

Research Article

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Historical Aspects of the Development of the State Educational System in the Field of Clinical Toxicology in Russia

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SUMMARY The analysis of the historical development of the state system of training in the field of clinical toxicology showed that the opening of the first specialized departments (centers) served as an impulse for the adoption in the future of appropriate organizational decisions and regulatory documents that led to the creation of the country's first department of clinical toxicology. In addition, this became possible after the emergence of qualified personnel of clinical toxicologists, as well as scientific and practical areas, primarily general resuscitation and toxicological chemistry, and the achievements of fundamental sciences, new pharmacological and technical means of detoxification of the body, on which basis educational materials of the proper level were formed.

An important role for the creation of the Department of Clinical Toxicology was played by the publication by E.A. Luzhnikov, the country's first textbook on clinical toxicology. The results of the activities of Academician E.A. Luzhnikov in the organization of training in the field of clinical toxicology also contributed to the acquisition of a comprehensive level of knowledge and the expansion of teaching in this direction.

However, today, clinical toxicology has not become a basic specialty in the vast majority of medical institutions of higher education, including Moscow, which, in our opinion, hinders the process of training the required number of practical, scientific, and teaching personnel in this area. The choice of clinical bases for training is of fundamental importance, of which multidisciplinary research emergency hospitals or emergency hospitals are optimal.

Along with the proven form of teaching in the form of field cycles, further reflection requires the place of distance learning as another approach to expanding the audience of listeners. It is also absolutely necessary to support the teaching process within the framework of continuous professional education, including cooperation with scientific and practical medical societies.

The most important component of the learning process is the accumulation of scientific experience in the specialty, to which a decisive contribution is made by the creation of scientific schAPs on the bases of toxicological subdivisions. Additional opportunities are also provided by the modern formation of the scientific specialty "Toxicology", which makes it possible to achieve the most qualified examination of the results of scientific research.

CONCLUSION The development of the state educational system in the field of clinical toxicology in Russia is closely related to its formation as an independent scientific and practical direction in medicine, which has high social significance, and the adoption of the experience gained in the course of educational activities.

Keywords: history of medicine, emergency medical care, clinical toxicology, training

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AP — acute poisoning

BSMU — Bashkir State Medical University

CIID — Central Institute for the Improvement of Doctors

COLIID — Central Order of Lenin Institute for the Improvement of Doctors

CRL — Central Research Laboratory

DET — distance educational technologies

FAT — Faculty of Advanced Training

FCPE — Faculty of Continuous Professional Education

FPE — Faculty of Postgraduate Education

ICPE — Institute of Continuous Professional Education

IPE — Institute of Postgraduate Education

LenSIIDS — S.M. Kirov Leningrad State Institute for the Improvement of Doctors Skills

PR — professional retraining

RAS — The Russian Academy of Sciences

RI EM — Research Institute for Emergency Medicine

RMACE — Russian Medical Academy of Continuous Professional Education

SPTC — Scientific and Practical Toxicological Center

The formation and development of the state system for training specialists in the field of clinical toxicology in Russia is distinguished by its extraordinary way, which is associated both with the specifics of this specialty and the activities of its most prominent representatives.

The peculiarities of teaching clinical toxicology should include the need to include in the curriculum relevant information related to the following points:

- the need for the formation of professional competencies by students from a large number of related areas of clinical medicine - primarily resuscitation, internal and infectious diseases, clinical pharmacology, rehabilitation, etc.

- the constant introduction into practice of new drugs (now - non-barbituric hypnotics, psychodysleptics, synthetic cannabinoids, designer drugs, etc.) and poisoning with them;
- the use of new methods of detoxification of the body (hemosorption, physio- and chemo-hemotherapy), the intensive development of which dates back to the end of the 20th - beginning of the 21st century; in recent years, such promising methods as enteral detoxification (intestinal lavage, enterosorption) and enteral correction of disturbed homeostasis indicators have also been successfully developed, information about which has taken a significant place in the teaching process;
- the use of physical factors in the rehabilitation of toxicological patients;
- the detoxification effect inherent in the above methods of detoxification and rehabilitation, which involves the acquisition of certain knowledge regarding the physicochemical and biological processes that contribute to its implementation;
- understanding the essence of physical parameters that characterize the impact of detoxification components on the body, since their purposeful change (clinical dosimetry) makes it possible to control detoxification therapy and predict its effect;
- objectification of the severity of damage to the body in acute poisonings (AP) and its response to the ongoing treatment using not only an assessment of the content of exogenous toxicants in biological media, but also the significance of changes in the main parameters of homeostasis (hemorheological, immune, oxidative, etc.) and, in addition, manifestations of endotoxemia rapidly developing against the background of their disorders, which together constitute the most important part of clinical toxicometry, the use of which can significantly advance the disclosure of the pathogenesis of chemical diseases and optimize their treatment.

In a relatively short period of time, the list mentioned above has significantly increased compared to the one given by us earlier [1], which is associated with the fact that practice in the field of clinical toxicology requires multifaceted knowledge that can be acquired only with a sufficiently high level of development of related fields of clinical medicine. This may also explain the fact that although AP has long been well known, historically the emergence of emergency clinical toxicology as a new specialty took place relatively recently. It should also be noted that the inclusion of information about the latest scientific achievements in the teaching process, in our opinion, is the shortest way to introduce them into the clinic.

The above features of training in this area make it a very difficult task to train the teaching staff.

The creation of organizational foundations for emergency clinical toxicology in our country began in the first half of the 20th century - after it left the framework of forensic medicine, pharmacology, as well as military and industrial toxicology. In this regard, the studies begun in the therapeutic clinic of the Research Institute for Emergency Medicine (RI EM) named after A.I. N.V. Sklifosovsky (academician of the Academy of Medical Sciences of the USSR A.N. Kryukov, prof. P.L. Sukhinin), which led to the opening of the first toxicological department in the country (now the scientific department of acute poisoning and somatopsychiatric disorders) and made it possible to resolve issues of AP on the new level [1a]^[2].

The obvious successes achieved in this direction by the employees of the department served as a prerequisite for the creation on the basis of the Research Institute for Emergency Medicine named after N.V. Sklifosovsky Republican [2a] and All-Union [3a] centers for the treatment of AP, whose teams began active work on the preparation of relevant legal documents and the organization of toxicological centers (departments) in the regions. In addition, another way to improve toxicological care was the creation of an information and advisory toxicological service - first in the form of an information and advisory toxicological center of the Ministry of Health of the Russian Federation [4a] (currently the Scientific and Practical Toxicological Center of the Federal Medical and Biological Agency of Russia, SPTC), and then similar local institutions.

As a result, by the end of the 20th century, the foundation of the toxicological service was created in the Russian Federation - a network of 44 centers (departments) for the treatment of AP in 41 regions, which today provides specialized care to the population of 50% of the territory of the Russian Federation and serves as the basis for the introduction of advanced achievements in this area [2, 3].

An outstanding role in the formation of emergency clinical toxicology as a new scientific and practical direction in clinical medicine belongs to Academician of the Russian Academy of Sciences E.A. Luzhnikov (September 27, 1934–April 20, 2018) (Fig. 1), who had headed the toxicological department of the N.V. Sklifosovsky Research Institute for more than 40 years, whose creative biography was presented by us earlier [2, 3].



Fig. 1. Academician of RAS E.A. Luzhnikov

Soon after the start of work of the toxicological departments and in connection with its rapid expansion, due to their high practical significance, the issue of establishing the corresponding specialty and training clinical toxicologists was on the agenda.

It should be noted that training in emergency medical care, including the diagnosis and treatment of AP, was initially conducted at the Department of Emergency Therapy of the Central Institute for Improvement of Doctors (CIID) (Head - Academician of the USSR Academy of Medical Sciences A.N. Kryukov, Fig. 2), established in 1931 on the basis of the N.V. Sklifosovsky Research Institute.



Fig. 2. Academician of the USSR Academy of Medical Sciences A.N. Kryukov. Link: <https://ru.wikipedia.org/>

Kryukov Aleksandr Nikolayevich (08/19/1878, Moscow - 12/19/1952, Moscow) - Doctor of Medicine (1909), Professor (1918), Academician of the USSR Academy of Medical Sciences (1948), Honored Scientist of the Uzbek SSR (1949). One of the leading domestic therapists of the 20–40s of XX century, the founders of emergency therapy, the founder of the scientific school of clinical hematology. He graduated from the medical faculty of Moscow University (1901), where he was a privat-docent in 1914–1918, and a professor in 1918–1919. In 1919–1930 - at the Turkestan (Central Asian) University: director of the faculty therapy clinic and head of the hospital therapy clinic, and the Head of the Clinic for Tropical Diseases in 1927–1930. He laid the foundations of scientific medicine and regional tropical pathology in Central Asia. During the Great Patriotic War (WWII) - the chief therapist of the evacuation hospitals of the People's Commissariat of Health of the USSR.

In 1931–1952 - Head of the Emergency Therapy Clinic of the Moscow N.V. Sklifosovsky Research Institute for Emergency Medicine, at the same time head of Department of Emergency Therapy CIID (1934–1952) on the basis of the Institute ^[3]. Under the leadership of A.N. Kryukov, issues of diagnosis and treatment of urgent diseases of internal organs (bleeding, pain syndrome, acute circulatory disorders, hypertension, acute myocardial infarction, etc.) were developed.

A.N. Kryukov also touched upon the issues of AP, with special attention being paid to the frequent AP at that time by mercury, arsenic and caustic substances. He summarized his achievements in the fundamental guidelines for emergency care in the clinic of internal diseases [4, 5]. Later, in the publications of an employee of the clinic and the department O.I. Glazova presented information on the diagnosis and treatment of AP with more than 250 chemicals [6].

A significant increase in the number and forms of household AP, due to the rapid development of the chemical and pharmaceutical industries in the country, however, required radical solutions to improve the results of their treatment, the methods of which no longer satisfied the current situation [2, 3].

With the opening of the first toxicological departments, an important step in this direction was the introduction of a specialized medical specialty. This was initiated by the orders of the Ministry of Health of the USSR and the Ministry of Health of the Russian Federation (1970, 1971 and 1999) [6a–8a], which approved the specialty “toxicologist” and the position of “toxicologist”. At the same time, the specialty “toxicology” is being introduced into the nomenclature of specialists with higher medical and pharmaceutical education in healthcare institutions of the Russian Federation who require additional training, including in the therapeutic section - “clinical toxicology”.

Another group of orders — the orders of the Ministry of Health of the USSR (1961, 1980 and 1989) and the Ministry of Health of the RSFSR (1970, 1981) [9a–11a, 2a, 12a] — was devoted to improving the organization and quality of medical care in AP. In particular, they contained indications of the need to develop proposals for the improvement and advanced training in clinical toxicology of doctors from specialized departments and medical institutions and emergency doctors, the organization on the basis of the Central Order of Lenin of the Institute for the Improvement of Doctors Skills and the N.V. Sklifosovsky Research Institute for Emergency Medicine Postgraduate Training in Clinical Toxicology; it was prescribed to give lectures and conduct practical classes for students of medical institutes, as well as teaching the basics of clinical toxicology at medical institutes according to an approved inter-departmental program.

Central chemical-toxicological laboratory of the head institution for the analytical diagnosis of toxic substances in biological fluids and human tissues - the Sechenov 1st Moscow Medical Institute, together with the Department of Toxicological Chemistry of the Institute, the training of the teaching staff of the relevant departments of the institutes was charged. In this regard, it should be noted that in 1965 the Department of Forensic Chemistry of the Sechenov 1st Moscow Medical Institute was transformed into the Department of Toxicological Chemistry, which reflected the importance of the analytical diagnosis of AP in living individuals.

The specialized departments of medical and pharmaceutical institutes as regional centers and the departments of institutes for the improvement of doctors were entrusted with postgraduate training of specialists from the territories assigned to the centers. The organization of scientific events was also envisaged.

As for Moscow health care, already in the above-mentioned order of the Moscow Health Department “On the organization of a center for combating acute poisoning” [1a], the Center was ordered to provide advanced training for doctors in the city’s inpatient polyclinic institutions on issues of prevention and treatment of AP. Other orders [13a–15a] on the basis of the institute proposed to organize training in the provision of emergency medical care for diseases of chemical etiology for doctors of the emergency and emergency medical care station, admissions, therapeutic departments of hospitals of city and district subordination of Moscow. The orders assumed the formation of programs for permanent courses and a clear system for allocating doctors to participate in the work of courses with their release from work on the day of classes and the preservation of wages. At the same time, the last order approved the Emergency Medicine Teaching Program, which also included a section on AP.

The Center trained emergency and emergency physicians, resuscitation departments of medical institutions in Moscow and other cities, interregional toxicology centers, as well as doctors and paramedics of special units, and a 2- month cycle at the Center was introduced into the training program for clinical residents. In addition, emergency doctors and resuscitation department doctors were trained at the workplace. Short-term cycles were conducted for doctors and paramedics of special units (4th Main Directorate of the USSR Ministry of Health, civil defense), specialists of the USSR Ministry of Defense and medical colleges. The training was conducted by the head and staff of the Center. The content of the lectures, however, covered a limited range of issues of a nosological nature only - AP with sleeping pills, organophosphorus compounds, cauterizing agents, mushrooms, as well as bites of poisonous snakes and insects, and, for example, from October 1972 to July 1973, it was presented with only 2 lectures.

In addition to the measures taken, the order of the Main Directorate of Health of the Moscow City Executive Committee [16a] ordered “to conduct June 30, 1972 Scientific and Practical Conference “Poisoning by psychopharmacological agents” on the basis of the N.V. Sklifosovsky Research Institute. The responsibility for holding the conference rested with the leadership of the institute. The reports made at the conference were prepared mainly by the staff of the N.V. Sklifosovsky RI EM.

The activities mentioned above undoubtedly contributed to an increase in the level of knowledge of doctors in the field of clinical toxicology, but at the same time, the need for much more extensive training in this direction became clear.

In 1972, by order of the rector [17a], at the military department of the sanitary-hygienic faculty, a course of household toxicology was organized at COLIID (for therapists, heads of republican and regional centers for the treatment of AP, toxicologists of the 2nd Main Directorate of the Ministry of Health of the USSR and ambulance doctors). In accordance with the instructions of the Ministry of Health of the USSR (1973) [18a] and the order of the rector of COLIID (1973) [19a], he was soon transferred to the Department of Radiation Hygiene (headed by Prof. V.Ya. Golikov) of the same faculty as special course in toxicology of household chemicals. The systematic training of specialists in this course was facilitated by the country's first "Unified program for postgraduate training of doctors in clinical toxicology" developed by its teachers and approved by the Ministry of Health of the USSR.

In addition to full-time teachers (head of the course Prof. A.P. Vorotyntsev, Associate Professor N.N. Kotov, assistant V.N. Dagaev), employees of the Toxicological Department of the Research Institute for Emergency Medicine named after V.N. N.V. Sklifosovsky (Prof. E.A. Luzhnikov, Candidates of Medical Sciences T.V. Novikovskaya, A.L. Muromov, Yu.N. Ostapenko, A.S. Savina, L.G. Kostomarova, etc.).

The training on the course was rich - in addition to lectures, seminars and practical part, it, including at dedicated clinical bases during field cycles, included simulation classes in section rooms with a demonstration of the full range of surgical approaches on cadavers for detoxification and resuscitation activities. In addition, using the equipment of the course, in the presence of students, hemosorption operations were performed for selected inpatients according to indications (Candidate of Medical Sciences, Yu.S. Goldfarb).

Particular importance was attached to conducting monthly trips to various cities of the RSFSR and, in the absence of specialized toxicological assistance, to other republics of the USSR (Vladimir, Yuzhno-Sakhalinsk, Tallinn, Dushanbe, Barnaul, Samarkand, Ashgabat, Batumi, etc.). This made it possible to effectively train a large number of specialists and introduce new detoxification technologies.

The successful activity of the course put on the agenda the organization of the Department of Clinical Toxicology, which was established in 1985 by order of the rector of COLIID prof. M.D. Kovrigina [20a] on the basis of the relevant order of the Ministry of Health of the USSR, issued in 1984 [21a] and signed by Deputy Minister Acad. USSR Academy of Medical Sciences Yu.F. Isakov. At the same time, the department was introduced into the faculty of advanced training of doctors in Moscow (currently it is part of the therapeutic faculty). The educational and clinical base of the department was determined by the N.V. Sklifosovsky Research Institute for Emergency Medicine (toxicological department), which is it to this day. Interim head of Professor of the Department of Radiation Hygiene Professor A.P. Vorotyntsev (Fig. 3), its first head in 1986 was Professor E.A. Luzhnikov (until 2016), and the teachers are mostly the most experienced employees of the specified department.



Fig. 3. Professor A.P. Vorotyntsev. Link: http://www.imha.ru/uploads/posts/2016-02/1455465784_sgm_2006-17.jpg

Vorotyntsev Aleksey Pavlovich (1918-1995) - doctor, scientist, teacher, colonel of the medical service, an active participant in the Great Patriotic War, Cand. Med. Sci. (1952), Dr. Med. Sci. (1962). Author of a significant number of scientific papers, 12 inventions. The working path of A.P. Vorotyntsev reflects the peculiarities of the formation of specialists - clinical toxicologists, who, as a rule, come to her from other areas of clinical medicine. Since 1949, he worked at the CIID (later COLIID) at various departments, including military toxicology; in 1973-1985 - Professor of the Department of Radiation Hygiene, Head. course in toxicology of household chemicals, in 1985-1988 . - Professor of the Department of Clinical

Toxicology, and in 1988-1995. – chief researcher of the scientific group of the Central Research Laboratory at the specified department. Scientific research by A.P. Vorotyntsev were first devoted to the issues of gas infection, damage by penetrating radiation and chemical weapons, and later - sorption purification of blood from toxicants.

Since 2016, the department has been headed by a student of Acad. E.A. Luzhnikov and his follower prof. Yu.S. Goldfarb, who has been dealing with AP issues for about 50 years at the N.V. Sklifosovsky Research Institute and has been teaching it for about 40 years at the Russian Medical Academy of Continuous Professional Education (RMACPE) and other medical institutions. He has extensive experience in practical, advisory and scientific work (more than 580 publications) in this field.

In methodological terms, the first edition of the textbook "Clinical Toxicology" for medical institutes (1982), prepared by E.A. Luzhnikov, which was later republished several times (in 1994, 1999, co-authored in 2008) [7, 8] and was awarded the Prize of the Government of the Russian Federation (1999).

At the department - first on the territory of the USSR, and then the Russian Federation - active work was started and continues to train and improve the skills of toxicologists, resuscitators, therapists, pediatricians, and more recently, polyclinic specialists.

In accordance with modern requirements [22a], educational and methodological work at the department is carried out according to additional professional programs focused on improving existing competencies by doctors or acquiring new ones, reflecting specific learning outcomes and presenting evaluation materials, taking into account the provisions of the Professional Standard "Toxicologist" [23a]. The computer information retrieval toxicological system *POISON* and demonstrations of chemical and toxicological diagnostics of AP are actively used on modern equipment of the chemical and toxicological laboratory of the N.V. Sklifosovsky Research Institute for Emergency Medicine, which gives an additional opportunity to improve the skills of students.

The created epidemiological situation required the reorganization of the educational process of the department with the help of distance learning. Until recently, it was carried out using the *Mind Russia video conferencing service*, and now it is a more functional *Microsoft 365 program (Microsoft Teams application)* based on the *Microsoft Office platform*. In many respects, this became possible as a result of the adoption of legal documents that provide for the implementation of educational programs using e-learning and distance education technologies (DET) [24a-29a], which make it possible to both gain knowledge and develop skills and abilities using case technology. It must be said that in the field of additional professional education there is no list of educational programs, the implementation of which does not allow the use of exclusively e-learning, DET [26a].

In our opinion, the advantages of DET include the ability to communicate with an unlimited number of students, and, if necessary, to repeat the material in the recording; students also have the opportunity to work independently with remote modules. This form of education also allows you to update the training materials and assessment tools presented in the virtual room.

The disadvantages of this method of teaching are the lack of a sufficiently complete contact with the audience, especially emotional, and the possibility of technical problems during the classes.

In the context of the *COVID*-19 pandemic, students' readiness for self-education has increased, as evidenced by the increase in the frequency of their access to educational materials available at the department, including those developed at it, including the differential diagnosis of *COVID*-19 with AP.

The staff of the department prepared more than 60 methodical works.

Teaching at the department traditionally takes place both at its medical base and at the bases of other hospitals that have toxicological and intensive care units in their composition, in the form of visiting cycles, which can significantly increase the number of students who have the opportunity not only to improve their skills, but also, with the end of the 90s of the XX century, also get certified. In total, about 30 such cycles were carried out - in the cities of both the former USSR and the Russian Federation (Vilnius, Cherepovets, Samara, Voronezh, Dnepropetrovsk, Tolyatti, Penza, Kyzyl, Omsk, Stavropol, etc.). As can be seen, a significant part of the territory of the European part of Russia has now become the main area of study for the department.

During the work of the department, about 5000 specialists have been trained at it.

At the end of the 20th - beginning of the 21st century, other departments were also organized with the teaching of clinical toxicology: in Leningrad (1986, Department of Clinical Toxicology of the Leningrad State Institute for the Improvement of Doctors named after S.M. Kirov (LenSIIDS), head - Dr. Sciences G.A. Livanov^[4], Yekaterinburg (1995, Department of Occupational Diseases and Toxicology of the FAT and PR of the Ural State Medical Academy, head - Doctor of Medical Sciences V.G. Sentsov^[5]), Ufa (1996,

Department of Clinical Toxicology and Occupational Diseases of the Bashkir State Medical University (BSMU), Head — Prof. Z.S. Teregulova^[6]), Khanty-Mansiysk (2008, course of resuscitation, intensive care and extreme medicine at the Department of Hospital Surgery of the Khanty-Mansiysk State Medical Institute, head - Candidate of Medical Sciences B.B. Yatsinyuk^[7]), Moscow (2010, Department of Toxicology and Clinical Pharmacology of the Academy of Postgraduate Education of the Federal Scientific and Clinical Center of the Federal Medical and Biological Agency of Russia, Head — Doctor of Medical Sciences S.Kh. Sarmanaev^[8]) and Khabarovsk (2011, Department of Clinical Toxicology and Extreme Medicine of the Far Eastern State Medical University, head - Candidate of Medical Sciences A.Yu. Shchupak).

In addition, according to our information, training in toxicology programs is now also carried out at departments in Moscow (Department of Anesthesiology, Resuscitation and Pediatric Toxicology, RMACPE, Head - Prof. I.F. Ostreikov, Department of Pediatric Anesthesiology and Intensive Care, FCPE Russian National Research Medical University named after N. I. Pirogov, Head — Prof. V. V. Lazarev, Professor of the Department — Prof. G. N. Sukhodolova, Department of Transplantology, Nephrology and Artificial Organs of the Federal University of Higher Education, Moscow Regional Research Clinical University, Head - Academician of the Russian Academy of Sciences A. I. Grigoriev), Voronezh (Department of Anesthesiology-Resuscitation and Emergency Medicine, ICPE, Voronezh State Medical University named after N.N. Burdenko, Head — Prof. Yu.V. S Truk), Kazan (Department of Anesthesiology and Resuscitation, Disaster Medicine, Kazan State Medical University, Head. - prof. A.Zh. Bayaliev), Kursk (Department of Anesthesiology, Intensive Care Medicine, Kursk State Medical University, Head — Prof. S.A. Sumin), Yaroslavl (Department of Anesthesiology and Intensive Care, Yaroslavl State Medical University, Head — Doctor of Medical Sciences P.A. Lyuboshevsky) and Cheboksary (Department of Surgery of the Institute for Advanced Training of Doctors of the Ministry of Health of Chuvashia, head - Candidate of Medical Sciences V.V. Voronchikhin).

As can be seen, training in the field of clinical toxicology has been consistently expanded since the 60s of the twentieth century, however, as the only subject, it is currently conducted only at the RMACPE department of the same name mentioned in this article.

It should be noted that the above departments primarily provide teaching of clinical toxicology as postgraduate education in the form of advanced training and professional retraining in additional professional programs with a labor intensity of 18 to 576 hours, as well as residency programs, or this is the only area of study. At the same time, in the programs of higher medical education, according to the data we received in relation to more than 90% of the institutions implementing them, little space is given to this subject, usually in the amount of 4-6 hours of lectures, seminars, practical classes and self-training, as a rule, at departments teaching resuscitation or extreme medicine. This is clearly not enough. In addition, clinical toxicology is not taught at all in more than half of the medical institutions of higher education. At the same time, as experience shows, if such institutions have relevant specialists, the volume of teaching clinical toxicology to students both in non-core and specialized departments can be increased to 16–36–72 hours.^[9]

The training of scientific personnel is extremely important for the progress of clinical toxicology. To a large extent, this was associated with the approval in different years of specialized scientific specialties: 14.782 "Pharmacology and toxicology" (medical sciences) (1969) [30a], 14.00.20 "Toxicology" (medical sciences) (1972) [31a], 14.03.04 "Toxicology" (medical and biological sciences) (2009, rev. 2017) [32a], 14.03.04 "Toxicology" (medical, biological, pharmaceutical sciences) (2017, rev. 2018) [33a], and currently - 3.3.4. "Toxicology" (medical, pharmaceutical, biological sciences) (2021) [34a].

Also, at the Department of Clinical Toxicology of the RMACPE, from the moment of its creation and until 2013, the scientific group of the Central Scientific Research Laboratory of COLIID also functioned, dealing with the issues of detoxification of the body, as well as the study of new forms of AP.

Over the past years, the staff of the department has published more than 1000 scientific papers on topical issues of clinical toxicology - the study of new nosological forms and toxicological syndromes of AP (cardiotoxic, exotoxic shock, damage to the central nervous system (toxic-hypoxic encephalopathy), respiratory system, gastrointestinal tract, liver and kidneys, endotoxemia, secondary immunodeficiency and toxic coagulopathy, problems of complex detoxification of the body using efferent (sorption-dialysis and enteral) and physico-chemical methods of detoxification of the body, as well as clinical toxicometry and toxicology of childhood [9–17]. Medical rehabilitation, enteral correction of homeostasis disorders, improvement of laboratory diagnostics of AP, as well as the organization of the toxicological service and other issues related to AP have been studied [18–22]. Manuals and guidelines on clinical toxicology have been prepared [23, 24]. Among them, we should especially note the first in our country National Guide to

Medical Toxicology, edited by E.A. Luzhnikov, created with the participation of leading experts from St. Petersburg and Yekaterinburg and containing the most up-to-date information on various aspects of AP [25].

Largely due to the scientific research of the staff of the department, the scientific school of Academician of the Russian Academy of Sciences E.A. Luzhnikov, whose formation dates back to the early 1970s, is the most representative and largest in the field of clinical toxicology, including about 150 of his students and followers [26, 27].

As a result, it became possible to preserve the pedagogical process within the framework of this school, which determined and continues to determine the scientific and pedagogical policy of the department, consistency and continuity in the above areas of its work. Also, conditions were created for intensive training of scientific personnel, due to which the conduct of a large amount of scientific research by the staff of the department made it possible to obtain innovative fundamental and applied results. This contributed to the development of new medical technologies for examination, treatment and rehabilitation in AP and the participation of the department staff in the preparation of basic scientific publications in the field of clinical toxicology.

With the advice and guidance of the staff of the department, 17 doctors and 65 candidates of sciences were trained.

It should be noted that in recent years, the participation of toxicologists in the work of scientific events - congresses (Moscow, 2012, 2013, 2016 and 2018) and conferences (Suzdal, 2016, Kazan, 2017, Ryazan, 2019, Vladikavkaz, 2019, Moscow, 2020), organized by the Scientific and Practical Society of Emergency Medicine Physicians (SPS EMP) (Fig. 4–7). This made it possible to present the results of scientific research in the framework of specialized sections or sections on anesthesiology and resuscitation much more widely. More than 20 scientific reports were made only with the participation of the staff of the department, and more than 80 scientific papers were published in the materials of the events mentioned above. Most of these events were held with accreditation as educational within the framework of the system of continuing medical education, including the specialty "Toxicology". This greatly increased the interest of specialists in them.



Fig. 4. All-Russian conference "Delivery of Emergency and Acute Medical Care at the Present Stage. Achievements and Prospects" (Kazan, October 12–13, 2017). Plenary meeting of participants



Fig. 5. All-Russian conference "Delivery of Emergency and Acute Medical Care at the Present Stage. Achievements and Prospects" (Kazan, October 12–13, 2017). Work of the section "Acute poisonings"



Fig. 6. 4th Congress of emergency medicine doctors “The Role of Emergency Hospitals and Research Institutes of Emergency Medical Care in Reducing Preventable Mortality Among the Population” (Moscow, October 19–20, 2018). Presidium of the section “Critical Conditions in Acute Poisoning and Endotoxemia — Specialized Toxicological Assistance.” Left to right: Cand. Med. Sci. M.M. Potshkveriya, Dr. Med. Sci. A.N. Lodyagin, Cand. Med. Sci., Assoc. Yu.N. Ostapenko



Fig. 7. In the conference hall “The role of the diagnostic complex and X-ray endovascular technologies at the hospital stage of emergency and emergency medical care” (Vladikavkaz, June 27–29, 2019)

At present, in the work of the department, according to the concept of continuing professional education [35a], special attention is paid to scientific and practical activities carried out jointly with the staff of the toxicological department of the N.V. Sklifosovsky Research Institute for Emergency Medicine, chief toxicologist of the Moscow Health Department and the Ministry of Health of the Russian Federation and members of the Interregional Charitable Public Organization “Association of Clinical Toxicologists” - in order to increase the cognitive needs of toxicologists and other specialists. The organization of such events on topical topics over the past 5 years has attracted more than 1300 participants from 23 regions of the country; at the same time, about 700 specialists from 22 regions took part in the conference, held in October 2020 already remotely (Fig. 8). When analyzing the results of these events, in addition to an increase in the number of participants, an increasing interest in them was revealed by doctors of various specialties, including polyclinics [28].



Fig. 8. On-line conference of the Department of Clinical Toxicology of the Russian Medical Academy of Science and Technology and the Scientific Department of Acute Poisoning and Somatopsychiatric Disorders of the N.V. Sklifosovsky Research Institute for Emergency Medicine “Topical Issues in Clinical Toxicology” (Moscow, October 25, 2020). Head of Department of Clinical Toxicology, RMACPE, prof. Yu.S. Goldfarb reports

The scientific achievements of other departments are also undoubted. To a large extent, they are based on the activities of domestic scientific schools. In Saint Petersburg under the guidance of prof. G.A. Livanov (July 17, 1934–January 24, 2020) (Fig. 9), problems of the formation of nonspecific lesions in critical conditions, respiratory system disorders, including hypoxia and hyperhydration of the lungs caused by AP, as well as improving resuscitation care were developed [29– 35]. The study and evaluation of the effectiveness of modern methods of detoxification of the body continues [36].



Fig. 9. Professor G.A. Livanov. Link: <https://server2.topspb.tv/>

In the same place, in St. Petersburg, prof. V.V. Shilov (Fig. 10) leads the development of new methods for the diagnosis and treatment of AP with neurotropic agents, the study of the mechanisms of the toxic effect of xenobiotics, express methods for assessing the toxicity of new chemicals and the patterns of the influence of harmful environmental factors on the human body in emergency situations, as well as the examination of AP [37–40].



Fig. 10. Professor V.V. Shilov. Link: Szgmu.ru

Through the efforts of mainly specialists from St. Petersburg, the National Guidelines for the EMC were created, which has a large toxicological section [41].

A large scientific school "Ural Clinical Toxicology" (Prof. V.G. Sentsov) was formed in Yekaterinburg (Fig. 11), in its research it is closest to the ideas of Academician E.A. Luzhnikov. The subject of study of this school is the improvement of the diagnosis and treatment of AP, including taking into account the age factor, cardiotoxic drugs, opioids, as well as the development of nutritional support and the study of violations of homeostasis parameters in AP with acetic acid; original methods of artificial detoxification of the body have been proposed [42–51]. Organizational and epidemiological issues of public organizations are being addressed at the regional level [52–54].



Fig. 11. Professor V.G. Sentsov. Link: toxicology-association.ru

Among others, studies on poisoning by psychopharmacological agents have been continued [55]. Poisoning by industrial toxicants has been studied, diagnostics have been improved, and methods of pathogenetic therapy of AP with alcohol-containing disinfectants have been developed, which is of great importance for helping patients with mass poisoning [56–59].

The issues of prevention and ensuring readiness to eliminate the medical consequences of emergencies during the production, transportation and use of hazardous chemicals, while providing emergency and urgent medical care, and countering chemical terrorism are being addressed [60–63].

Attention is drawn to the preparation of new legal documents [64].

At the turn of the XX–XXI centuries mainly in research medical institutions, on the basis of the federal law “On Education in the Russian Federation” [26a], the organization of training centers for postgraduate education began. Such a Center was also created at the N.V. Sklifosovsky Research Institute for Emergency Medicine. Currently, it has postgraduate and residency programs in various specialties, as well as programs for additional professional education. In particular, the center has the opportunity to improve the qualifications of doctors in accordance with the residency program in clinical toxicology.

Of course, today the main load in the training of specialists in the field of clinical toxicology is still associated with the activities of medical institutions of higher and additional professional education.

The important role of teaching in the training and retraining of clinical toxicologists should be emphasized, given the high social significance of their professional activities. It should be noted that we are talking about 200,000–250,000 only patients of predominantly working age hospitalized for AP annually, and the number of deaths over the same period, including the prehospital stage, is 70,000–80,000. Thanks to the provision of specialized toxicological care, already in the first During the years of operation of toxicological centers, an improvement in the quality of treatment of AP was noted: for example, in the toxicological department of Volgograd, mortality from 28% in 1971 decreased to 9.5% in 1980 (3 times), and in the same department of Chita, respectively, from 14.3% to 3.5% (3.5 times) [12a]. In general, the possibility of reducing mortality in the provision of specialized care at the prehospital stage from 39.1 to 12.4% (3.2 times), overall mortality in AP from 6 to 2.5% (2.4 times) and its reduction in toxicological hospitals by 1.2–10 times or more [65]. The consequence of organizational work at the present stage was a further decrease in mortality from AP in the Russian Federation as a whole - from 4.14 to 3.69% in 2006–2008, and the frequency of deaths from AP over 8 years (in 2000–2008) - from 59.1 to 47.5 per 100,000 population. At the same time, in recent years, mortality in AP in general hospitals remained 2.4–2.6 times higher than that in specialized toxicological centers - in general, 6 and 2.4%, respectively [25]. Moreover, in 2016, the mortality rate for AP in specialized toxicological departments was 0.9%, while in general hospitals it was 7.5%, which was 8.3 times higher. At the same time, only 3.7% of patients received a consultation with a toxicologist [66]. The presented data, in our opinion, require a comprehensive assessment.

CONCLUSION

Thus, the development of the state system of education in the field of clinical toxicology in Russia is closely related to the formation of clinical toxicology as an independent scientific and practical area in medicine, which has a high social significance, and the dissemination of the experience gained in the course of educational activities.

As can be seen, there are still untapped opportunities for progress in this regard. At the same time, the need to train toxicologists today has been noted at a high state level [36a].

The analysis of the historical development of the state system of education in the field of clinical toxicology allowed us to draw conclusions that are of fundamental importance for its state today.

1. The opening of the first specialized departments (centers) significantly, 6–8 years earlier than the approval of the specialty “Toxicologist”, which was caused by the urgent need to provide specialized assistance of this type and served as an incentive for the adoption of the necessary organizational decisions and legal documents in the future;

2. Significantly later decision to create the first in the country Department of Clinical Toxicology in COLIID - 14 years after the establishment of the specialty “Clinical Toxicology” among the specialties requiring additional training. This circumstance was associated with the practical absence of earlier personnel of clinical toxicologists with relevant modern experience, as well as the emergence only in these terms of such important scientific and practical areas as, first of all, general resuscitation and toxicological chemistry, the development of new pharmacological and technical technologies based on the achievements of fundamental sciences, means of detoxifying the body and methods of their use. As a result, a significant

period was required for the preparation of a sufficient number of qualified specialists in this field, the accumulation of practical, scientific and organizational experience, on the basis of which it became possible to form training materials of the proper level;

3. The publication of E.A. Luzhnikov, the country's first manual on clinical toxicology, intended for medical institutes. In this work, the available material was presented for the first time from the angle of education, which outlined the content of the curriculum for this specialty and opened the way for other works of this kind;

4. It should also be noted the most important role of such an outstanding personality as Academician of the Russian Academy of Sciences E.A. Luzhnikov, in the organization of training in the field of clinical toxicology, which he approached with all exactingness, having accumulated extensive scientific and practical experience, accumulating modern theoretical information for students and successfully solving didactic issues in relation to the specialty. This ensured for a long time a comprehensive level of knowledge obtained not only at the department headed by him, but also contributed to the expansion of teaching and improvement of its quality at related departments;

5. At present, however, clinical toxicology has not become a basic specialty in the vast majority of medical institutions of higher education, including in Moscow, which, in our opinion, hinders the process of training the required number of qualified practical, scientific and teaching staff in this field. At the same time, in the light of the above data, this remains extremely necessary, given the need not only for specialists directly involved in medical work, but also for staff for advisory work [67];

6. The choice of clinical bases for training is crucial. The experience has shown, that the most suitable ones are multidisciplinary research emergency hospitals, such as the N.V. Sklifosovsky Research Institute for Emergency Medicine in Moscow and I.I. Dzhanelidze Research Institute of Emergency Medicine in St. Petersburg, or emergency hospitals, especially if they have toxicological departments. This contributes to the highly qualified examination and treatment of patients and the rapid professional and scientific growth of existing and potential teachers due to their obtaining advanced knowledge and skills, which has a beneficial effect on the quality of education;

7. Along with the proven form of teaching in the form of traveling cycles, further comprehension requires the place of distance learning as another approach to expanding the audience of listeners;

8. It seems absolutely necessary to support the teaching process within the framework of continuous professional education, including in cooperation with scientific and practical medical societies, taking into account the rapidly changing spectrum of toxicants that cause AP, and the emergence of new diagnostic and treatment technologies, which development contributes to a natural improvement in the results of specialized medical care for this pathology;

9. The most important component of the learning process is the acquisition of new scientific knowledge in the specialty and the preparation of dissertation research. In this regard, as we noted above, the establishment of scientific schools on the basis of toxicological subdivisions makes a decisive contribution. Additional opportunities are also provided by the modern formation of the scientific specialty "Toxicology" in three areas - medical, biological and pharmaceutical sciences [34a], which allows to achieve the most qualified consideration of the results of scientific research, taking into account the opinions of specialists with knowledge of the subject in various aspects.

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^[1] — the department in different years was headed by prof. P.L. Sukhinin (1962–1972), acad. RAS E.A. Luzhnikov (1972–2014), Dr. med. Sciences V.A. Matkevich (2014–2016), since 2016 it has been headed by Ph.D. honey. Sciences M.M. Potskhveria

^[2] - 1a and further with the index "a" - links to the index of archival documents

^[3] - subsequently, this department was reorganized into the Department of Hematology [5a]

^[4] - in 1987 G.A. Livanov approved in the academic rank of professor; honored scientist of the Russian Federation (2011); in 1984, a toxicology course was organized at LenGIDUV to train doctors in chemical safety; in 1990, the department of toxicology was separated from the department of clinical toxicology, which trained specialists in the field of preventive toxicology since 2000 — Department of General and Clinical Toxicology, St. Petersburg Med. Academy of Postgraduate Education, currently - Department of Toxicology, Extreme and Diving Medicine of the North-Western State. honey. un-ta im. I.I. Mechnikova (head - prof. V.V. Shilov)

^[5] - in 1997 V.G. Sentsov was approved in the academic rank of professor; since 2015 - Department of Anesthesiology, Resuscitation and Toxicology, since 2018 - Department of Anesthesiology, Resuscitation, Toxicology and Transfusiology of the Ural State University. honey. un-ta (head - prof. A.V. Kulikov, professor of the department - honored doctor of the Russian Federation, prof. V.G. Sentsov)

^[6] - since 2005 - the Department of Occupational Health and Occupational Diseases with the course of IPO, currently - the Department of Therapy and Occupational Diseases with the course of IDPO BSMU (Head - Honored Scientist of the Republic of Bashkortostan, Prof. A.B. Bakirov, Professor of the Department - Honored Doctor of the Republic of Bashkortostan, Prof. Z.S. Teregulova)

^[7] - since 2015 - Department of Anesthesiology-Resuscitation, Emergency Medicine and Clinical Toxicology of the Khanty-Mansiysk State University. honey. Academy (Head - Candidate of Medical Sciences, Associate Professor, Prof. RAE B.B. Yatsinyuk)

^[8] - in 2013 S.Kh. Sarmanaev approved in the academic rank of professor; honored doctor of the Russian Federation (2019); the department is the assignee of the department of occupational medicine and human ecology, where since the late 90s of the twentieth century. teaching of clinical toxicology was started (Doctor of Medical Sciences S. Kh. Sarmanaev, Prof. Yu. for the training of specialists in medical and preventive profile, head - Prof. A.A. Kasparov)

^[9] Voronezh state. honey. un-t im. N.N. Burdenko, North-Western state. honey. un-t im. I.I. Mechnikov, Far Eastern State. honey. un-t, faculty of fundamental medicine of the Moscow state. un-ta, Khanty-Mansiysk state. honey. academy