional to the intensity of the pure radiation signal using the integral method. The final error obtained based on the analysis of the radiation sensitivity measurement results for a statistically significant array of TE samples does not exceed 0.25.

With an increase in the dose rate, significant differences in the values of the EPR spectra of the samples were observed, which correlates with the available literature data on the use of EPR in the context of acute emergency exposure, due to loss of radioactive sources, local accidents at enterprises associated with nuclear installations.

The results of a cytogenetic study of the regional background frequency of chromosomal aberrations in residents of various regions of Kazakhstan in the context using dicentric analysis (DCA) are also presented. The data obtained on the average frequency of the standard background level of chromosomal aberrations in the regions of Kazakhstan should be taken into account when constructing the dose-effect calibration curve as a “zero” dose point, which will reduce uncertainty in quantifying the individual absorbed dose of the population of Kazakhstan.

Continuous improvement and research of biological and physical dosimetry methods, in terms of emergency human dosimetry, make it possible to ensure timely assessment of the impact on the general population.

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ANALYSIS OF HEAVY METALS IN BOTTOM SEDIMENTS OF ANTHROPOGENIC WATER BODIES: AN ENVIRONMENTAL-GEOCHEMICAL APPROACH

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In this article the study aims to assess the degree of pollution of water bodies caused by anthropogenic activities and its impact on the ecosystem. During the work the samples of bottom sediments and water from anthropogenic water bodies – Loshitsa river, Chizhovsky reservoir, Svisloch river (zoo area), Titovka river were selected, as background object Sergeyevskoye lake was chosen. The methods of analysis included photocolorimetry and titrimetry to determine the concentrations of heavy metals such as copper, iron, zinc, nickel, chromium.

Keywords: bottom sediments, secondary pollution, heavy metals, anthropogenic object, environmental pollution, aquatic ecosystem.

The sediments of water bodies represent a system of an accumulation of various pollutants over many years. The accumulation of heavy metals in bottom sediments is a particular hazard to the aquatic ecosystem [1].

The following water bodies were selected as research water objects – Loshitsa river (river in Minsk, right tributary of Svisloch river), Chizhovsky reservoir (a reservoir in the Vileyka-Minsk water system), Svisloch (river in the zoo park area), Titovka river (river in Marjina Gorka city, tributary of the river Svisloch), as background object – Sergeyevskoye lake (Pukhovichy district, Minsk region). Sediment samples were selected by a peat drill, water samples were taken by a submersible bathometer [2].

The heavy metal content in the sediments was determined by photocolorimetry and titrimetry. Total heavy metal content in extracts is shown in Table [3].

Table

Total concentration of heavy metals in bottom sediments and water samples

Sample name	Concentration, mg/kg (bottom sediments), mg/dm^3 (water)				
	Cu	Fe	Cr	Zn	Ni
Bottom sediments					
Loshitsa river, coast	149,33	8,15	0,0004	228,80	586,93
Loshitsa river, direction	158,90	14,7	0,0004	147,08	293,47
Chizhovsky reservoir, coast	451,89	14,2	0,0004	594,87	586,93
Chyzhovsky reservoir, center	367,83	3,6	0,16	464,13	293,47
Svisloch, direction	260,54	34,2	0,004	310,50	293,47
Titovka, direction	127,09	1,8	0,112	163,43	293,47
Sergeevskoe lake, coast	127,09	11,6	0,00001	49,73	45,63
Sergeevskoe, direction	57,19	12,32	0,00001	36,65	17,39
Water					
Loshitsa river	158,86	7,5	0,5	235,33	586,93
Chyzhovsky reservoir	190,64	5	0,375	189,036	293,46
Svisloch river	222,4	12	7,5	300,7	410,85

Titovka river	301,84	13,5	5	313,7	469,5
Sergeevskoe lake	66,52	8,9	0,025	18,03	293,47

Based on the following concentrations of heavy metals, it can be concluded that only the background object – Sergeevskoe lake does not exceed the limited concentration for soils. Exceeding of concertation of heavy metals in the water body indicates significant anthropogenic impact on water ecosystem.

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ECOLOGICAL ASSESSMENT OF THE SOIL COVER IN THE AREA OF INFLUENCE OF BELARUSKALI OJSC

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The article presents an ecological assessment of the soils adjacent to Belaruskali OJSC. It has been established that local pollution is observed. These territories are mainly located in the immediate vicinity of salt dumps and sludge storage facilities.

Keywords: pollutants, soil, heavy metals

On the territory of Belarus, among the most transformed regions in terms of the degree of technogenic transformation of the earth's surface is the area of the Soligorsk potash industries. The amount of industrial waste accumulated on the Earth's surface of the Soligorsky district exceeds 1 billion [3].

Belaruskali OJSC belongs to the large industrial enterprises of the Belneftekhim concern. The main sources of chemical pollution of the environment near this enterprise are processing plants, halite waste and clay-salt sludge. Annually, with the existing production volume, Belaruskali produces 16-20 million halite waste and 1.5–2.0 million clay-salt sludge, for storage of which over 1.9 thousand hectares of land are allocated for salt dumps and sludge storages.

The distribution of pollutants in the soils of the territories adjacent to Belaruskali was determined by the soil cover and the degree of soil hydromorphism, the distance from the source of emission, and the direction of prevailing winds [1].

As a result of the observations, it was revealed that the content of mobile forms of chlorine and sodium in the areas adjacent to the salt dumps of Belaruskali OJSC was maximum compared to remote sites (Table 1).

Table

The content of mobile forms of elements in soil samples (in mg/kg)

Sample	P_2O_5	K_2O	Na	CI
Control (500 m from the dump)	30,6	105,1	13,5	7,97

50 m from the dump	138,8	341,9	10,5	6,62
70 m from the dump	97,2	450,7	10,5	17,83
130 m from the dump	70,3	301,2	20,5	30,92

As can be seen from the presented data, the highest content of elements was found at a distance of 70 m from the salt dump. The site at a distance of 500 m from the salt dump served as a control [1].

It was found that as the transition from sod-podzolic sandy loam soils of normal moisture to sod-podzolic light loamy gleamy soils, an increase in the concentration of the pollutant of mobile forms of chlorine is observed in all horizons of the soil profile.

Currently, heavy metals (HMS) occupy one of the leading positions in terms of the degree of danger. Among heavy metals, Pb, Cd, Zn, Hg, As, and Cu are considered the most dangerous pollutants, since their accumulation in the environment is very high. The main HMS polluting soils are lead and cadmium. The weighted average content of gross Cd forms in the soils of the territories adjacent to the enterprises of Belaruskali OJSC was 0.18 mg/kg, with a background element content of 0.1 mg/kg [2].

The average content of gross forms of lead in the soil (12.8 mg/kg) slightly exceeded the background content (12.0 mg/kg). The maximum content of gross lead in the soil reached 22 mg/kg, which is lower than the maximum permissible concentration of this element in soils (35 mg/kg). The content of mobile forms of lead was in the range of 2.6-8.9 mg /kg, which is 5.8 -3.4 times lower than acceptable [2].

Thus, it was established that the main polluting elements of the soil cover in the area of influence of Belaruskali are sodium, chlorine and heavy metals, namely cadmium and lead.

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RESULTS OF MONITORING OF SURFACE AND GROUNDWATER IN THE AREA OF INFLUENCE OF JSC BELARUSKALI

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It is shown that the Belaruskali enterprise has a negative impact on environmental objects in the region, in particular on groundwater and surface waters. It has been established that the main pollutants of groundwater are chlorides, as well as their increased mineralization. It is noted that the main pollutants of the surface waters of the Sluch River are chlorides, petroleum products, surfactants and nitrates.

Keywords: local monitoring of ground and surface water, water pollution, salinization, mineralization, potassium industry

The main sources of salinization of groundwater are salt dumps and sludge storage facilities. Salt dumps, containing more than 90% of halite, are also a constant source of salinization of groundwater and surface waters. NaCl-saturated

brines are formed as a result of the dissolution of the surface of the dumps by atmospheric precipitation, as well as due to condensation moisture and the squeezing of excess moisture from new waste at the time of their storage. The mining and industrial complex is located in an excessively humid zone, therefore atmospheric precipitation, due to the dissolution of salts in it, is a constant source of brine formation. As a result of the repeated leaching by atmospheric precipitation, a clay crust forms on the surface of the dumps, which prevents dissolution and promotes surface runoff of relatively salt-saturated solutions. High concentrations of chloride ions, water mineralization, and sulfate ions are observed in groundwater wells near the salt dumps and sludge storages of Belaruskali mine departments. According to the results of groundwater local monitoring, the highest mineralization rates were 67647.7 mg/dm^3 in 2020, the highest chloride ion rates were 36487.6 mg/dm^3 in 2018, and the highest sulfate ion rates were 366.9 mg/dm^3 in 2021. At the same time, according to Sanitary rules and regulations 10-124 RB 99, the maximum permissible concentration (MPC) of chlorides in drinking water is 350 mg/dm^3, the mineralization index is 1000 mg/dm^3, and ion sulfate index is 500 mg/dm^3.

The surface waters in the area of the facility's location belong to the basin of the Sluch River, the third largest and most watery left-bank tributary of the Pripyat River. The waters of the Sluch River are fresh, characterized by average mineralization, about 300 mg/dm^3, and, according to the pH value, are neutral. Basically, the chemical composition of the waters is chloride-bicarbonate, magnesium-calcium. At the same time, there is an increased concentration of ammonium nitrogen in the water of the Sluch River, which is 1.1-1.7 MPC. These waters are noted to be polluted by various petroleum products, the concentration of which is 0.021 mg/dm3, as well as by synthetic surfactants, which concentration is 0.058 mg/dm^3.

Periodically, an increased content of nitrite ions was recorded in the waters of the reservoir. It should be noted that in the northern part of the Soligorsk reservoir, which is most closely adjacent to the production sites of the enterprise, the increased surface water mineralization values of 409.7-457.0 mg/dm^3 are representative, and lower mineralization values of 224.1-378.8 mg/dm^3 are typical for the southern part.

The mining and chemical industry of Belaruskali has a significant impact on the environment, in particular on groundwater and surface waters. Additional measures are required to reduce the impact of production processes on these environmental objects.

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MASSIVE PASSERINE BIRDS OF CHINA AND BELARUS

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The paper analyzes the systematic composition of passerine birds in the cities of China (Fuzhou, Handan) and Belarus (Minsk). The problems of synanthropization are considered using the example of mass corvids.

Keywords: birds, passerines, corvids, monitoring, synanthropization, urbanization.

An important factor for the progress of some bird species in the last century for China and Belarus, as well as other countries, was the synanthropization of their populations – the transition to living in anthropogenic landscapes and using food of anthropogenic origin. This is especially characteristic, for example, of some passerine birds, such as the gray crow, rook, jackdaw, magpie, etc. [2]. The reason for the appearance of many bird species can be considered global warming and environmental protection measures, widely carried out in both countries [2, 3].

Currently, in foreign countries of Europe and Belarus, there is a widespread increase in the number of corvids in the territory of urbanized landscapes. The absence of competition among other representatives of the avifauna of cities, an accessible food supply and a large number of favorable places for nesting make corvids rone of the mass representatives of passerines [1, 3].

In China, modern bird biodiversity is represented by 1449 species belonging to 28 orders, 115 families and 497 genera, where the dominant order is passerines – 792 species (55%) [3]. The list of all bird species of Belarus includes 339, including 20 orders and 61 families, 115 of which belong to the order passerines (40%) [2].

In the 21st century, early birds form the main synanthropic core of the aviation fauna of residential landscapes of European cities, which leads to a violation of the ecological stability of cities [1].

Common synanthropes of the crow family for the city of Minsk are: jackdaw (*Corvus monedula L.)*, rook (*Corvus frugal L.)*, grey crow (*Corvus cornix L.)* and magpie *(*Pica *pica L.).* Corvids are also called synurbated birds – birds that have successfully mastered urbanized territories.

The Jackdaw (*Corvus monedula*) is one of the most common corvids in Minsk. The maximum population density of this species of corvids in winter is found in densely populated residential areas built in the 1960s-1970s and 1990s-2000s – 352.1±105.4 and 300.2±95.4 individuals/km^2. The jackdaw is attracted to these biotopes primarily by the abundance of food. In the private sector, the population density of jackdaws in urban residential buildings of different years of construction is very low and ranges from 0.7±0.2 (early summer) to 5.4±1.5 (winter).

The second position is occupied by the rook. The population density of the rook in the capital is clearly differentiated and correlates with the availability of food supplies and suitable nesting substrate. During the nesting period, the rook concentrates in the microdistricts of the cities of old housing development, where its average density is 246.8 ± 27.3 individuals/km^2.

Unlike Belarus, in the cities of Fuzhou and Handan (China) there is no common synanthropus. This family is represented only by the rook, with a population density of 122.8 ± 17.3 individuals/ km^2 up to 9 6.8 ± 16.5 os./km^2 respectively. Other species of synanthropes of the crow family in these cities are: the black crow (*Corvus corone*) and the common magpie (*Pica pica L.*).

Thus, the avifauna of both countries at the present stage is characterized by processes of active formation of habitats both due to the immigration of individual species and the observed climate change (warming) at the end of the 20th and beginning of the 21st century.

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PHYTOINDICATOR POTENTIAL AND POLYMORPHISM OF CREEPING CLOVER IN URBAN MINSK

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This study investigates the potential of creeping clover as a phytoindicator for environmental conditions, specifically by analyzing the occurrence of «gray spots» on the leaf blades. The study, conducted in June-July of 2023, found that the average PRI from all reference points is 72%. The findings highlight the adaptive responses of creeping clover to urban stressors and propose its utility as a low-cost, efficient method for environmental monitoring.

Keywords: *Trifolium repens*, anthropogenic load, phytoindication, environmental conditions, polymorphism, phenotype, genotype, population, *« gray spot »*

Under anthropogenic load, the degree of polymorphism of the gene responsible for the «gray spot» on the leaf blade of creeping clover increases, while in its absence, the populations are characterized by morphogenetic homogeneity [2]. The presence of a «gray spot» on the leaves is a dominant trait (V), while the absence (solid green color) is recessive (v).

To investigate the presence of hereditary polymorphism, samples of *Trifolium repens* plants were collected from different populations of the territory of Minsk. A statistical analysis was performed to determine the frequency of the *«gray spot»* in each population. A total of 2,188 plant samples were analyzed at 23 reference points. To describe and compare leaflet morphs within a population, the amount of variation in each distinct pattern is taken into account and, as such, dominant, associated, background and rare variants are distinguished.

Genetic diversity increases the adaptability of the population to changing conditions of the urban environment [1]. Thus, the urban conditions of Minsk are characterized by a wide variety of genotypes.

The total diversity of genotypes encountered in the selected points amounted to 20. The vv genotype predominates in almost all selected points (from 21% to 54%), except for Shkolnaya St., where the frequency of occurrence of vv genotype was only 2%. At the same time, the V^SV^S mutant genotype predominates at this point (40%). Nevertheless, only at point 15 (Sedikh St.) the frequency of occurrence of the vv genotype (without pattern) is higher than the cumulative occurrence of mutant genotypes (with pattern). At the same time, the most common mutant genotypes are V^SV^S (14%), Vv (11%), V^HV^H (11%), and V^PV^H (9%).

Rarest genotypes (<1%) are represented by $V^{Bh}v$, $V^{Bh}V$, V^Bv, V^BV^B, V^SV^H, V^FV^F.

In addition, the index of the ratio of phenes (PRI) in the studied populations was calculated (by street): Nadezhdinskaya – 51%, Plekhanova – 80%, Rokossovskogo – 65%, 50 Let BSSR – 72%, Turgeneva – 70%, Mozyrsky trakt – 84%, Beletskogo – 61%, Slobodskaya – 75%, Dzerzhinskogo – 87%, Daineko – 79%, Kalinina – 74%, Mikhalovskaya – 62%, Lenina – 89%, Shkolnaya – 98%, Sedikh – 43%, Serafimovicha – 76%, Krasnoarmeyskaya – 80%, Dolgobrodskaya – 65%, Loshitsky Park – 54%, F. Skaryna – 69%, Molodezhnaya – 86%, Dostoevsky – 74%, Naberezhnaya – 59%.

The highest PRI was in reference point 14 (Shkolnaya Street, 98%), and the lowest was in reference point 15 (Sedikh Street, 43%). The average PRI from all reference points is 72%. Overall, based on the index of the ratio of phenes in different territories and the diversity of phenotypes, it can be concluded that there is a significant anthropogenic load on the territory of Minsk city.

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ASSESSMENT OF ENVIRONMENTAL QUALITY IN URBANIZED AREAS OF GOMEL CITY BY MEANS OF SNOW COVER BIOTESTING METHOD

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Abstract: In the course of the study was made an assessment of the environmental condition of the territories of Gomel city with different anthropogenic load, which are represented by 9 study sites, based on the indicators of biotesting with seed radish (*Raphanus sitvis* L.), including morphometric data: root and stem length, shoot weight, as

well as the percentage of their germination. According to the obtained data, the worst studied indicators are presented in the territory of Gomselmash, the highest data are noted in the vicinity of Gomel chemical plant.

Keywords: biotesting, snow cover, melt water, sown radish, environment, morphometric indices, anthropogenic load.

The problem of the impact of anthropogenic factors on the environment is relevant for most regions of the world. Bioindication and biotesting methods are used for integral assessment of the degree of toxicity of the natural environment [2].

Biotesting allows us to assess the potential danger of melt water samples of various compositions directly for living organisms.

Melt water is a natural indicator of environmental pollution. Due to the increase of anthropogenic load on the territory of Gomel city, increase in the number of motor transport, construction of new residential areas and development of industry increases the pressure on the surrounding area. Melt water pollution reflects the degree of anthropogenic impact on the environment [1].

The data of melt water of Gomel city territory with different anthropogenic load (n=9: point-1 – vicinity of the Gomel chemical plant, point-2 – Gomel-Rechitsa highway, point-3 – vicinity of Gomselmash plant, point-4 – Volotova district, point-5 – Melnikov Lug district, Golovatskogo str., point-6 – Melnikov Lug district, Mazurova str., point-7 – Birch Grove forest, point-8 – Rumyantsev and Paskevich Park, point-9 – Lake Volotovskoe). In the study, the assessment of anthropogenic impact and environmental quality of the studied snow samples was determined by the percentage of germination and morphometric indicators of sown radish (*Raphanus sitvis* L.), including the length of stems and roots of the studied test object, also the mass of germinated seeds.

When analyzing the biotesting with seed radish (Raphanus sitvis L.), we found that the highest contamination is in point-3 (the vicinity of Gomselmash plant), characterized by a low percentage of seed germination: on the 4th day - 5.5%, on the 7th day - 34.5% of seeds. Negative dynamics is also observed in such indicators as stem length (on the 4th day - 33.33 ± 8.5 mm, on the 7th day - 38.67 ± 4.04 mm), as well as root length - on the 4th day - 33.33 ± 8.5 mm and on the 7th day - 38.67 ± 4.04 mm, indicating morphological deviations from the norm in radish seedlings. The shoot weight on the 4th and 7th days was 0.2 ± 0.01 g and 0.46 ± 0.01 g, respectively.

The highest investigated parameters are observed in point-1 (neighborhood of Gomel chemical plant): the number of germinated seeds on the 4th day was 44.4%, on the 7th day - 58.8% of seeds, based on the table of pollution on morphometric indicators seedlings of radish (Raphanus sitvis L.) in comparison with the control are shorter and thinner, some seedlings have deformities - this means that the territory has average pollution. Root length was 57.33 ± 7.51 mm on the 4th day and 95.33 ± 4.73 mm on the 7th day, shoot stem length was 104.33 ± 2.52 mm on the 4th day and 132 ± 1.73 mm on the 7th day, with an average weight of 1.13 ± 0.01 g on the 7th day. Such results of morphometric indices are associated with high co-content of metal cations, which are plant growth stimulators.

Thus, according to the results obtained, the lowest environmental assessment indicators were observed at point-3 (neighborhood of Gomselmash plant) - this can be attributed to high anthropogenic impact and high emission of by-products of production, which accumulate in the snow cover. The highest data on morphometric indices of the investigated test-object were observed in point-1 (vicinity of Gomselmash chemical plant), which also indicates a high anthropogenic load on the environment due to the emission of waste products of the plant, represented by potassium and phosphorus fertilizers, which at the initial stages of development show positive dynamics in plant development.

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ENERGY-EFFICIENT TECHNOLOGY FOR CLEANING METAL SURFACES USING A WATER JET OF LIQUID

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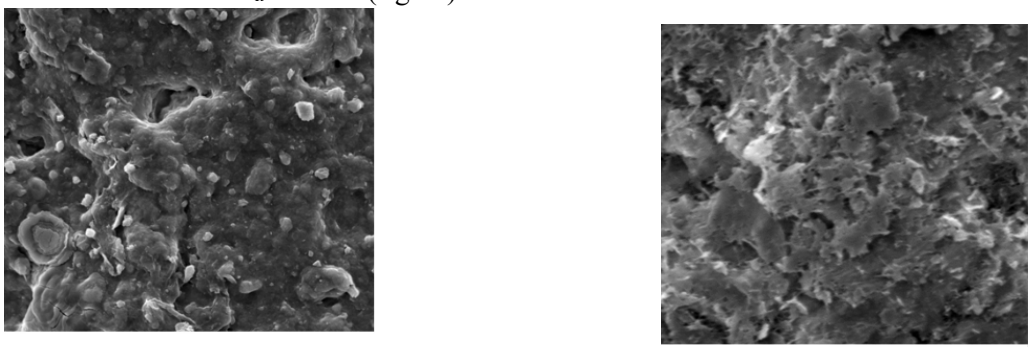
A distinctive feature of modern energy production in the Republic of Belarus is the absence of its own raw material base. There is a significant dependence on imported energy carriers and material resources supplied at world prices. When working in such conditions, production efficiency can be achieved through comprehensive savings and the use of energy- and resource-saving technologies that ensure the production of high-quality, competitive products.

The efficiency of implementing a number of technological processes in energy production directly depends on the quality of cleaning surfaces from corrosion products.

The corrosion rate of metals in industrial atmosphere can reach an average of 575 g/m2 per year. The annual losses of the CIS countries due to corrosion are estimated about 100 billion dollars. According to experts, irreversible metal losses due to corrosion account for approximately 10–15% of global steel production [1]

The most effective way to clean metal surfaces from corrosion is the water jet method. The Department of Energy Efficient Technologies, ISEI, BSU carried out the research. Optimal substance concentrations in the composition of a water-based working fluid were obtained: bentonite - $K_б$ = 1–3 %, polyacrylamide - $K_п = 10^{-7}–10^{-3}$ %, soda ash - $K_{к.с.}$ = 0,1–2%. These concentrations of substances provide cleaning with maximum forceful impact of the jet on the obstacle and simultaneously form protective film coating of the metal surface from St 45[2]. The cleaning parameters are the following: inlet pressure confuser is $p_{вх}$ = 25 MPa, distance from the confuser to the surface being processed is L = 25 mm, outlet diameter confuser is $d_к$ = 1mm. (figure).



а) – x1000; б) – x5000

material – steel 45, $K_б$ = 3%, $K_п = 10^{-5}$%, the rest is water

Fig. 1 – Photographs of the coating formed on a cleaned surface when it was treated with a working fluid composition based on bentonite clay [2]

After treatment with a jet of working fluid ($K_б$ = 3 %, $K_п = 10^{-5}$ %, $K_{к.с.}$ = 2 %, the rest is water). A protective anti-corrosion coating with high adhesive strength is formed on the metal surfaces of cleaned samples.

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BACTERIA IDEONELLA SAKAIENSIS

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This article provides data on environmental pollution with plastic, due to which animals die, ecosystems are destroyed, the climate changes. The article indicates the causes of clogging and proposed methods to improve the situation with plastic.

Keywords: Ideonella Sakaiensis, plastic.

The average decomposition time of plastic products made using different technologies ranges from 400 to 700 years. Plastic bags that people use every day decompose in the environment from 100 to 200 years. This contrasts with the strength and durability of plastic products.

Approximately 8.8 million tons of plastic are dumped into the ocean every year. According to the latest data from the UN Environment Program (UNEP), the total amount of plastic in the World Ocean is currently estimated in the range of 75 to 199 million tons. Plastic clogging occurs for various reasons: plastic waste becomes a serious problem due to insufficient disposal and recycling. Most of the plastic used is not recycled or recycled, but ejected into the environment. This leads to the accumulation of plastic waste and environmental pollution. The use of disposable plastic products, such as bags, bottles and utensils, also contributes to an increase in the amount of plastic waste. The popularity of these convenient, but disposable items leads to mass production and their subsequent ejection, worsening the problem of plastic pollution. Microplastic, which is generated by wear of large plastic waste or added to cosmetic and household products, is also a source of environmental pollution.

Today there are many opportunities to improve the situation with plastic. For example, explore the ideonella sakaiensis bacteria, which can quickly decompose plastic. The process in which bacteria eat plastic is called biodegradation of plastic. This type of bacteria was found on polyethylene terephthalate waste in a landfill in Japan. Ideonella sakaiensis is able to use polyethylene terephthalate as a power source, decomposing it into simpler connections. It is believed that cells live on the surface of the polyethylene terephthalate film, which are interconnected by outgrowths, and shorter outgrowths connect the cells and the film itself. Perhaps through these outgrowths, enzymes that can decompose polyethylene terephthalate enter the film. Under the influence of bacterial enzymes, the polyethylene terephthalate film was significantly destroyed and completely decomposed in 6 weeks at a temperature of 30 °C.

Ideonella sakaiensis research opens up amazing prospects in the fight against the problem of plastic pollution. The ability of these bacteria to decompose the polyethylene terephthalate emphasizes the potential of biotechnology to create sustainable methods for recycling plastic waste. Further research and development in this area can lead to innovative solutions that contribute to the conservation of the environment and create a cleaner and healthier world for future generations.

EFFECT OF DETERGENTS ON ENVIRONMENT

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The production of detergents is an important branch of the chemical industry, which plays a key role in the daily life of the country's population.

Every day we use various detergents in our life and in manufacture, without thinking about how they affect the environment.

Keywords: pollutants, surfactants.

Nowadays, no production, no person can do without detergents. The main advantages of detergents are the efficiency of cleaning various surfaces, tanks, ease of use and time saving, a variety of formulas, antibacterial properties.

The main ingredients of detergents are a solvent, most often water, and surfactants. In addition, there may be additives such as perfumes, enzymes, abrasives and substances to change the pH. There are also water softeners, antifoaming agents and viscosity control components, corrosion inhibitors and preservatives, oxidizing agents are used for bleaching and disinfection.

The choice of these components depends on the purpose of the detergent application. For example, chromic acid is used for laboratory utensils, and a highly foaming surfactant is used for washing dishes with your hands. Non-foaming products are suitable for dishwashers, ammonia for windows, and alcohols for car window washers.

When we produce and use detergents, this often leads to the discharge of wastewater, which contains residues of surfactants and other pollutants. Surfactants can cause high starvation among fish and other inhabitants of the aquatic ecosystem, creating a film on the surface of the water and preventing gas exchange between water and the atmosphere. An excess of phosphates promotes the growth of algae, which causes eutrophication, which can lead to oxygen starvation, due to starvation of fish and deterioration of water quality.[1]

As an example, an analysis of one of the enterprises producing detergents in the Republic of Belarus was carried out.

The analysis showed that the waste generation at the enterprise during the year amounted to 500 tons, where waste of hazard classes 3 and 4 prevail.

According to the results of the inventory of pollutant emissions, 68 sources of emissions were identified in the organization, which emit 28 pollutants.

Wastewater disposal is carried out by household and industrial sewers, the volume of water consumption, including for technological needs, amounted to 5,119 m3, discharge of household wastewater -3729 m3, the volume of stormwater wastewater – 20165 m3.

An alternative option to reduce the environmental impact is the use of biological surfactants, such as saponins, lecithin, biosurfacts, as they are less toxic and decompose faster in the environment.

To reduce emissions into the environment at the detergent manufacturing plant, the following measures can be implemented:

- Transition to environmentally friendly and biodegradable components.
- Reducing the use of toxic chemicals and harmful substances.
- Installation of energy-efficient equipment and technologies.
- The introduction of technologies that minimize the use of water.
- Installation of systems for continuous monitoring of emissions and resource consumption.
- Conducting regular audits to identify sources of pollution.

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CYTOGENETIC INDICATORS OF ENVIRONMENTAL PHYTOSTRESS

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The paper presents the results of studying the impact of soil radiation background in the exclusion zone of Polesskiy State Radiation Ecological Reserve. Various factors disrupt mitosis in onion root meristem cells, causing chromosomal aberrations; in this work we considered the impact of radiation background. The aberrations indicate the negative effect of radiation on genetic material.

Keywords: radiation background, chromosomal aberrations, mitotic index.

Relevance of the topic: Due to the deterioration of ecology and climate change, the problem of phytostress identification is very urgent and it is important to develop effective methods of identification of stress factors of plants of different origin. The methods of the research were Allium-test and theoretical data analysis.

The object of the study was soil extracts from the territories exposed to radiation contamination, in particular from: village Krasnoselye, village Dronki and village Babchin.

Specific activity indices of beta- and gamma-emitting radionuclides in soils of the studied territories are the following: for Cs-137: Dronki - 3852 Bq/kg, Krasnoselye 7871 Bq/kg, Babchin - 1073 Bq/kg; for Sr-90: Dronki -540 Bq/kg, Krasnoselye 1253 Bq/kg, Babchin - 515 Bq/kg; for K-40: Dronki -129 Bq/kg, Krasnoselye 544 Bq/kg, Babchin - 665 Bq/kg. These indicators are elevated compared to those of the Berezinskiy Biosphere Reserve, which is relatively clean: level of Cs-137 - 10.82 Bq/kg (394 times lower than in PSRER), Sr-90 - 0 Bq/kg (769 times lower than in PSRER), K-40 - 295.85 Bq/kg (1.5 times lower than in PSRER). Radiation background of soil extracts induced changes in mitotic index relative to the control, as well as various chromosomal aberrations. In the studied soil, the maximum mitotic activity index was 9% for samples from Krasnoselye - a value maximally close to the control - 10.9 %. The minimum value was found in samples from Babchin - 6.85%.

In the studied samples, the maximum mitotoxic effect of soil extracts from the exclusion zone of the Polessky State Radiation Reserve on the root meristem of Allium sulphureum was detected in Krasnoselye samples (26.15%), the minimum in Babchin samples (19.3%). The decrease of the prophase index in Babchin samples (22.5%) suggests that the radiation background affects the processes occurring in the interphase, disrupting the processes of cell preparation for division, in particular, repair processes necessary to repair DNA damage. The cell passes the S-period checkpoint, resulting in chromosomal aberrations [1].

Chromosome advancement is the most frequently occurring chromosomal aberration in all studied points. The maximum number and diversity of chromosomal aberrations was found in samples with soil extracts from Krasnoselye village. The following were detected in these points: advance (29 %), bridges (21 %), micronuclei (29 %), fragment (21 %). The highest mitotic index and number of disorders in samples of one soil can be explained by the fact that at high radiation background defence mechanisms are switched on - mitosis arrest in control points, when repair processes take place, as a result the level of mutagenic effect is estimated as weak. Damages are present in the S-period, but the control point is not triggered, and the cell goes further into mitosis, so the number of aberrations is high [2]. The presence of bridges shows that the radiation background is able to cause fusion of telomeric regions of chromosomes or breaks in DNA, which lead to nonreciprocal translocations. In asymmetric exchange, dicentrics are formed as a result of joining fragments with centromeres, which leads to the appearance of bridges in anaphase when chromosomes diverge. In some cells, chromosomal fragments were observed along with bridges. Chromosome fragmentation is a sign of destruction of their structure associated with lysis of DNA molecules by enzymes and serves as an indicator of genome instability [3]. Chromosome lagging occurs with disorders both in the chromosome itself and in the achromatin spindle of division. The predominance of the number of mutations in the experimental variants over the control suggests a negative effect of radiation background on the meristem of onion roots. It should be noted that constant contact with this mutagenic factor leads to an increase in genetic disorders.

Thus, the stress factor of radiation nature affects the course of mitosis. On the one hand, it can stimulate mitotic division, but on the other hand, it increases the probability of growth of chromosomal aberrations.

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PHYTOMELIORATION AND ECOSYSTEM RESTORATION ON DESERTIFIED LANDS

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The drainage of Belarusian wetlands represents one of the nation's most significant environmental disasters. The most severely affected areas have experienced desertification, which is the most extreme form of soil degradation. Today, restoring these areas is a pressing and complex challenge.

Keywords: Wetland drainage, soil degradation, desertification.

The wetland drainage policy implemented by the Soviet Union during the 20th century is widely criticized today. Belarus, with wetlands covering 14.1% of its territory, was heavily impacted, particularly in the southern regions, such as Polesia. Wetland drainage has since been halted due to the “Law on the Protection and Use of Peatlands.” Efforts are underway to block drainage systems to restore water levels in wetlands and support their natural regeneration, with international cooperation playing a key role. Notably, the UN Development Program (UNDP) continues to back numerous projects in Belarus, providing a total budget of $19.19 million..

The recovery of lands affected by desertification presents the most demanding challenge, and currently, little restoration work is being undertaken. Among the various methods, phytomelioration has proven to be the most effective. Supporting and enhancing natural soil recovery processes helps prevent damage to existing ecosystems, allowing them to expand naturally into degraded areas over time.

Scots pine (Pinus sylvestris) is especially well-suited to sandy soils, making it particularly effective in restoring degraded and desertified land. It stabilizes the soil and helps create conditions conducive to the gradual return of biodiversity. In the Pripyat River basin, pines play an especially important role due to their deep root systems, which can reach the nutrient-rich waters of the river, fed by nearby peatlands. This enables the pine to thrive where other tree species struggle to access water and nutrients. Increasing the clay content of soil is another critical step in restoring degraded lands, as it helps to reduce wind erosion, limit the occurrence of sandstorms, and decrease water evaporation.One way to enhance the clay content is by applying a spray of water mixed with clay onto arid and degraded land. This method, proven in the UAE, has successfully enhanced the fertility of sandy soils.

Even minor fertilization of these lands can trigger rapid vegetation growth. A clear example is seen following forest fires in nearby areas. Although destructive, fires leave behind organic materials like carbon, ash, and essential nutrients, creating favorable conditions for new plant growth. As a result, natural regeneration processes are activated after such events. These natural processes can be further supported by human intervention without disrupting existing forests.

Starting restoration efforts sooner will result in faster outcomes and reduced costs. Converting these lands into agricultural use and expanding forested areas will not only strengthen food security but also help preserve biodiversity and promote ecological stability in the long run.

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DESIGN AND OPERATION OF TIDAL POWER PLANTS IN CONTEXT OF SEA LEVEL RISE

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The rise in global sea levels may increase the efficiency of tidal power plants but also poses risks to their infrastructure, requiring consideration of changes in coastal hydrodynamics and morphology. When planning new stations, it is crucial to factor in these issues and adapt to climate change to ensure long-term stable energy production.

Keywords: Tidal power plants, sea level rise, flooding, climate change adaptation.

Sea level rise significantly impacts the performance of tidal power plants. Climate change induces atmospheric pressure anomalies, alters wind patterns, and affects ocean currents, which influence waves and storm surges. As a result, regions like Northern Europe are experiencing decreases in average ocean levels, while others, such as coastal areas of the USA, face an increase.

Research shows that even a small rise in water levels can dramatically boost energy output. For instance, in New Jersey waters, a 0.5-meter sea level rise led to a 21% increase in energy production, while a 1-meter rise resulted in a 43% increase. Figure 1 illustrates global trends in tidal amplitude changes.

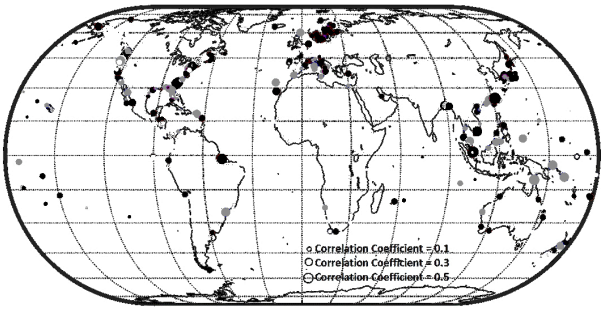

Fig. 1 - Tidal amplitude changes relative to sea level rise (black - increase, gray - decrease)

However, these processes also increase the likelihood of storm surges, threatening coastal regions and their infrastructure. In such conditions, traditional tidal power plants can also serve as coastal defense systems, mitigating the destructive effects of waves and storms. Their large structures, such as dams and barriers, can partially function as breakwaters, reducing wave intensity and preventing erosion and flooding.

Penzhin Bay, with its tidal range of up to 13 meters, is an ideal location for harnessing tidal energy. The Penzhin Tidal Power Plant has the potential to become one of the largest in the world. It could provide a stable renewable energy source, meeting domestic energy demands while allowing for excess energy exports. This would also reduce the carbon footprint, contributing to international environmental commitments. In the long term, large projects like the Penzhin Tidal Power Plant could play a key role in the global transition to clean energy, reinforcing the Union State's (Russia and Belarus) position in international energy and environmental policy.

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FEATURES OF THE ROCK DOVE SCARING DISTANCE IN SETTLEMENTS OF VARIOUS TYPES

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The study presents the results of research on the flight initiation distance of the rock dove (*Columba livia, Gm., 1789*), conducted in June and August 2024. It was found that the average flight initiation distance of the rock dove was 0,9 m (n=100). Observations indicated that the primary reaction to the approach of a human was stepping aside from the person's path (95,1%). In rural areas, doves do not allow humans closer than 20-30 meters, which may represent the natural flight initiation distance.

Keywords: rock dove, flight initiation distance, anthropotolerance, urban environment, rural area.

Humans are constantly changing their habitat, creating new conditions for birds and animals. Birds must continuously adapt to changing conditions. The main form of adaptation is behavioral change. This involves the development of appropriate responses to external stimuli related to humans and their activities [1].

Gradually, birds become accustomed to vehicles, bicycles, etc. Sparrows, doves, rooks, and other birds do not show concern about approaching vehicles. This trust can lead to serious consequences, as birds often die under the wheels of cars when they do not fly away in time to a safe distance [1].

The flight initiation distance of doves was determined using the standard methodology of A.A. Rezanov [2].

Considering significant differences in the disturbance factor from humans, three types of bird habitats are conventionally distinguished: a) residential districts in the city; b) parks, squares, gardens, etc.; c) rural areas [2].

The disturbance factor was assessed using the method of tracking the intensity of human passage [2].

A total of 50 observations, each lasting 15 minutes, were conducted. The following indicators were calculated: in a residential area 15,2 people/ 15 min, in a park – 9,4 people/ 15 min, in rural area – 1,3 people/ 15 min.

In the park, the disturbance factor was lower, but the flight initiation distance was shorter than in residential areas, as people often interact with and feed the birds in these public places.

In Bobruisk, the average flight initiation distance of the rock dove was 0,9 m (n=100). For individual birds, this distance ranged from less than 10 cm to 2 m. In feeding areas (squares and parks), the flight initiation distance was shorter – up to 0,5.

Observations showed that the primary reaction to a human's approach was stepping aside from the person's path (95,1%), with fewer instances of flight (4,9%). When approached directly, the birds could take flight, which was not observed when approached indirectly.

There was no observed correlation between flight initiation distance and plumage color morphs.

A distinctive feature of the rock dove scaring distance in rural areas (Stasevka village) is the fact that pigeons do not let people get closer than 20-25 m. The birds only responded to human approach by flying away.

Thus, in urban environments, the flight initiation distance of the rock dove decreases as anthropogenic pressure increases. Birds adapt to urban living conditions, developing anthropotolerance traits. In rural areas, the flight initiation distance exceeds that in urban environments, which may represent the natural flight initiation distance, as other researchers also point out [2].

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ANALYSIS OF THE EFFICIENCY OF THE BELARUSIAN NUCLEAR POWER PLANT

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The commissioning of the Belarusian Nuclear Power Plant (BelNPP) has become an important stage in ensuring the energy independence of the Republic of Belarus. An analysis of its energy production allows us to assess the effectiveness of the project, its impact on the country's energy balance and the stability of the energy system as a whole. This paper examines the key indicators of electricity production at BelNPP and their dynamics since its launch.

Keywords: BelNPP, ICUF, power unit

The construction of the Belarusian NPP has become the most high-tech and large-scale cooperation project between the Rosatom State Corporation and the Republic of Belarus. The main target technical and economic characteristics of the Belarusian NPP: installed rated capacity of the power unit is 1200 MW (e); number of power units - 2 pcs.; service life of the power unit is 50 years; efficiency (net) - 33.9%; average annual availability factor for operation at the installed rated capacity is 0.92; electricity consumption for the plant's own needs is no more than 7.48% of the rated capacity. The commissioning of the Belarusian NPP will significantly improve the economic and energy security of the country and will make it one of the world leaders in the share of nuclear generation in the overall energy balance[1].

The installed capacity utilization factor (ICUF) is the most important characteristic of the efficiency of enterpriseselectric power industry. It is equal to the ratioarithmetic meanpowerToinstalled capacityelectrical installationsfor a certain period of time. Innuclear energygive a slightly different definition: KIUM is equal to the ratio of actual energy productionreactor installationfor a certain periodexploitationto the theoretical energy output during non-stop operation at nominal power [1].

The first unit of the Belarusian nuclear power plant was put into commercial operation in June 2021, the second - in November 2023. At the moment, the first power unit is in the 3rd operating interval, the second power unit was put into commercial operation again on October 14, 2024 after the first scheduled preventive maintenance. The total electricity generation is more than 35 million kWh [2]:

$$\mathrm{ICUF} = \frac{\mathrm{FE}}{\mathrm{TE}} (1)$$

where FE is the actual energy production of energy productionreactor installationfor a certain periodexploitation, TE - theoretical energy production during non-stop operation at nominal power.

During the work on the BelAES website, the energy production indicators of the first and second power units were taken from the moment of the first launch to the present. Based on the data obtained, the coefficient of the used installed capacity was calculated for each power unit, as well as the overall coefficient of the used installed capacity for the entire power plant. KIUM for the first power unit– 0.88 (88%), for the second power unit – 0.73 (73%), the total capacity factor for the entire power plant is 0.8 (80%), which means that our plant is operating satisfactorily compared to the world capacity factor, which is approximately 0.82 (82%).

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ASSESSMENT OF SPECIES COMPOSITION AND FLUKE INFESTATION OF LAKE DRIVYATY MOLLUSKS (2023-2024)

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This work includes the results of a study of the species diversity and infestation of freshwater pulmonate mollusks of the *Planorbidae* family of Lake Dryvyaty in Braslav, obtained in July-August 2023-2024. It was revealed that in areas subject to greater anthropogenic transformation, the *Dreissena polymorpha* outnumbers, while a decrease in aquatic vegetation (targeted mowing) leads to a change in the species composition of mollusks.

Keywords: Planorbidae, Planorbarius corneus, species diversity, parasitic invasion

The study of species diversity gives an idea of the qualitative composition of the biocenosis and the quantitative relationships of species. Coils are intermediate hosts for trematodes, pathogens of many infectious diseases – schistosomiasis, cercariasis, fascioliasis, etc. Therefore, their natural populations represent real or potential foci of helminthic infections [1].

The purpose of this work was to assess the species composition of mollusks in coastal waters that were under anthropogenic influence and to determine the degree of their infection with trematode larvae.

Lake Dryvyaty is located on the territory of the Braslav Lakes National Park. The lake area is 36.1 km2. The maximum depth is 12 meters [2]. Within Braslav, a significant part of the lake is landscaped, and beaches are present throughout most of the coastline [3].

During the study in 2023-2024, 4 sites with a size of 80 m^2 in biotopes with different anthropogenic influence were selected:

1. The first site is characterized by dense vegetation, a large number of *Phragmites*, *Scirpus*, *Glyceria*. The bottom is muddy. Natural environment, there are no traces of anthropogenic changes (buildings, mowing of coastal vegetation, beach areas, etc.).
2. There is less vegetation on the second site, silt is found only near reeds, the rest of the bottom is sandy. The natural environment, there are no traces of anthropogenic change.
3. The third site is located closer to the territory of private development, there are many boats and fishing buildings on this site. The bottom is muddy in places, but more often sandy.
4. The fourth site is the city beach. There is no vegetation, the bottom is sandy, sometimes rocky.

In 2023, the first two sites on Lake Drivyaty were dominated by *Planorbarius corneus*: 66,7% of the total number of mollusks collected in the first site, 78,55% – in the second. The third site was dominated by numbers *Lymnaea stagnalis* – 58,3% of the total number of mollusks. On the fourth, which is subject to the greatest anthropogenic changes, it was most often found *Dreissena polymorpha* – 77,8%. The infection rate was 1.4% of the total number of collected individuals *Planorbidae*.

In 2024, on Lake Dryvyaty, the first and second sites are dominated by the number of *Planorbarius corneus* (48,9% and 72,2% respectively), the third and fourth sites are dominated by *Dreissena polymorpha* (61,8% and 93,3% respectively). The change in indicators at the third site is most likely due to human activity: during the year, coastal vegetation was mowed down, the coast became more sandy, which is preferable for the existence of *Dreissena polymorpha* . The infection rate of shellfish remained almost at the same level and amounted to 1,5%.

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THE INTRODUCTION OF SMALL MODULAR REACTORS INTO TRADITIONAL NUCLEAR POWER

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In the context of the prospects for the development of nuclear energy using small modular reactors and low-power nuclear power plants, the report examines the Pamir-630D ASMM, made on an automobile chassis, developed by the Institute of Nuclear Energy of the Academy of Sciences of the BSSR. The project of the floating ASMM Akademik Lomonosov, implemented by the Rosatom State.

Keywords: MMR, ASMM, RYTM-200, Pamir.

After the transition of nuclear energy to IV generation reactors, the next stage will be the transition to the use of small modular reactors, which can become an alternative to reactor installations and which have their significant advantages over full-size nuclear power plants [1]:

- Cheapness of construction;
- Does not require a large amount of infrastructure to support safety and operation;
- Rational use of energy;
- The MMR and other components of the installation can be built separately from each other
- You can add power gradually as needed;
- Mobile.

Considering the above, the question arises - are there such projects of nuclear power plants? An analysis of Internet publications shows how the concept of the Pamir mobile nuclear power plant was implemented in 1985 in Belarus. The first goal of the PAES project is to use an autonomous and mobile energy source for energy–cut-off enterprises located in hard-to-reach areas. The installation contained a Pamir-630D reactor with a dissociating coolant – diazote tetraoxide. The electric power was 630 kW, the thermal power was 5 MW. After the Chernobyl accident in 1986, further use of the complex was threatened with prohibition. In 1988, by decision of the Council of Ministers of the USSR and the Presidium of the Academy of Sciences of the BSSR, the Pamir-630D project was closed [2].

The next question is brewing – is there a working installation? The undoubted leader in this field is the State Corporation Rosatom, which has implemented the floating nuclear power plant Akademik Lomonosov, which uses two KLT-40S reactor plants. The NPP was created to operate as part of ASMM and supplies 60 MW of electricity to the onshore network. This station can provide electricity to a settlement with a population of about 100,000 people. The floating station can also be used as an installation for desalination of seawater (from 40 to 240 thousand m3 of fresh water per day) [3].

Thus, the approaches implemented in projects for the creation and implementation of small modular reactors make it possible to provide areas cut off from electricity supply, or to create stable energy transmission from mobile energy sources.

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MODERN ASSESSMENT OF RADIONUCLIDE CONTENT IN FOOD PRODUCTS

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The article examines the main aspects related to radiation processing of food products and the regulatory framework for this processing in the Republic of Belarus.

Keywords: radiation, irradiation, food safety, labeling, expiration date.

An important task of ensuring food security in the Republic of Belarus is to increase production and improve the quality of agricultural products, since more than 20% of agricultural products are lost due to losses and spoilage, the preservation of food products is a problem no less important than their production. The introduction of new technologies that ensure the growth of production will help reduce losses during storage and processing. Processing of food products with ionizing radiation is one of the promising technologies for combating pathogenic microorganisms. The process of irradiation of food products is associated with the effect of ionizing radiation on food products in such a way that these products absorb a certain amount of this radiation. The products do not become radioactive: electrons have too little energy to interact with the nuclei of atoms. Since radiation treatment does not heat food products, they retain their original freshness (fruits, fish, vegetables) and physical condition (dried or frozen products). Packaged products do not contain spoilage substances (bacteria, insects, etc.), and if the packaging materials are impermeable to bacteria and insects, then recontamination does not occur. Ionizing radiation is eliminated or reduced by the use of thermal exposure, food preservatives, pesticides and other chemicals. For the treatment of food products, radiation-technological installations with three types of ionizing radiation sources are used: a) gamma irradiation using cobalt-60 or cesium-137; b) X-ray radiation with an energy at or below 5 MeV; c) electron irradiation with an energy at or below 10 MeV.

The history of food irradiation begins with the peaceful use of the atom, that is, in the mid-1950s. At that time, nuclear engineers and health care workers realized the prospect of using radiation to sterilize food products. For the former, this was an application of their knowledge for a completely peaceful cause and an expansion of the market for their products - radioactive isotopes. The latter received an excellent tool for preserving the freshness of food products.

Agronomists and sanitary workers also became interested in the technology: it turned out that irradiation helps kill not only bacteria, viruses, fungi, but also sterilizes all kinds of insects and other arthropods, depriving them of the ability to reproduce. Another amazing property of radiation was discovered: it inhibits the germination of vegetables and the ripening of fruits. These three areas - sterilization of food, pest control in imported agricultural products, preservation of fresh vegetables and fruits - are the main ones in the irradiation of food products today.

To get rid of insects, a relatively small dose is required, up to 100 Gy: this is how grains, dried vegetables and fruits are treated. To protect products from bacteria and mold, they are irradiated with a dose of kilogray. One of the most important results of radiation treatment is the extension of the shelf life of products. Treated vegetables and fruits are stored twice or three times longer than usual, because microorganisms do not develop in them. Doses from 3-4 kGy (for vegetables and fruits) to 6-8 kGy (for semi-finished meat products) are used. For example, fresh strawberries, even in the refrigerator, are stored for only 4-6 days. Radiation treatment doubles this period, with losses amounting to 5-10%, while the losses of non-irradiated berries reach 25%.

To regulate the circulation of products treated with radiation, it is important to accurately determine what dose of radiation the products received. Most of these methods are expensive, inefficient, time-consuming, require high operator qualifications, and are not universal enough.

The "fingerprint" method for determining the dose absorbed by product samples during irradiation was developed by employees of the Chemistry Department of Moscow State University with the participation of colleagues from the Physics Department. The idea of the method is to monitor various indicator reactions involving specially developed carbocyanine dyes - fluorophores and oxidizers.

The reaction rate and fluorescence intensity of dyes in extracts prepared from irradiated products are digitized using a specially developed visualizer, and then, using data processing using machine learning algorithms, it is possible to

assess the probability of distinguishing between product images that received different doses of radiation during processing.

When irradiating any food product, the minimum dose of absorbed radiation must be sufficient to achieve the technological goal, and the maximum must not exceed the dose that could pose a risk to consumer safety or that could adversely affect the structural integrity, functional or organoleptic properties of the product. The dose used must correspond to the technological goals and the goals of ensuring national health, as well as the standards for the use of radiation. The leading positions in the use of ionizing radiation in agriculture are occupied by the United States, China and India. There are also centers for the irradiation of raw materials and food products in France, Germany, South Africa, Indonesia, Brazil, Belgium, Mexico, Chile, Spain, Thailand, Vietnam, Bangladesh, Peru, Great Britain, Moldova, etc. The method of radiation treatment of berries, fruits and vegetables has found wide application not only in the United States, but also in Canada and the Netherlands. Most often, this technology is used for strawberries, grapes, peaches, apples, pears, tomatoes, bananas, eggplants, papayas, mangoes. The Russian Federation has accumulated extensive experience in the use of ionizing radiation in the agricultural sector.

To determine whether food products have been treated with ionizing radiation, the electron paramagnetic resonance method is used.

In the Republic of Belarus, GOST ISO 14470-2014 "Radiation processing of food products. Requirements for the development, validation and routine control of the process of irradiation of food products with ionizing radiation" was developed. Which was put into effect on 01.01.2016.

In order to develop radiation technologies in agriculture and the food industry in the Republic of Belarus, a regulatory framework should be developed, the technological process should be worked out in detail, and specialized centers for irradiation of agricultural and food products should be built. However, the lack of domestic research, the need for personnel training and difficulties in financing make the introduction of processing agricultural products with ionizing radiation a labor-intensive and energy-consuming process. On an industrial scale, significant efforts will need to be made and support from international organizations will need to be secured. The advantage of using traditional food processing technologies (heating, cooling, drying) is that they have not been subjected to thorough research on the preservation of the nutritional qualities of products; their industrial implementation also did not require special legislation, consent from health authorities and appropriate consumer training.

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LICHENOINDICATION OF AIR POLLUTION IN THE SEVASTOPOL PARK OF MINSK

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The analysis of the state of atmospheric air in the three territories showed significant differences in the level of pollution. There is increased pollution near the road due to heavy car traffic. In the depths of the park, the situation is different: a large number of lichens have been recorded here, which indicates a high level of environmental well-being. The third area, next to the construction works, also suffers from pollution due to sulfur dioxide emissions.

Keywords: lichenoindication, bioindication, index of relative purity of the atmosphere, epiphytic lichens.

Lichenoindication is a method of assessing air quality using lichens, which are sensitive indicators of environmental change. It is an important tool in ecology and environmental protection, allowing you to identify and track changes in ecosystems related to pollution and other factors. Lichens are sensitive to changes in the ecosystem, especially to air quality and pollution levels. Therefore, they can be used as bioindicators to assess the ecological state of the area. The use of lichenoindication allows not only to assess the current level of pollution, but also to track changes over time, which makes this method a valuable tool for environmental monitoring. Introduction to lichenoindication requires an understanding of the ecology of lichens, their biological characteristics and interaction with the environment.

The purpose of our work was to assess the ecological condition of the Sevastopol Park in Minsk with the help of lichens. To achieve this goal, the following tasks were set:1) To study the general characteristics and species diversity of lichens.2) To determine the life form of epiphytic lichens depending on the shape of the thallus and to conduct a study of the diversity of lichens in the Sevastopol Park in Minsk.3) To assess air pollution by the method of linear intersections

Three test sites were installed in the park: one next to the roadway, two in the depths of the forest and one near the construction site. At least 10 hanging birch (Bétula pendula) trees were examined at each site for the presence of epiphytic lichens. As a result of the study, two species of epiphytic lichens were identified: rock Parmelia (Parmelia saxatilis) and Xanthoria multiplex (Xantoria palycarpa). The projective coverage with scale lichens ranged from 0 to 9%, and with leafy lichens — from 10 to 35%. Bushy lichens were not found during the survey. The calculated indices of the relative purity of the atmosphere at the sites in the depths of the park did not have significant differences (p=0.05) and averaged 0.72±0.03, which indicates atmospheric air pollution. The index of relative purity of the atmosphere in the construction site differed significantly and amounted to 0.73± 0.103, which indicates a high level of pollution. Similarly, the relative purity index of the atmosphere near the road was 0.73±0.103, indicating very polluted air.

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MAIN TYPES OF AGROLANDSCAPES SOIL DEGRADATION IN BELARUS

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Main types and forms of soil degradation are discussed in the article.

Keywords: soil degradation, water erosion, deflation, radioactive contamination, peat soils.

Soil is the most important and irreplaceable natural resource, which is the national treasure of any country, the basis of human life, on the rational use of which sustainable socio-economic development and environmental well-being depend.

Soil degradation is a set of natural and anthropogenic processes that lead to changes in the soils function, quantitative and qualitative deterioration of soil composition, properties and regimes, and the natural and economic lands significance [1].

In the modern world, the problem of soil (land) degradation is one of the most important and has a global character. Worldwide, 1.96 billion hectares of soil cover are subject to degradation caused by human activity, mainly under the influence of water erosion and deflation [2]. According to FAO, the total area of degraded land is more than 25% of the land area, and every year about 12 million hectares are added to the total area of degraded land. According to various estimates, the annual global damage caused by land degradation ranges from 40 to 300 billion US dollars [3], and according to some sources reaches 490 billion US dollars [2].

The problem of degradation of soil (land) resources and the prevention of its further development is extremely relevant for Belarus. More than 20 types and forms of soil degradation have been identified in the republic. The main ones are water erosion and deflation, radioactive contamination and mineralization of peat soils. The total area of land subject to the main types of degradation is more than 1.7 million hectares. Degraded lands in relation to the total area of agricultural land occupy about 20%, including by types of degradation: exposed to water erosion and deflation – 556.5 thousand hectares; exposed to ^{137}Cs and ^{90}Sr radioactive contamination – 819.8 thousand hectares; degraded peat soils – 313.8 thousand hectares (Figure).

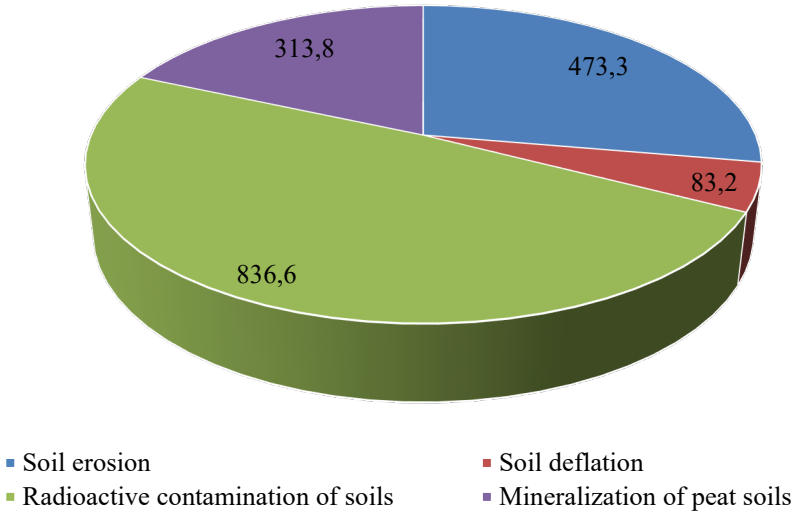

Fig.1 – Soil areas by main types of degradation (thousand hectares)

The territorial distribution of various types of soil degradation, their combinations and the development intensity vary significantly across the regions of Belarus. In the Northern soil-ecological province (Poozerye), due to the peculiarities of the relief, geomorphology, and the nature of the soil-forming rocks, the processes of water soil erosion and lands waterlogging are common. In the Southern soil-ecological province (Polessky region), due to the significant specific gravity in the structure of the soil cover of sandy and sandy loam soils, the processes of soil deflation are intensively manifested in the granulometric composition of sandy and sandy loam soils. Degraded peat soils occupy significant areas in this region, as well as lands exposed to radioactive contamination as a result of the Chernobyl disaster. The processes of water erosion (in the northern and northeastern parts), deflation and degradation of peat soils (in the southern part) are developing in the Central soil-ecological province. The lands in the eastern and southeastern parts of this region are exposed to radioactive contamination.

Thus, the listed types of soil degradation by regions of the republic, administrative districts and individual land users have different combinations and manifestation intensity.

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DEIRONING OF GROUNDWATER OF THE TERRITORY OF MOSTOVSKY DISTRICT (BOLSHIE OZERKI)

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The paper presents the results of the study of iron content in drinking water taken from the water supply system and wells in the village of Bolshiye Ozerki. Experimental data on the results of studying various iron removal methods is presented and the best option for removing iron from water is suggested.

Keywords: iron removal, water quality, sorption, aeration, purification method.

The quality of drinking water in the Republic of Belarus is assessed based on microbiological indicators, chemical composition and organoleptic properties. Belarus has a problem with high iron content in groundwater, which is the main source of water supply. Iron in water can be present in various forms (dissolved divalent iron, insoluble trivalent iron, colloidal iron, organic and bacterial iron), a method of iron removal depends on its form [1].

The research goal was to assess the quality of drinking water in Bolshiye Ozerki to select a method of iron removal. The following tasks were solved to achieve the goal: to collect samples of drinking water in wells and from the water supply system; to determine the content of total iron in the collected samples; to determine the content of total iron in tap water at different times of the day; to compare the obtained results with sanitary and hygienic standards; to test iron removal methods (sorption, aeration, combined method) on model and real waters.

The objects of the study were water samples from the water supply system and wells, collected in Bolshiye Ozerki (Mostovsky district, 12 sampling points in total). Water sampling was carried out in accordance with TKP 17.13-14-2021, GOST 31861-2012.

The concentration of iron in household water was determined using the NILPA® HOME rapid test. Iron was also determined photocolorimetrically. The method is based on the formation of colored iron complexes with sulfosalicylic acid [3]. Sulfosalicylic acid interacts only with Fe^{3+} ions in a weakly acidic medium (pH 4) forming a red complex stable at pH 4–8. Sulfosalicylic acid reacts with Fe and Fe^{2+} ions in an alkaline medium (pH 8–11.5) forming a yellow complex.

It was found that in water samples taken from wells and the water supply system the iron concentration varied from 0.11 mg/dm^3 to 0.36 mg/dm^3. The iron standard was exceeded by 1.2 times only in one water sample (from the water tower). The total iron concentration was close to the MAC (0.97 MAC) in one water sample taken from a well in a residential building. The concentration of the iron was about half of the MAC in six samples. A comparative analysis of the NILPA® HOME rapid test and the photocolorimetric method showed that the latter is a more accurate and reliable method for determining iron content. This is important for future research and control, since the accuracy of measurements directly affects decision-making on water purification and treatment.

It has been shown that iron concentration in tap water depends on time. The highest concentration values were observed at 5:30 am and 9:00 pm, which is probably due to iron accumulation in the pipeline at low water flow rates. This observation highlights the need for regular monitoring and time-dependent water quality management.

As a result of testing various ion exchange materials, it was found that ion exchange threads are ineffective, while the cationite KU-2-8 allows achieving 81.5% iron removal, and the most effective was Tokem-100 with a cleaning efficiency of 89% in 2 hours of treatment. This shows that the choice of cationite, its characteristics and the conditions of the process significantly affect the cleaning efficiency.

The study of the aeration oxidation method showed that it takes 1 hour (air consumption 180 l/h) to convert divalent iron to trivalent iron. Therefore, aeration can be a fast and effective alternative for iron removal.

Based on the analysis, it can be concluded that a comprehensive approach is needed to solve the problem of high iron content in drinking water in the areas under study, including the use of effective purification methods, such as sorption and aeration. It is also important to develop a sustainable water quality monitoring system that takes into account temporary fluctuations in iron concentrations. The use of more accurate water analysis methods and the selection of suitable ion-exchange materials will significantly optimize the purification process, which will ultimately provide residents with safe and high-quality drinking water.

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COMPARATIVE STUDY OF THE EDUCATION MANAGEMENT SYSTEMS OF CHINA AND RUSSIA: A COMPREHENSIVE ANALYSIS FROM POLICY, STRUCTURE TO IMPLEMENTATION OUTCOMES

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Abstract: With the advancement of globalization, both China and Russia are facing different challenges and opportunities in their educational management systems. Despite differences in educational backgrounds, historical cultures, and social structures, the comparative analysis of their education management systems in terms of policy formulation, structural design, and implementation outcomes offers important insights for educational reform in both countries. This paper explores the similarities and differences between the two countries' education management systems and suggests optimization paths for educational management in the context of globalization.

Goal: The education management systems of China and Russia have significant differences in historical development, cultural backgrounds, and educational philosophies. China's education management system emphasizes centralized control, with national policies and the central government playing a dominant role in educational reforms (Zhang & Wu, 2020). In contrast, Russia's education system is more decentralized, with local governments having greater autonomy, particularly in higher education (Petrov & Kuznetsov, 2021). These two different management models present both strengths and challenges, which warrant further analysis and comparison.

Policy Background and Education Management Structure: The central government leads China's education management policies, and national-level educational policies have a strong guiding influence on local governments and schools. For example, policies issued by the Ministry of Education directly affect the planning and implementation of the national education system (Li, 2022). In contrast, Russia's education management system relies more on the flexibility of local governments and regional educational needs. For instance, in Russian higher education, local education boards and universities have more autonomy in curriculum design and teaching arrangements (Borisova & Ivanova, 2021). These policy backgrounds and management structures reflect the differing educational governance models in China and Russia.

Implementation Outcomes Analysis: Regarding implementation outcomes, China's education management system emphasizes large-scale national investment and the optimization of educational resource allocation to achieve educational equity and quality improvement (Yang & Li, 2023). For example, national policies on compulsory education and regional educational policies have successfully promoted the balanced distribution of educational resources between urban and rural areas. However, Russia's education system focuses more on personalization and regional characteristics, which, while meeting the needs of different areas, faces challenges in improving overall educational quality (Zaitseva & Ivanov, 2022).

Conclusion: In conclusion, there are significant differences between the education management systems of China and Russia in terms of policy, structure, and implementation outcomes. China's education system emphasizes centralized management and policy direction, while Russia leans towards local autonomy and flexibility. The comparative study of the two countries' education management systems provides valuable insights for educational reforms in the context of globalization. In the future, both countries can learn from each other's strengths in the reform of educational management systems, optimizing resource allocation and improving educational quality.

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CURRENT STATUS OF PASSERINE BIRDS (AVES, PASSERIFORMES) OF CHINA AND MAJOR THREATS TO THEIR BIODIVERSITY

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China is among the richest countries in the world in terms of bird diversity, with 1,445 species, more than 34 families of which belong to the *Passeriformes* birds (*Aves, Passeriformes*) order. However, the rich diversity of these Passeriformes birds is under threat due to multiple factors, including habitat loss and degradation, hunting and trade activities, biological invasions, environmental pollution, and global climate change [1]. Given that China is also one of the countries facing the greatest biodiversity threats, it is imperative to comprehend the current status of Passeriformes birds in China and the threats to their diversity, as this understanding is pivotal for effective biodiversity conservation efforts in the country.

Keywords: Passerine birds *(Aves, Passeriformes)*, China, biodiversity.

The distribution of birds in China is uneven, and the regions with the highest diversity of birds are the southwestern and southeastern regions [2]. The order Quercus is the most diverse order in the Ornithischia, and is also the most advanced group of birds. The Chinese finches are distributed throughout the country [3]. According to China's public birdwatching data collection from the China Birdwatching Records Centre (www.birdreport.cn), the top three provinces in China in terms of the number of birdwatching records and the number of bird species in the last decade are Yunnan,

Sichuan and Tibet. Yunnan Province is one of the most bird-diverse regions in China, with more than 20,000 records and 890 bird species, including 52 families and 549 species of the order *Passeriformes*. Yunnan Province also has the highest number of threatened bird species in China, followed by Sichuan, Fujian, Guangdong and Guangxi [4].

According to the China's Red List of Biodiversity: Vertebrates, among the top 10 most threatened families of birds in China, there are six threatened species in the family of the Eight-coloured Thrush, which belongs to the order *Passeriformes*, with a threatening ratio of 66.7%, and four threatened species in the family of the Flycatcher, with a threatening ratio of 44.4%.

Among the two species of Critically Endangered (CR), the blue-crowned thrush (*Garrulax courtoisi*) belongs to the order *Passeriformes*. Among the vulnerable (VU) species, the Brown-headed Lapwing (*Leucosticte sillemi*) belongs to the order *Passeriformes* and is endemic to China.

China has a total of 93 endemic bird species, of which 68 are in the order *Passeriforme*s [1]. Among them, three of the five most threatened families belong to the order *Passeriformes*: *Pycnonotidae* (100%), *Certhiidae* (100%), and *Sittidae* (100%).

China is one of the countries where biodiversity is most seriously threatened. Bird diversity is seriously threatened by over-utilisation of resources, habitat loss and degradation caused by human activities, environmental pollution and climate change. According to the assessment report of the China's Red List of Biodiversity: Vertebrates, there are many factors causing bird endangerment in China, among which «habitat degradation and loss» caused by deforestation and substitution of planting of economic forests, and wetland reclamation, etc., are ranked as the most important endangering factor for birds, and the capture of birds for consumption, trade, and settlement of wetlands are the most important factors for birds [3]. Overall, the endangerment of birds in China is mainly caused by various human activities.

And climate change is another major threat to birds in the order of finches in China. Climate change leads to higher temperatures, changes in precipitation patterns, etc., which affects the birds' migration, breeding and foraging behaviour, leading to changes in their populations as a result of increased pressure on their survival.

In conclusion, it is of great significance for China's biodiversity conservation to pay attention to the current status of finch birds in China and the threats to their diversity, with special focus on habitat degradation and loss and the impact of climate change on biodiversity.

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PEPTIDE ELICITOR ATPEP INCREASES PLANT RESISTANCE TO OXIDATIVE STRESS

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The effect of the peptide elicitor AtPep on the resistance of agricultural plants to oxidative stress was studied. In different plants this peptide has eliciting effect at concentrations 10-7-10-9 M. It was found that treatment of the aerial part of plants with AtPep leads to an increase in the activity of peroxidase and superoxide dismutase and a decrease in the level of lipid peroxidation products in plants under oxidative stress. Revealed effects cause an increase in the plant resistance to stress.

Keywords: peptide elicitors, AtPep, oxidative stress, plant resistance.

One of the most important problems of modern environmental safety is the introduction of new technologies for protecting plants from diseases, pests and abiotic stress factors. In recent decades, the development of biological methods of protection has become widespread, which are aimed at inducing genetically determined protective mechanisms of plants. Such methods include the treatment of plants with peptide elicitors. These are natural compounds synthesized by plants or microorganisms that are perceived by the plant cell and trigger a cascade of protective reactions that lead to an increase in non-specific resistance of plants to a number of stress effects of biotic and abiotic nature. These compounds do not have a biocidal effect, and, therefore, do not lead to disruption of biological diversity in ecosystems, they do not accumulate in living organisms and do not pollute the environment.

One of the most studied peptide elicitors of plants is AtPep, first isolated from *Arabidopsis thaliana* plants. To date, its analogs have been found in more than 50 plant species from different families. It has been shown that this peptide is synthesized in plants in response to mechanical damage by bacterial, fungal and viral pathogens, as well as when treating plants with stress hormones. AtPep activates PTI-like immunity and increases plant resistance to phytopathogenic microorganisms and insect pests. The aim of this work was to study the effect of the peptide elicitor AtPep on the resistance of a number of agricultural plants to oxidative stress. The experiments were carried out in laboratory conditions. Pre-stress treatment of the aerial part of plants was carried out by spraying with aqueous solutions of the peptide in the concentration range of 10^{-7} – 10^{-12} M. Oxidative stress was created by immersing the root system of plants in a hydroxyl-generating mixture.

It was found that peptide AtPep in the studied concentration range exerts an elicitor effect on arugula, lettuce, wheat, soybean, pea and cowpea plants. Exogenous treatment of the above-ground part of the seedlings of these crops leads to a decrease in the negative effect of stress on the morphometric characteristics of plants, which indicates an increase in their resistance to oxidative stress. It was shown that under the action of the elicitor, signaling systems are induced with the participation of reactive oxygen species (ROS), the content of which significantly increased already 2 hours after treating the plants with the peptide. With an increase in the time of exposure to the peptide, a subsequent decrease in this indicator to the initial level occurred. A decrease in the ROS content is due to the activation of antioxidant enzymes. Experimental data indicate that under the action of the AtPep peptide, an increase in the activity of peroxidase and superoxide dismutase occurred. A direct relationship was established between the dynamics of changes in the ROS level and the content of lipid peroxidation products in the leaves of pea seedlings treated with the peptide, as well as an inverse relationship between the content of lipid peroxidation products and the activity of antioxidant enzymes. Modification of the redox status of cells induced by the peptide elicitor AtPep led to an increase in plant resistance to the subsequent action of oxidative stress. It was shown that under stress conditions, antioxidant enzymes are activated more quickly in the treated plants, and, as a consequence, the rate of lipid peroxidation decreases.

The obtained experimental data allow us to conclude that pre-stress treatment of plants with the AtPep peptide leads to the induction of ROS-dependent signaling pathways and the launch of protective mechanisms that lead to an increase in plant resistance to oxidative stress. The obtained patterns of the elicitor activity of AtPep can serve as a scientific basis for the development of environmentally friendly methods for plant protection.

COMPARATIVE ASSESSMENT OF EFFECTIVENESS OF CHEMICAL AND MECHANICAL CONTROL METHODS FOR CANADIAN GOLDENROD IN ORSHA DISTRICT

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The study compares the effectiveness of chemical and mechanical methods of control for Canada goldenrod in the Orsha district. Chemical treatment is more effective in the short term. Mechanical treatment is more environmentally friendly but less effective. An integrated approach combining both methods is the most optimal.

Keywords: Canadian goldenrod, invasive species, chemical methods, mechanical methods, efficiency.

A comparative assessment of the effectiveness of chemical and mechanical methods of control of Canadian goldenrod in the Orsha district. Canadian goldenrod is an invasive species that is aggressively spreading in Belarus, including the Orsha district. It displaces native plants, negatively impacts biodiversity and degrades soil quality. Fighting goldenrod is an urgent task requiring the use of effective methods. This paper provides a comparative assessment of the effectiveness of chemical and mechanical methods of control of Canadian goldenrod in the Orsha district, based on data on the area of land treated in 2022-2024. According to the inventory of Canadian goldenrod habitats conducted in 2022, the area of goldenrod growth was 104.8025 ha, of which 45.2107 ha were treated chemically and 50.0781 ha mechanically. In 2023, the area increased to 118.7397 hectares, with chemical treatment covering 96.4588 hectares and mechanical treatment covering 22.2802 hectares. The increase in area in 2023 is due to the identification of new outbreaks and an increase in area in places with poor mechanical treatment. In 2024, the area decreased to 115.0209 hectares, chemical treatment was carried out on 96.5006 hectares, and mechanical treatment on 38.7883 hectares. According to the 2024 inventory, the area of growth was 109.9484 hectares. Data analysis shows that chemical treatment is effective.

Chemical treatment is highly effective in the short term, but it has a number of drawbacks: environmental impact, the risk of developing resistance to the herbicides used in goldenrod, and the need for repeated treatments. The use of chemical methods is particularly relevant in inaccessible areas, such as under trees or in bushes, where mechanical treatment is impossible. Moreover, the effectiveness of chemical treatment depends on weather conditions: rain can wash away the preparation, reducing its effectiveness. Mechanical treatment is less effective in the short term, but it has a number of advantages: environmental friendliness, reduced risk of resistance development, and long-term effectiveness with systematic use. Mechanical methods are most effective in open areas where machinery is accessible. The traditional method of mowing is quite effective, but only if the cut stems with flowers and seeds are completely removed, as they can ripen on the ground and germinate the following year. For maximum effectiveness, double mowing is recommended: in May and August. It is important to note that a comprehensive approach that includes both chemical and mechanical methods, combined with biological methods, is the most effective way to combat goldenrod [1].

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MODERN ASSESSMENT OF AUTHENTICITY OF COGNAC PRODUCTION IN THE REPUBLIC OF BELARUS

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This article determines the main directions of research into the authenticity of cognac production and their relevance in order to prevent low-quality products from entering the market of the Republic of Belarus.

Keywords: distillate, cognac spirit, volatile fraction, falsification.

Cognac is a strong alcoholic drink, in the production technology of which oak wood is used. The organoleptic and physicochemical characteristics of cognac are acquired due to a complex of substances from grape distillate, passing into it from oak wood during the aging process. Modern assessment of the authenticity of cognac production in the Republic of Belarus.

Cognac is a strong alcoholic drink, in the production technology of which oak wood is used. The organoleptic and physicochemical characteristics of cognac are acquired due to a complex of substances from grape distillate, passing into it from oak wood during the aging process.

In the Republic of Belarus there are no raw materials for the production of cognacs using the classic production technology, due to which imported cognac spirits, brandy and cognacs in bulk enter the market. All cognacs and brandy in Belarus are produced from imported raw materials, the main producers of which are France, Armenia, Georgia, Moldova, Azerbaijan, Ukraine, Russia and other countries. The import of a large amount of cognac spirits and cognacs in bulk from various production regions has caused the need to control the quality and authenticity of incoming products.

Modern trends in the study of the authenticity of cognac production products include the assessment of the contact of cognac spirit with oak wood, compliance with the region of production, the presence of characteristic and the absence of uncharacteristic components and their quantitative relationship. The study of cognac production products in these areas can be carried out on the basis of a comprehensive assessment using modern methods of analyzing the component composition of the volatile and non-volatile fraction. Quality control of cognacs is mandatory and is one of the links in preventing the entry of poor-quality and counterfeit alcoholic beverages into the market.

Mathematical processing of the results of instrumental measurement methods allows to judge the origin of the product and determine the substances that form in cognacs during the aging process. Detection of uncharacteristic changes in the composition and additional components in the samples under study indicates falsification of the product. Statistical analysis methods require taking into account variable factors, so it is necessary to have a reliable database of samples characterized by individual signs of authenticity: type of product, geographical origin, period of contact with oak wood, category, etc.

Identification of cognacs is difficult due to the complex chemical composition caused by the interactions between the components of wine distillate and oak wood. Over 700 chemical compounds have been identified in cognac, each of which makes its own individual contribution to the composition of the aromatic and flavor properties of the finished drink. Technological features of cognac production lead to differences in the products of different factories, as a result of which there are no reference samples for comparison and determination of aging periods. Improvement of cognac production technology and improvement of quality characteristics based on established criteria of authenticity will help prevent the entry of low-quality and counterfeit products into the market of the Republic of Belarus.

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CHLAMYDOPHILA PSITTACI IN FECAL SAMPLES OF SYNANTHROPIC PIGEONS (*COLUMBA LIVIA URBAN FORM)* IN THE URBAN LANDSCAPES OF THE CITY OF MINSK

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The paper presents the results of studies on the presence of *Chlamydophila psittaci* in the feces of rock pigeons taken from pigeons by the PCR method in the administrative districts of Minsk in the period 2019-2020. An analysis of biomaterials is carried out for the degree of carriage of rock pigeons with the causative agent of chlamydia *Chlamydophila psittaci.* Based on the results of the analysis, it was reliably established that 13 individuals or 14.94% of all pigeons examined were carriers of Chlamydia *Chlamydophila psittaci.*

Keywords: synanthropic rock pigeon, epidemiological situation, avian chlamydia.

Natural infections with *C. psittaci* are widespread in many wild and domestic bird species. Currently, this number includes about 500 bird species from 30 different orders [1]. The disease is zoonotic in nature and can be transmitted to humans by direct contact or by inhalation of infectious aerosol. Pigeons, especially feral pigeons, are also one of the important reservoirs of *C. psittaci* [2].

In Belarus, avian chlamydia has not been studied and there is no data on this disease in the republic.

As shown by the analysis of the obtained results, the load of synanthropic rock pigeons of Minsk with the chlamydia pathogen *Chlamydophila psittaci* is relatively low and amounts to 14.9%. The results of the comparative analysis of the obtained data show approximately the same level of load of the parasite in rock pigeon populations living in urban markets – 12.0% (Komarovsky market) and 14.2% (Zapadny market).

Urbanized landscapes with high industrial loads, as well as five-story residential buildings with household waste stored in open and pigeon-accessible bins, are characterized by the highest level of contamination – 35.7% (Belarus department store).

On the contrary, multi-storey residential buildings are characterized by the lowest charge level – 4.8% (6 Prityts kogo St.). These pigeon populations are fed by the local population with various cereals.

Based on the results of the analysis, it was reliably established that 13 individuals or 14.94% of all pigeons examined were carriers of Chlamydia *Chlamydophila psittaci.*

According to the structure, taking into account the phenotype, among pigeons that are carriers of chlamydia, 9 individuals (69.2%) were black-cheeked, 2 individuals (15.4%) were blue-gray, 1 individual each (7.69%) were brown and black. No carriers of chlamydia were found among piebald birds.

The average bird density at the station was 323.1±28.6 birds/ km^2. Statistical processing of the obtained data taking into account Pearson's χ^2 revealed the presence of significant differences between the locations studied. Thus, the presence of significant differences in the carriage of chlamydia in pigeons in the area of the Belarus department store (Partizansky Avenue) relative to the area of the Euroopt store (6 Prityts kogo Avenue) ($p = 0.028$) was established with the frequency of detected carriage of 35.71% (5 individuals) and 4.76% (1 individual), respectively.

Thus, based on the results of the analysis, we have reliably established that 13 individuals or 14.94% of all examined pigeons in Minsk were carriers of *Chlamydophila psittaci.* Wild pigeons living in urban landscapes are a natural reservoir of *C. psittaci*, which poses a potential risk of zoonotic infections. However, further studies are needed on the impact of contaminated pigeon feces in terms of professional and non-professional risk of developing chlamydia.

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RADIATION DAMAGE AND MODERN METHODOLOGY OF ITS ASSESSMENT

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This paper analyzes the concept of radiation damage. The methodology for calculating radiation damage should evolve with advances in public health and scientific understanding of radiation exposure.

Keywords: radiation damage, risk, cancer.

In [1], damage was presented as a rough estimate of the probability of fatal cancers and serious hereditary abnormalities. The dependence of cancer risk on age and sex and the contribution of the nonfatal component were taken into account in [2].

The significant increase in the estimate of lifetime risk of fatal cancer was due to longer follow-up of patients who survived the nuclear accident and the adoption of the relative risk model. The parameters involved in the damage calculation: the DDREF coefficient, the estimated dose, and the lethality fraction have a significant impact. The choice of DDREF value has a direct impact, leading to a 2-fold increase in radiation risk for solid cancers if it is set to 1 instead of the default value of 2. The assumed dose for calculating lifetime risk is 0.1 Gy, but changing it by 1 Gy results in more than 2-fold greater radiation damage to bone marrow.

Among the attributes that define a population, sex and age at the time of exposure have a significant impact on radiation damage rates. Averaging by sex, the risk of developing ovarian and breast cancer is halved. There are significant differences in the lifetime risk of developing cancers of other organs, such as lung, liver, colon, and thyroid, between men and women. Radiation damage for the population exposed at a young age (0-14 years) is higher than for the general population (exposed at the age of 0-89 years), more than 2 times for some organs and tissues (stomach, breast, thyroid and other solid cancers) [3].

Radiation damage is quantified based on a linear-less-threshold dose-effect relationship for resistant cancers and a linear-quadratic dose-response relationship for leukemia. A dose-effect and dose-rate coefficient is applied to resistant cancers to adjust the risk estimated from epidemiologic data on exposure to high doses and dose rates. There are 2 parts used to calculate radiation damage, which in turn consist of sequential steps. The first part is the nominal risk calculation - an estimate of the lifetime risk associated with radiation exposure, including the risk of cancer and hereditary diseases. Cancer risk estimates are averaged by sex, age at exposure, and geographic region (i.e., population) for each cancer focus. The second stage of the radiation damage calculation is the severity adjustment, which accounts for mortality, quality of life. The first part depends on the radiation dose. The second part is practically independent of radiation exposure, but reflects the severity of cancer of the corresponding organs or tissues. Radiation damage should vary according to changes in cancer incidence and survival rates, as well as advances in scientific understanding of the health effects of ionizing radiation [1, 3].

Thus, updating and improving reference population data and cancer severity parameters are necessary. In particular, the reference cancer incidence and mortality rates are based on data from the 1990s, and these rates have changed significantly in recent decades for some stages of cancer. The mortality rates currently used in damage calculations are based on data from the 1980s in the United States. Subsequent advances in diagnostic and treatment methods may lead to significant reductions in mortality.

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TEST METHODS FOR NUCLEAR POWER PLANT STRUCTURAL MATERIALS

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The review of the main types of tests of NPP structural materials is carried out. The method of bursting tests and the device of bursting machine are studied. Tearing tests on the example of carbon nanotube prototype are carried out.

Keywords: NPP, structural materials, rupture tests

Extreme operating conditions of nuclear power plants (NPP) require the use of materials capable of withstanding high temperatures, pressure, radiation and corrosion for decades. Even small errors in their selection can lead to catastrophic consequences, as demonstrated by the Chernobyl and Fukushima accidents. The reliability of materials is tested using a variety of methods, including tensile tests, impact tests, corrosion resistance tests and radiation resistance tests. These tests help predict the behaviour of materials during all phases of reactor operation, from start-up to decommissioning. Tensile testing is one of the most fundamental and common methods of mechanical inspection [1].

The aim of the work is to study the technique of tensile testing on the example of a prototype carbon nanotube (CNT).

A tensile testing machine is a laboratory apparatus designed to perform tensile or tear tests on various materials and parts. The main parts of the machine are the loading device and measuring instruments. In a tensile test, a tensile force is applied to the material and the stress (strain) response of the specimen is measured. Thus, this test determines how strong the material is and how much it can elongate.

The mechanical properties of materials with different wall thicknesses were investigated by testing prototype CNTs on a tensile testing machine (Figure 1). The 3 mm thick prototype with a hollow hexagonal structure withstood the load longer than the 4 mm thick solid tube, which in turn showed the highest mechanical stress, becoming the strongest among the tested samples.

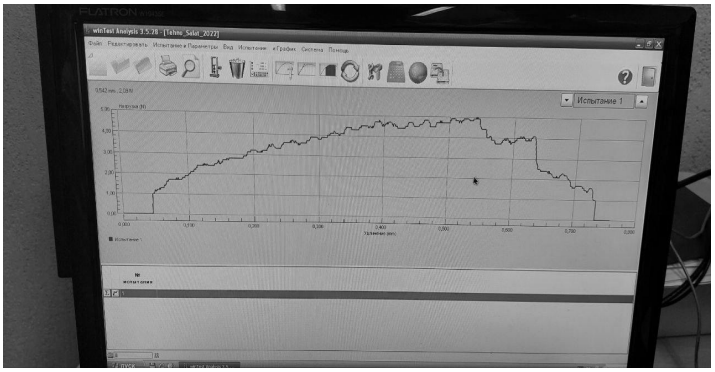

Fig.1 - Processing of tensile test data.

Analyses of the tests performed show the following:

1.The structures consisting of hollow hexagons are able to withstand the longest period of time under load before the deformation process occurs.

2.The specimen, which is a monolithic tube of hexagonal structure, showed the highest index of mechanical stress in the tensile machine test and is the strongest of the tested specimens.

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IMPLEMENTATION OF ECONOMIC DATA IN GEOGRAPHIC INFORMATION SYSTEMS

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The work is devoted to the relevance of the introduction of economic data into geographic information systems (GIS). The introduction of economic data into GIS is considered as a way to improve the efficiency of territorial management. Particular attention is paid to the integration of economic indicators, which will open up new opportunities for the comprehensive management of the territories of the Republic of Belarus with the provision of specific solutions to improve the environmental situation and increase the efficiency of national business processes.

Keywords: GIS, geographic information systems, territorial management, environment, economic data

GIS are systems that combine methods for collecting, storing, analyzing, and graphical visualization of spatial data and related information. A distinctive feature of GIS from other information systems is their ability to work with four types of data: spatial, attribute, symbol libraries and metadata [1]. GIS allow to provide the efficient use of territories, taking into account their various features. Therefore, GIS are widely used in various fields, such as agriculture, ecology, transport, urban development, and many others. It has been scientifically proven [2] that most of all information has a

territorial reference. The integration capabilities of GIS are limitless, since these systems allow for keeping records of the population size and structure, while simultaneously using this information to plan the transport network and optimally locate socially significant facilities [3]. Therefore, one of the interesting areas of GIS application is the integration of economic data into them. This will allow to make a comprehensive spatial analysis that takes into account both geographic and economic factors. The introduction of economic indicators into GIS contributes to a more accurate assessment of the quality and value of the territory, optimization of land resource use, effective planning and management decision-making.

The most widespread GIS software products over the last decade are ArcGIS, QGIS, gvSIG and others [4]. They provide wide opportunities for working with spatial data, including analysis, visualization and management functions. Belarusian online service 2GIS deserves special attention, as it provides detailed reference information about organizations, companies and other economic entities in the territory of the Republic of Belarus. However, existing solutions do not reflect economic data of the Republic of Belarus with reference to its territory. Therefore, it is important to develop and improve GIS integrating economic data into them, train relevant specialists and raise public awareness of the opportunities that these systems can provide. The introduction of GIS into the economy has enormous and still unrealized potential.

For integration into GIS, it is proposed to use data on the economic sector from the Statistical Bulletin of the National Bank of the Republic of Belarus. This bulletin provides statistical data generated on the basis of reports submitted to the National Bank by entities of the financial market of the Republic of Belarus. The statistical bulletin is detailed with information on average interest rates on loans and deposits, interbank market rates by currency based on reporting form 1720 "Information on the credit and deposit market".

Integration of economic data into GIS will allow to solve various problems related to planning, forecasting and management decision-making based on spatial analysis. For example, GIS can be used to assess the investment attractiveness of territories, determine the optimal placement of production facilities, analyze market trends and the competitive environment, and conduct other economic research based on foreign experience [5]. Thus, the introduction of economic data into GIS in the Republic of Belarus will open up new opportunities for the integrated management of its territories, providing specific solutions for improving the environmental situation and increasing the efficiency of national business processes.

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DETERMINATION OF DAMAGE CLASSES AND ELEMENTARY COMPOSITION OF NEEDLES OF THE COMMON SPRUCE OF THE NATURE MONUMENT OF THE OAK GROW "SHCHOMYSLITSKAYA" OF THE CITY OF MINSK

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In March-April 2024, the needles of the common spruce of the nature monument of oak grove "Shchomyslitskaya" in Minsk were examined. The prevalence of II and III classes of needle damage was established. Thus, the air in the oak grove "Shchomyslitskaya" is clean. An increase in the concentrations of Fe and Zn in the needles of spruce of different ages was detected. The concentrations of Zn, Hg, Pb were within the permissible norm, Cu - below the established required amounts of the element in plants.

Keywords: needles, drying class, damage class, Norway spruce, X-ray fluorescence analysis.

Shchomyslitskaya oak grove is located within 1 km from the ring road of the largest city in the Republic of Belarus, Minsk, and has the status of a specially protected natural area and is a botanical nature monument of national significance. Due to the importance of this territory, it is important to promptly identify violations in the condition of its forest stand, find out the causes of these violations and take measures to restore it. Conifers are good indicators of air pollution. Therefore, the aim of our research was to identify the impact of atmospheric pollution on the needles of the common spruce in the Shchomyslitskaya oak grove. Research objectives: 1) to determine the classes of damage to the needles of the common spruce; 2) to assess the elemental composition of the needles of the common spruce.

To determine the lifespan, damage classes and drying of the needles of Norway spruce, young spruce trees 1-1.5 m tall, spaced 20-25 m apart from each other on 4 test sites were selected. On each site, 5 trees were examined. During the work, the needles of the second from the top section of the central shoot were carefully examined and the damage and drying class of the needles was determined according to the scale. The needles were examined using a magnifying glass, chlorosis, necrosis of the tips of the needles and the entire surface, their percentage and nature were identified. The lifespan of the needles was assessed by examining the shoots with needles in whorls. [1]

For X-ray fluorescence analysis, spruce needle samples were dried at room temperature, then thoroughly ground with scissors and in a laboratory mill, and sifted through a laboratory sieve. The sample was weighed on a scale and pressed into a tablet using a hydraulic press from the spectrometer kit. [2]

Analysis of the selected samples of needles [1] showed that in all four test sites, damage classes II and III predominate. This indicates that the air in the Shchomyslitskaya oak grove is clean, within normal limits.

X-ray fluorescence analysis the analysis of the data showed that the concentration of Fe at site 1 increases over the years, at sites 2 and 4 the maximum concentration (30±3.3 mg/kg and 128.5±4.2 mg/kg) occurs in the third year of life of the needles of Norway spruce. The concentration of Cu in the needles of Norway spruce at sites 1, 3 and 4 is unevenly distributed, at site 2 a decrease in the concentration of Cu by 1.4 mg/kg is observed from the first to the third year of life of the needles. The concentration of Cu at all test sites is less than the established required amount of the element. At sites 2, 3 and 4 an increase in the concentration of Zn from the first to the third year of life of the needles is observed, at site 1 the concentration differs significantly ($p=0.05$). The concentration of Zn at all test sites is within the permissible norm. The concentration of Sr at sites 1, 3 and 4 differs significantly from each other, at site 2 its increase is observed ($p=0.05$). The concentration of Hg and Pb in spruce needles at the test sites does not exceed the norm.

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VETERINARY AND SANITARY EXAMINATION OF THE CARCASES OF HUNTING WATERBIRDS FOR THE DETECTION OF SCROCCOSIS

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Hunting waterfowl is quite a popular activity all over the world. It is not only about the extraction of poultry and the use of game as a valuable food product, but also (especially in recent years) this type of hunting is an ideal way to communicate with nature and an active process of rehabilitation of the body of people who are fond of this activity.

If the second aspect, in terms of the positive effect on the body of people involved in the process of hunting waterfowl, is beyond doubt, then the first, where we are talking about the use of game as food, has some risks. These risks are created by a number of infectious and invasive diseases and their pathogens.

One of the most common diseases among waterfowl is sarcocystosis, since its pathogen can cause pathological processes in the human body. This may occur if veterinary and sanitary rules are not followed when cutting and using batted game for human food.

Keywords: sarcocystosis of wild and farm animals, parasitocenoses, hunting waterfowl, parasitological studies, veterinary and sanitary examination.

It is possible to establish the presence and degree of damage to domestic and wild waterfowl only during the butchering process. For safety reasons, when using poultry meat, including batted game, all carcasses, without exception, must be subjected to veterinary and sanitary control (see photo).

These figures show the veterinary and sanitary examination of the pectoral muscles of the ducks sviyaz (Mareca penelope). As can be seen in the photos presented, the game is safe for sarcocystosis.

Veterinary and sanitary examination of duck carcasses sviyaz (*Mareca penelope*).
(Yu.G. Lyakh, November 4, 2024, Molodechno district, Minsk region)

The examination is carried out by a veterinary specialist who has certain qualifications in this matter. Each disease affecting wild animals and birds has its own characteristic features (pathological signs), if it concerns diseases of bacterial or viral etiology. In diseases whose infectious origin is multicellular parasitic organisms, all organs and tissues are affected, depending on the specificity of the parasite [1, 2].

With a slight degree of lesion, sarcocysts are localized in the muscle tissue of wild waterfowl. As a rule, these are the pectoral muscles. They are the most mobile and are abundantly supplied with blood. With a strong degree of sarcocystic invasion, the pathogen can be found in other muscle groups.

The main vectors of parasites are wild carnivores. It is not uncommon for sarcocystosis to be spread by stray domestic carnivores – cats and dogs.

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OPTIMIZING EDUCATIONAL MANAGEMENT SYSTEMS IN THE CONTEXT OF MODERNIZED EDUCATIONAL GOVERNANCE: THEORETICAL FRAMEWORK AND EMPIRICAL ANALYSIS OF A MULTI-LEVEL GOVERNANCE MODEL

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Abstract. In the context of global educational governance modernization, optimizing educational management systems has become increasingly essential. The multi-level governance model has emerged as a pivotal framework, providing precise and scientific guidance for policy development, resource allocation, and oversight mechanisms within complex educational systems. The core of this model lies in the collaborative management across multiple levels, including national, provincial, municipal, and district levels, to optimize resource allocation, ensure effective policy implementation, and promote educational equity.

Goal. Emphasize the need to optimize education management systems in the context of global education governance modernization.

Theoretical Framework of Multi-Level Governance in Education. From a theoretical perspective, the multi-level governance model is rooted in principles of systematization and coordination. It integrates various layers and departments within the education system into a cohesive framework (Ansell & Torfing, 2021). The model emphasizes a dynamic balance between centralization and decentralization, allowing regional educational bodies the autonomy to manage resources locally while maintaining centralized oversight for policy consistency. Additionally, the model advocates for robust information flow and feedback mechanisms that enable adaptive policy adjustments through upper-level guidance and lower-level feedback (Olssen, 2018). This theoretical foundation supports educational managers in rationalizing resource allocation and achieving educational goals more effectively.

Empirical Evidence and Advantages in Practice. Empirical research underscores the advantages of the multi-level governance model in educational management practices. Studies indicate that under this framework, efficiency and equity in resource allocation have significantly improved. For instance, in resource distribution, regional educational departments can allocate resources based on local needs, reducing wastage and optimizing utilization. Additionally, the model's tiered approach to policy implementation enhances coordination across administrative levels, allowing policies to be better adapted to regional contexts (Jacobsen & Andersen, 2020). In certain regions, implementing a multi-level governance model has addressed resource imbalances and improved educational management efficiency and accountability (Schulze-Cleven & Olson, 2017).

Conclusion. In summary, the theoretical and empirical insights into the multi-level governance model indicate that this approach can effectively optimize educational management systems, offering a practical pathway toward modernized educational governance. As educational demands become increasingly diverse and complex, the multi-level

governance model is positioned to play a critical role in advancing educational equity, improving quality, and achieving modernization in educational governance.

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EDUCATION BIOMEDICAL SCIENCES APPROACH TO EDUCATIONAL MANAGEMENT THEORY AND PRACTICE: EXPLORATION BASED ON LEARNING PSYCHOLOGY AND NEUROEDUCATION

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Abstract. The rapid advancement of biomedical sciences in modern education management has introduced innovative perspectives and methodologies for the field. Neuroeducation, an interdisciplinary domain that merges learning psychology with neuroscience, has significantly contributed to understanding brain mechanisms and behavioral responses in learning. This has brought forward valuable insights for theoretical innovations and practical applications in educational management.

Goal. Understanding Brain Responses in Various Learning Conditions

One of the primary goals of neuroeducation is to explore how the brain responds under diverse learning conditions. Traditional educational management approaches have often viewed students as homogeneous groups, largely overlooking physiological and psychological diversity (Howard-Jones, 2018). Neuroeducation, however, reveals the wide spectrum of individual cognitive and emotional variations. For instance, students with different learning styles show unique cortical activation patterns, and factors like emotion and motivation directly influence learning outcomes (Sousa, 2019). Brain imaging technologies and neural network modeling have enabled educators to quantify these influences, facilitating personalized interventions that hold significant implications for promoting educational equity, particularly for students who face challenges in traditional instructional settings.

The Importance of Educational Equity in Inclusive Learning.

Educational equity is central to modern educational practices. Neuroeducation shows how personalized brain activation can vary based on learning style, emphasizing the critical role of emotions and motivation in learning outcomes. Through brain imaging technologies, educators can assess and cater to these diverse needs with tailored interventions (Ansari et al., 2020). Such approaches benefit students who struggle with conventional methods, allowing for a more inclusive and equitable educational environment.

Conclusion. Neuroeducation and learning psychology provide educational management with a novel, student-centered approach, enabling precision and personalization in education. Continued research in this field promises to build an education system tailored to individual student needs, driving innovation and transformation in educational management practices.

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IMPLEMENTATION OF FOURTH GENERATION REACTORS: EXPERIENCE AND PROSPECTS ON THE EXAMPLE OF THE CHINESE HIGH-TEMPERATURE GAS-COOLED REACTOR SHIDAOWAN

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Generation IV reactors are innovative nuclear energy technologies designed to improve the safety, efficiency and sustainability of nuclear energy. In this paper, we will focus on the first commissioned generation IV HTGR nuclear reactor, Shidaowan.[1]

Keywords: fourth generation nuclear reactors, NPP, HTGR, carbon neutrality.

Generation IV reactors are promising developments in nuclear energy that aim to improve safety, sustainability, and resource efficiency. One of the key projects in this area is the Shidaowan HTGR reactor built in China, which is the first commercially operated high-temperature gas-cooled reactor (HTGR). This project has become an important milestone in the development of nuclear energy both in China and internationally [1-2].

Description of the Shidaowan reactor

The reactor belongs to the class of high-temperature gas-cooled reactors (HTGR), operating on solid graphite fuel.

Technical characteristics: power 200 MW, coolant outlet temperature up to 750°C, which makes it possible to use the reactor in various industrial processes, including hydrogen production.

The use of safe innovative technologies such as passive heat dissipation system and ball fuel, which significantly reduces the risk of serious accidents.

Advantages of fourth generation reactors[3]:

- Enhanced safety: passive safety systems and resistance to serious accidents.
- Efficient use of fuel: the possibility of fuel reprocessing and the use of plutonium and thorium.
- Environmental sustainability: reducing the volume of long-lived radioactive waste.
- Cost-effectiveness: long-term operation and reduced construction and maintenance costs thanks to the modular design.

Challenges and Prospects:

- Technological challenges related to material durability and improvement of fuel processing processes
- Financial and infrastructural barriers that could hinder the widespread deployment of these reactors.
- International perspectives and opportunities for dissemination of HTGR technology to other countries striving for carbon neutrality.

The Shidaowan fourth-generation reactor project demonstrates significant potential for the development of sustainable and safe nuclear energy. The introduction and commercial operation of high-temperature gas-cooled reactors opens up new horizons in the application of nuclear technology for both energy and industrial needs. China's experience

in this area can become the basis for global cooperation and the transition to a new era of nuclear energy that meets the challenges of the 21st century.

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EFFECT OF SEWAGE SLUDGE ON THE GROWTH OF FAST-GROWING WILLOW SPECIES

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One of the products of human anthropogenic activity is sewage sludge, the accumulation of which complicates production activities at wastewater treatment plants, causing the need to expand the network of sludge ponds for the storage and disposal of sewage sludge, which leads to the alienation of scarce land resources.

Keywords: mineral fertilizers, sludge maps, sewage sludge, kek.

On the basis of the agro-town of Volma, with the participation of two species of fast-growing willow (White willow and control species Inger) and their subsequent fertilization with sewage sludge, we carried out a field experiment. A plot of 500 m2 was divided into plots of 3 x 3.5 m^2. The experiment was repeated three times. In each repetition there were 5 plots. The appropriate components were added to each plot. Also, 5 crops were selected from each plot, and from June to September, biomass growth was observed, as indicated in Table.

Table

Dynamics of willow biomass growth from June to September

Fertilizers applied	Month	
	June	September
Control (without mineral fertilizers and kek)	26,1 cm	223,9 cm
Mineral fertilizers (nitrogen-phosphorus-potassium) (0.5 kg)	26,7 cm	233,7 cm
Kek (30 kg)	29,4 cm	227,1 cm
Kek (15 kg) + sand (15 kg)	27,9 cm	252,6 cm
Kek (15 kg)	30,5 cm	245,2 cm

Analyzing the data in the table, we can draw the following conclusions:

1. From June to September, a significant increase is observed in the plots where mineral fertilizer (nitrogen-phosphorus-potassium) was added. Since the readily available nutrients contained in mineral fertilizers are quickly absorbed by plants, eliminating the deficiency and promoting growth.

2 Also, from June to September, an increase was noted in plots with kek weighing 15 kg and 30 kg. The composition of wastewater sludge includes macro- and microelements such as magnesium, copper, calcium.

Magnesium is an important element for the implementation of such basic functions in plants as photosynthesis (magnesium is the central element in the chlorophyll molecule), phosphorus transport, sugar synthesis, starch redistribution, and fat formation. Magnesium is also part of many enzymes and is their activator, controls the consumption of nutrients, and improves the absorption of iron [1].

The presence of magnesium has a positive effect on the vital activity of nodule bacteria and, consequently, on nitrogen binding.

Calcium also promotes increased photosynthesis and metabolism, regulates the acid-base balance of cell sap, affects the construction of cell membranes, the movement of carbohydrates, the transformation of nitrogenous substances, in particular, accelerates the breakdown of seed storage proteins during germination.

Copper plays an important role in protein and carbohydrate metabolism, in regulating plant respiration, participates in the synthesis of chlorophyll, promotes an increase in the content of proteins, fats, carbohydrates and vitamins in fruits and root crops, regulates the production of growth enzymes, and takes an active part in the process of fixing molecular nitrogen [2].

3. A mixture of kek and sand contributed to growth due to the macro- and microelements contained in the cake, which were discussed above. Adding sand contributed to the loosening of the soil and, as a result, there are the successful rooting of seedlings and the access of plants to nutrients.

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USE OF ALGAE CELLS FOR BIOTESTING THE CHARACTER OF S-TRIAZINES ACTION

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The nature of the time dependence of cyclosis rate shifts induced by sim-triazine herbicides has been revealed. He change in the rate of cyclosis in Nitella flexilis cells is difficult to depend on the concentration and chemical nature of the s-triazines. The effect of pretreatment of plant cells with low concentrations of herbicide on the nature of the subsequent action of high concentrations has been established. A certain intracellular or membrane concentration of the s-triazine herbicide is required to manifest its effect.

Keywords: biotesting, test object, test reaction, *Nitella flexilis* cyclosis, atrazine, simazine, promethrin.

S-triazines are used as pesticides, bleaches, dyes, disinfectants and explosives [1]. S-triazine herbicides are persistent (they remain active in the soil for 2-3 years after application), toxic, and also have cumulative properties and are able to accumulate along the trophic chain. The cells of the char algae *Nitella flexilis* are successfully used as a test object for biotesting the state of the environment and the presence of toxicants. Different parameters can be selected as a test reaction for this, for example, a change in the bioelectric reaction of the plasmalemma (the membrane potential and the membrane resistance) or the speed of movement of the cytoplasm. We used the cyclosis rate as a test reaction to test the nature of the action of sim-triazine herbicides. Experimental solutions of herbicides of concentrations of 5, 10, 20 mg/l were prepared by adding to APV (artificial pond water) an appropriate amount of 1% alcoholic solution of simazine (80% pp), atrazine (50% pp), promethrin (50% pp). The experiments were carried out according to the scheme: APV → APV + herbicide, n·mg/l → APV → APV + herbicide 2n·mg/l → APV → APV + herbicide 4n·mg/l → APV, where n corresponds to the minimum herbicide concentration used, which was 5 mg/l ($2{,}1 \cdot 10^{-5}$ M promethrin; $2{,}3 \cdot 10^{-5}$ M of atrazine and $2.5 \cdot 10^{-5}$ M of simazine). The exposure in the herbicide solution was 20 minutes. The cyclosis rate was

determined visually by measuring the time of particle movement between two selected divisions on an ocular micrometer using a stopwatch under a microscope.

Based on the data obtained, it can be concluded that the action of chlorine-containing (simazine, atrazine) sim-triazines differs from the action of thiomethyl-containing (promethrin). Thus, for simazine and atrazine, in contrast to promethrin, it was found that during the sequential change of a solution with a lower concentration (5 mg/l) to a solution with a higher concentration (10 mg/l), the influence of pretreatment of plant cell structures with low concentrations of herbicide on the nature of the subsequent action of high concentrations cannot be excluded. This indicates the ability of the plant organism to adapt to the presence of such a stress factor in the environment as symmetrical triazines. It is noteworthy that the subsequent increase in the effective concentration of sim-triazine by 2 times (20 mg/ l) removes the intended effect of pretreatment. Moreover, the inhibition caused by this concentration is approximately 2 times greater than that induced by sim-triazine at a concentration of 10 mg/l. This type of exposure to sim-triazine herbicides probably indicates the need for a certain intracellular concentration of this compound to manifest an inhibitory effect. This, in turn, taking into account the exposure time (no more than 20 minutes), is an indicator of the ability of sim-triazines to quickly penetrate into plant cells and accumulate in them. On the other hand, sim-triazine herbicides have a sufficiently pronounced membranotropic effect, which increases with increasing concentration and can change the speed of cytoplasm movement indirectly through shifts in the membrane potential. Based on this, the results obtained may be the result of the increasing membranotropic effect of this xenobiotic with an increase in the external concentration.

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CONTENT OF RADON AND ITS DAUGHTERS IN THE AIR OF THE PREMISES OF BUILDING №3 ISEI BSU

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One of the most dangerous sources of natural radiation is radon. It is emitted from bedrock and mixes with the air as it passes through the ground. Outdoors, radon poses no danger to human health. However, indoor radon is truly dangerous, and many studies confirm that even low concentrations found in homes and workplaces pose a health risk.

Keywords: radon, daughter decay products, volumetric activity, EEVA.

There are different ways of radon entering the human body, the main one is inhalation. The most dangerous are the decay products of radon, not the gas itself, which are deposited on air molecules and get with inhaled air into the human body. Exposure of the human body to radon poses certain health risks, namely:

- Increased risk of developing lung cancer. WHO estimates that radon causes 3% to 14% of all lung cancer cases.
- Increased risk of other lung diseases.
- Increased harmful effects in smokers - their risk of developing lung cancer is 25 times higher compared to non-smokers.

One of the main ways to minimize the risks of exposure to radon and its daughter decay products is monitoring and control of this radionuclide in premises. To effectively control the content of radon and its daughter decay products, it is necessary to use an integrated approach, including measurement of the volumetric activity and equivalent equilibrium volumetric activity. Ionization chambers, scintillation and semiconductor, solid track and thermoluminescent detectors, as well as containers with activated carbon are used to determine the content of radon isotopes and their daughter decay products in air. Specific methods and techniques have been developed for each detector.

Building 3 at 20 Dolgobrodskaya of the ISEI BSU was chosen as the object of research, since students spend a significant amount of time in classes. The equipment used was “Alpharad Plus”. During the work the equivalent

equilibrium volumetric activity (EEVA) of radon and thoron was measured on all floors of the building and in various service rooms.

Based on the results of the equivalent equilibrium volumetric activity measurements, the maximum annual average EEVA value was obtained in the basement of the building, equal to 144.2 Bq/m^3, and the minimum annual average EEVA value on the fifth floor in the corridor, equal to 10 Bq/m^3. The EEVA values were then converted to volumetric activity, since the current regulations use this parameter for control. The maximum value according to the calculations was obtained in the basement in room 014, equal to 190 Bq/m^3, and the minimum value on the third floor after ventilation, equal to 6 Bq/m^3. Comparing the calculated values of radon volumetric activity and the established norm of 300 Bq/m^3, it can be seen that there are no exceedances.

Despite the results obtained, it is important to note the main anti-radon measures, which include selection of optimal modes of ventilation and cleaning of facilities and premises, organization and reconstruction of forced ventilation with mandatory air exchange of basement premises, sealing the floor slabs of the first floor, development and application of effective systems for monitoring the radon level, informing employees about the risks and safety rules when working in rooms with high radon levels, as well as radon intake is significantly suppressed.

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^{90}SR ACCUMULATION BY VEGETATION OF THE IPUT RIVER FLOODPLAIN ON SODDY-GLEYIC SANDY AND SODDY-GLEY SANDY SOILS

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The accumulation coefficients (C_A) of ^{90}Sr by the above-ground part of the Iput River floodplain vegetation were determined. They are the most important parameters allowing to estimate the transition of ^{90}Sr in the soil-plant system. Thus, it was established that the C_A of ^{90}Sr by floodplain vegetation varied from 0.8 to 15.4, depending on the density of soil contamination, the type of plant associations, the structural element of the floodplain, the type of soils and their agrochemical properties.

Keywords: accumulation coefficient, ^{90}Sr, sod-gley soil, sod-gleyic soil

Among the natural destabilizing factors that significantly affect the quality of plant products of floodplain meadows contaminated with radionuclides, an important role is played by abnormal changes in climatic conditions [1]. The absorption of ^{90}Sr by plants, like any nutrient, depends on such factors as the chemical properties of the radionuclide, agrochemical characteristics of the soil, biological characteristics of plants, and natural and climatic conditions. In the remote post-Chernobyl period, the intake of the ^{90}Sr radionuclide by plants of cereal, forb, sedge, forb-cereal, and cereal-sedge plant associations on sod-gleyic and sod-gley sandy soils, as the most typical for the terrace, central, and riverbed floodplain of the Iput River, was studied. The soil and plant samples (10 pairs of conjugate soil and plant samples) for research were collected in the floodplain of the Iput River, Dobrush District, Gomel Region, by employees of the Institute of Radiobiology of the National Academy of Sciences of Belarus during summer field work in 2023.

The content of ^{90}Sr in soil and plant samples was estimated by radiochemical analysis with identification of the β-activity of the daughter isotope ^{90}Y on an UMF-2000 alpha-beta radiometer. The chemical yield of strontium in the samples was determined by flame atomic absorption spectrophotometry. It was found that the specific activities of soils

for ^{90}Sr were in the range of 4 - 87 Bq/kg. The specific activity of ^{90}Sr in the aboveground phytomass of floodplain plants varied in the range from 4 Bq/kg to 812 Bq/kg and, in general, did not exceed the permissible level of 260 Bq/kg.

To assess the entry of ^{90}Sr from soil to plants, an indicator such as the accumulation coefficient (C_A) was used. The accumulation coefficient is the ratio of the radionuclide content in plant mass (Bq/kg) to the radionuclide content in the soil (Bq/kg). The studies revealed significant differences in ^{90}Sr accumulation by plants of different plant associations. It was found that the C_A ^{90}Sr by floodplain vegetation varied from 0.8 to 15.4, depending on the type and species composition of the vegetation cover, the density of soil contamination, the type of soils, their agrochemical properties and different positions of soils in the landscape (structural elements of the floodplain). The minimum ^{90}Sr accumulation coefficients (0.8-2.15) are typical for plants of cereal and forb-cereal associations: fine bentgrass, awnless brome and creeping couch grass on soils with the highest content of exchangeable Ca (268 mg/kg - 418 mg/kg) regardless of the soil type. It has been noted that for sod-gleyic sandy soils with different levels of ^{90}Sr contamination and with different properties, the transfer of ^{90}Sr into the same plant species decreases by 2.3-7.7 times with an increase in the content of organic matter in the soil, exchangeable forms of calcium and an increase in pH.

The updating the data on the coefficients accumulation of ^{90}Sr by plants forms the basis for assessing the transfer of ^{90}Sr into the phytomass of plants in floodplain ecosystems due to changes in hydrological and climatic conditions in the late period of the Chernobyl accident on radioactively contaminated floodplain meadows. The obtained data can be used in developing theoretical foundations for the rational use of radioactively contaminated floodplain meadows for the effective and sustainable development of both livestock farming and the entire agro-industrial complex as a whole.

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EFFECT OF PROLONGED IRRADIATION ON ERYTHROCYTES OF EXPERIMENTAL ANIMALS

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Radiation exposure to the body is one of the risk factors for people who, due to professional duties, living conditions or medical reasons, are forced to contact radiation sources for a certain time. Blood is the most sensitive to the effects of radiation, and changes in the composition and condition of its cells can cause disruption of the functioning of a number of organs and systems. Despite the fact that red blood cells are highly specialized, nuclear-free shaped blood elements, they are recognized as the most convenient object for studying radiation effects because they allow analyzing both their quantitative changes, as well as, due to the relatively easy production of erythrocyte shadows, and the structural and functional characteristics of plasma membranes. The successes achieved in recent years in the field of membranology make it possible to consider the erythrocyte membrane not only as a structural component of the cell, but also as a coordinator of the cell's work to perform its main function – providing oxygen to cells of various tissues.

Keywords: Prolonged irradiation, erythrocyte membrane, hemoglobin, erythrocytes.

Sexually mature mongrel white rats aged 6-10 months were used in the experiments. The animals were irradiated in a prolonged mode at the GAMMARID-192/120 installation from a cesium source with a dose rate of 2.8 x 10.7 G/s to total absorbed doses of 0.25, 0.5 and 1 Gy. The objectives of the study included the study of the effect of prolonged irradiation of animals on the number of erythrocytes, the viscosity characteristics of the total lipid phase and annular lipids (lipids of the protein layer) of plasma membranes, conformational rearrangements of membrane proteins. The content of hemoglobin and the features of conformational rearrangements of its molecules were analyzed.

Prolonged irradiation at a dose of 1 Gy led to a decrease in the number of red blood cells in all periods of the post-radiation period (3-30 days). The hematocrit decreased only 3 days after irradiation. Against the background of a decrease in the number of red blood cells, an increase in the average volume of these cells and the average hemoglobin content in them was observed, which ensured the preservation of normal hemoglobin levels in the blood after irradiation. However, the conformation of the hemoglobin molecules themselves changed after prolonged irradiation. In the control group of animals, two binding centers of 1,8-ANS with a hemoglobin molecule were detected, and in irradiated animals, one. A decrease in the affinity of hemoglobin to 1,8-ANS, as well as a decrease in Imax values, suggested that the reason for such a restructuring is a decrease in the degree of hydrophobicity of the probe environment in the corresponding binding center. Such rearrangements of the hemoglobin conformation indicate an increase in the ability of molecules to release oxygen to tissues. In the post-radiation period, there was no increase in the amount of methemoglobin in erythrocytes. In plasma membranes, prolonged gamma radiation at a dose of 0.25 Gy led to an increase in lipid polarity on the 10th day of the irradiation period, a significant decrease in the micro viscosity (increase in fluidity) of the total lipid bilayer of membranes, but did not affect the areas of annular lipids. After irradiation at a dose of 0.5 Gy, there were no significant changes in the parameters characterizing the physical state of the lipid bilayer and annular lipids of erythrocyte membranes. It is possible that the rate of radiation recovery of the structural and functional properties of erythrocyte membranes could be higher after an absorbed dose of 0.5 Gy than after 0.25 Gy. It is known that the degree of polarity, as a rule, increases due to the melting of lipids. Our studies revealed that an increase in the fluidity of the lipid bilayer of membranes was indeed accompanied by an increase in the polarity of the total lipid bilayer. The detection after gamma irradiation at a dose of 0.25 Gy of an increase in the polarity in the probe environment in a non-protein lipid, the viscosity characteristics of which have not changed, may probably be due to the existence of lipid domains heterogeneous in viscosity in membranes.

Thus, it is important to note that in order to prevent hypoxic conditions, which could lead to a post-radiation decrease in the number of red blood cells in the blood, adaptive mechanisms are activated in the body after the action of radiation, leading to an increase in the volume of these cells, the amount of hemoglobin in them and the ability of these molecules to give oxygen to rat tissues.

ANALYSIS OF SENSITIVITY TO BROAD-SPECTRUM ANTIBIOTICS OF AUXOTROPHIC FORMS OF *BACILLUS* BACTERIA UNDER PROLONGED EXPOSURE TO IONIZING RADIATION

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This paper presents the results of the study of sensitivity of auxotrophic forms of bacteria of the genus *Bacillus* (*Bacillus cereus*, *Bacillus subtilis*, *Bacillus thuringiensis* and *Bacillus mycoides*), which were under prolonged exposure to ionizing radiation, to broad-spectrum antibiotic drugs. It was revealed that auxotrophic forms of bacteria of the genus *Bacillus* exhibit sensitivity of different degrees of severity.

Keywords: Bacillus bacteria, ionizing radiation, antibiotic drugs, disk-diffusion method, auxotrophic forms

Radiation situation on the territory of the Republic of Belarus has been developing for a dozen years as a consequence of global contamination of the natural environment with radionuclides deposited as a result of the Chernobyl NPP accident. Due to the fact that it is the biological component of ecosystems that is most exposed to the radiation factor, the expediency of biological monitoring of radioactive contamination becomes objectively significant. It should be noted that the concept of biomonitoring is based on the assessment of the state of a biological object, as its adaptation parameters reflect the state of the environment.

A special place among a wide range of biological indicators of chemical and radioactive contamination is occupied by the soil microbiota rich in qualitative and quantitative terms. This is due to the fact that soil is a huge reservoir, which is a habitat for many microorganisms playing an important role in the physical and chemical transformation of radionuclides [2].

For many years, the object of research of most microbiologists is bacteria of the genus *Bacillus*. This is due to the fact that among various representatives of exogenous microflora, bacilli are characterized by a number of advantages: ubiquitous distribution, peculiarities of the development cycle, unusual resistance of spores to chemical, physical agents and pathogens.

In the course of this study we analyzed the sensitivity to broad-spectrum antibacterial drugs of auxotrophic forms of bacteria of the genus *Bacillus* isolated from soils of the Polessky State Radiation and Ecological Reserve (PGRES), which were under long-term exposure to ionizing radiation and the territory of the Berezinsk Biosphere Reserve (natural background level of ionizing radiation) (BBZ).

Auxotrophic variants were identified by failure to grow on minimal agarized medium (300 ml of 2% water agar, 100 ml of salt concentrate (NH_4Cl - 20 g, NH_4NO_3 - 4 g, Na_2SO_4 - 8 g, K_2HPO_4 - 12 g, KH_2PO_4 - 4 g, $MgSO_4 \times 7\ H_2O$ - 0.4 g, distilled water - 1000 ml) and 4 ml of 20% glucose solution).

The antibiotic sensitivity of auxotrophic forms of *Bacillus* bacteria was analyzed using the disk-diffusion method. The level of bacterial sensitivity was determined by the growth retardation zone (GIZ) when cultured under optimal conditions [1].

It was shown that auxotrophic forms of *Bacillus subtilis* isolated from PGRES soil samples exhibited a high level of sensitivity to clarithromycin (GIZ 11±0.2 mm) and ampicinil (GIZ 11±0.2 mm). As for the auxotrophic forms of *Bacillus mycoides*, high sensitivity was observed to streptomycin (GIZ 14±0.2 mm) and clarithromilin (GIZ 12±0.2 mm). It should be noted that auxotrophic forms of *Bacillus cereus*, isolated from samples of soils of BBZ, showed high sensitivity to some representatives of macrolide groups (GIZ 14±0.2 mm), tetracyclines (GIZ 12±0.2 mm) and aminoglycosides (GIZ 11±0.2 mm). It was also found that auxotrophic forms of *Bacillus thuringiensis* isolated from soils of the same area showed a high level of sensitivity to clarithromycin (GIZ 11±0.2 mm) and furazolidone (GIZ 12±0.2 mm).

Thus, in the course of the study an increase in sensitivity of auxotrophic forms of *Bacillus* auxotrophic bacteria isolated from soil samples of PGRES and BBZ to some antibacterial drugs was noted, which may indicate a decrease in the efficiency of natural resistance mechanisms as a result of blocking of vital enzymes under the prolonged action of ionizing radiation.

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FREQUENCY OF OCCURRENCE OF POLYAUXOTROPHIC VARIANTS OF BACTERIA OF THE GENUS *BACILLUS* IN SOIL SAMPLES EXPOSED TO PROLONGED IONISING RADIATION

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Ionising radiation can cause damage to the structure of many biomolecules, including DNA. Anthropogenic sources of ionising radiation include accidents at nuclear power plants, such as the Chernobyl accident in 1986, which caused long-term radioactive contamination [1]. Studies assessing the frequency of occurrence of polyauxotrophic variants of ammonifying bacteria in the microbial communities of soils in radioactive zones have given us a better understanding of how nutritional requirements change under conditions of chronic exposure to radiation.

Keywords: ionising radiation, polyauxotrophic forms, soil samples, microbiological communities.

Ionising radiation is a type of radiation in the form of electromagnetic waves or particles with sufficient energy to ionise an atom or molecule [2]. Excess of this radiation has a damaging effect on many living organisms. For example, the structure of soil microbiocenoses in the areas affected by the damage of the fourth unit of the Chernobyl nuclear power plant has shifted towards species that have lost the ability to independently synthesise several key amino acids - polyauxotrophs.

This study evaluated the spectrum of polyauxotrophy in bacteria of the genus Bacillus (B. cereus, B. subtilis, B. thuringiensis, B. mycoides) isolated from soils exposed to long-term ionising radiation. Soil samples were taken at three sites with different levels of environmental radioactivity in August and September 2023: the territory of Polessky State Radiation and Ecological Reserve (PSRER), Belarusian Nuclear Power Plant (Bel NPP) and Orsha district (natural background level of ionising radiation).

Soil material was sampled using the envelope method from a plot with a total area of 25m2 for each study area. Polyauxotrophic variants were identified by their inability to grow on minimal agarised medium (300 ml of 2% water agar, 100 ml of salt concentrate (NH_4Cl - 20 g, NH_4NO_3 - 4 g, Na_2SO_4 - 8 g, K_2HPO_4 - 12 g, KH_2PO_4 - 4 g, $MgSO_4 \times 7\ H_2O$ – 0,4 g, distilled water - 1000 ml) and 4 ml of 20% glucose solution) and the requirement of five or more growth factors (amino acids). Seventeen amino acids with a concentration of 2 mg/ml (leucine, proline, serine, cysteine, tyrosine, glutamic acid, histidine, arginine, lysine, methionine, asparagine, glycine, tryptophan, alanine, phenylalanine isoleucine, threonine) were used. All cultures were incubated at +37°C for 24 hours.

As a result of the conducted research on estimation of frequency of occurrence of polyauxotrophic variants of bacteria of genus Bacillus in soil samples, which were under conditions of long-term exposure to ionising radiation, it was revealed that less frequently polyauxotrophic variants of bacteria of genus Bacillus were found in soil samples of Orsha district - 33,8±2%, which were under conditions of natural background level of ionising radiation, than in soil samples from PSRER - 58,75±2%. It is also shown that in the soil samples taken in the territory of Bel NPP the percentage of polyauxotrophic variants of the investigated genus was 52,4±2%.

The current study is one of the first to investigate the structure of soil microbiological communities under conditions of radioactive stress. Our results showed that prolonged exposure to ionising radiation of anthropogenic nature can lead to an increase in the percentage of occurrence of polyaxotrophic variants of bacteria of the genus Bacillus in soil microcommunities. Our study revealed disturbances of the main metabolic processes under conditions of increased radioactive stress. The biodiversity of soil microbial communities and mechanisms of implementation of genetic errors in biosynthetic processes largely depend on the impact of prolonged ionising radiation.

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METHODOLOGICAL APPROACHES FOR PREPARING BIOLOGICAL FLUID SAMPLES FOR DETERMINING TRITIUM CONTENT

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Tritium occupies a special place in ensuring radiation safety and is the most radiologically hazardous long-lived nucleide. Therefore, it is necessary to monitor the dose of internal irradiation from the tritium. The physico brake and nuclear properties of tritium make it impossible to measure it directly using dosimetry methods. Consequently, indirect dosimetry methods must be used, such as in bioprobes like blood, saliva, gastric contents and urine.

Keywords: tritium, internal irradiation, liquid scintillators, distillation

Tritium is one of the factors of human internal irradiation in both industrial and domestic conditions. It enters the human body primarily in the form of tritiated water (HTO) through inhalation, ingestion, and absorption through the skin. After ingestion, inhalation, or absorption through the skin, HTO is completely absorbed into the bloodstream within several seconds to tens of minutes. Upon entering the bloodstream, HTO is distributed throughout all organs and tissues of the body, instantly penetrating through vessel walls into extracellular fluid and then into tissue cells, thus evenly dissolving in the body's water. This process takes from several dozen minutes to several hours. As a hydrogen isotope, tritium accumulates in areas with the largest water content. Since water is evenly distributed throughout the body of a person, tritium evenly irradiates soft tissues, which are the main location of internal body water. Biological fluids that can be used include urine, blood, saliva, and gastric contents [1].

For preparing blood samples, centrifugation and subsequent filtration through microfilters are recommended. When preparing plasma blood samples, it is important to consider the possibility of plasma component coagulation and apply anticoagulants. For saliva samples, preliminary particle sedimentation and removal of food fibers are recommended. When working with gastric contents samples, consideration should be given to the specifics of their physical structure and specialized processing methods should be applied. The preparation of urine samples includes the following steps: activated carbon treatment of the sample; filtration through a blue-ribbon filter; distillation of the sample at a temperature of 80-90°C.

Since urine consists of 90% water, the presence of tritium in human urine allows for the most effective internal dosimetry of this radioactive isotope. There are many methods for preparing urine samples to determine the volume activity of tritium, which are used in practice. The simplest method is mixing a liquid scintillator with the sample; however, a large number of impurities significantly impair the result. Distillation is the most universal method due to its simplicity, but it requires additional equipment. Various methodological approaches for conducting distillation of tritium-containing urine samples offer numerous options, such as preliminary decolorization, multiple oxidizing agents, and conditions different from normal ones [1-2].

It is important to choose the measurement method. The primary method of measuring tritium content is the scintillation method based on recording tritium emission radiation. Various types of detectors are also used, including liquid scintillators and gas proportional counters. To increase the sensitivity of measurements, signal amplification methods are applied, such as converting radiation energy into light pulse energy. An important factor is selecting the appropriate sample volume and measurement time depending on the expected level of tritium content [1].

When choosing a method for preparing samples and measurements, it is necessary to consider the specific requirements of the experiment, the expected level of tritium content, and available equipment. Combining several methods can significantly increase the accuracy and reliability of results.

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USE OF PAST PROGRAM AND GIS–TECHNOLOGIES IN THE PROCESSING AND VISUALISATION OF BIOLOGICAL DATA

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Monitoring of green spaces in the city helps to identify problems and improve the state of urban greenery. PAST software and GIS–technologies provide better analysis of data on biological objects and make it possible to visualise the obtained data.

Keywords: environmental monitoring, PAST, GIS–technologies.

An important component of environmental monitoring in the urban environment is the analysis of the health status of tree plantations in various functional zones of the urban ecosystem. Systematic monitoring of the condition and health of trees allows timely identification of problems and corrective measures, as well as more effective planning of urban greening works. The PAST software allows statistical analysis of various biological data [1], and the use of GIS technologies allows the creation of maps showing the spatial distribution of tree stands, which facilitates analysis and comparison with other environmental parameters [2].

In our study on woody vegetation inventory and assessment of its condition, data processing was carried out using the PAST programme. Biodiversity indices were determined and the influence of different environmental factors on tree condition was assessed. Key environmental factors were identified using analysis of variance, linear model building techniques and canonical correspondence analysis (Fig.2). QGIS software was used to create maps of vegetation distribution by life state classes in roadside plantings of Vitebsk city, allowing visualisation of spatial data (Fig. 1).

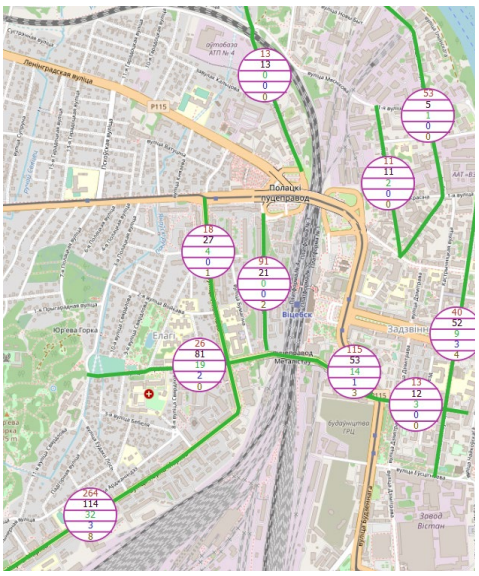

Fig. 1 - Creating maps in QGIS

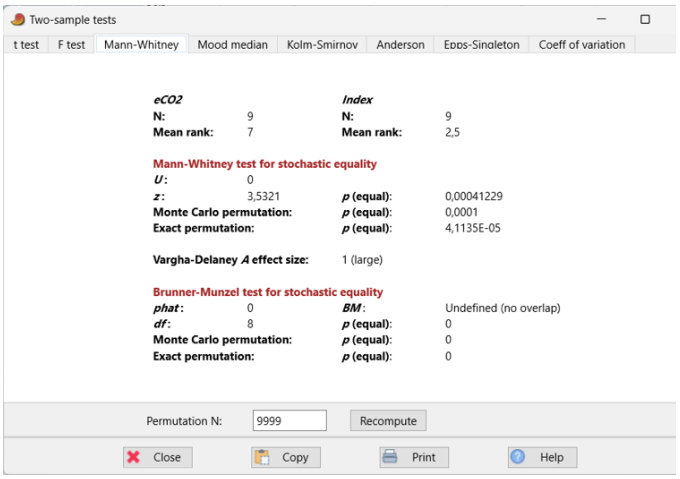

Fig. 2 - Performing a Mann–Whitney analysis in PAST

Thus, the use of PAST and GIS–technologies for processing and visualisation of biological data allows for a more qualitative and comprehensive analysis of the condition of trees within the city, which in turn contributes to the preservation of green spaces and improvement of the ecological situation in the urban environment.

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EFFICIENCY OF USING REPRESENTATIVES OF THE GENUS SALIX AS A SOURCE OF USEFUL SUBSTANCES. METHODS OF THEIR PRODUCTION

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Keywords: willow, bark, salicylic acid, flavonoids, tannins, extraction, chromatography, distillation.

Plants of the genus Salix willow are widely used as fast-growing crops in short-cycle plantations. The cultivation of short-cycle plantations of fast-growing willow allows not only to obtain wood for energy purposes, but also to use it for obtaining a number of other economically useful compounds.

Willow bark has many uses in chemistry and science due to its content of a variety of bioactive compounds. Here are a few areas where willow bark can be used:

Pharmaceuticals. Willow bark contains salicylic acids, which may have anti-inflammatory and analgesic properties. Biotechnology. Flavonoids can be extracted from willow bark, which are powerful antioxidants and can be used to create antioxidant supplements or drugs. Tannins from willow bark can be used in the food industry as preservatives or antioxidants. Ecology. Willow, along with other plants, can be used to clean the soil of pollutants due to its ability to accumulate harmful substances. Cosmetology. Escin can be extracted from willow bark, which has anti-inflammatory and anti-exudative properties. This component is often used in cosmetics to reduce swelling and improve skin condition. Industry. Willow bark also contains cellulose, which can be used in industry to produce paper, textiles or food additives.

Some plant species such as Salix alba, Salix ingeri viminalis, Salix tor viminalis, Salix acutifolia are used for comparative analysis.

The methods of obtaining useful substances from willow bark can vary depending on the specific purposes and applications of these substances.

Extraction is one of the most common methods of obtaining tannins. In this process, biomass containing tannins is subjected to extraction using various solvents such as water, organic solvents (e.g., ethanol or methanol), or a combination of both. The solvent extracts the tannins from the biomass and the resulting extract can then be used for various purposes.

Based on the experimental data, the optimal extraction conditions were determined - 70% ethyl alcohol, the ratio of raw material: extractant - 1:40. The most complete extraction of tannins from raw materials is achieved using water-acetone mixture in the ratio of 3:7, containing 0.1% ascorbic acid to prevent oxidation of phenols. The extraction is carried out at room temperature, then the acetone is removed under vacuum at 40 °C. The resulting aqueous extract is lyophilized and stored at reduced temperature until use.

After extracting the beneficial substances from willow bark, the waste can be recycled and used in a variety of applications. Here are a few uses for willow bark waste:

Energy. Willow bark wastes can be used in the production of biofuels or biogas. They have potential as a source of renewable energy, helping to reduce dependence on fossil fuels. Fertilizers. Biomass is rich in organic matter and nutrients. They can be used as a natural fertilizer for the soil. This helps in improving the fertility of the land and plant

growth. Industry. Willow bark waste can be used in the production of wood panels, paper, textiles and other materials. They have certain characteristics that make them valuable raw materials for various industrial purposes.

The use of willow bark in the processes of obtaining useful substances fits into the concept of sustainable development and efficient use of natural resources, which is relevant in the context of growing environmental awareness.

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INFLUENCE OF LOW DOSE OF ELICITORS ON THE GROWTH MENTHA PIPERITA IN MICROCLONAL PROPAGATION

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Experiments were carried out in order to obtain an influence of low dose of growth stimulant elicitor action for in vitro propagation of *Mentha piperita* Caramel. Apical and axillary buds were used as initial explants for the establishment of cultures. The buds were successfully disinfected in hydrogen peroxide. MS medium was used as basal medium in all stages of culture. Establishment, multiplication stage, root and shoot elongation were satisfactory on the medium containing elicitors in different concentration. The rooted plats survived successfully and grew into normal plants.

Keywords: *Mentha piperita*, elicitors, reishi, microclonal propagation.

In conditions of intensification and expansion of pesticide use, when it becomes mandatory to consider possible environmental consequences of their use, the search for new effective and environmentally safe pesticides is a very urgent task. Even breeding resistant varieties, which is one of the most environmentally friendly methods of controlling crop losses, does not help for long, as phytopathogens overcome the defence barriers of resistant varieties faster than new varieties are developed.

Elicitors act as signalling compounds at very low concentrations. Their treatment of plants induces the triggering of signalling systems leading to the expression of various defence-related genes and increases plant resistance to biotic and abiotic stresses. Most of the elicitors described so far are carbohydrates, proteins and peptides, glycoproteins, lipids and glycolipids. The biotechnology department is carrying out research work to study the effect of elicitors from the Reishi *Ganoderma lucidum* (with state registration in the State Committee on Science and Technology of the Republic of Belarus).

To investigate direct influence of elicitors for *Mentha piperita* Caramel plant in this research we use method of microclonal propagation. MS medium was used as basal medium for propagation, using different concentration of dedicated elicitors ($5*10^{-2}$ mg/l, $1*10^{-3}$ mg/l, $2*10^{-3}$ mg/l)

Fig.1. – In vitro propagation of *Mentha piperita* with elicitors in different concentrations (from left to right: control, $5*10^{-2}$ mg/l, $1*10^{-3}$ mg/l, $2*10^{-3}$ mg/l).

According to the results of the experiment, the growth and development of Mentha piperita Caramel increased by 35% compared to the control. The present conclusions allow us to recommend the use of specific elicitors on medicinal plants of *Mentha piperita* under different stress conditions.

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ECOLOGY OF THE SIBILANT SWAN HABITAT IN MINSK REGION

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According to estimates, in Belarus, the number of sibilant swans at the nesting site is 750-900 pairs, in winter - up to 1.5 thousand individuals. The species has been listed in the Red Book of Belarus since 1981. Climate change towards an increase in the temperature balance has allowed some species of waterfowl living in Belarus to neglect seasonal migrations and stay for a winter near non-freezing reservoirs. However, natural conditions do not always allow the hissing swan, like other waterfowl, to safely survive the winter period. Harsh winters, poor food supply, predatory animals and birds – all this reduces the chance to wait for the spring warmth. In addition, infectious and invasive diseases often do not leave opportunities for weakened organisms of waterfowl (who have already experienced adversity) to successfully complete their wintering.

Keywords: global warming, habitat ecology, waterfowl, parasitocenoses, prevention of infectious diseases.

Every living organism in the process of evolution is obliged to adapt to the external environment in which it lives. Over the centuries, the adaptive reactions of living systems, as a rule, have undergone the most severe changes precisely to the deterioration of their living conditions. These evolutionary qualities have been firmly entrenched from year to year at the genetic level. If we apply the above to the waterfowl living in Belarus, then seasonal migrations for them were the way to preserve the species and the number of populations in each of the species. The last decade has allowed us to observe the opposite (see photo).

A sibilant swan on a drainage canal in the Molodechno district of the Minsk region.

(Photo by Yu.G. Lyakh. November 26, 2018)

As already noted, it was the tightening of habitat conditions, respectively, and the food supply that led to the formation of protective body systems, forms and ways of living in waterfowl, which have been fixed for centuries in each individual species at the genetic level.

However, recent decades have shown that the body of some species of waterfowl, when creating favorable conditions for their maintenance and feeding, is able to change the genetic program in a fairly short period of time (throughout the entire 3 to 5 generations). This is exactly what we can observe with the example of the hissing swan and other species of waterfowl, which, contrary to the age-old traditions of seasonal migrations, do not fly away for the winter.

However, it should be noted that this behavior concerns units of individuals of waterfowl and is not yet of a mass nature.

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ECONOMIC COOPERATION AND CHALLENGES IN THE CONTEXT OF EDUCATIONAL INTERNATIONALIZATION: OPPORTUNITIES AND POLICY BARRIERS IN SINO-FOREIGN EDUCATIONAL INDUSTRY COOPERATION

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Abstract. With the advancement of globalization, educational internationalization has become a key direction for reform in national educational systems. In this context, Sino-foreign educational industry cooperation has become one of the crucial paths to promote educational development. However, despite the significant opportunities presented by such cooperation, various challenges also arise, particularly policy barriers. This paper analyzes the opportunities of Sino-foreign educational industry cooperation and explores the policy barriers encountered in economic cooperation, aiming to provide theoretical support and policy recommendations for promoting cross-border educational cooperation.

Goal. Educational internationalization has brought diverse cooperation opportunities globally, especially in Sino-foreign educational industry cooperation, which has become increasingly diversified in terms of forms and models. Educational industry cooperation not only promotes the global flow of educational resources but also advances the enhancement and innovation of educational quality (Zhang & Liu, 2021). However, such cross-national cooperation faces many policy and institutional barriers, particularly challenges arising from differences in national policies, incompatible educational systems, and cultural differences (Chen & Lee, 2022).

Opportunities in Sino-Foreign Educational Industry Cooperation. The greatest opportunity in Sino-foreign educational industry cooperation lies in the sharing of advanced educational concepts, teaching methods, and educational technologies. Specifically, through the introduction of foreign-funded educational projects, cooperation between China and Western countries plays a vital role in improving educational quality, promoting educational equity, and enhancing teaching standards (Wang & Yang, 2020). Furthermore, with the advancement of the Belt and Road Initiative, educational industry cooperation has become an important component of deepening economic cooperation between countries, providing more opportunities for Sino-foreign partnerships (Zhao, 2021).

Policy Barriers Analysis. However, despite the broad prospects for Sino-foreign educational cooperation, multiple policy barriers remain. First, differences in educational policies between countries result in conflicts within educational systems. For example, foreign educational institutions entering the Chinese market are often constrained by local policies, such as faculty certification and school approval processes, which create barriers to smooth cooperation (Li & Zhang, 2023). Secondly, the allocation and utilization of educational resources are also limited by different policy orientations. As protectionism in educational industries increases, policy challenges for international education are becoming more severe (Song, 2022).

Conclusion. In conclusion, Sino-foreign educational industry cooperation presents diverse opportunities in the context of educational internationalization but also faces numerous policy barriers. To better promote educational internationalization, governments must make appropriate adjustments to policies, optimize resource allocation, reduce policy barriers, and strengthen supervision and support for cross-national educational cooperation. Only through policy support and optimization can sustainable development in Sino-foreign educational industry cooperation be achieved, thus promoting balanced and high-quality global education.

A COMPREHENSIVE APPROACH TO MODELING BIOENERGY POTENTIAL OF TERRITORIES

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This paper presents a comprehensive approach to modeling bioenergy potential of territories. It outlines the key stages of the modeling process, including climate and topography analysis, biomass assessment, production process modeling, environmental impact evaluation, economic analysis, and strategy development. The article emphasizes the importance of GIS technologies and integrated approaches in bioenergy potential assessment. It highlights the significance of this methodology for sustainable energy development and reducing dependence on fossil fuels.

Keywords: Bioenergy potential, territorial modeling, GIS technologies, sustainable energy development, renewable energy sources

Modeling bioenergy potential of territories is a crucial aspect of developing renewable energy sources and sustainable use of natural resources. This process involves several key stages and requires the application of various tools and methodologies.

The sequence of modeling bioenergy potential of territories includes the following main steps:

1. Analysis of climatic data and topography of the territory:
   - Study of solar radiation and wind flows
   - Assessment of terrain relief and its impact on microclimate

2. Evaluation of biomass and its potential use:
   - Analysis of plant species and their energy value
   - Determination of volumes of biomass that can be harvested without harming ecosystems
3. Modeling production processes:
   - Development of schemes for converting biomass into various types of energy
   - Assessment of efficiency and economic feasibility of different technologies
4. Environmental assessment and monitoring:
   - Analysis of the impact of bioenergy production on the environment
   - Development of measures to minimize negative consequences
5. Economic analysis and forecasting:
   - Assessment of production costs and potential revenues
   - Analysis of bioenergy market trends and industry development prospects
6. Development of project implementation strategy:
   - Determination of technology implementation stages
   - Formation of a team of specialists for project management

In modeling bioenergy potential of territories, various tools and methodologies are used. One of the key instruments is Geographic Information Systems (GIS). GIS technologies allow analyzing spatial data on relief, soils, vegetation, and other factors affecting bioenergy potential [1].

Specifically, when using GIS, the following technologies are applied:

1. Spatial data analysis for creating maps of energy potential of various territories
2. Multi-criteria analysis for identifying optimal areas for bioenergy projects
3. Spatial modeling of heat and energy distribution from potential facilities
4. Geostatistical analysis for interpolating data on climatic conditions and biomass
5. Data visualization for clear representation of results
6. Integration with other systems for comprehensive project evaluation
7. Network and route analysis for optimizing facility placement and logistics [2].

In addition to GIS, mathematical modeling, economic models, environmental assessment, computer simulation of processes, statistical analysis, and expert evaluations are also used during modeling.

A combined approach, integrating various methods and tools, allows for the most accurate assessment of bioenergy potential of territories and the development of optimal strategies for its use. This is an important step towards sustainable energy development and reducing dependence on fossil fuels.

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CONSERVATION OF BIODIVERSITY OF THE WATERFOWL IN BELARUS AND THE ROLE OF SARCOCYSTOSIS IN THIS ISSUE

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In nature everything is interrelated and linked in such a way that if one of the many species disappears, then following a chain reaction, as a rule, other species dependent on one another can disappear. In such a case, these species can only be preserved if they are able to adapt to new living conditions.

Keywords: Waterfowl, parasitozenosis, sarcistosis, prevention of parasitic diseases.

The extinction of a species in nature is comparable to the links in one chain that binds numerous relationships between living beings. The main and most important relationships in nature are trophic. However, in the evolutionary process all biological objects in nature are distributed according to the trophic needs of each species.

In this connection, all species and their phylogenetic characteristics were shaped by the very way of life that the natural environment provided them. This should include the range of all natural land (elements of trophic diversity) provided to these species for life.

The future of species diversity of living beings that were associated with the extinct species depends solely on their ability to adapt to new habitat conditions, respectively inhabit in the absence of species that have been closely dependent for centuries (food, territorial, etc.).

At present, in essence, only those species of living beings that have been able to adapt to the modern conditions of the ecological state of the environment are preserved. As we know, compared to the millennia that have passed, the millennium in which we live with you is changing its ecological qualities so quickly that most living beings (man is not an exception) are unable to rebuild their protective systems. The ecology of planet Earth is changing at such a rate that biological organisms and their adaptive properties are unable to find a solution to the problem of adaptation systems. Often, chemical, physical, biochemical, genetic and a whole range of processes and reactions cannot be reconciled so quickly in one of the many biological living objects that are united in a species.

In the present period of time, living beings have to face the challenge of environmental shocks and concentrate their protective systems to such an extent that they can preserve at least the part of the population that could maintain and consolidate these qualities on a genetic level. Qualities of protective reactions and pass on to their progeny.

To all this said, almost all living beings, except for the pressing environment, in terms of ecology, are constantly under the negative influence of parasitic organisms (viruses, bacteria, simple and other parasitic organisms) who, because of their biological way of existence, have better systems of adaptation. An example of this is sarcocystitis. Its pathogen has chosen a special cycle of development to preserve its species representation, which has practically secured the extinction of its species [1, 2].

This is the kind of environment that wild water birds have come into contact with. The reason is that one of the three elements (land, water, air) is most intensively polluted. Water is a universal solvent not only for biologically beneficial substances and minerals, but also is a solvent of toxic substances that have a detrimental effect on biological objects [3].

In essence, sarcocysts have chosen a fairly large representation of biological objects for their parasitization. Humans were no exception. Because domestic birds are kept in conditions that mostly prevent sarcocystitis from spreading, wild aquatic feathers have become the most suitable target for their existence.

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REINTEGRATION OF DRIED SWAMPS IN BELARUS AND THE ROLE OF THIS ACTIVITY IN PRESERVING NATURAL LANDSCAPES

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Swamp - (according to the interpretation of this term's biological meaning) a landscape site characterized by excessive wetness, humid living overburden. The swamp is characterized by soil surface deposition of organic matter that has not fully decomposed and which later turns into peat. The peat layer in the swamps is at least 30 cm, if less, then it is marshland.

Keywords: reintegration, remediated areas, swamp, re-waterlogging, environmental activities.

In the Republic of Belarus, this definition covers a seventh part of the country's area, which is about 25,000 square kilometers. In no one country in Europe, the swamps do not occupy more than 14% of the territory, for which, legally, Belarus has been named - the lungs of Europe. Swamps are part of the hydrosphere [1]. The first swamps on Earth were formed at the junction of silure and devine 350-400 million years ago.

But for the people of Belarus, this is not just a piece of land characterized by excessive wetness. These territories were not only a place of life for the Belarusians; they also served as protection from enemy attacks. Almost always on the large swamps there were small islets, where secret paths were laid, fortified with gates, where the local population hid, together with domestic livestock from enemy raids. Small warehouses were established on such islands, there were stores of grain and hay, and disguised dwellings were built.

Even during the Second World War, the swamps were saved from bombs by residents of Belarus. Bombs dropped from planes and mines did not burst into the swamp soil or cause harm to the population. These explosive objects are buried for centuries in the Belarusian swamps.

In the 60-70's of XX century in Belarus was carried out a large-scale melioration, which has never been conducted in such quantities. As a result, nearly three million hectares have been drained. The improvement of Belarusian lands and their development process took place under the auspices of increasing the area planted with crops and improving crop yields. Areas where uncontrolled sampling of peat was conducted were particularly affected [2, 3].

In the current period, the use of dried peat in agriculture is no longer as productive. The culture of agriculture, new varieties and technologies have brought crop production to new frontiers. Certainly, in the early years, drained land gave agricultural production a sharp increase, and the same was true of peat mining for fuel.

However, the situation has changed dramatically in recent times. And this is confirmed by scientific calculations and real calculations.

In the middle of last century, swamps occupied a large part of our republic - about 14%. Following the large-scale remediation undertaken in the last century, the number of natural wetland ecosystems has decreased. Today, 6.4% of the territory of Belarus is covered with peat (world average - 3.4%). In this regard, a certain part of the previously reclaimed areas our state considered it rational to restore the natural environment and to try to reintegrate them into ecological biocenosis under the control of environmentalists. Environmental integration is the solution of environmental problems related to the impact of human economic activities on the natural environment.

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EDUCATIONAL MANAGEMENT INNOVATION IN THE ERA OF GLOBALIZED EDUCATION: A STUDY ON CROSS-CULTURAL MANAGEMENT MODELS IN INTERNATIONAL EDUCATION PRACTICE

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Abstract: With the increasing trend of globalization, educational institutions worldwide are facing new challenges in managing culturally diverse student populations and staff. To address these challenges, innovative cross-cultural management models are essential for fostering effective educational practices in international contexts. Cross-cultural management in education focuses on creating inclusive environments that respect cultural diversity, supporting students' and educators' unique cultural perspectives while promoting harmonious, effective interactions (Wang & Collins, 2020)

Goal： The Need for Cross-Cultural Management in Education

A primary focus of cross-cultural management in education is understanding and bridging cultural differences in communication, learning styles, and expectations. Research shows that culturally responsive management practices can enhance student engagement, faculty satisfaction, and overall educational quality in international settings. For instance, incorporating culturally inclusive curricula and training programs that acknowledge students' backgrounds fosters a sense of belonging and reduces cultural friction (Jones & Thomas, 2021). Such practices encourage educational institutions to shift from a one-size-fits-all model to one that respects and values diverse cultural contributions.

The Multicultural Education Framework: One effective approach is the adoption of a multicultural education framework that promotes collaboration and mutual understanding among culturally diverse stakeholders. According to Pérez and Contreras (2022), this framework not only strengthens the academic experience for students but also equips faculty with the tools needed to navigate intercultural challenges, promoting an atmosphere of inclusivity and respect. By implementing a multicultural model, educational leaders can create policies and practices that support intercultural sensitivity and competency, preparing students for a globalized workforce.

Technology's Role in Cross-Cultural Management: Technology also plays a pivotal role in cross-cultural management by facilitating communication and collaboration across borders. Digital platforms allow for virtual classrooms, language support tools, and real-time translation services, making it easier for students and educators from different cultural backgrounds to engage meaningfully. Research by Kavanagh and D'Arcy (2023) suggests that integrating digital tools in education management has improved cross-cultural understanding and accessibility, especially for international students who may face language barriers or cultural adjustment issues.

International Partnerships and Exchange Programs: In addition, international partnerships and exchange programs contribute to cross-cultural understanding by exposing students and faculty to different educational practices and values worldwide. These experiences encourage adaptability and cross-cultural skills, which are vital in today's interconnected world. Such programs have been shown to significantly enhance students' global perspectives and empathy towards different cultures, fostering the development of a globally competent workforce (Li & Chen, 2022).

Conclusion: As globalization reshapes education, cross-cultural management models have become essential in fostering inclusive, adaptive educational environments. By embracing culturally responsive practices, adopting technology, and promoting international collaborations, educational institutions can improve management effectiveness and enhance the global readiness of students and faculty alike.

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INFLUENCE OF BUTTERFLY BIRDS ON THE URBAN LANDSCAPE OF HANDAN CITY (CHINA)

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The paper analyzes the influence of butterfly birds on the urban landscape of China using the city of Handan (Hebei Province) as an example. The issues of bird participation in the ecological cycle and ecological stability of the city are considered.

Keywords: butterflies, urban landscape, ecological cycle.

In Handan City, Hebei Province, swallowtail butterflies have a unique presence, exerting a multifaceted influence on China's urban landscape. This group of birds plays an important role in ecology, landscape, and culture.

The existence of swallowtail butterflies and other birds in Handan City enriches the city's biodiversity. They, together with other plants and animals, form a complex ecosystem that provides living space for various organisms. This biodiversity is crucial to the ecological stability of the city and can enhance the resilience of the city's ecological system and its ability to self-heal against disturbances. These birds participate in the ecological cycle by engaging in activities such as hunting insects and pollinating flowers. They help decompose organic matter, promote soil fertility, and provide good conditions for plant growth. At the same time, the droppings of swallowtail butterflies also provide nutrients to the soil, further promoting the positive ecological cycle.

The presence of these birds enriches the biodiversity of the urban landscape. They complement the natural landscape of flowers, trees, mountains and lakes, forming a vivid ecological picture. In urban planning, the habitat needs of phoenix butterflies can be fully taken into account to create more ecological and beautiful urban landscapes.

Birds have always played an important role in the historical and cultural heritage of Handan. Butterfly-like birds, as part of this heritage, carry rich historical and cultural connotations. Their images often appear in literature, painting, folk tales and other arts, becoming an important part of the city's culture.

The existence of swallowtail butterflies in Handan City has inspired people to be more aware of the need to protect the environment. Admiring these beautiful creatures, the people of our city also pay more attention to protecting the environment. By protecting these birds and their habitat, we can promote the sustainable development of the city and inherit and promote the concept of ecological civilization.

In order to give full play to the positive impact of swallowtail butterfly on urban landscape, we need to take a series of protective measures, the main ones being: a) designate bird protection zones to protect their habitat from destruction; b) strengthen the protection of forests, wetlands and other natural ecosystems to provide a safe habitat for birds; c) reduce environmental pollution by controlling the emission of industrial exhaust gases, sewage and domestic wastewater to reduce air, water and soil pollution; d) reduce noise pollution and create a quiet habitat for birds; carry out scientific education through bird exhibitions, scientific lectures and other activities; d) encourage people to participate in bird conservation activities and work together to create a good ecological environment.

Thus, the swallowtail butterflies in Handan have a multifaceted impact on China's urban landscape. They play an important role in the city's ecology, urban landscape, and culture, providing strong support for the sustainable development of this administrative center.

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DATA COLLECTION THROUGH SENSORS AND THE INTERNET OF THINGS AS A TOOL FOR ENVIRONMENTAL MANAGEMENT

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The article considers the application of sensors and IoT (Internet of Things) to collect data on the state of the environment in the plane of ecological problems.

Keywords: ecology, sensors and IoT, Internet of Things.

Modern society faces many environmental challenges for which information systems and technologies play an important role in collecting, analyzing and using environmental data to improve decision-making.

Today, information technology enables the efficient collection of environmental data. This can be done through remote sensing, where satellites and aerial drones collect information about the earth's surface. Data collection is also organized through sensors and IoT (Internet of Things). Sensors installed in various ecosystems monitor pollution levels, temperature, humidity, radiation levels and other parameters in real time [1].

Data collection through sensors and the Internet of Things (IoT) to solve environmental problems is very important. After all, sensors are devices that can measure physical or chemical parameters of the environment and convert them into electrical signals that can be transmitted and processed.

The Internet of Things (IoT) is a network of physical devices capable of collecting and exchanging data using the Internet. These devices are equipped with sensors that collect data and then transmit it to cloud servers or other devices for further processing.

The application of sensors and IoT in solving environmental problems can be as follows:

1. Environmental Monitoring. Sensors enable real-time monitoring of the environment. For example, they can be used to measure air pollution and identify sources of pollution; monitor the quality of water bodies (e.g., the presence of toxic substances); and monitor soil conditions, including moisture and nutrient levels.

2. Promoting sustainable agriculture. IoT sensors help optimize irrigation by measuring soil moisture levels and preventing excessive water consumption. Sensors monitor plant health, allowing farmers to respond in a timely manner to changes, such as the onset of disease.

3- Implementing conservation measures. Sensors and IoT devices can be used to monitor protected areas and protect rare species. Installing sensors in forests to detect forest fires at the initial stage. Monitoring animal migration using GPS sensors helps to study animal behaviour and develop conservation strategies.

4. As part of the smart cities concept, sensors and IoT technologies are used to manage urban resources and services: monitoring air quality in different parts of the city, optimizing street lighting systems, including switching lamps on and off depending on light levels, which helps reduce energy costs.

5. efficient management of natural resources. Monitoring systems can assess water supplies and enable more efficient planning and resource allocation, especially in the face of climate change. Sensors can be used to determine

the level of depletion of resources such as forests and water reserves, which can help to promote more sustainable management practices.

The use of sensors and IoT enables a number of benefits to be realized:

– automatic collection and transmission of data in real time allow for quick response to changes in the environmental situation;

– optimization of the use of water, energy and other resources;

– the ability to use data to create models and forecasts of environmental changes.

Thus, IoT sensors and systems are a powerful tool for monitoring and managing environmental processes. They open up new opportunities to prevent and mitigate environmental problems, improve sustainability and efficiency of natural resource use.

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REVIEW OF THE EFFECT OF HEAVY METALS ON AQUATIC ORGANISMS DAPHNIA MAGNA AND LEMNA MINOR

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The contamination of aquatic ecosystems with heavy metals poses a serious environmental problem. The need for monitoring and assessing the toxicity of these pollutants stimulates the development and application of bioindicator methods. In this study, the results of the research evaluating the toxic effects of ions of lead (II), copper (II), zinc (II), nickel (II) and cadmium (II) on two widespread aquatic organisms: the water flea *Daphnia magna* and the small duckweed (*Lemna minor*) are presented. The use of these organisms allows to assess the toxicity of individual ions and their mixtures, which is important for understanding the complex interactions in real conditions of pollution.

Keywords: bioindication, toxicity, heavy metals.

In the context of global anthropogenic impacts on water bodies, there is an increasing need to study the relationship between natural and anthropogenic factors in the development of their ecosystems. The potential for studying river ecosystems is determined by the fact that their changes serve as an indicator of anthropogenic pressure on the territory as a whole. The low predictability of anthropogenic impacts requires the study of changes in various ecosystem links, considering the ambiguous responses associated with the diversity of water body characteristics, their interaction with catchment areas, and the influence of landscape and climate. It is important to consider the structural and functional characteristics of communities and regulatory mechanisms to identify ecosystem resilience and predict their development. The toxicity of metal ions to aquatic organisms has been studied for decades, but understanding the mechanisms of their impact remains insufficient. Industrial wastewater contains a mixture of toxic and harmful substances that can adversely affect human health and aquatic ecosystems. Annually, a large amount of wastewater containing heavy metals is discharged by enterprises of various industries, which can pollute the environment and cause ecological problems.

Bioindication is an important tool for assessing the ecological state of water bodies. Tests with *Daphnia magna* and *Lemna minor* were used to assess the toxicity of cadmium, copper, lead, and nickel cations. These tests are standardized and relatively easy to perform, making them ecologically significant.

Both studies confirm the high sensitivity of *Daphnia magna* and *Lemna minor* to heavy metals. The results demonstrate that the toxicity of metal ion mixtures can differ significantly from the additive effect of individual ions, manifesting as either synergistic or antagonistic, depending on the combination of metals and concentrations. This underscores the need for further research to more accurately predict the toxic effects of heavy metal mixtures on aquatic

ecosystems. Both *Daphnia magna* and *Lemna minor* have shown their suitability as bioindicators for assessing water quality and monitoring heavy metal pollution. The obtained data can be used to develop more effective water quality monitoring and management strategies.

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EVALUATION OF OCCUPATIONAL RADIOLOGICAL EXPOSURES DUE TO NATURALLY OCCURRING RADIOACTIVE MATERIALS IN PHOSPHATE MINING: A CASE FOR DOROWA MINE, ZIMBABWE

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Phosphate mining has been identified as a significant source of naturally occurring radioactive materials (NORM) due to the naturally high levels of radionuclides in phosphate ore. This study evaluated occupational radiological exposures at the Dorowa Mine, Zimbabwe, which is one of the largest phosphate mines in the country. The Dorowa Mine was specifically chosen because it employed a large number of workers who were at risk of exposure to elevated radiation levels. Additionally, the mine produced by-products, including phosphate fertilizers, which are pivotal to the agricultural sector—a cornerstone of Zimbabwe's economy. In the vicinity of the mine, human settlements and nearby water bodies used for domestic purposes by the inhabitants and livestock further amplified the importance of radiation safety measures.

This study assessed radiation exposure levels among workers, considered the radiological effects on the surrounding community and environment, and explored the necessary measures to enhance safety protocols and regulatory frameworks. A high-purity germanium (HPGe) detector was used in gamma spectroscopy to precisely measure the activity concentrations of radionuclides of interest, including uranium-238 (^{238}U), thorium-232 (^{232}Th), and potassium-40 (^{40}K). Environmental sampling was conducted to determine radiation levels in phosphate ore, by-products, and the surrounding environment. In addition, dose rate measurements were taken to assess the external exposure risks for workers and the nearby community.

The findings underlined the importance of enhanced radiation safety management practices in phosphate mining, advocating for improved regulatory frameworks, continuous monitoring, and targeted safety measures to ensure worker and community safety and compliance with international radiation protection standards. The findings were intended to assist stakeholders in making informed decisions on the appropriate controls needed to protect both human health and the environment.

EPIDEMIOLOGICAL ANALYSIS OF INCIDENCE OF MALIGNANT NEOPLASMS OF PANCREAS IN POPULATION OF THE REPUBLIC OF BELARUS

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Pancreatic cancer ranks third in the structure of malignant tumors of the digestive system, surpassed in frequency only by stomach cancer and colorectal cancer. Among the causes of death from oncological diseases, it ranks fourth in men and fifth in women. Pancreatic tumors are most often registered in individuals over 60. Men are 1.5 times more likely to suffer from this disease than women. In 95% of patients with pancreatic adenocarcinoma, a mutation in one gene from the K-ras family is detected among all known oncogenes that control cell growth [2]. Such a high mutation rate has not been previously identified in any other type of malignant tumor.

Keywords: pancreas, cystic tumor, neuroendocrine tumor, incidence, complications, mortality, lethality, trend, prognostic index.

The aim of this study was to assess the incidence and mortality rates due to pancreatic cancer among the population of the Republic of Belarus during the period of 2016-2021. The analysis of pancreatic cancer incidence (PCI) in the population of the Republic of Belarus from 2016 to 2021 revealed an unstable upward trend ($R^2 = 0.267$). The average annual incidence rate of pancreatic cancer among both sexes (A0) was 12.43 cases per 100,000 population. In 2021, the proportion of pancreatic cancer in the structure of malignant neoplasms among men was 2.7%, and among women – 2.2%. During the observation period, the extensive incidence rate increased in both men and women. Differences in the incidence of pancreatic cancer by gender were noted. The incidence of men was on average 1.4 times higher than that of women. The average annual incidence rate of pancreatic cancer among men (A0) was 14.38 cases per 100,000 male population, with an annual trend rate (A1) of 0.18 per 100,000 population. The average annual incidence rate of pancreatic cancer among women (A0) was 10.75 cases per 100,000 female population, with an annual trend rate (A1) of 0.24 per 100,000 population. On average, the annual increase in incidence among men was 2.1%, while among women it was 2.2%.

The age structure of incidence shows that PCI predominantly affects people over 60. In the age group 80-85, the incidence reached its maximum values — in 2020, 594 cases per 100,000 population were registered, marking the peak of incidence for the entire study period. The incidence rate for men in this age group reached 575 per 100,000 population in 2020, while for women it was 467 cases. In younger age groups (under 30), the disease was extremely rare: the incidence ranged from 0 to 0.4 cases per 100,000 population. The analysis of the dynamics of working-age population incidence revealed the same trends as identified in the overall pancreatic cancer incidence dynamics and differentiated by gender.

The analysis of pancreatic cancer mortality showed its increase from 2016 to 2021. Among men, mortality increased from 11.2 to 13.9 cases per 100,000 population, equivalent to a 15% increase ($R^2 = 0.75$). Among women, mortality increased from 7.7 to 12.6 cases per 100,000 population — a 64% increase ($R^2 = 0.33$). The average annual mortality growth rate was 2.3% for men and 3.3% for women. Pancreatic cancer accounted for an average of 5.1% of cancer deaths in men and 6.0% in women during the observation period in the Republic of Belarus.

A prognostic index, reflecting the probability of death from pancreatic cancer, was calculated. The closer its value is to one, the worse the prognosis for this localization. The prognostic index for pancreatic cancer in the studied years was above 0.8, indicating a poor prognosis for this type of cancer (more than 0.5) [1].

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THE CORRELATIONS OF LEAD LEVELS IN THE KIDNEYS WITH HEAVY METALS IN THE ORGANS OF ROMANOV SHEEP

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One of the most important tasks for monitoring the ecological and physiological status of animals is to study the relationship between lead concentration in sheep's kidneys and other heavy metals in organs and tissues. A correlation was found between the Pb content in the kidneys and levels in the lungs and heart, as well as antagonism with arsenic in lung tissue. It was observed that changes in Pb levels in kidneys affect its concentration in testicles. For environmental monitoring and product safety, a minimally invasive method for measuring lead levels in sheep kidneys has been developed.

Keywords: elemental status, lead, sheep, Romanov breed, correlation, biological marker.

The relationship of heavy metals within and between organs and tissues in both healthy and sick animals is an important and unexplored issue in the chemistry of agricultural animals [1].

The objective of the study was to investigate the correlations between lead concentrations in the kidneys and concentrations of Cd, Pb, As, Cu, and Zn in the wool, muscles, heart, liver, kidneys, lungs and testes. The content of heavy metals was determined by atomic emission and absorption spectrometry.

The analysis of the content of Cd, Pb, As, Cu, Zn, Mo, Ni, Sr and other metals in soil, water and feed was conducted in the area of sheep zoning in Kuzbass. It was found that the concentrations of heavy metals in the studied samples did not exceed the MPC [2, 3]. After the slaughter of healthy animals, the content of toxicants and essential elements was studied in 120 samples. Among 45 correlating features, six significantly positive or negative relationships were revealed. It was shown that the level of lead in the kidneys correlated with its content in the lungs ($r=0.523\pm0.182$; $P < 0.01$) and the heart ($r=0.604\pm0.170$; $P < 0.01$). There is an antagonism between the concentration of Pb in the kidneys and As in the lungs ($r= -0.501\pm0.185$; $P < 0.05$). An increase or decrease in the level of lead in the kidneys leads to a decrease or increase in its level in the testes. A method that is minimally invasive for determining the level of Pb in sheep kidneys throughout their lifespan has been developed, thereby enabling the production of safe products and their utilization in environmental monitoring [4].

It is important to understand the relationship between heavy metals in the organs and tissues of healthy animals in order to study changes in correlations during animal diseases or their breeding under other environmental condition. It should be assumed that, in different environmental conditions, the magnitude and direction of the bonds between metals may vary. The research was funded by the Russian Science Foundation (Project No. 24-26-00136).

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SECTION 4

MODERN APPROACHES AND METHODS TO THE STUDY OF BIOMOLECULES

INFLUENCE OF TEMPERATURE ON BAND GAP VARIATION OF 2,4-DI-TERT-BUTYL-6-MORPHOLINOPHENOL MOLECULE

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In this work influence of temperature on 2,4-di-tert-butyl-6-morpholinophenol (figure 1) antioxidant properties has been studied. Calculations with molecular mechanics method MM2 of ChemBioOffice 2016 program package for quantum chemical modelling have been done.

Keywords: band gap, antioxidant properties, HOMO, LUMO

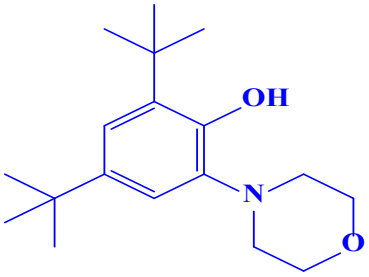

Fig. 1 - 2,4-di-tert-butyl-6-morpholinophenol

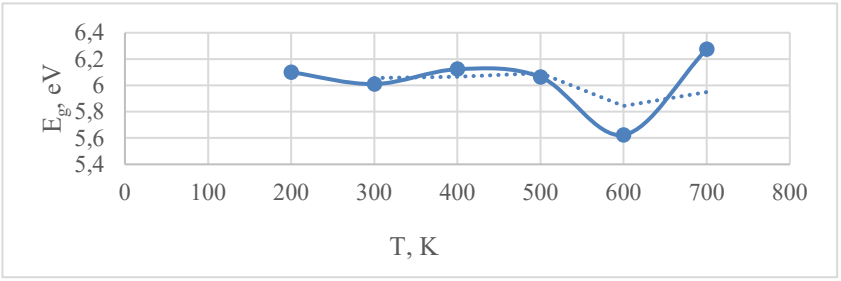

Fig. 2 – Band gap dependency on temperature

Table

Temperature, K	Total energy, kcal/mol	E_{LUMO}, eV	E_{HOMO}, eV	Eg, eV
200.0	39.9157	1.991	-8.011	6.100
300.0	42.8963	2.037	-8.047	6.010
400.0	42.0665	1.836	-7.959	6.123
500.0	43.7307	1.928	-7.991	6.063
600.0	40.3748	1.846	-7.470	5.624
700.0	41.4907	1.832	-8.107	6.275

Data from table 1 and figure 2 show that band gap value is lowest at 600.0 K, which suggests amplification of molecule's antioxidant properties. Rise of total energy value is followed by 2,4-di-tert-butyl-6-morpholinophenol biological activity decrease. Thus, the lowest biological activity value is recorded at temperature of 500 K.

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CALCULATION OF THE ELECTRICAL PROPERTIES OF MOLECULES 2-ETHOXY-4-FORMYLPHENYL (3AR,6S,7R, 7AR)-2-METHYL-1-OXO-1,2,3,6,7,7A-HEXAHYDRO-3A, 6-EPOXYISOINDOLE-7-CARBOXYLATE И 5-FORMYL-2-METHOXYPHENYL (6AR, 7R)-6-0X0-3,4,6,6A, 7,8-HEXAHYDRO-2H, 106H-8,10A-EPOXY [1,3] OXAZINO[2,3-A] LISOINDOLE-7-CARBOXYLATE

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In this work the electrical properties of the 2-ethoxy-4-formylphenyl (3aR,6S,7R, 7aR)-2-methyl-1-oxo-1,2,3,6,7,7a-hexahydro-3a, 6-epoxyisoindole-7-carboxylate (figure 1) and 5-formyl-2-methoxyphenyl (6aR, 7R)-6-0x0-3,4,6,6a, 7,8-hexahydro-2H, 106H-8,10a-epoxy [1,3] oxazino [2,3-a] lisoindole-7-carboxylate (figure 2). Calculations with molecular mechanics method MM2 of ChemBioOffice 2016 program package for quantum chemical modelling have been done.

Keywords: Ionization potential, total hardness, HOMO, LUMO

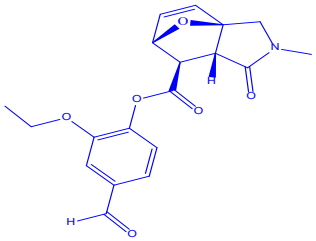

Fig. 1 - 2-ethoxy-4-formylphenyl (3aR,6S,7R, 7aR)-2-methyl-1-oxo-1,2,3,6,7,7a-hexahydro-3a, 6-epoxyisoindole-7-carboxylate

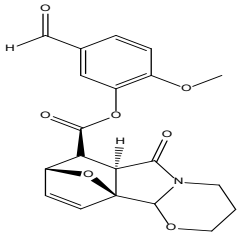

Fig. 2 - 5-formyl-2-methoxyphenyl (6aR, 7R)-6-0x0-3,4,6,6a, 7,8-hexahydro-2H, 106H-8,10a-epoxy [1,3] oxazino [2,3-a] lisoindole-7-carboxylate

Table

Number	E_{LUMO}, eV	E_{HOMO}, eV	IP, eV	EA, eV	η, eV	S, eV^{-1}	μ, eV	ω, eV	ω^+, eV	ω^-, eV
1	0,202	-0,258	0,258	-0,202	0,230	2,174	-0,230	0,006	0,017	0,045
2	0,182	-0,248	0,248	-0,182	0,215	2,326	-0,215	0,005	0,013	0,046

Ionization potential (IP) shows the amount of energy required to remove an electron from a molecule. Electron affinity (EA) is described as the energy released when a proton is added to the system: IP = - E_{HOMO}; EA = - E_{LUMO}. Total hardness (η) can be determined using the equation: η = (IP - EA) / 2. Chemical softness (S) - is a measure of the ability of an atom or group of atoms to accept electrons. It is estimated by the formula: S = 1 / η. Electronic chemical potential (μ) calculated by the formula: μ = -(IP + EA) / 2. The electrophilicity index (ω) - is a measure of stabilization of systems when they are saturated with electrons, it corresponds to the equation: ω = μ2 / 2η. A strong nucleophile is characterized by a lower μ, ω value, and a strong electrophile is characterized by a high μ, ω value. Thus, the molecule 2-ethoxy-4-formylphenyl (3aR,6S,7R, 7aR)-2-methyl-1-oxo-1,2,3,6,7,7a-hexahydro-3a, 6-epoxyisoindole-7-carboxylate is a strong electrophile and 5-formyl-2-methoxyphenyl (6aR, 7R)-6-0x0-3,4,6,6a, 7,8-hexahydro-2H, 106H-8,10a-epoxy [1,3] oxazino [2,3-a] lisoindole-7-carboxylate weak, accordingly.

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ANALYSIS OF THE PHARMACOKINETIC CAPABILITIES OF METHYL-3'-FORMYL-4'-HYDROXY[1,1'-BIPHENYL]-4-CARBOXYLATE AS A PROMISING DRUG FOR THE TREATMENT OF PARKINSON'S DISEASE

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The docking between epoxysoindole derrivatives and 5CGJ (PDB ID) protein gave the reasons for further research on practical use of Methyl-3'-formyl-4'-hydroxy[1,1'-biphenyl]-4-carboxylate as a promising ligand in the complex of treatment of Parkinson's disease.

Keywords: pharmacokinetics, druglikness, 5CGJ

Methyl-3'-formyl-4'-hydroxy[1,1'-biphenyl]-4-carboxylate inhibits (more than 90% probability) serine/threonine protein kinase, an ER signaling protein that is responsible for apoptosis. It also can conduct both nuclear and cytosolic reactions, associate with Induced myeloid leukemia cell differentiation protein Mcl-1, that regulate the apoptotic directions. As can be seen from the diagram, it has an enzymatic and nuclear receptor functional capacity. It has no Lipinsky violations, high druglikness, Consensus Log Po/w=2.61, high gastro-intestinal absobtion, the blood-brain barrier permeation.

As a result, methyl-3'-formyl-4'-hydroxy[1,1'-biphenyl]-4-carboxylate is highly selective, has the pharmacokinetics necessary for the drug, and is successfully metabolized (Fig. 1,2). Moreover, we have revealed that Methyl-3'-formyl-4'-hydroxy[1,1'-biphenyl]-4-carboxylate acts as a ligand in relation to Parkinsonian protein with ID: 5CGJ. So it is a perspective drug for Parkinson’s disease treatment.

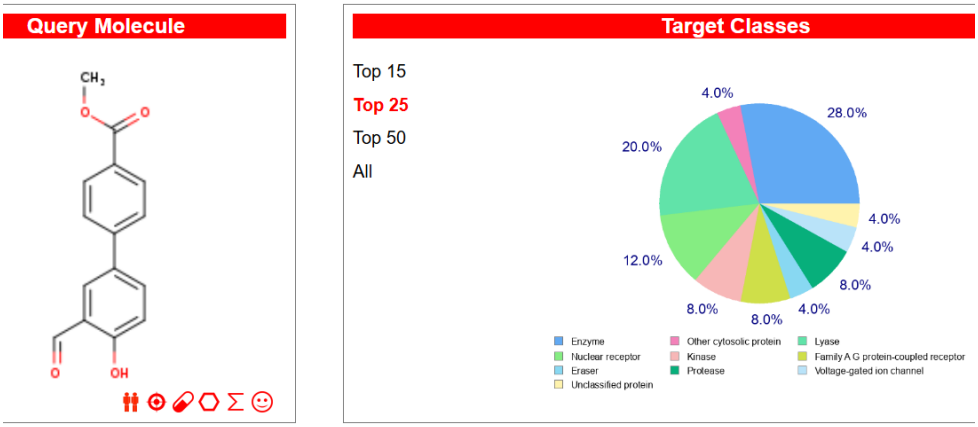

Fig. 1 - Methyl-3'-formyl-4'-hydroxy[1,1'-biphenyl]-4-carboxylate target classes. The enzymes and nuclear receptor are the main classes of the drug.

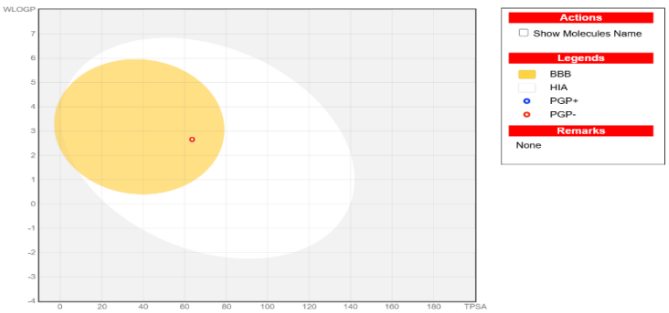

Fig. 2 - Boiled-egg diagram shows a high selectivity of Methyl-3'-formyl-4'-hydroxy[1,1'-biphenyl]-4-carboxylate and BBB-transmition

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BIOLOGICAL ACTIVITY OF BATRACHOTOXIN MOLECULE

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In this work, the biological activity of Batrachotoxin (BTX) molecule was investigated using the semi-empirical quantum chemistry method PM6 of Gaussian 09 W software package. Molecular modeling has become an essential component of almost any research in chemistry, biochemistry and biology in the last decades [1-4]. BTX is an alkaloid steroidal toxin found in the exudate from the skin of poison frogs, which have a wide distribution in Central and South America, and in the feathers and skin of birds of the genus Pitohui living in New Guinea. Batrachotoxin currently has no clinical use.

Keywords: batrachotoxin, biological activity, semi-empirical method.

The following formulas indicating the electrical and biological properties of substances were used to evaluate the biological activity:

- ionization potential IP = - E_{HOMO}, (eV);
- electron affinity EA = - E_{LUMO}, (eV);
- global rigidity ŋ = (IP - EA)/2, (eV);
- electronegativity μ = - (IP + EA)/2, (eV);
- electrophilic index ω = μ^2/2 ŋ, (eV);
- electron-donating ability of the molecule ω- = $(3IP + EA)^2$/16(IP - EA), (eV);
- electron-accepting ability of the molecule ω+ = $(IP + 3EA)^2$/16(IP - EA), (eV);
- chemical softness S = 1/(2ŋ), (eV);
- forbidden zone width Eg = E_{HOMO} - E_{LUMO}, (eV) [2,3].

Table

Biological properties of BTX molecule

Connection	IP, eV	EA eV	ŋ, eV	μ, eV	ω, eV	ω^-, eV	ω^+, eV	S, eV	E_g, eV
BTX	-0,0015	0,3113	-0,3128	0,1549	-0,0384	-0,0188	-0,1737	-1,5986	0,3128

According to the obtained data, it can be concluded that the BTX molecule has a very high biological activity, including antioxidant activity [3], as evidenced by the value of the forbidden band width equal to 0.3128 eV (Table).

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SYNTHESIS OF 5′-AMINO-5′-DEOXYTHYMIDINE CONJUGATES

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The aim of the present work is synthesis of conjugates of aromatic ligands with 5'-amino-5'-deoxythymidine (2a-c).

Keywords: pyrimidine nucleosides, 5'-amino-5'-deoxythymidine, conjugates, nitrile-containing ligands.

The important role of nucleosides in a functioning cell suggests that the introduction of their modified analogs into the cell may lead to changes in the functioning of the system of nucleic acid metabolism enzymes, which will affect the processes of proliferation and differentiation of both normal and degenerated cells [1].

Currently, a variety of nucleoside and nucleotide analogs are known, which have a wide range of biological activity and have fragments of various biomolecules in their structure [2, 3]. The development of such hybrid molecules makes it possible to improve the pharmacokinetic or pharmacodynamic parameters of existing nucleosides and nucleotides or to give them completely new properties.

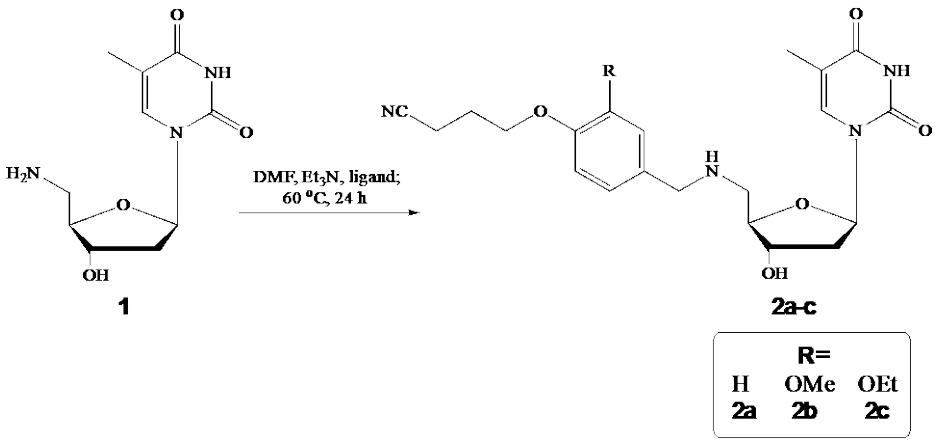

Fig.1 – Scheme for the synthesis of 5'-amino-5'-deoxythymidine conjugates

Synthesis of compounds **2a-c** was carried out according to the scheme indicated above (Figure 1). The reaction process was monitored by thin layer chromatography (TLC) on "Kieselgel 60 F254" plates "Merck" (Germany) in the solvent system: chloroform/methanol (5:1 vol/vol). The isolation of compounds 2a-c was carried out by column chromatography on 60 H silica gel. The structure of the synthesized compounds was confirmed by NMR spectroscopy and mass spectrometry.

5'-Amino-5'-deoxythymidine obtained by the Appel reaction [4] followed by Staudinger reduction [5], were used to prepare conjugates with various aryl substituents. The synthesis was carried out under weakly basic conditions under heating. Compounds 2a-c were isolated in 75-80% yield. The obtained compounds are planned to be used to evaluate their antiproliferative activity *in vitro*.

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HOMO AND LUMO ENERGY STUDY OF 1,8-DIHYDROXY-3-(HYDROXYMETHYL)ANTHRACENE-9,10-DIONE

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This article is devoted to the investigation of HOMO and LUMO energies of the 1,8-dihydroxy-3-(hydroxymethyl)anthracene-9,10-dione (Aloe-emodin) molecule.

Keywords: quantum-chemical modelling, antioxidant, Aloe emodin.

Aloe-emodin (1,8-dihydroxy-3-(hydroxymethyl)anthracene-9,10-dione) (AE), a naturally occurring anthraquinone derivative, is one of the major active constituents found in various herbs such as Cassia occidentalis, rhubarb palmatum, aloe vera and multiflowered mountaineer. AE was found to possess a diverse spectrum of pharmacological effects including anticancer, antiviral, antioxidant, anti-inflammatory, antibacterial, and neuroprotective and hepatoprotective properties [1]. In this work, we used the MM2 method of the quantum-chemical modelling software package ChemBioOffice 2016 (table 1, 2).

Table 1

HOMO and LUMO molecules of Aloe emodin

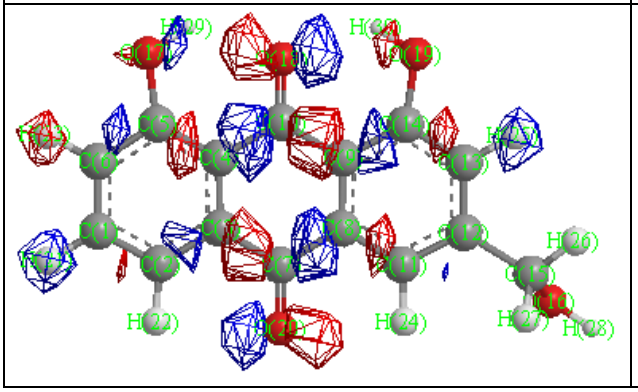
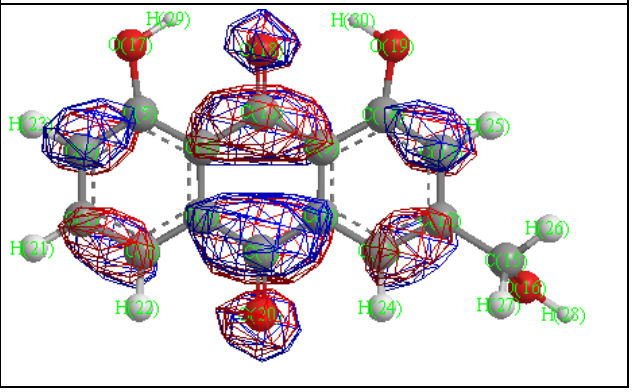
HOMO	LUMO
	

Table 2

Physicochemical properties of the Aloe-emodin molecule

E_T, kcal/mol	E_{HOMO}, eV	E_{LUMO}, eV	E_g, eV
20,5988	-9,317	-7,509	1,808

The data presented in the table and picture indicate that the Aloe emodin molecule is thermodynamically unstable molecule and cannot exist in free form under standard conditions, but it has high antioxidant activity.

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QUANTUM-MECHANICAL SIMULATION OF TOCOPHEROL AND NITAZOXANIDE

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This article discusses the results of quantum chemical modeling of 2-[(5-nitro-1,3-thiazole-2-yl)carbomoyl]phenyl acetate (nitazoxanide) and RRR-α-tocopherol (vitamin E), conducted using the chemical packages ChemOffice 2016, by the molecular mechanics method MM2.

Keywords: nicotine, varenicline, quantum chemical modeling.

Currently, antioxidants play an important role in maintaining human health. The use of these substances can prevent many diseases and effects on the body. Nitazoxanide and tocopherol are among such drugs [1-2]. Understanding the mechanism of nitazoxanide in the human body at the molecular level is a key factor for understanding its antioxidant properties (tables 1, 2).

Table 1

Structure and physicochemical properties of the tocopherol calculated by method MM2

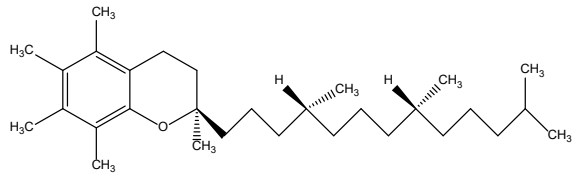
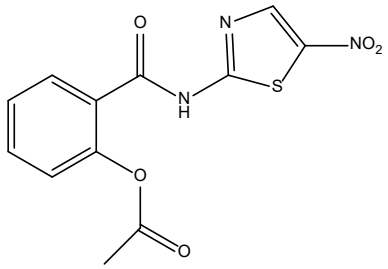
Structure	E_T, kcal/mol	E_{HOMO}, eV	E_{LUMO}, eV	E_g, eV
	28.4418	-11.225	1.415	12.64

Table 2

Structure and physicochemical properties of the nitazoxanide calculated by method MM2

Structure	E_T, kcal/mol	E_{HOMO}, eV	E_{LUMO}, eV	E_g, eV
	25.5871	-8.290	-2.780	-11.07

The data obtained in Tables 1,2 indicate that the nitazoxanide molecule is thermodynamically more stable compared to tocopherol and its band gap is -11.07 eV, which indicates its higher antioxidant activity.

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CONFORMATIONAL THEOBROMINE ANALYSIS

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This paper discusses the results of conformational analysis of theobromine carried out using the ChemOffice 2016 chemistry package by the MM2 molecular mechanics method.

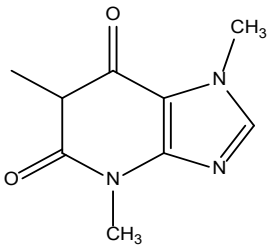
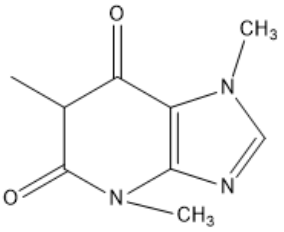
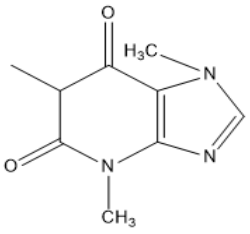
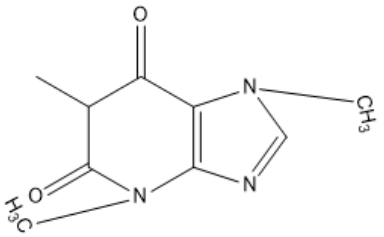
Keywords: theobromine, conformational analysis, quantum-chemical modeling.

Theobromine ($C_7H_8N_4O_2$) – is a bioactive compound from the group of methylxanthines. Widely distributed in the world, the richest sources are cocoa beans, tea leaves and some types of coffee beans [1,2]. In medicine, preparations containing theobromine are used to treat respiratory diseases. In addition, experimental studies have shown that theobromine is able to excite the heart muscle for therapeutic purposes, as well as provoke an increase in the amount of urine like caffeine. Theobromine is also used in the manufacture of toothpastes to strengthen enamel.

We found 4 most probable conformations of Theobromine molecule according to the values of total energy of the molecule (E_T).

Table

Conformational analysis of Theobromine by MM2 method

Condition	Theobromine	E_T, kcal/mol
1		25.3859
2		188.3421
3		166.7724
4		266.6378

The data shown in the table indicate that configuration 1 is thermodynamically more stable than the others are and has a total energy value of 25.3859 kcal/mol.

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ANALYSIS OF HUMO AND LUMO ZONES OF CHALCON DERIVATIVES

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This article discusses the analysis of HOMO and LUMO zones of chalcon derivatives.

Keywords: HOMO and LUMO zones, chalcon derivatives, quantum chemical modeling.

Chalcones are organic compounds that are widely used in the pharmaceutical, agricultural, and materials science fields. Their biological activity, including anti-inflammatory, antibacterial, and antitumor properties, is due to the electronic properties of the molecule [1]. Analysis of the HOMO (highest occupied molecular orbital) and LUMO (lowest free molecular orbital) chalcone bands and its derivatives allows us to obtain information about the reactivity of a molecule and predict its interaction with other molecules.

To analyze the HOMO and LUMO bands of chalcon derivativesхалконов, quantum chemical methods are used, such as Density Functional Theory (DFT), which allows us to calculate HOMO and LUMO energies, electron density, and molecular orbitals [2].

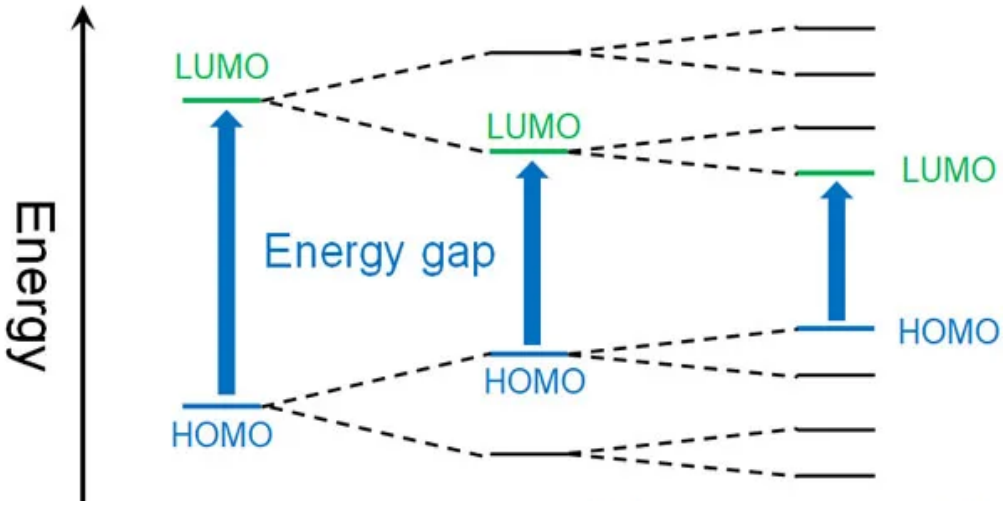

Fig. 1 – HUMO and LUMO zones

The energy difference between HOMO and LUMO – is key to understanding the reactivity of halcons. Ifм the gapis large, the molecule will be less reactive, and if it is small, it will tend to interact with other molecules.

HOMO and LUMO are also related to the biological activity of chalcons. When interacting with a target (for example, a protein), the chalcyon HOMO can "share" electrons with the target's LUMO. This exchange of electrons can activate or inhibit certain processes in the body.

The study of HOMO and LUMO zones of chalcon derivatives is the key to the development of new drugs, as well as to the creation of new materials with unique properties [2].

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QUANTUM-MECHANICAL SIMULATION OF NICOTINE AND ITS AGONIST VARENICLINE

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This article discusses the results of quantum chemical modeling of 3-(1-methylpyrrolidin-2-yl)pyridine (nicotine) and its agonist 6,10-methano-6H-pyrazino[2,3-h][3]benzazepine (varenicline) carried out using the chemical packages ChemOffice 2016, Gaussian 09W and GaussView 5.0 using the molecular mechanics method MM2 and the semi-empirical method AM1.

Keywords: nicotine, varenicline, quantum chemical modeling.

Today, nicotine addiction is a serious problem affecting millions of people worldwide. The development of effective drugs for the treatment of nicotine addiction is a pressing issue. Varenicline, a partial agonist of the α4β2 nicotinic receptor, is one such drug [1-2]. Understanding the mechanism of action of varenicline in the body at the molecular level is key to understanding its pharmacological properties (Tables 1, 2).

Table 1

Structure and physicochemical properties of the nicotine calculated by method AM1

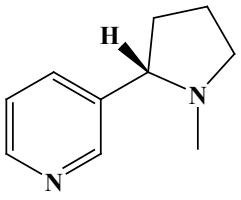
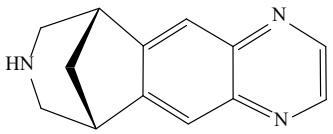
Structure	E_T, kcal/mol	E_{HOMO}, eV	E_{LUMO}, eV	E_g, eV
	23.1955	-0.33969	0.00891	0.3486

Table 2

Structure and physicochemical properties of the varenicline calculated by method AM1

Structure	E_T, kcal/mol	E_{HOMO}, eV	E_{LUMO}, eV	E_g, eV
	27.0122	-0.33912	-0.02151	0.31761

The data obtained in tables 1 and 2 indicate that the varenicline molecule is thermodynamically more stable compared to nicotine and its band gap is 0.31761 eV, which indicates its higher antioxidant activity.

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ABSORPTION OF THE ANTICANCER DRUG CRIZOTINIB

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The study examines the absorption profile of the anticancer drug crizotinib using the online resource SwissADME.

Keywords: Crizotinib, absorption, anticancer drug.

Crizotinib is an anticancer drug used for the treatment of certain types of non-small cell lung cancer (NSCLC), specifically tumors with mutations in the ALK (anaplastic lymphoma kinase) gene or the ROS1 gene. Crizotinib is a tyrosine kinase inhibitor that blocks the action of these genes, leading to the suppression of tumor cell growth.

This drug is most commonly prescribed to patients with metastatic NSCLC whose organisms are sensitive to other treatments or have specific mutations. Crizotinib can be effective in ALK-mutated cancer, providing improved treatment outcomes and quality of life for patients.

Like any anticancer drug, crizotinib may cause various side effects, including nausea, fatigue, diarrhea, and liver problems. Before starting treatment, it is important to discuss all potential risks and benefits with a doctor.

The study considers the drug's absorption profile using the online resource SwissADME.

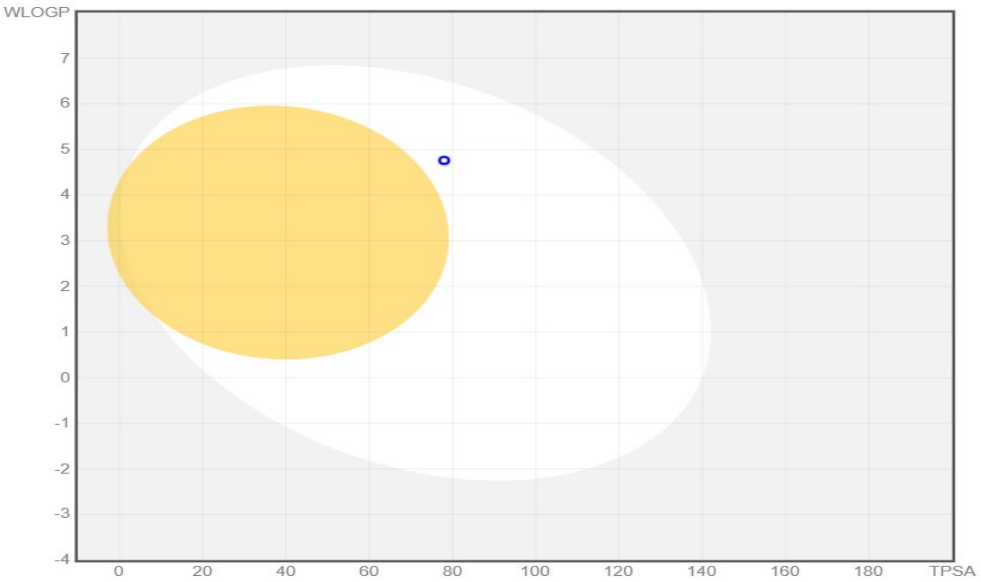

Fig.1 - Absorption Scheme of the Drug

The white area corresponds to a region with a high probability of passive absorption by the gastrointestinal tract, while the yellow area indicates a high probability of brain penetration. The yellow and white areas are not mutually exclusive. Crizotinib is predicted to be well absorbed but not to penetrate the brain.

After absorption, crizotinib is metabolized in the liver by cytochrome P450 enzymes, which can affect its blood levels and interactions with other medications. Therefore, it is important to consider concomitant therapy and the patient's condition when prescribing crizotinib treatment.

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USING ANCESTRAL SEQUENCE RECONSTRUCTION METHOD FOR THE ENGINEERING AND ANALYSIS OF STEROID DEHYDROGENASES

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The aim of this study is to reconstruct the ancestral sequences of the human 3β-hydroxysteroid dehydrogenase (3β-HSD) protein for subsequent analysis of their structure and functional properties. Multiple sequence alignment, phylogenetic tree construction, and ancestral sequence reconstruction were performed. The analysis showed that the obtained ancestral forms possess potential stability and enzymatic activity, which opens up prospects for further research in the field of protein engineering and biotechnology.

Keywords: protein engineering, ancestral sequence reconstruction, 3β-hydroxysteroid dehydrogenase.

The primary goal of protein engineering is to create protein variants suitable for industrial, academic, or medical applications by optimizing the stability and solubility of existing proteins while preserving or enhancing their primary function (e.g., enzymatic activity) and identifying or designing protein sequences that impart new activity or specificity toward a ligand/substrate.

Membrane enzymes, particularly human 3β-hydroxysteroid dehydrogenase (3β-HSD), play a key role in metabolic processes, and their study is of great importance for medicine and biotechnology. Ancestral sequence reconstruction is an innovative technology that can be used to develop new drugs and diagnostic methods.

Ancestral sequence reconstruction (ASR) has become a valuable tool in protein engineering, as ancestral proteins often exhibit desirable characteristics, including increased thermostability or unique activity profiles. Furthermore, by comparing the structure and function of modern proteins with ancestral intermediates, ASR highlights functionally important substitutions and can thus serve as a foundation for the rational design of new variants. Ancestral forms are reconstructed by inferring phylogenetic relationships between modern homologs and applying a statistical model of amino acid substitutions to calculate sequences at the internal nodes of a phylogenetic tree [1, 2].

The search for sequences homologous to the target 3β-HSD sequence was conducted using the Basic Local Alignment Search Tool (BLAST) provided by the National Library of Medicine, USA.

The following selection criteria were applied: homology with the native human 3β-HSD sequence ranging from 40% to 100%, exclusion of duplicate sequences, as well as the elimination of all low-quality sequences and synthetic constructs. Additionally, sequences containing unread clusters (X) during sequencing were removed, and individual unread amino acids were replaced using a pattern search method. As a result, a dataset comprising 1,096 sequences was obtained for further analysis.

Multiple sequence alignment was performed using the "mafft" software package for Linux Terminal [3]. The construction of the phylogenetic tree was carried out using the "FastTree" package for Linux Terminal [4]. The direct reconstruction of ancestral sequences was performed using the web service "Graphical Representation of Ancestral Sequence Predictions" (GRASPs) provided by The University of Queensland, Australia [5]. As a result of the reconstruction, a phylogenetic tree with an identifier for each branch was obtained, along with 1,091 sequences, each corresponding to a branch of the tree.

The ancestral sequences were analyzed using several approaches. Structural and functional predictions of the theoretical proteins were carried out using the "I-TASSER" web service (Zhang Lab, USA [6]). Physicochemical parameters, such as amino acid composition and the instability index of the theoretical proteins, were determined using the "ProtParam" service (Swiss Institute of Bioinformatics, Switzerland [7]). The search for N-glycosylation sites was conducted using the "NetNGlyc-1.0" web service (Department of Health Technology, Denmark [8]).

Seven potentially stable sequences were selected on the branches corresponding to the evolutionary pathway of the native 3β-HSD sequence. These sequences were further analyzed for their physicochemical properties, presence of glycosylation sites, homology with modern sequences (table 1), as well as their predicted structural and functional properties.

Table

Physicochemical Properties of the Reconstructed Sequences

Sequence	Instability index (II)	Cysteine count	N-glycosylation sites	Homology
3β-HSD *Homo sapiens*	39,87	5	N52, N269	–
N86	39,17	8	111NVTG	99,2% *Aves*
N228	37,83	9	104NVTG	96% *Aves*
N270	39,41	4	–	75,7% *Aves*

N272	39,14	4	–	82,8% *Mammalia*
N280	39,60	6	269NYTL	87,7% *Mammalia*
N332	36,61	6	267NYTL	80% *Mammalia*
N337	34,24	6	269NYTL	90,4% *Primates*

Due to the reconstruction of the possible structures and properties of the recovered protein sequences, it can be noted that each of them is stable (II < 40), possesses a cofactor-binding site, and has potential enzymatic activity, making them potentially interesting for further research.

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EMERGING ISSUES AND STRATEGIES USED IN THE DEVELOPMENT OF NEW ANTIMICROBIAL DRUGS

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Antibiotics are effective in treating diseases caused by bacterial infections, however, the overuse and even abuse of antibiotics in the past few decades has led to the gradual development of bacteria from drug-sensitive to drug-resistant.

Keywords: antibiotics, antibiotic resistance, bacteria.

The growing problem of bacterial drug resistance poses a serious challenge to public health and medicine worldwide. Infections with drug-resistant bacteria have multiple adverse effects on patients, including prolonged hospital stays, increased healthcare costs, and improved mortality rates. In addition, drug-resistant bacteria limit the choice of treatment options, making it difficult to treat some common bacterial infections properly. In 2017 the WHO published a list of 12 drug-resistant bacteria that pose the greatest threat to human health, which are considered to be one of the most pressing antibiotic resistance problems globally [1].

Bacterial resistance mechanisms are very complex and different types of bacteria may adopt different resistance mechanisms or have multiple resistance mechanisms at the same time. Common bacterial drug resistance mechanisms mainly include[2]:

1) Production of drug-degrading or inactivating enzymes to break down or inactivate the drug;

2) Blocking drug binding by altering the structure of the drug target;

3) Overexpression of exocytosis pumps, which pump drugs out of the bacterium through cell-active exocytosis, reducing the intracellular concentration of antimicrobial drugs;

4) Altering cell permeability and limiting drug penetration into the cell by changing the structure and composition of the cell wall or cell membrane;

5) Blocking drug penetration by secreting extracellular polysaccharide protein complexes and forming periplasm.

Nowadays, anti-resistant bacterial drugs are mainly classified into the following categories: β-lactam antibiotics, tetracycline antibiotics, glycopeptide antibiotics, quinolone antimicrobials, and oxazolidinone antimicrobials, all of which are facing the challenge of antibiotic resistance.

Currently, the following strategies could be used to develop new antimicrobial agents against multidrug-resistant bacteria:

1) Using high-throughput screening to discover antimicrobial drugs with novel mechanisms of action, targets and chemical structures;

2) Modifying the chemical structure of existing antibacterial drugs to make them more active and stable;

3) To search for substances that can enhance and protect the performance of antimicrobial drugs and at the same time enhance the body's defence function and reduce the pathogenicity of microorganisms;

4) Interfering with bacterial genetic mechanisms, inhibiting the expression of drug-resistant genes or promoting their elimination, thus reducing bacterial resistance to antibiotics.

Since the introduction of antibiotics, the mortality rate of infectious diseases has been greatly reduced, and there is still a need for further in-depth research on the mechanism of reversing bacterial resistance, in order to develop more new and effective antibacterial drugs against drug-resistant bacteria at an early date.

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STUDIES ON THE INHIBITORY ACTIVITY OF NEW COMPOUNDS AGAINST 3HNR IN MAGNAPORTHE GRISEAS

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This article presents an analysis of the inhibitory activity of new compounds on 3HNR obtained by virtual screening method.

Keywords: Magnaporthe grisea, 3HNR, Molecular Docking.

Magnaporthe grisea, also known as rice blast fungus, rice rotten neck, rice seedling blight, blast of rice, oval leaf spot of graminea, pitting disease, ryegrass blast, Johnson spot, neck blast, wheat blast and Imochi is a plant-pathogenic fungus and model organism that causes a serious disease affecting rice. *Magnaporthe grisea* mainly forms an appressorium that infects rice leaves, stalks and other parts of the rice, resulting in yield loss. It has been reported that rice yields are reduced by as much as 30% annually due to *Magnaporthe grisea*.

Currently, melanin biosynthesis inhibitors (MBIs) are commonly used in the control of rice blast, and MBIs prevent further infestation of plants by inhibiting melanin production in the adherent spores of *Magnaporthe grisea* [1]. 1,3,8-trihydroxynaphthalene reductase (3HNR) plays an important role in melanin formation and is a promising target for MBIs [2].

There are few reports on MBIs, and representative commercialised agents include tricyclazole, pyroquilon and phthalide [3]. Based on the 3HNR crystal structure information (from RCSB Protein Data Bank PDB ID: 1G0N), we obtained (E)-(2-nitrovinyl)benzene (**1**) by virtual screening, from which we designed (Z)-3-(1-hydroxy-2-nitrovinyl)benzonitrile (**2**) and (Z)-3-(1-bromo-2-nitrovinyl)benzonitrile (**3**) compounds. The binding energy values by molecular virtual docking were compared with the now commercially available Tricyclazole (**4**).

The analysis of inhibitory activities of mentioned compounds on 3HNR were carried out with reference to the literature methods [4] . Inhibition curves were plotted with the concentration of the compounds as the horizontal coordinate and the corresponding inhibition rate as the vertical coordinate to calculate the inhibition rate *(I_1 /%*) of the compounds. All the Molecular Docking calculations were run on PyMOL 2.2.0 and AutoDockTools 1.5.7. Molecule of Tricyclazole was used as a control agent.

Table

Inhibitory activity of target compounds against *Magnaporthe grisea* 3HNR

Compound	3HNR IC_{50}/(μmol/L)	Binding Energy(kcal/mol)
1	3.8	-4.36
2	2.8	-5.73
3	0.52	-6.13
4	0.32	-6.19

From the obtained data, we can conclude that compound 3 showed the best inhibitory activity (IC_{50} = 0.52 μmol/L, Binding Energy = -6.13), which was similar to Tricyclazole. The results of molecular docking method showed that the bromine atom in compound 3 could form hydrogen bond with the hydroxyl groups of Tyr223 and Tyr178 in 3HNR, which explained the better inhibition effect of compound 3 on 3HNR.

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APPLICATION OF DRUG DISCOVERY METHODS BASED ON THE STRUCTURE OF PROTEINS

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This paper discusses protein structure-based drug design (SBDD) and introduces the application of virtual screening, protein - ligand docking techniques and AI in drug discovery.

Keywords: structure-based drug design, artificial intelligence.

SBDD is mainly used to analyse three-dimensional structural information of macromolecules, usually proteins or nucleic acids, in order to identify key sites and interactions that are important for their respective biological functions. This information is then used to design antimicrobial drugs that competitively bind to the target, thereby interrupting

biological pathways essential for microbial survival. SBDD can be divided into 2 types: The De novo and virtual screening (VS).

The De novo use information from the 3D receptor to discover small fragments that are good matches for the binding site, which are then joined according to appropriate joining rules to produce a structurally novel and synthesisable ligand that can be used for further screening. Boibessot designed a series of thiophene derivatives that inhibit bacterial histidine kinase (HK) based on this approach [1].

VS is a rapid and inexpensive method using small molecule libraries (table) to identify compounds with specific biological activities that replace existing ligands of a target biomolecule, or to discover compounds with unexplored known targets with usable structural information. Gudzera used a VS approach to screen for molecular inhibitors of leucyl-tRNA synthetase (LeuRS) in Mycobacterium tuberculosis [2].

The application of AI technology in the field of new drug research and development runs through the whole process of new drug research, which can discover new targets and predict the structure of biomolecules(Protein modeling software in *Table 1*), effectively assisting the drug discovery of complex biomolecule complexes, and has good potential for use in molecular design, virtual screening and compound optimisation. Zhang investigated virtual screening performance using AlphaFold structures in the place of experimental structures. AlphaFold3 is capable of predicting the joint structure of complexes including proteins, nucleic acids, small molecules, ions and modified residues. Virtual screening will be more accurate with the aid of artificial intelligence [3].

Table

Various commonly used softwares and resources for SBDD

Molecular Docking software	Database	Protein modeling
AutoDock	DrugBank	phyre2
AutoDock Vina	GLIDA	AlphaFold2
SwissDock	PubChem	Alphafold-multimer
AlphaFold3	ZINC	MODELLE

In conclusion, SBDD and AI have a promising application in drug discovery, reducing the time and cost of drug development.

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ANALYSIS OF PHARMACOKINETIC PROPERTIES OF ROPIVACAINE

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This article analyzes the lipophilicity and water solubility of ropivacaine as sodium channel inhibitors.

Keywords: Ripovacaine, lipophilicity, solubility, bioavailability.

Ropivacaine is a pure S(−)-enantiomer of propivacaine and is a long-acting local anesthetic of the amide series. It causes nerve blockage by reversibly inhibiting the influx of sodium into nerve fibers. Ropivacaine is well tolerated and

is effectively used for regional anesthesia, including surgical anesthesia, as well as to relieve postoperative and labor pain [1].

The data analysis of the molecule were carried out using PubChem and SwissADME services.

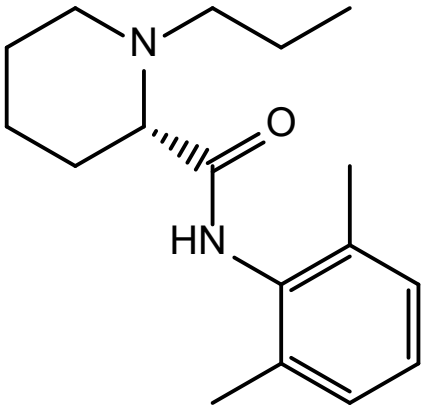

Fig. 1 – 2D model Ropivacaine

The molecular weight of ropivacaine is 274.40 g/mol, indicating its high membrane permeability. It is considered a low-molecular compound because its weight is less than 300 g/mol. The lipophilicity of the drug (Log $P_{o/w}$) is 3.27 (LOGP) and 2.90 (XLOGP3), which indicates moderate fat solubility, since than ranges from -2 to 5. This may contribute to the delayed release of ropivacaine into the systemic circulation, which is required to ensure the long-lasting effect of the anesthetic.

The solubility (Log S) of ropivacaine in water was:-3.26 (ESOL), -3.24 (Ali) and -4.86 (SILICOS-IT) which indicates the low solubility of this compound, since the values are below 3. It shows that the compound can dissolve in organic solvents better than in water, and limits its bioavailability when administered orally. Low solubility may contribute to a longer-lasting effect of the anesthetic. This indicator is comparable to its lipophilic properties and may affect the pharmacokinetics and clinical efficacy of ropivacaine as a local anesthetic.

Based on SwissADME calculations, a high degree of absorption in the gastrointestinal tract is observed, indicating the effectiveness of ropivacaine when administered orally. A positive result for blood-brain barrier permeability indicates the ability of ropivacaine to penetrate the central nervous system.

Moderate lipophilicity, water solubility, high absorption in the gastrointestinal tract and permeability through the blood-brain barrier determine the pharmacokinetic properties of ropivacaine, which indicates the possibility of its use in anesthesiology.

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CONFORMATIONAL ANALYSIS OF RESVERATROL

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This paper discusses the results of conformational analysis of resveratrol carried out using the ChemOffice 2016 chemistry package by the MM2 molecular mechanics method.

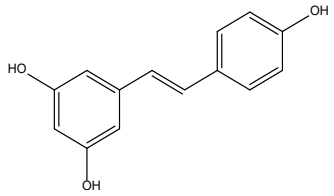
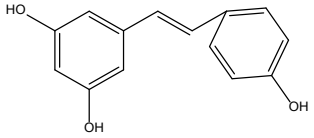
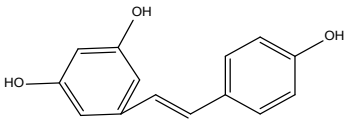
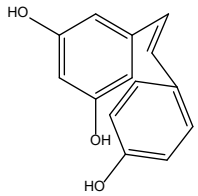
Keywords: resveratrol, conformational analysis, quantum chemical modeling.

Resveratrol ($C_{14}H_{12}O_3$) is a natural phytoalexin, a derivative of trans-stilbene, a polyphenol. It has been synthesized by some plants as a defense response against parasites such as bacteria and fungi [1,2]. In experiments with mice and rats, the beneficial effects of resveratrol such as antitumor, anti-inflammatory effects, blood sugar lowering and

cardioprotective properties have been found. In addition, in 2003, the ability of resveratrol to increase the lifespan of some invertebrates and then short-lived fish has been revealed. However, some experiments did not confirm this effect. Clinical trials to test similar effects in humans have not been conducted. We have found 4 most probable conformations of the Resveratrol molecule according to the values of the total energy of the molecule (E_T).

Table

Conformational analysis of the Resveratrol by MM2 method

Condition	Resveratrol	E_T, kcal/mol
1		-3.1033
2		105.2728
3		106.1809
4		105.2738

The data shown in the table indicate that configuration 1 is thermodynamically more stable than the others and has a total energy value of -3.1033 kcal/mol.

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ANTIOXIDANT PROPERTIES OF PHORBOL IN TEMPERATURE CHANGES

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The paper examines the physicochemical and biological properties of phorbol((1aR,1bS,4aR,7aS,9bS,8R,9R,9aS)-4a,7b,9,9a-Tetrahydroxy-3-(hydroxymethyl)-1,1,6,8-tetramethyl-1,1a,1b,4,4a,7a,7b,8,9,9a-decahydro-5H-cyclopropa [3,4] benzo[1,2-e]azulen-5-one) using the MM2 molecular mechanics method included in the ChemOffice 2016 software package.

Phorbol is a chemical compound of natural and vegetable origin. It is an element of tiglian, which is part of the family of diterpenes (fig. 1)

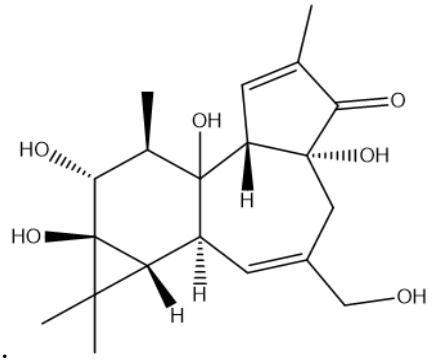

Fig.1 − The structure of the Phorbol molecule

The smaller the band gap, the higher the antioxidant properties of the molecules [1]. The width of the forbidden zone was found using the formula: Eg= ELUMO-EHOMO, where Eg is the width of the forbidden zone, eV.

The energy value of the orbitals LUMO, HOMO and the band gap of the floorball at temperatures of 300-600 K (table).

Table

Antioxidant properties of phorbol at different temperatures

300 k		
E_{LUMO}, eV	E_{HOMO}, eV	E_g, eV
-4,250	-10,227	5,977
400 k		
-8,118	-9,255	1,137
500 k		
-8,095	-9,258	1,163
600 k		
-8,093	-9,254	1,161

It was found that the antioxidant properties increase by 5.25 times with an increase in temperature from 300 K (Eg 5,977) to 400 K (1,137). A further increase in temperature does not significantly affect the change in antioxidant properties.

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ANALYSIS OF ANTIOXIDANT PROPERTIES OF INDOLE DERIVATIVES

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One of the promising indole derivatives is ziprasidone, which has already found application in clinical practice as an antipsychotic drug. However, in addition to its main action, ziprasidone may have additional properties, such as antioxidant activity, which is of interest for further studies.

Keywords: ziprasidone, antioxidant activity, biological activity

This study evaluate the antioxidant properties of ziprasidone by quantum chemistry methods , which will reveal its potential as a multifunctional therapeutic agent.

The following formulae were used to calculate the physicochemical properties of the molecules:

Ionisation potential (IP) = $-E_{HOMO}$ (eV)

Electron affinity (EA) = $-E_{LUMO}$ (eV)

Hardness (η) = (IP-EA)/2 (eV)

Softness (S) =1/2η (eV)

Electronegativity (μ) =(IP+EA)/2 (eV)

Electrophilic index ω = μ2/2 ŋ, (eV);

The electron-donating capacity of the molecule ω^- = (3IP + EA)2/16(IP - EA), (eV);

The electron acceptor capacity of a molecule ω^+ = (IP + 3EA)2/16(IP - EA) , (eV);

Forbidden band width (E_g) = E_{LUMO} - E_{HOMO} (eV)

Table

Physicochemical properties of indole-3-carbinol

E_{HOMO}	E_{LUMO}	E_g , eV	IP, eV	EA, eV	Ŋ, eV	S, eV	μ, eV	ω, eV	$^-\omega$, eV	$^+\omega$, eV
-0,262	0,00925	0,27125	0,262	-0,00925	0,13562	3,686	0,12637	0,0589	0,139	0,0126

The low E value of$_g$ (0.27125 eV) indicates that the molecule has high antioxidant activity. The molecule is "soft" (3.686 eV) and has a low electronegativity (0.12637 eV) and has an ionisation potential (0.262 eV), indicating that the molecule has high biological activity.

COMPARATIVE EVALUATION OF ANTIOXIDANT ACTIVITY OF CURCUMIN AND CAFFEINE

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The main chemical parameters such as the minimum energy of the molecule, the energy of the Highest Occupied Molecular Orbital (HOMO), the energy of the Lowest Unoccupied Molecular Orbital (LUMO), as well as the value of the forbidden zone (Eg) for caffeine and curcumin were determined. The calculated indicators show that curcumin is a good antioxidant in comparison with the results of caffeine. Antioxidants can be used in sports because they provide protection against oxidative stress by neutralizing free radicals, improving strength performance and reducing fatigue.

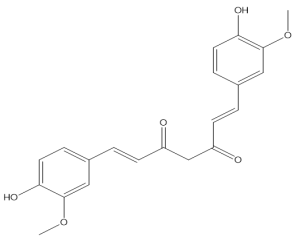
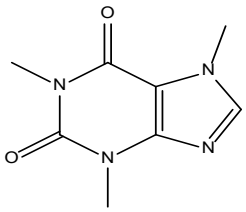
Keywords: curcumin, caffeine, antioxidants.

The purpose of our study investigation of antioxidant activities of curcumin and caffeine were determined.

Using Gaussian 09W software the PM6 method was used to analyze the chemical activity and antioxidant properties of caffeine and curcumin, respectively. The following parameters were analyzed: minimum energy of the molecule, the energy of the highest occupied molecular orbital (HOMO), the energy of the lowest unoccupied molecular orbital (LUMO), and the value of the forbidden zone. In addition, a comparative assessment of the antioxidant activity was carried out. The calculation results are presented in Table.

Table

Comparative assessment of the antioxidant activity of curcumin and caffeine

Formula	Total energy (kcal/mol)	HOMO (eV)	LUMO (eV)	Method	Eg (eV)
 Curcumin	-0.2555	-0.32112	-0.03693	PM6	0.28419
Caffeine 	38.6061	-9.921	-1.254	PM6	11.175

Based on the obtained data of antioxidant activities of title structures the most powerful antioxidant is curcumin.

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ANALYSIS OF THE ELECTRONIC SPECTRUM OF 4-(4-METHYLPIPERAZIN-1-YL)-4-OXO-N-(4-SULFAMOYLPHENYL) BUTANAMIDE COMPOUNDS

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In this work, a quantum chemical simulation of 4-(4-methylpiperazin-1-yl)-4-oxo-N-(4-sulfamoylphenyl) butanamide using the density functional theory DFT/B3LYP/6-311++G** method with a MidiX basis set. The electronic structure of the compound has been investigated.

Keywords: quantum chemical modeling, electronic structure.

Currently, an important area of modern organic chemistry and pharmacology is the production of new biologically active compounds as potential active ingredients of new drugs. Computational chemistry methods allow modeling and analyzing molecules of various natures and origins [1].

Hartree-Fock (HF) and density functional theory (DFT) methods are often used to solve certain problems in quantum chemistry [2]. In this work, a complete quantum-chemical modeling was carried out using the nonempirical method of density functional theory B3LYP/MidiX.

Table

Calculated electronic spectrum of the molecule 4-(4-methylpiperazin-1-yl)-4-oxo-N-(4-sulfomoylphenyl) butanamide

State	Wavelength (nm)	Expansion of wave functions in terms of a singly excited configuration	Oscillator strength (f)
$S_0 \rightarrow S_2$	265	0.69 (92→95)	0.75
$S_0 \rightarrow S_{14}$	219	0.45 (89→95) + 0.13 (90→ 95) + 0.37 (91→ 96) + 0.31 (92→ 96)	0.26
$S_0 \rightarrow S_{19}$	208	0.11 (90→96) + 0.10 (90→ 98) + 0.12 (91→ 98) + 0.20 (92→ 98) + 0.43 (93→ 97) + 0.15 (93→ 98) + 0.33 (93→ 99) + 0.13 (94→ 102) + 0.10 (94→ 105)	0.23

Note – The table only shows transitions with an oscillator strength greater than 0.10.

The electronic spectrum of the compound exhibits three intense transitions at 264.95, 218.94 and 208.31 nm.

According to the calculation results (Table), the most intense absorption peak in the electronic spectrum of the compound is observed at = 265 nm and f = 0.75. The maximum wavelength is due to the electron charge transfer to the excited singlet state $S_0 \rightarrow S_2$, which is a wave function that includes one configuration for single-electron excitations (92→95). The excitation of an electron from the 92 molecular orbital to the lowest unoccupied molecular orbital 95 makes the main contribution to the absorption band at 265 nm.

The second absorption band with a maximum at 219 nm is due to the transition to the excited singlet state of the molecule ($S_0 \rightarrow S_{14}$). Calculations show that this excited state is described by a wave function that corresponds to the superposition of four functions: (89→95), (90→95), (91→96), (92→96).

The third absorption band with a maximum at 208 nm refers to the transition to the excited singlet state of the molecule ($S_0 \rightarrow S_{19}$). Calculations show that this excited state is described by a wave function that corresponds to the superposition of nine functions: (90→96), (90→98), (91→98), (92→98), (93→97), (93→98). (93→99), (94→102), (94→105).

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ANALYSIS OF ELECTRICAL PROPERTIES OF N-(4-((4-METHYLPIPERAZIN-1-YL) METHYL)PHENYL)-4-(MORPHOLINOMETHYL)BENZAMIDE COMPOUNDS

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In this work, a quantum chemical simulation of N-(4-((4-methylpiperazin-1-yl)methyl)phenyl)-4-(morpholinomethyl)benzamide using the density functional theory DFT/B3LYP/6-311++G** method with a MidiX

basis set. The electronic structure of the compound has been investigated. Electronic properties such as E_{HOMO} and E_{LUMO} have been calculated.

Keywords: quantum chemical modeling, electronic structure, HOMO, LUMO.

Currently, an important area of modern organic chemistry and pharmacology is the production of new biologically active compounds as potential active ingredients of new drugs. Computational chemistry methods allow modeling and analyzing molecules of various natures and origins [2]. In this work, a complete quantum-chemical modeling was carried out using the nonempirical method of density functional theory B3LYP/MidiX.

Table

Calculated electronic properties of the N-(4-((4-methylpiperazin-1-yl) methyl) phenyl)-4-(morpholinomethyl)benzamide molecule

Names	IP, eV	EA, eV	η, eV	S, eV^{-1}	μ, eV	w, eV	w^+, eV	w^-, eV
Meaning	0.3159	0.0138	0.151	3.31	-0.164	0.089	0.0019	0.193

IP – ionization potential, EA – electron affinity, η – hardness, S – softness, μ – electronegativity, w – electrophilic index, w^+ – electron-acceptor ability, w^- – electron-donor ability

E_{LUMO} = - 0.01389, eV; E_{HOMO} = - 0.31592, eV; E_G = 0.3, eV

According to the data in the table, we can say that the substance N-(4-((4-methylpiperazin-1-yl)methyl)phenyl)-4-morpholinomethyl)benzamide has antioxidant activity with a band gap of 0.3 eV. The ionization potential of the substance is 0.3159 eV, and the electron affinity is 0.0138 eV. The hardness and softness values are 0.151 eV and 3.3 eV-1, respectively. Electronegativity, based on the table, is 0.089 eV, and the electron-acceptor and electron-donor abilities of this substance are 0.0019 eV and 0.193 eV, respectively.

The ionization potential shows the ability of molecules to give up electrons. Therefore, structures with low ionization potential values can be more easily subjected to oxidation. Electron affinity indicates the intensity with which a molecule accepts electrons. Global hardness corresponds to the energy gap between LUMO and HOMO. A molecule with a small energy gap has high chemical reactivity, low kinetic stability and is a soft molecule, while a hard molecule has a large energy gap. Electronegativity is a measure of the ability of an atom or group of atoms to attract electrons, and chemical softness describes the ability of an atom or group of atoms to accept electrons. The electrophilic index is the stabilization energy of systems when they are saturated with electrons [1].

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THE ENERGY GAP IN XYLENOLS. BIOINFORMATICAL SUBSTANTION OF CANCEROGENISITY OF XYLENOLS

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Xylenols exist in the following isomeric forms: 2,6-Xylenol (2,6-dimethylphenol), 2,5-Xylenol (2,5-dimethylphenol), 2,4-Xylenol (2,4-dimethylphenol), 2,3-Xylenol (2,3-dimethylphenol), 3,4-Xylenol (3,4-dimethylphenol), 3,5-Xylenol (3,5-dimethylphenol). For these compounds are known Free energy of formation ΔG_f, Enthalpy ΔH, Entropy S, Dissociation constant, Critical temperature, Critical pressure etc. In our study we present computation of E_{HOMO}, E_{LUMO}, Eg using the Gaussian 16 software at the B3LYP/MidiX level of DFT.

Keywords: xylenol, energy gap, E_{HOMO}, E_{LUMO}, cancerogenisity

The xylenols are colorless crystallizing compounds that are soluble in alcohol, acetone, and in many other organic solvents. They are less soluble in water than the cresols. Except for 3,5- xylenol, their acidity is likewise lower than that of the cresols. They are soluble in aqueous sodium hydroxide, but to different extents, depending on the structure. Their chemical behavior is similar to that of the cresols. For dependence of the thermodynamic data on temperature [1].

Xylenol mixtures are used as solvents (e.g., for wire enamels), disinfectants (e.g., in sheep dips), textile auxiliaries, and in ore flotation. Mixtures, particularly if they are rich in 3,5-xylenol and xylenols with two hydrogen atoms in the o- and/ or p-positions, are used in the manufacture of xylenol – formaldehyde resins. Xylenols without an o-methyl group are used to produce nontoxic plasticizers and trixylenyl phosphates that serve as fire-resistant hydraulic fluids.

2,5-dimethylphenol is a fragrance compound with sweet, naphthyl, phenolic, smoke, bacon odor, but in uses is allergenic agent. All of isomers are toxic and dangerous for the environment, toxic in contact with skin and if swallowed [2].

As phenols are rapidly absorbed through the skin and a causal treatment of the poisoning does not yet exist, rinsing them off the skin (not wiping them off) as soon as possible constitutes a decisively important first aid measure.

We conducted a study in the Gaussian 16 software using the B3LYP/MidiX basic set and visualized the results in the graphical program for working with quantum chemistry computations Chemcraft.

Now we have presented the value of E_{LUMO}, E_{HOMO} and calculated the Energy gap (E_g=E_{LUMO}-E_{HOMO}), see Table 1. The larger the Eg of the molecule, the lower the ability to transition from the σ to the σ^* orbital. It means that substances with a high Eg have carcinogenic properties. Thus, the physicochemical evidence of carcinogenic properties of Xylenols has been demonstrated.

Name/Value	E_{HOMO} (A.U.)	E_{LUMO} (A.U.)	E_g (ev)
2,3-Xylenol	-0.21041	0.00935	5,98
2,4- Xylenol	-0.20639	0.00658	5,80
2,6- Xylenol	-0.21019	0.00558	5,87
3,4- Xylenol	-0.20668	0.00977	5,91
3,5- Xylenol	-0.21156	0.00873	5,99

Table 1. Values of E_{HOMO} (A.U.), E_{LUMO} (A.U.), E gap (ev) in Xylenols.

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DETECTION OF ANDROGENIC ANABOLIC STEROIDS BY TANDEM MASS SPECTROMETRY

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Theoretical information about the advantages of using the tandem mass spectrometry method for the detection of androgenic anabolic steroids is considered.

Keywords: androgenic anabolic steroids, GC-MS, HPLC-MS, MS/MS.

Androgenic anabolic steroids (AAS) are preparations of a group of steroidal compounds that have a stimulating effect on protein synthesis in the body. AAS are analogs of the hormone testosterone. They have pronounced anabolic properties, so they are prohibited substances in doping control.

Detection of AAS is a very difficult process, as they undergo metabolic transformation in the body and are excreted as metabolites. AAS are also synthesized endogenously in the body. That is why they cannot be detected in the form in which they entered the body. Detection of metabolites is a reliable indicator of AAS use.

Gas chromatography-mass spectrometry (GC-MS), high-performance liquid chromatography-mass spectrometry (HPLC-MS), and tandem mass spectrometry (MS/MS) are the methods of AAS detection.

Quantification of AAS by GC-MS is not suitable for routine clinical analysis due to high labor intensity, high cost, and low sensitivity [1].

HPLC-MS is currently the main method for the analysis of AAS. It is HPLC-MS that allows analyzing non-volatile and thermolabile substances with high specificity and accuracy. In addition to high throughput, the method requires small sample volumes and minimal sample preparation. In particular, for steroids characterized by low thermal stability, HPLC-MS significantly increases the detection limits [2].

The disadvantages of chromatography-mass spectrometry are long analysis time and inability to separate some components efficiently. Soft ionization methods are characterized by intense peaks of molecular ions, but the lack of fragmentation makes it difficult to establish the structure of compounds.

The use of tandem mass spectrometry solves these problems. Today, the mass spectrometer works according to an algorithm: first, a mixture of chemical compounds is separated into its components, and then their structures are established. The mixture is ionized by electrospray ionization (ESI), the resulting molecular ions pass through the first analyzer in turn, and then in a field-free space their internal energy is increased, causing fragmentation. The second analyzer, by recording the fragment ions formed, allows the MS/MS spectrum of the individual compound to be obtained.

MS/MS spectrum allows to establish the formula with maximum accuracy, determine characteristic ions and thereby make an "ion passport" of the compound. Thus, tandem mass spectrometry is the most accurate and convenient method for the determination and detection of AAS [3].

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COMPUTERIZED SCREENING OF NEW POTENTIAL INHIBITORS OF INSULIN MOLECULE FIBRIL FORMATION

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In the present work the main physicochemical and pharmacokinetic properties of 3-methoxy-4-hydroxycinnamic acid (ferulic acid, C10H10O4) (FA) such as molecular weight, lipophilicity and water solubility were calculated using the Internet resource https://biosig.lab.uq.edu.au/pkcsm/prediction. Pharmacokinetic properties are characteristics that describe how a drug substance behaves in the body. They include:

Absorption - the process by which the drug enters the bloodstream.

Distribution - how the drug is distributed to tissues and organs.

Metabolism - the chemical changes the drug undergoes in the body, usually in the liver.

Elimination - the excretion of the drug from the body, most often through the kidneys or with bile.

These properties help you understand how a medicine works, its effectiveness, and its safety.

Keywords: insulin, fibril formation, ferulic acid.

Insulin fibrillation is inhibited by compounds that either prevent native protein unfolding or sequester partially coiled aggregation competent intermediates. FA is one of the most abundant phenolic acids in plants and has been found to be an inhibitor of Aβ fibril formation as well as a destabilizer of pre-formed amyloid fibrils [1].

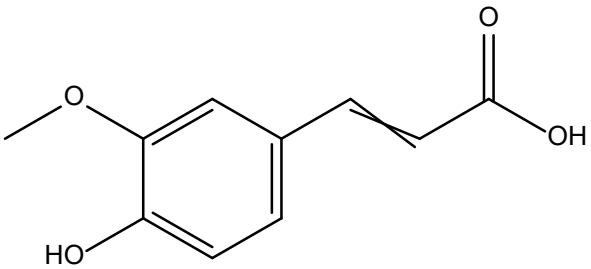

Fig. 1 - 2D structure of ferulic acid

For preliminary assessment of the similarity of the substance to the drug, its physicochemical and pharmacokinetic properties should be taken into account.

The molecular weight of FA is 194.18 g/mol. The optimal range of molecule size is from 150 to 500 g/mol.

The lipophilicity Log Po/w(iLOGP), reflecting the affinity of the molecule to the lipophilic environment, is 1.62 (optimal range is -0.7 to +5.0).

The water solubility index is -2.11. Its optimum range is not higher than 6.

The results of the study indicate that the FA molecule is promising for preventing insulin fibril formation process, which is an important factor in the treatment of type II diabetes mellitus.

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THE ELECTRONIC SPECTRUM OF N-(2-HYDROXYPHENYL)-4-METHYLBENZOSULFONAMIDE BY HF METHOD

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In this work, the electronic spectrum of the N-(2-hydroxyphenyl)-4-methylbenzenesulfonamide molecule is calculated.

Keywords: absorption spectrum, nonempirical high-frequency method.

The molecule N-(2-hydroxyphenyl)-4-methylbenzosulfonamide belongs to the class of sulfonamides, which are widely used in organic chemistry and biomedical research due to their pharmacological properties. Sulfonamides are known as antibacterial agents, but their structural diversity allows them to be used in various directions, such as enzyme inhibition and treatment of inflammatory diseases.

We have studied the electronic spectrum of the molecule using the nonempirical Hartree-Fock method. The electronic structure was optimized and calculated by the Hartree-Fock method of the Gaussian 09W quantum chemical modeling software package. The electronic spectrum of the molecule is calculated for 5 excitations in the range of 200-300 nm (Table).

Table

The electronic spectrum of N-(2-hydroxyphenyl)-4-methylbenzenesulfonamide

Wavelength (λ), nm	Energy of transition, eV	Brakedown of wave function for singly exicited configuration	Oscillator strength (f)
287,54	4,3119	0,11(44 → 49) + 0,21(46→50)- 0,12(46→51) + 0,46(46→52) - 0,26(47→51) - 0,16(47→55) + 0,21(47→60)	0,2172
254,08	4,8797	0,1(41→50) - 0,47(44→49) + 0,41(45→48)	0,5499
244,31	5,0748	0,13(42→52) + 0,11(43→52) - 0,13(46→51) - 0,29(47→54) + 0,28(47→55) - 0,41(47→56) + 0,1(47→58)	0,0541
247,22	5,0150	-0,4(44→48) - 0,52(45→49) - 0,1(45→50)	0,2520
279,17	4,4411	-0,11(46→50 – 0,3(46→51) + 0,15(46→52) - 0,25(47→52) + 0,22(47→55) + 0,24(47→56) - 0,33(47→60)	0,0694

According to the values in the table, the first wide and intense absorption band is observed at 254.08 nm and the oscillator strength is 0.5499 and corresponds to the transition to the excited state of the molecule $S_0 \rightarrow S_2$. The second strong absorption band is observed at 247.22 nm.

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ADSORPTION PROPERTIES OF THE ANTITUMOR DRUG ALECTINIB

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The electronic spectrum of the alectinib molecule was calculated using the Hartree-Fock (HF) method.

Keywords: absorption spectrum, HF method, alectinib.

Antitumor drugs affect the reproduction and division of cells in tissues and are aimed at destroying cancer cells.

Alectinib is an antitumor agent, a tyrosine kinase inhibitor that works by blocking a protein called anaplastic lymphoma kinase. It only works in cancer cells with an abnormal version of this protein [1].

The absorption spectrum of the alectinib molecule is considered using the Hartree-Fock method.

The electronic structure is optimized and calculated using the Gaussian 09W software package and the HF method [1]. The results of the absorption spectrum calculation are presented in table.

Table

The calculated electronic spectrum of alectinib

λ , nm	E, eV	Decomposition of the wave function	*f*
334	3.71	0.27(85→94)-0.14(89→97) + 0.18(90→94) + 0.12(90→95) + 0.15(92→95) - 0.19(92→98) - 0.23(93→94) + 0.25(93→95) - 0.31(93→98)	0,20
323	3.84	-0.16(87→95) - 0.11(87→96) + 0.12(87→97) + 0.13(89→94) - 0.22(89→95) + 0.15(89→96) - 0.19(89→97) + 0.12(89→ 98) - 0.11(90→96) -0.13(91→95) + 0.13(92→94) -0.17(92→95) + 0.14(92→96) + 0.16(93→95) + 0.14(93→98)	0,20
300	4.13	- 0.34(90→94) - 0.12(90→95) - 0.30(90→96) + 0.11(92→94) + 0.18(92→95) + 0.15(93→94) + 0.23(93→95) + 0.23(93→96)	0,99

*Note – the table shows only transitions from ≥ 0.05

The table data indicate that the main transition is observed at a wavelength of 300 nm and an oscillator strength of 0.99. Orbitals are involved in the formation of a transition with a wavelength of 300 nm (90, 92, 93, 94, 95, 96).

Thus, in the alectinib molecule, the main transition is observed at a wavelength of - 300 nm and an oscillator strength of - 0.99.

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BIOACCESSIBILITY ANALYSIS OF DANUGLIPRONE, A GLUCAGO-LIKE PEPTIDE 1 AGONIST

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Analysis of the bioavailability of the oral glucagon-like peptide-1 receptor agonist danugliprone by considering lipophilicity and solubility in water.

Keywords: Danuglipron, lipophilicity, water solubility.

Danuglipron is an oral small molecule glucagon-like peptide-1 receptor (GLP-1R) agonist that is being investigated to improve glycemic control in people with and for chronic weight control in obesity. It's rapidly absorbed from the gastrointestinal tract after oral administration. Typically, maximum plasma concentrations are reached within 1-2 hours after administration. This means that the drug has a fairly rapid onset of action, which is important for blood sugar control. It is metabolized in the liver, where it undergoes various processes, including oxidation and conjugation [1]. The bioaccessibility data analysis of the danuglipron molecule was performed using sources such as PubChem and SwissADME.

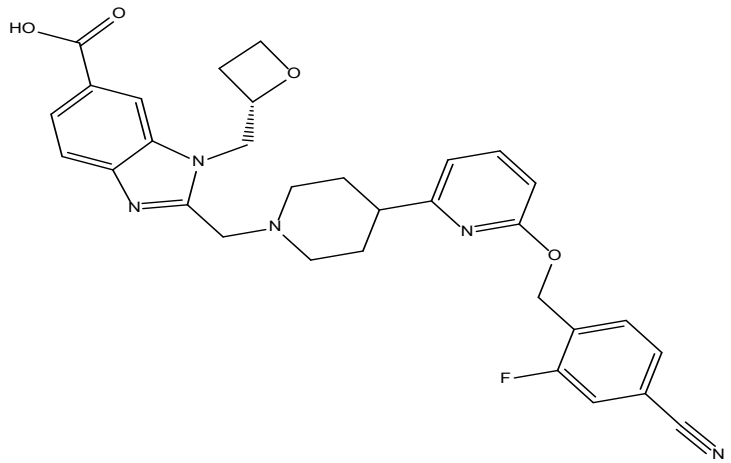

Fig.1 – 2D model of Danuglipron

The molecular weight of Danuglipron is 555.60 g/mol.The lipophilicity range is estimated using the partition coefficient (logarithm of the partition coefficient between octanol and water, Log Po/w). Moderate lipophilicity is characterized by Log P in the range from 0 to 3. Danuglipron's Log Po/w (XLOGP3) is 1.36, that indicates a more stable effect of the drug, since it can be released into the bloodstream more slowly, providing a long-lasting effect.

The solubility of danuglipron in water is 65.8 mg/ml (low solubility is considered to be less than 100 mg/ml). Low solubility may result in ineffective absorption of the drug in the gastrointestinal tract, which may reduce its therapeutic effect. Limited solubility may negatively affect bioavailability, i.e. the amount of active substance that reaches the systemic circulation and has the desired effect. Drugs with low solubility often require the use of special technologies or excipients to improve their absorption.

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SYNTHESIS OF 5'-AMINO-2′,5'-DIDEOXY DERIVATIVES OF PYRIMIDINE NUCLEOSIDES

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The aim of the present work is synthesis of 5'-amino-2′,5'-dideoxy derivatives of pyrimidine nucleosides (3a-c).

Keywords: pyrimidine nucleosides, 5'-azido-2′5'-dideoxynucleosides, 5'-amino-2′,5'-dideoxynucleosides, Staudinger reaction, Appel reaction.

A large number of works are devoted to the synthesis of nucleosides containing azido groups in their composition. Although they themselves do not possess high biological activity, they remain an important intermediate in the synthesis of various conjugates based on them [1]. Nucleosides containing an azido group are convenient synthons for the preparation of their bioconjugates that are stable under physiological conditions and have potential biological activity [2], as well as for the preparation of amino derivatives [3].

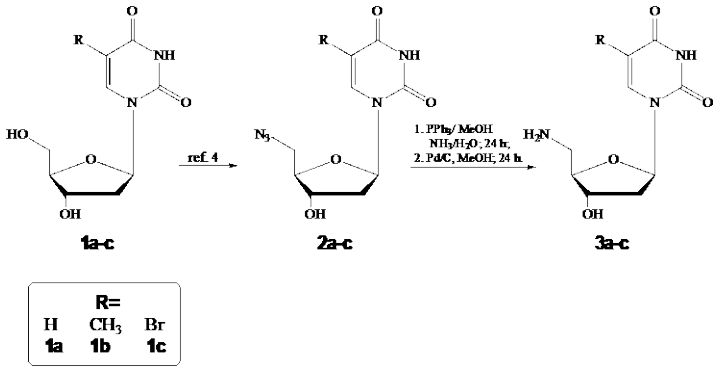

Fig.1 – Scheme for the synthesis of 5'-amino-2',5'-dideoxy derivatives of pyrimidine nucleosides

Synthesis of compounds **3a-c** was carried out according to the scheme indicated above (Figure). The reaction process was monitored by thin layer chromatography (TLC) on "Kieselgel 60 F254" plates "Merck" (Germany) in the solvent system: chloroform/methanol (5:1 vol/vol). The isolation of compounds **3a-c** was carried out by column chromatography on 60 H silica gel. The structure of the synthesized compounds was confirmed by NMR spectroscopy and mass spectrometry.

From commercially available 2'-deoxypyrimidine nucleosides (**1a-c**), azido derivatives of **2a-c** were synthesized in one step in good yields by a modified Appel reaction [4], and isolated by silica gel column chromatography followed by recrystallization from ethyl acetate/petroleum ether mixture.

The azido group was reduced to the amino group by two methods. The first method is based on the Staudinger reaction, which allows to obtain the target amine derivatives in good yields. The conversion to the target amine was 90-95%. The second method is based on the hydrogenation reaction over Pd/C as a catalyst. The reaction was carried out within 24 hours with conversion of 75-80% of the initial azido derivative to the target product. The results obtained indicate the advantage of the Staudinger method over hydrogenation over Pd/C in the synthesis of 5'-amino-2′,5'-dideoxy derivatives of pyrimidine nucleosides.

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QUANTUM-CHEMICAL MODELING, PHYSICOCHEMICAL AND ANTIOXIDANT PROPERTIES OF VITAMINS A, E, C

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In this work we analyzed theoretical information concerning the molecules of vitamins A, E, and C. Their quantum-chemical modeling by the MM2 molecular mechanics method was carried out, and then the physicochemical and antioxidant properties of the studied structures were studied. The equilibrium geometry of molecules, the value of total energy (E_{TOTAL}), the energy of the highest occupied molecular orbital (E_{HOMO}) and the lowest vacant molecular orbital (E_{LUMO}), and the width of the forbidden zone as the main parameter of the biological activity of organic compounds were calculated.

Keywords: quantum-chemical modeling, antioxidants, vitamins A, E, C, molecule optimization.

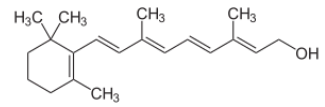
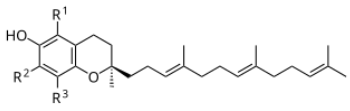
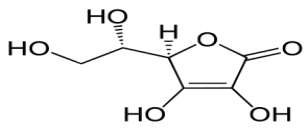
Antioxidants are substances that inhibit oxidation in the cells of living organisms, thus preventing the formation of free radicals. The mechanism of action of the most common antioxidants consists in breaking reaction chains: antioxidant molecules interact with active radicals to form low-active neutral molecules.

Antioxidants are widely used in food industry, medicine, cosmetology and other spheres of human activity.

The molecular mechanics method (MM2) of the ChemOfficeBio 2016 software package is chosen to calculate the total energy of molecules, the energy of boundary orbitals (E_{LUMO}, E_{HOMO}) and the forbidden zone width (Eg). In the course of this work, a specific algorithm is developed, including the following steps: 1) converting each structural formula into a three-dimensional structure; 2) optimizing the geometry of the molecule; 3) calculating the total energy of the molecule; 4) finding the forbidden zone width using E_{LUMO}, E_{HOMO} values (table).

Table

Physicochemical properties of vitamins A, E, C

Substance	E_{TOTAL}, kcal/mol	E_{LUMO}, eV	E_{HOMO}, eV	E_g, eV
Vit A 	26.0015	-5.907	-10.589	4.682
Vit E 	20.1199	1.452	-10.555	12.007
Vit C 	8.4832	-1.394	-10.533	9.139

It was found that vitamin A has the highest antioxidant activity, since it has the highest value of total energy and the smallest value of forbidden zone width among the studied antioxidants.

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STUDY OF THE PRESENCE OF CHARGE TRANSFER TRANSITIONS IN FIVE COMPLEXES USING DENSITY FUNCTIONAL THEORY

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The ground state structure and CT transition of the complex generated by the reaction of hydrogen peroxide (H_2O_2) with the five antibiotics (TMP, NOR, OFL, CIP, and SMR) are theoretically investigated by density functional theory (DFT). The synthesized CT complexes are characterized using various spectral techniques, including UV-Vis spectroscopy, IR spectroscopy and ^{1}H NMR spectroscopy, and the complex sites between the H_2O_2 and antibiotics are demonstrated.

Keywords: Charge Transfer interaction, Antibiotics, Excitation energy, Spectra, HOMO-LUMO.

Stable charge transfer (CT) complexes of receptors reacting with drugs or biological compounds have received much attention. The study of CT complexes of drugs is helpful to understand the interaction between drugs and receptors and the mechanism of action of drugs. Trimethoprim (TMP) is widely used in clinical medicine and veterinary animal husbandry, and in agriculture as an effective herbicide [1].

The purpose of this work is to study the CT interaction between H_2O_2 and five antibiotic (TMP, CIP, NOR, OFL, and SMR) using density functional theory.

Hydrogen peroxide was obtained from Sigma-Aldrich Chemical Co. Ciprofloxacin (TMP; $C_{14}H_{18}N_4O_3$; 290.32), Ofloxacin (OFL; $C_{18}H_{20}FN_3O_4 \cdot 1/2H_2O$), Sulfamerazine (SMR; $C_{11}H_{12}N_4O_2S$), Ciprofloxacin (CIP; $C_{17}H_{18}FN_3O_3$), Norfloxacin (NOR; $C_{16}H_{18}FN_3O_3$) were purchased from Sigma-Aldrich with a stated purity greater than ≥98% (HPLC).

All computational studies were carried out on personal computers using density functional theory (DFT) at the Becke-Lee-Yang-Parr mixed exchange dependent three-parameter functional (B3LYP) level with the standard 6-31G* basis set via the Gaussian 09 package 18. DFT/B3LYP was used to calculate the structure and vibration assignment of the TMP-PA complex in the ground state [2]. The theoretical coordinates of the complex were generated using Gaussian view.

The geometry of the hydrogen peroxide/five antibiotics complex was optimized under gas-phase conditions. The geometry of a molecule depends on the balance of Coulombic attraction and repulsion that exists between the many charged particles in the molecule, both nuclei, and electrons, resulting in a minimum energy point on the potential energy surface.

In this work, the geometric structures of the H_2O_2-TMP, H_2O_2-NOR, H_2O_2-CIP, H_2O_2-OFL, and H_2O_2-SMR complexes were studied by means of computational methods. Theoretical studies have revealed the existence of charge transfer transitions in the five complexes. The electron spectra of the compounds were determined and the important molecular orbitals of the compounds were determined by TD-DFT method. The electron density in HOMO was mainly concentrated on the benzene ring (the hydroxyl group and the two nitro groups), while the electron density in LUMO was mainly concentrated on the entire benzene ring. The calculated LUMO-HOMO orbital energy can be used to estimate molecular hardness, ionization energy, and other physical parameters. The synthesized CT complexes were characterized using various spectroscopic techniques including UV–Vis, IR, and ^{1}HNMR spectroscopy.

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ANALYSIS OF THE ADSORPTION MECHANISM OF ANTIBIOTICS ON BIOCHAR IN WATER USING DENSITY FUNCTIONAL THEORY

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The paper comparatively investigated the adsorption properties and mechanisms of ciprofloxacin on biochar modified with the same concentration of phosphoric acid and potassium hydroxide.

Keywords: Adsorption, Antibiotics, Modification, Active site, Specific surface area.

Adsorption is the most commonly used method to remove antibiotics from water bodies due to its high cost-effectiveness, simplicity and high productivity. To fill the knowledge gap, we chose ciprofloxacin (CIP) as a model compound, and the mechanism of CIP adsorption on three biochars was explored using adsorption kinetics and the active sites analysis (including oxygen-containing groups) on the biochar surface and density functional theory (DFT) calculations.

The antibiotic sample was purchased from Sigma-Aldrich. Rice straw was paralyzed in a tube furnace under a continuous flow of N_2 gas for 4 h to produce a biochar sample, which was prepared at a pyrolysis temperature of 500 °C. The biochar sample obtained was called B5. The acid-alkali modified biochar was prepared as follows. 3.0 g of B5 was dispersed in phosphoric acid solution (95.0%, 1.0 mM, 100.0 mL) and potassium hydroxide (KOH) solution (>99.0%, 1.0 mM, 100.0 mL) with continuous stirring for 12 hours. The reacted biochar suspension was filtered to obtain solid biochar pellets, and then the biochar pellet samples were washed repeatedly with ultrapure water and dried at 60°C to remove moisture. The phosphoric acid-modified biochar was labelled as PB5 and the KOH-modified was named as KB5.

We investigated the amount of CIP adsorbed on the solid phases of B5, PB5, and KB5 after 1 h and 18 h of reaction at different pH conditions. The results showed that monovalent anions had little effect on CIP adsorption, while divalent anions inhibited CIP adsorption to a greater extent. In the B5 and KB5 systems, the presence of HCO_3^- on the contrary led to an increase in the absorption of CIP, indicating that HCO_3^- had a certain promotion effect on the adsorption of CIP; the presence of CO_3^{2-} and SO_4^{2-} had a greater inhibition effect on the absorption of antibiotics, of which the inhibition effect of SO_4^{2-} reached 2.9 mg/g in the PB5 system.

In this study, DFT calculations demonstrated that KOH-modified biochar and acid-modified biochar exhibited excellent adsorption performance because they contained a relatively high amount of COOH. The COOH on the surface of biochar had a strong adsorption capacity for CIP due to the dual forces (hydrogen bonding and van der Waals forces). This implies that biochar can significantly enhance its antibiotic adsorption capacity through targeted adjustment of acid and alkali concentrations and synergistic modification, which increases its specific surface area and carboxyl group content. Meanwhile, the establishment of a clear adsorption structure-activity relationship between biochar and antibiotics by combining efficient research tools such as machine learning can provide an effective help to face the complex applications in the real environment.

STUDY OF CHARGE-TRANSFER INTERACTIONS BETWEEN ANTIBIOTICS AND COUMARIC ACID USING DENSITY FUNCTIONAL THEORY (DFT) CALCULATIONS

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A new charge transfer complexes were synthesized, using ofloxacin (OFL) and sulfamethazine (SMR) as electron donors and coumaric acid (COA) as electron acceptors. The structural characterization and intermolecular reaction mechanisms of these complexes were investigated through a combination of spectroscopic analysis and DFT calculations.

Keywords: Donor; Acceptor; Antibiotics; DFT; Complexes; Charge-Transfer.

CT interactions between biological/pharmacological compounds and small molecular acceptors offer various applications[1]. This makes small-molecule organic acids, due to their carboxyl and hydroxyl groups, important chemo-receptors in CT studies with antibiotics.

Ofloxacin (OFL; $C_{17}H_{18}FN_3O_3$; 331.34 g/mol) and Sulfamethazine (SMR; $C_{11}H_{12}N_4O_2S$; 264.30 g/mol) were obtained from Sigma-Aldrich Chemical Company (USA) with a stated purity of ≥98% (HPLC). The chemicals and reagents used were of analytical grade, including coumaric acid (COA; 140.09 g/mol).

The solid CT complexes of OFL and SMR with COA were prepared by mixing equimolar amounts of OFL and SMR with each acceptor in methanol (10 mL).

The title compound was optimized and validated using the Density Functional Theory (DFT) method, with the 6-31G* basis set, and was found to have no negative frequencies. All nonlinear calculations for the title compound were performed using the Gaussian 09W (G09W) software package.

Firstly, UV and IR spectroscopy confirmed the formation of new complexes between the donors and acceptors. The stoichiometric ratio of the donor to acceptor influenced the formation of these complexes, with the optimal ratio determined to be 1:1 for all complexes via spectrophotometric titration. The resulting structures displayed varied morphologies: the COA-OFLomplexes formed long and short rod-like or granular shapes, while the COA-SMR complexes exhibited flat structures. Additionally, quantum chemical calculations were performed to compare the steady-state structures, energy levels, and charge densities of the complexes. The results indicated that all six compounds demonstrated favorable reactivity tendencies and optimal sites for electrophilic and nucleophilic attacks.

Moreover, the key molecular interaction groups involved in the charge transfer interaction were identified. The C-N and N-H groups in the donor molecules, along with the COOH group in the acceptor molecules, played crucial roles in the complexation process[2]. Therefore, by targeting specific structural features of the antibiotic, suitable acceptor molecules can be selected for charge transfer reactions, enabling the synthesis of new complexes.

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BIOACTIVITY AND ANTIOXIDANT PROPERTIES OF NEW ACRIDINE DERIVATIVES

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Two new acridine derivatives were modeled and then synthesized using the nonempirical density functional theory (B3LYP/MidiX) method in an aqueous medium. Their physico-chemical and biological properties have been studied.

Keywords: antioxidant, DFT, acridine.

Acridines are heterocyclic structures, which are important because of their wide range of applications in medicine, pharmacology and biochemistry.

Acridine derivatives with a biologically active nitrogen-containing heteroaromatic ring have various properties such as antibacterial, antiviral, anti-inflammatory, antitumour, antiparasite and antioxidant properties. The biological activities of the acridines are mainly because of their ability of their acridine moiety to intercalate between base pairs of double-stranded DNA through interactions.

In the present work two new acridine derivatives were modeled, synthesized and identified using UV-vis, IR, ^{1}H and CNMR spectroscopy.

On the base of calculations, geometries, Bond Dissociation Enthalpy (BDE), Energy gap (Eg), it's predicted that synthetized Acridine derivatives have high level of antioxidant activity.

Table

Physicochemical properties of acridine derivatives

Com-pound	GPCR lig-and	Ion channel mod-ulator	Kinase in-hibitor	Nuclear receptor ligand	Protease in-hibitor	Enzyme in-hibitor
AD-1	-0,27	-0,30	-0,79	-0,24	-0,33	-0,10
AD-2	-0,23	-0,24	-0,81	-0,16	-0,26	-0,07

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IMPACT OF CARBON NANOTUBES ON ECOLOGY

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This article discusses the ecotoxicity of carbon nanotubes.

Keywords: carbon nanotubes, environmental safety, nanomaterials, toxicological assessment.

Carbon nanotubes (CNTs) are the key to the development of the future, but their release into the environment will increase as their production increases and they are widely used in industrial and consumer products (Figure). Exposure and effect data are needed to understand the potential hazards of these new materials. Several scientific reviews have assessed the sources, behavior, fate, and mechanisms of toxicity of nanomaterials in general (using specific nanomaterials as an example) [1-3].

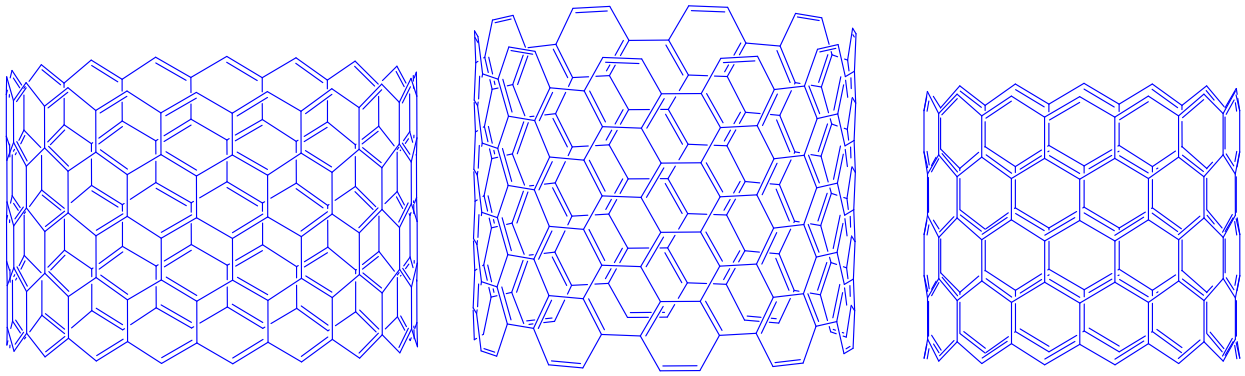

Fig. 1 - Carbon nanotubes

Most of these reviews usually conclude that more research in the field of nanoecotoxicology is needed and future studies should include more precise particle and exposure characterization. Furthermore, it is often concluded that at present, risk assessment of nanomaterials can only be reasonably performed on a case-by-case basis [2]. In the case of CNTs, few scientific studies relevant to risk assessment have been published in recent years. Although human toxicological assessment is in development [3], there are still gaps in environmental hazard identification and exposure/exposure assessment of CNTs. However, experience with nanomaterials in ecotoxicology laboratories is improving and recommendations for systematic and comparable assessments are emerging.

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QUANTUM CHEMICAL MODELING, PHARMACOLOGICAL AND BIOLOGICAL ACTIVITY OF 2-ARYLAMINOPYRIMIDINE DERIVATIVE

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The article presents the results of quantum chemical calculations for a pyrimidine derivative based on a substituted chalcone. The simulation was performed using the GAUSSIAN 09 application software package. Using the B3LYP density functional, a search for the optimal geometry of the molecule was carried out. The band gap was calculated as the main parameter of biological activity, as well as pharmacological parameters.

Keywords: quantum chemical modeling, biological activity, E_{HOMO}, E_{LUMO}, pharmacological activity

In the modern world, quantum chemical modeling occupies an important place in the study of various processes at the molecular level. The relevance of creating new antiviral agents is due to the combined action of such constantly acting factors as the spread of socially significant, especially dangerous infections, as well as the emergence of pathogenic viral strains resistant to the action of existing drugs.

Quantum chemical modeling of 4-(2-bromophenyl)-6-(2,6-dimethylphenyl)-N-(4-nitrophenyl)pyrimidine-2-amine was carried out.

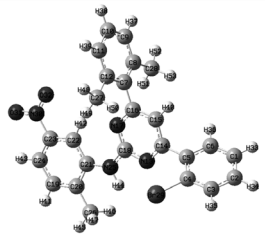

Fig.1 - Optimized molecular structure of the compound

If the HOMO and LUMO energy values of a molecule are known, global descriptors of the reactivity of the molecule can be found, and the difference between the HOMO and LUMO energy values can be defined as the chemical stability of the molecule or the band gap ($Eg = E_{LUMO} - E_{HOMO}$), as the main parameter indicating the presence or absence of biological activity [1]. ELUMO = -0.231 eV, E_{HOMO} = -0.111 eV. The band gap is 0.120 eV, which indicates the presence of biological activity in 4-(2-bromophenyl)-6-(2,6-dimethylphenyl)-N-(4-nitrophenyl)pyrimidin-2-amine. Similarity to drugs is assessed by Lipinski's rule of five, which concerns simple ranges of physicochemical parameters (MW (molecular weight) ≤ 500, miLogP (lipophilicity) ≤ 5, nHBD (hydrogen bond donors) ≤ 5, nHBA (hydrogen bond acceptors) ≤ 10) related to 90% of orally active drugs that have passed clinical trials [2].

For 4-(2-bromophenyl)-6-(2,6-dimethylphenyl)-N-(4-nitrophenyl)pyrimidin-2-amine miLogP = 7.79, TPSA = 83.64, natoms = 32, MW = 489.37, nHBA = 6, nHBD = 1, nviolation = 1, nrotb = 5, therefore the studied structure can be used for drug development.

Conclusion. Quantum-chemical modeling of 4-(2-bromophenyl)-6-(2,6-dimethylphenyl)-N-(4-nitrophenyl)pyrimidin-2-amine was performed, the optimal geometry of the molecule was found. The parameters of biological and pharmacological activity were calculated, it was found that the structure has moderate biological activity, and can also be used to develop drugs with antiviral and antitumor activity.

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SYNTHESIS OF 8-SUBSTITUTED PURINE NUCLEOSIDES

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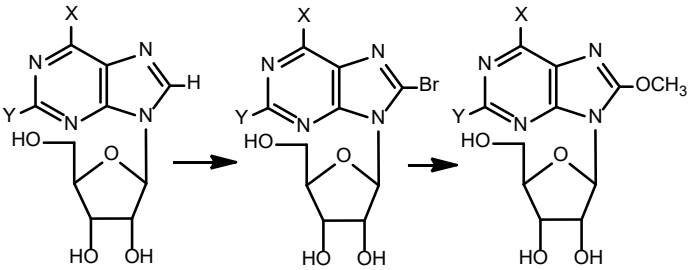
A number of nucleoside and nucleotide analogues have antitumor and antiviral activity and are used in clinical practice [1]. The use of modern approaches to the synthesis of organic compounds makes it possible to obtain new analogues of nucleosides and nucleotides with potential biological activity. In a number of purine derivatives, the nucleophilic substitution reaction of the halogen atom in the 8-position of the heterobase is widely used to obtain new compounds [2]. The aim of this study was the synthesis of 8-substituted purine nucleosides for further study of their antibacterial activity.

Keywords: synthesis, nucleosides.



№	1	2	3	4	5	6
X	NH_2	OH	NH_2	OH	NH_2	OH
Y	H	NH_2	H	NH_2	H	NH_2

Fig.1 – Scheme of the synthesis of 8-substituted adenosine and guanosine derivatives

The synthesis of 8-substituted derivatives of adenosine 1 and guanosine 2 was carried out according to the scheme shown in the figure. The reaction was monitored using thin-layer chromatography (TLC) on Kieselgel 60 F254 plates (Merck, Germany) in a solvent system: chloroform/methanol 4:1 and isopropanol/ammonium hydroxide/water 7:2:1. Product stains on the plates were detected by viewing them under ultraviolet light with a wavelength of 254 nm, or with a naphthoresorcinol solution in the presence of sulfuric acid and subsequent heating of the plate to 80-90 ° C, as well as using an iodine chamber in which the spots of compounds absorbed iodine vapor. The starting compounds 1 and 2 were converted into their 8-bromine derivatives 3 and 4, respectively, by the action of a bromine solution in water on an adenosine solution in a sodium acetate buffer, and in the case of guanosine by the action of a bromine solution on a suspension of guanosine in water. The reaction mixture was stirred on a magnetic stirrer at room temperature for 3-4 hours. The resulting precipitate was filtered and washed on a filter with a 5% solution of sodium bisulfite and cold distilled water. The resulting 8-bromine derivatives 3 and 4 were recrystallized from a hot water/alcohol mixture 9:1. The solution was cooled and kept in the refrigerator for 18–20 hours. The crystalline precipitates were filtered on a glass Schott filter, washed with cold alcohol and dried at room temperature in air, and then in a phosphorus pentoxide desiccator to a constant weight. The yield of 8-bromine derivatives 3 and 4 was 50–70%.

The bromine atom substitution reaction in compounds 3 and 4 was carried out by the action of an excess of sodium methylate solution on a suspension of bromine derivatives in methanol when the reaction mixture was cooled using an ice bath. Upon completion of the reaction, a mixture of methyl alcohol and hydrochloric acid was added to the reaction mixture in a ratio of 9:1 to a neutral reaction. The resulting suspension was evaporated on a rotary evaporator at 40°C to dry. The resulting residue was extracted several times with chloroform in the case of 8-methoxyadenosine 5 and ethyl alcohol in the case of 8-methoxyguanosine 6. The solutions of the compounds were evaporated dry, ethyl alcohol was added to the residue and 8-methoxy derivatives 5 and 6 were filtered of. The powders of the compounds were dried in air to a constant weight. The yield of the reaction products was 10-30%.

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