

CURRENT DIRECTIONS OF THE DEPARTMENT OF HYGIENE, FACULTY OF PEDIATRICS, PIROGOV RUSSIAN NATIONAL RESEARCH MEDICAL UNIVERSITY (115TH ANNIVERSARY OF THE DEPARTMENT)

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The paper provides the analysis of the research and practical work done at the Department of Hygiene, Pirogov Russian National Research Medical University, for the period between 2018 and 2023 aimed to determine the today's directions of the Department and demonstrate their relevance, scientific and practical significance; prospective directions of further research are defined. Statistical data processing was performed using the Statistica 13 PL software and the tag (word) cloud service. Staff of the Department did extensive educational and methodological, organizational and methodological, expert and consulting, research work (paragraphs 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12 of the academic passport for the specialty 3.2.1. "Hygiene"); a total of 10 textbooks and three toolkits, three guidelines, two software products, one patent for invention and 39 database certificates, 11 collective monographs were published; two hygienic standards were approved; the activity outcomes were presented during 95 scientific and practical events, including that with international involvement. A total of 150 articles were published: 46 in the journals indexed in international databases (Scopus, Web of Science), 58 in the journals indexed by HAC under the Ministry of Education and Science of the Russian Federation, one in the Nature journal. Two candidate and two doctoral theses on the specialty 3.2.1. "Hygiene" were prepared and defended. The activity outcomes provided helped to address the hygienic challenges currently faced by professional community to achieve the national goals of the Russian Federation in the fields of demography, public health and digitalization.

Keywords: Department of Hygiene, educational and methodological work, scientific and practical activities, publication activity, children, adolescents, youth, students, children with disabilities, physical development, health assessment, disease prevention, food hygiene, sanitary microbiology, toxicology, hygienic education

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СОВРЕМЕННЫЕ НАПРАВЛЕНИЯ ДЕЯТЕЛЬНОСТИ КАФЕДРЫ ГИГИЕНЫ ПЕДИАТРИЧЕСКОГО ФАКУЛЬТЕТА РНИМУ ИМЕНИ Н. И. ПИРОГОВА (К 115-ЛЕТНЕМУ ЮБИЛЕЮ КАФЕДРЫ)

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Представлен анализ научно-практической деятельности кафедры гигиены РНИМУ имени Н. И. Пирогова за период с 2018 по 2023 г. с целью определить современные направления деятельности кафедры и продемонстрировать их актуальность и научно-практическую значимость; определены перспективные направления дальнейших исследований. Статистическую обработку проводили с использованием программного обеспечения Statistica 13 PL и сервиса «облако тегов (облако слов)». Сотрудниками кафедры проведена большая учебно-методическая, организационно-методическая, экспертно-консультационная, научная работа (п.п. 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12 Паспорта научной специальности 3.2.1. «Гигиена»); опубликованы 10 учебных и три учебно-методических пособия, три методические рекомендации, два программных продукта, один патент на изобретение и 39 свидетельств на базы данных, 11 коллективных монографий; утверждены два гигиенических норматива; результаты деятельности доложены более чем на 95 научно-практических мероприятиях, в том числе с международным участием. Опубликовано 150 статей, из которых 46 — в журналах, индексируемых в международных базах данных (Scopus, Web of Science), 58 — в журналах, индексируемых ВАК Минобрнауки России, одна публикация в журнале Nature. Подготовлены и защищены две кандидатские и две докторские диссертации по специальности 3.2.1. «Гигиена». Представленные результаты деятельности способствовали решению гигиенических проблем, стоящих в настоящее время перед профессиональным сообществом, для достижения Национальных целей Российской Федерации в сфере демографии, здравоохранения и цифровизации.

Ключевые слова: кафедра гигиены, учебно-методическая работа, научно-практическая деятельность, публикационная активность, дети, подростки, молодежь, обучающиеся, дети с ограниченными возможностями, физическое развитие, оценка здоровья, профилактика заболеваний, гигиена питания, санитарная микробиология, токсикология, гигиеническое воспитание

Вклад авторов: О. Ю. Милушкина — планирование исследования, подготовка черновика рукописи; Н. А. Скоблина — планирование исследования, сбор, анализ, интерпретация данных, анализ публикационной активности с помощью сервиса «облако тегов (облако слов)», подготовка черновика рукописи; В. В. Королик, Н. И. Шеина, Н. А. Бокарева, Ф. У. Козырева, М. Б. Булацева, Е. А. Дубровина, Ю. Л. Тихонова — сбор данных; С. В. Маркелова — сбор, анализ, интерпретация данных, подготовка черновика рукописи.

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In 2023, the Department of Hygiene of the Faculty of Pediatrics, Pirogov Russian National Research Medical University, celebrates its 115th anniversary. Historically, the departments of hygiene and their research schools are used to sum up the results, commemorate teachers and mentors, set out prospects to the memorable dates [1–8].

Preventive healthcare departments often having a common ancestry and history still have some historical evolution features and demonstrate unique directions of scientific research, teaching aids preparation, student research society activities, etc. [9–10].

The study involved the analysis of current directions of the Department over time (five years), since the analysis of the earlier period had been comprehended and published as a substantial monograph [11].

It was shown that the directions of the department were different in different historical periods, considering the sanitary and epidemiological, environmental, social and economic situation in the country. Thus, the issues of municipal hygiene related to establishing the link between chemical composition of water and water contamination were addressed under the guidance of Professor M.B. Kotsyn (1860–1917). His successor, Professor P.N. Diatroptov (1859–1934), continued the Department's work in the field of municipal hygiene and sanitary microbiology. Academician of AMS USSR, Professor N.K. Ignatov (1870–1951), resumed the research in the field of municipal hygiene and started the research in the field of food hygiene. Corresponding member of AMS USSR, Professor N.N. Litvinov (1893–1971), introduced the research in the field of radiation hygiene into the Department's activities, he resumed the research in the field of municipal hygiene focused on ambient air and food hygiene related to food poisoning and focused on the hospital hygiene. His successor, Professor A.S. Arkhipov, who headed the Department for a short time, dealt with issues of occupational hygiene and occupational disorders. Professor V.A. Spassky, who also headed the Department for a short time, focused on activities in the field of general and military hygiene. The Department's research in the field of municipal and food hygiene was resumed under the guidance of academician AMS USSR, Professor G.I. Sidorenko (1926–1999). His student and successor, RAS academician Professor Yu.P. Pivovarov (1936), supplemented the issues of nutritional hygiene and sanitary microbiology with the issues related to environmental problems and anthropogenic pollution of the environment. The work done by Yury P. Pivovarov and scientific cooperation made the Department of Hygiene one of the reputable hygiene schools. Thus, the research work at the Department of Hygiene of the Faculty of Pediatrics, Pirogov Russian National Research Medical University, was conducted in accordance with paragraphs 1, 2, 3, 5, 6, 8, 9 of the academic passport for the specialty 3.2.1. "Hygiene" throughout the period of its existence.

Our study was aimed to determine the today's directions of the Department of Hygiene and demonstrate their relevance, scientific and practical significance.

We conducted the analysis of the research and practical activities, scientific papers of the Department of Hygiene published in periodicals indexed in E-Library, PubMed, Scopus, Web of Science for the period between 2018 and 2023. Assessment of the effects of the factors of educational environment and daily routine components on the students' health status was the main research focus. Statistical processing of the data obtained was performed using the Statistica 13 PL software package (StatSoft; USA) and the tag (word) cloud service for visualization of text using the most abundant words.

Today, the professor staff of the Department is represented by the RAS academician, RAS corresponding member, six doctors of science, eight candidates of science and four staff members having no scientific degrees, who are engaged in preparation of dissertations. Over five years, the average age of the Department's professor staff has decreased from 62.5 to 52.0 years ($p \leq 0.01$). The average teaching experience is 20.4 years. The share of teachers under the age of 39.0 years is 25.0%. The existing team represents a mix of experience and youth, collaboration of graduates of the preventive medicine, general medicine, preventive, and biological faculties. According to the publication activity data and the citation impact (Hirsch Index), the staff members of the Department of Hygiene are among top 100 professors of the Pirogov Russian National Research Medical University. Over five years, two candidate and two doctoral theses on the specialty 3.2.1. "Hygiene" were prepared and defended at the Department, six postgraduate students have undertaken or are currently undertaking postgraduate study. The Department's staff members regularly pass advanced training in pedagogy, update their knowledge and practices using the system of continuing medical education, a half (50.0%) of the Department's staff members have qualification certificates or have been accredited in accordance with the existing specialty.

Extensive organizational and methodological work is done at the Department. The Department's staff are members of the Dissertation Council 21.2.058.12 at the Pirogov Russian National Research Medical University and the Dissertation Council 24.1176.01 at the Izmerov Research Institute of Occupational Health, stand as opponents and reviewers of the third party research and practical experience. The research hygienists are members of editorial boards of the following journals: Russian Journal of Occupational Health and Industrial Ecology, Health Risk Analysis, Public Health and Life Environment — PH&LE, Hygiene and Sanitation, Current Problems of Health Care and Medical Statistics, Volgograd Journal of Medical Research, Pediatric Nutrition, Russian Medical Journal, Russian Bulletin of Hygiene.

The Department's staff members initiated, led in the creation and are currently actively engaged in publication of the journal "Russian Bulletin of Hygiene", the first issue of which was published in 2021. This is a peer-reviewed academic journal of the Eastern European Cluster for Medical Research and Education of the Central Federal District founded by the Pirogov Russian National Research Medical University and Burdenko Voronezh State Medical University. On July 11, 2023 the journal entered the list of peer-reviewed research and practical journals recommended by the HAC under the Ministry of Education and Science of the Russian Federation (in accordance with the HAC List as at 17.07.2023, No. 2260). The journal accepts papers on the specialty 3.2.1. "Hygiene" (health sciences) and 3.2.1. "Hygiene" (biological sciences).

Specialists of the Department of Hygiene conduct expert and consulting work in various fields of medical knowledge. They are members of the Profile Commission on Hygiene in Children and Adolescents of the Ministry of Health of the Russian Federation, members of the Problem Commission of the RAS Academic Council for hygiene, Presidium of the Russian Society for Development of School and University Medicine and Health, European Anthropological Association, Academic Council of Rospotrebnadzor, they are experts of RAS, members of the Commission on State Sanitary and Epidemiological Standards under the Federal Service for the Oversight of Consumer Protection and Welfare, members of the HAC Expert Council under the Ministry of Education and

Science of the Russian Federation for medical and preventive research.

Olga Yu. Milushkina, Head of the Department since 2015, is the main supernumerary specialist in hygiene of children and adolescents at the Ministry of Health of the Russian Federation, Secretary for higher medical and non-medical education at the Central Accreditation Commission of the Ministry of Health of the Russian Federation, Vice-Rector for Academic Affairs at the Pirogov Russian National Research Medical University since 2020. During the past period she was awarded the Gratitude of the Minister of Health of the Russian Federation (2017, 2020), Honorary Diploma of the Ministry of Health of the Russian Federation (2021), medal "For Contribution to Implementation of State Policy in the Field of Education and Science and Technology Development" (2022). The Department's staff members were awarded Honorary Diploma and Gratitude of the Pirogov Russian National Research Medical University, Gratitude of the Minister of Health of the Russian Federation, Honorary Diploma of the Ministry of Health of the Russian Federation, orders and medals of the Russian Federation.

In the reporting period, the Department's material and technical foundation was improved: educational and support facilities were renovated, lighting systems were replaced, technical foundation of the computer class and the teachers' workplaces was renovated, three classrooms were equipped with multimedia facilities.

In 2019–2023, about 13,000 of students of the general medicine, pediatrics, dentistry, biomedical and international faculties were trained at the Department, among them 667 foreign students, who were taught in English. The average annual number of students trained at the Department is 2500, while that of residents is about 150.

The Department's professor staff does extensive educational and methodological work. A total of 10 textbooks, three toolkits, and three guidelines have been issued. Methodological materials on the subjects of lessons are regularly updated, video-lectures are recorded. Informational and educational materials to be posted on the portal of continuing medical and pharmaceutical education of the Ministry of Health of the Russian Federation have been prepared.

The educational and methodological publications issued with the help of the Department's staff members receive public recognition and awards. First prize of the Pirogov Russian National Research Medical University Contest was awarded for the best educational and methodological performance in 2021 (textbook "Hygiene of Nutrition in Pregnancy, Lactation and Children in Their First Year of Life" (Milushkina OYu, Tikhonova YuL, et al.)). The paper "Working Conditions and Occupational Diseases of Medical Professionals" (Milushkina OYu, et al., editors) won in the nomination Discovery of the Year of the IX All-Russian Book Award "Golden Fund" in 2022; in 2023, the gold medal of participant of the 36th Moscow International Book Fair was awarded for the textbook "Hygienic Education of Students in Terms of the Safe Use of Electronic Devices in Educational and Leisure Activities" compiled in direct coordination with O.Yu. Milushkina, N.A. Skoblina, S.V. Markelova, A.A. Tatarinchik, O.V. Ievleva, as well as for the textbook "Hygienic Aspects of Preventing the Diseases Associated with Exertion of Body's Adaptive Mechanisms During Acclimatization" compiled in direct coordination with O.Yu. Milushkina and N.A. Skoblina.

The Department's staff members closely cooperate and conduct joint research with the friendly research teams of the Cluster for Medical Research of the Central Federal District of Russia uniting experts from Moscow, Voronezh and Ryazan,

as well as with their colleagues from Moscow, Ekaterinburg, Kazan, Nizhny Novgorod, Samara, Omsk, Krasnoyarsk, Saratov, Vladivostok, Arkhangelsk, Astrakhan, et al.; they are engaged in international scientific cooperation with the colleagues from Belarus, Kazakhstan, Tajikistan, Uzbekistan, Kyrgyz Republic, keep in touch with experts from the USA, Italy, Netherlands; cooperate within the framework of activities of the association of organizations and experts in hygiene "Union of Hygienists" (<http://iuh.su>).

To promote the National Goals of the Russian Federation in digital transformation, the open access software products have been developed together with friendly research teams and are used for training at the Department: Standards for Physical Development of Children and Adolescents (registration certificate of a computer program RU2018661994, 25.09.2018, application № 2018619420 of 27.08.2018) and the anthro-prof software product "Program for Assessing Physical Development of Schoolchildren" (registration certificate of a computer program 2022669375, 19.10.2022, application № 2022668886 of 13.10.2022).

The software product "Program for Assessing Physical Development of Schoolchildren" makes it possible to estimate the child's physical development in accordance with the Order No. 514n "On the procedure for conducting preventive medical examinations of minors" of the Ministry of Health of the Russian Federation (Fig. 1).

A total of one patent for invention, 39 database certificates were registered, 11 collective monographs were published, two hygienic standards were approved together with friendly research teams.

The results of the Department's research, methodological and other activities for the past period were reported during more than 95 international, all-Russian with international involvement, and other scientific and practical events. The knowledge accumulated was popularized via media: Russia-1, Zvezda, TV Center TV channels, RIA Novosti news agency, Trud and AIF Za Kaluzhskoj Zastavoj newspapers, Medical Newspaper, Teacher's Newspaper.

As for scientific papers reflecting the today's directions of the Department of Hygiene of the Faculty of Pediatrics, Pirogov Russian National Research Medical University, a total of 150 articles were published over a five-year period, among which 46 in the journals indexed in international databases (Scopus, Web of Science), 58 in the peer-reviewed journals recommended by HAC under the Ministry of Education and Science of the Russian Federation. Furthermore, the results of the global study "Diminishing Benefits of Urban Living for Children and Adolescents' Growth and Development" involving the researchers of the Department of Hygiene from the Russian Federation were published in the British journal "Nature" on March 29, 2023.

The Department's staff members continue research in the field of sanitary microbiology, thereby developing the scientific ideas of the RAS academician, Professor Yu.P. Pivovarov. Methodological approaches to assessment of the engineered microorganisms



Fig. 1. QR code leading to a webpage of the anthro-prof software product "Program for Assessing Physical Development of Schoolchildren"



Fig. 2. Visualization of the content of scientific papers using the most abundant words

and appropriate preparations' safety for environmental objects were developed; the criteria to estimate toxicity and hazard of the single-component and multicomponent medications based on the engineered microbial strains and the approaches to development of the methods to control their levels in air were determined. The team of the Department's toxicologists (Professor N.I. Sheina, Professor V.V. Korolik, E.D. Drugova) takes part in pre-clinical trials of novel active substances; coordinates and conducts collaborative research focused on determining the tentative safe exposure levels (TSEL) taking into account specific effects of chemical compounds being the substances of drugs and disinfectants; a total of 26 MACs in the working area air and atmospheric air for the engineered microbial strains (*Komagataella pastoris*, *Pichia pastoris*, *E.coli*, *Beauveria bassiana*) and biologics (Fitosporin, Arkoil, Lovchij, TurinBash, etc.) have been determined, which have been included in the SanPiN 1.2.3685-21 "Hygienic Standards and Requirements for the Environmental Factor Safety and/or Harmlessness to Humans". The study results have also provided the basis for the updated guidelines "MAC Experimental Substantiation and Regulation of the Levels of Engineered Microbial Strains and Biologics Containing Them in Industrial and Environmental Objects" (authors: Professors N.I. Sheina and V.V. Korolik, RAS academician Professor Yu.P. Pivovarov, candidates of science E.G. Skryabina, L.P. Sazonova, L.I. Myalina, V.V. Kolesnikova), which are now awaiting approval by Rospotrebnadzor.

Today, the Department's toxicologists are engaged in the development of express methods allowing for fast and early detection and identification of the toxic agent effects on the organism, the use of which is promising for express diagnosis to be used in clinical practice and experimental settings.

The Department's staff members conduct research in the field of food hygiene (academician Yu.P. Pivovarov, RAS corresponding member O.Yu. Milushkina, D. Sci. (Med.) N.A. Bokareva, Cand. Sci. (Med.) Yu.L. Tikhonova). Preventive measures aimed at reducing the chemical contaminant nutritional load associated with poor nutrition in children in their first year of life resulting from unreasonable refusal of breastfeeding, abnormal timing of introduction of complementary foods have been substantiated at advanced methodological levels. The proposed preventive

measures have been introduced into the activities of obstetrics hospitals, maternity clinics and volunteer work with puerperas, thereby reducing the risk of disorders in the child population.

The global growth of childhood disability over the recent years has become a worldwide problem impacting all spheres of public life (economic, political, social, spiritual). This trend gives relevance to the search for measures contributing to improving quality of life of children with disabilities. The Department's researchers (RAS corresponding member O.Yu. Milushkina, Cand. Sci. (Med.) E.A. Dubrovina) have conducted research focused on assessing the differences in perception of the educational material rationally presented to children with various disorders during the lessons. The mass and individual timing protocols for the classes, where children with disabilities are taught, have been developed for the study, the guidelines on arranging educational activities in this cohort of children and disabled schoolchildren have been proposed. Such work in organizations of secondary and higher vocational education involving the Department employees is continued.

The analysis of the Department's professor staff publication activity using the tag (word) cloud service is provided in Fig. 2.

Visualization of the analysis of publication activity presented using the tag (word) cloud service clearly illustrates the research objects over a five-year period, including mainly children, adolescent and youth, i.e. students (schoolchildren and medical and non-medical university students). Estimation of their health status and physical development has been the research subject. The impact of such factors, as the use of electronic (including mobile) devices in educational activities has been assessed, specifically during distance learning and in leisure time. The studies conducted (RAS corresponding member O.Yu. Milushkina, Professor N.A. Skobolina, D. Sci. (Med.) S.V. Markelova, D. Sci. (Med.) F.U. Kozyreva, Cand. Sci. (Med.) A.A. Tatarinchik, O.V. Ilevleva, A.V. Kirillova) have resulted in the development of preventive and health-promoting measures, lifestyle correction, including using the hygiene training forms and methods focused on prevention of diseases of the eye and adnexa, functional impairments of the body's cardiovascular, musculoskeletal, nervous and other systems.

Great attention was paid to developing new forms of teaching hygiene (business games, online quests, etc.) and to hygiene training of medical students (RAS corresponding member O.Yu. Milushkina, Professor N.A. Skoblina, D. Sci. (Med.) S.V. Markelova, associate professors M.B. Bulatseva, R.S. Volkova, Cand. Sci. (Med.) G.G. Chub, Cand. Sci. (Med.) A.A. Tatarinchik, O.V. Ievleva, D.D. Kaminer, A.V. Kirillova).

Thus, the directions of the Department of Hygiene of the Faculty of Pediatrics, Pirogov Russian National Research Medical University, maintaining the scientific school continuity and conducting research in conventional areas, include research on the new paragraphs of the academic passport for the specialty 3.2.1. "Hygiene" (paragraph 10 (Information and Analytical Hygiene), paragraph 11 (Hygiene of Health Preservation) and paragraph 12 (Hygiene Training)), as well as on the conventional paragraph 4 (Hygiene of Children and Adolescents).

The National Healthcare Project is implemented in Russia in 2019–2024. According to the Passport of the project, it is planned to increase coverage of the child population with routine check-ups aimed at preservation of health along with the national reproductive and labor potential. In 2017, this indicator accounted for 38.7% of the total number of children subject to check-ups; it is planned to increase this value to 80.0% by 2024. Currently, it is stated in the standard and methodical base of the Ministry of Health of the Russian Federation, specifically in the Order № 514n "On the procedure for conducting preventive medical examinations of minors" (current version), that assessment of the child's physical health is the key criterion of assessment of his/her health status essential for identification of children at risk aimed at developing new guidelines on shaping healthy lifestyle, daily routine, nutrition, physical exercise, and the guidelines on dispensary supervision, treatment, medical rehabilitation and resort treatment. Given the actual goals and priorities of the modern society development, the Department's research was focused mainly of health protection in children, adolescents and youth, i.e. on preservation of the national labor, reproductive and defense potential. The studies considered the most relevant factors, such as widespread use of electronic devices, distance learning, restrictions associated with the pandemic, etc. [12–17].

The problem of unregulated use of electronic devices was also solved for other cohorts, specifically for the working population (teachers and healthcare professionals) [18–19].

New hygienic research methods were substantiated, specifically the use of online questionnaire surveys, their sensitivity, specificity and validity were demonstrated [20].

Pursuit of healthy lifestyle in today's children, adolescents and youth, as well as their parents, teachers and even healthcare professionals are primarily associated with having no harmful habits. Students do not realize that the key role is played by proper diet, enough sleep, optimal physical activity, etc., which demonstrates their insufficient awareness of these issues and the lack of shaped health preservation skills [21–28].

In recent years, the hygiene training programs aimed to prevent health problems in the population were seldom or never

used. At the same time, the potential of measures for hygiene training of various population groups using advanced forms is considered to be the most important and promising area of hygiene showing the research and practical significance. Due to changes in the population living conditions and lifestyle is was necessary to update the hygiene training forms and methods, as well as to develop and test the new ones. Furthermore, special attention should be paid to students of medical universities and colleges, medical volunteers as future custodians of knowledge and skills related to shaping adherence to healthy lifestyle in patients and the population [29–30].

The Department of Hygiene has always attached great importance to training of researchers. The research activities of many Department's professors started from studentship. Numerous scientists and teachers were involved in research in the student's scientific circle and resumed scientific activity in during their postgraduate course. This is still implemented today, when the students being members of the circle conduct studies, publish the reports in the peer-reviewed journals, win prizes at the International Pirogov Scientific Medical Conference and other forums [31].

We can say that the work done by the Department's staff continues the work of the acknowledged founders of hygiene. Thus, if we turn to history, in Russia hygiene had been just an academic discipline for a long time. Only the research conducted by Alexey P. Dobrosлавин, who started conducting routine studies (including experimental studies) to substantiate the hygienic provisions, which showed its usefulness and compliance with the requirements of the times. Moreover, he made students familiar with practical application of hygienic knowledge to the real life conditions when examining the objects of practical interest: hospitals, waterworks, canteens, barracks. He attached the utmost importance to sanitary public education and promotion of hygienic knowledge using a wide range of forms for this purpose: public lectures, publication of the sanitary educational brochures and articles [32].

CONCLUSION

The research and practical work done at the Department of Hygiene covers almost all areas of research for the specialty "Hygiene" and actively develops the toxicology research methods. The professor staff demonstrates high publication activity, develops educational and methodological materials together with standards, actively cooperates with the colleagues in both Russia and the countries near and far abroad, improves qualification in pedagogy and medical specialty, teaches students and residents, trains researchers. The outlined prospects for the development of scientific directions, the Department's staff great interest to their work and high rate of publications in the journals showing high citation impact make it possible to expect further professional growth of the Department's employees and scaling up the results of their research and practical activities.

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