


HYGIENE AS A SCIENCE IN MODERN CLINICAL THERAPEUTIC PRACTICE: FROM OBSERVATION TO DIGITALIZATION (PART ONE)

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Building on the global medical historiography, this review attempts to demonstrate the continued interest and involvement of doctors in investigation of the influence of environmental factors, their epidemiological and pathological aspects, on life expectancy and health of human beings, as well as to cover the most significant domestically developed prevention measures applicable in everyday life, during epidemics and against occupational hazards. We have also attempted to outline the history of interinfluence of the two medical specializations, including the new round of their transformation as they merge into the digital reality of today. The review shows that when medicine, as science and trade, in Russia was going through its establishing phases in Russia, the prominent Russian experts underscored the need for integrated application of therapeutic and hygienic approaches, development of the most effective combination thereof with the aim of qualitative improvement of public health care. The article considers the historical prerequisites for development of the system of preventive and anti-epidemic measures, which are the key safeguards against diseases, and development of the hygiene, including occupational hygiene, from the moment of inception to the age of digital medicine we live in currently.

Keywords: hygiene, therapy, history of medicine, prevention, digitalization of hygiene


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ГИГИЕНИЧЕСКАЯ НАУКА В СОВРЕМЕННОЙ КЛИНИЧЕСКОЙ ТЕРАПЕВТИЧЕСКОЙ ПРАКТИКЕ: ОТ НАБЛЮДЕНИЯ К ЦИФРОВИЗАЦИИ (ЧАСТЬ ПЕРВАЯ)

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В обзоре предпринята попытка продемонстрировать неизменный интерес и вовлеченность врачей в изучение влияния факторов внешней среды с позиций эпидемиологии и патологии на продолжительность жизни и здоровье людей на основе общемировой медицинской историографии, коснуться наиболее значимых отечественных разработок в области профилактических мероприятий для использования в повседневной жизни, медицине труда и в периоды эпидемий, а также попытаться наметить контуры истории взаимного влияния двух медицинских специализаций, в том числе нового витка их трансформации в процессе погружения в сегодняшнюю цифровую реальность. Показано, что в ходе становления медицины в России выдающиеся отечественные специалисты акцентировали внимание на комплексном использовании терапевтических и гигиенических подходов, формировании наиболее эффективного сочетания этих направлений, чтобы качественно улучшить охрану здоровья населения. В статье рассмотрены исторические предпосылки развития системы профилактических и противоэпидемических мероприятий, являющихся главными средствами предупреждения заболеваний, с развитием гигиены (в том числе гигиены труда) с момента зарождения и до настоящего времени — эпохи цифровой медицины.

Ключевые слова: гигиена, терапия, история медицины, профилактика, цифровизация гигиены

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While being independent areas of medicine, hygiene and therapeutics have been closely intertwined throughout their histories and remain so in the modern age healthcare organization system. Continuing with the division of the history of hygiene into long periods, the "empirical and pragmatic stage of the history of hygiene and therapeutics" and the "stage of research and experimental hygiene", it was suggested to register the beginning of the third stage thereof, one that sees digital technologies enabling the two fields of medicine to jointly expand prevention and patient treatment capabilities in various life situations [1].

The new stage begins at the outset of the SARS-CoV-2 pandemic. The last three years will go down in the history of health prevention because of the coronavirus infection. This was the period when virtually every hygienist, epidemiologist and physician around the world underscored the need for

an overhaul of the approach to training and the very essence of practice of healthcare professionals involved in sanitary and medical prevention efforts.

The author outlines the digital experience of interaction between medical institutions, doctors and patients enabled by telemedical solutions, mobile applications, voice assistants, special remote diagnostics devices, internet of things and artificial intelligence [1].

Methods

We reviewed 50 papers covering the history of development of the therapeutic and hygienic branches of medicine. For the purpose, we scanned the eLibrary, PubMed, Cyberleninka databases for sources in 2020–2023.

Ideas about hygiene in the ancient times

The knowledge about hygiene based on practical experience and everyday observations started taking shape in ancient times. As long ago as in 2500s BC, there lived a Egyptian physician named Methm, who was responsible for health of the workers and slaves that were building the pyramids. The numerous surviving papyri dedicated to medicine show that ancient Egyptians attached great importance to hygiene and sanitation [2]. The Ebers Papyrus, written around 1500 BC and found by archaeologists in Thebes in 1874, contains over 900 recipes of medicines and recommendations for their use. In addition, the 108 sheets of this 20.5 meter long ancient monument set dietary rules and prescribe skin care routines for priests [3].

Hippocrates, the great ancient Greek physician (born about 460 BC), developed medicine and believed that there are natural causes behind symptoms of diseases. "On a healthy lifestyle", "On water, air and terrain", his discourses related to hygiene, survived to the present [4].

Galen (born c. 130), the ancient Roman physician, surgeon and philosopher unified all of Greek medicine and used it as the basis for his own doctrines and practices [5]. He wrote "Hygiene", which is better known as the "On Preservation of Health" discourse, during one of the most fruitful periods of his life (170–180). Galen also authored two treatises on the relationship between health and well-being. He investigated the theoretical matter of whether hygiene is part of medicine or gymnastics, and outlined the interrelated roles of physicians and physiotherapists [5]. A fundamental work by Vitruvius (80–70 BC), an ancient Roman architect and scientist/encyclopedist, tells that architects are obliged to factor in human physiology and hygiene rules when building cities and houses. This is a vivid example of an empirical approach to hygiene: relying on common sense, a scientist, a thinker and not a medical professional gives practical advice regarding everyday hygiene and health improvement for citizens of ancient Italian cities [6].

Speaking of Ancient Rome, it is only fair to mention Aulus Cornelius Celsus (about 25 – 50 BC), a scientist/encyclopedist who gave us interesting information about hygiene, diet, therapy, various pathologies, anatomy, surgery, pharmacology and more. The surviving fragment "On Medicine" (chapters 6–13) describes the most common ideas about hygiene and therapeutics adhered to by doctors of late antiquity [7].

The establishment of hygiene in the Middle Ages

"The Canon of Medicine", a tractate written by Abu Ali ibn Sina (980–1037), a great scholar from Central Asia, describes important aspects of hygiene, ways and means of treatment and prevention of diseases caused by sleep disorders, nutrition, etc. [8].

There are some other historical documents on hygiene worth mentioning. In the 13th century, Arnaldus de Villanueva (1235–1311), a Spanish philosopher, medic and alchemist, published two works: "Occupational Hygiene" and "Occupational Diseases" [9]. As for therapeutics, he addressed this subject in the "Salerno Code of Health" [10].

Development of hygiene as a science in the Modern Age

From the very outset, hygiene was closely interrelated not only with therapeutics but with the occupational health field, too. Paracelsus (1493–1541), a doctor that also investigated medicinal chemistry, was showing great interest in prevention of occupational diseases among miners [11].

In 1546, the treatise "On Infectious Diseases" attempted to summarize information about the patterns of spreading of infectious diseases. The author of this work, Girolamo Fracastoro (1478–1553) from Venice, was not only a physician but also a writer. It is him that single-handedly named the contagious disease "syphilis" [12].

In the 16th century, "De re metallica", a work by Georg Agricola (1494–1555), a German physician and father of mineralogy, was published posthumously; that book has many sheets dedicated to the issues of occupational health [13].

The "Diseases of Workers" by Bernardino Ramazzini (1633–1714) published in 1701 became the main reference book on hygiene and therapeutics for the next two centuries [14].

Another historical milestone is the "System of Complete Medical Police" study. This is a work comprised of six volumes; written by Peter Frank (1745–1821) and published in 1817, it touches upon the majority of issues of public sanitation. [15].

Eight years later, Christoph Wilhelm Hufeland (1762–1836), the physician-in-chief for the Prussian King Friedrich Wilhelm III, published "Macrobiotics", a book about personal hygiene. These works have, in a way, finalized the period of observational attitude to hygiene stemming from everyday experiences [16].

The researcher of the history of hygiene [1] proposes to divide the history of development of hygiene as a science into two periods: first period — from antiquity to the end of the 18th century when "empirical hygiene" was emerging, second period — age of "scientific and experimental hygiene", which began after the publication of works of Max Pettenkofer (1818–1901), a German physician and founder of the first school of hygienists, and the works of his students. In 1865, Max Pettenkofer established the first department of hygiene at the medical faculty of the University of Munich. The subjects studied there were factors of the environment (water, air, soil, food).

In the 1880s, Louis Pasteur (1822–1895), a French scholar, discovered a link between germs and transmission of diseases. His ideas had a profound impact on understanding and further thoughts about hygiene and therapeutics developed in the West [17].

During those years, hygienic science was increasingly evolving from purely empirical observations to being filled with new experimental data. A name to be remembered here is that of Michel Lévy (1809–1872), a French medical service general who authored hygienic recommendations set out in the "Treatise on Public and Private Hygiene" [18]. It is also important to mention Edmund Parkes (1819–1876) an English scientist, military physician, hygienist and author of the "Practical Guide to Hygiene" and a whole series of essays covering the battle against the cholera epidemic in London and Asia [19].

The origin and development of hygiene as a science in Russia

Empirical knowledge about hygiene was formed as early as in the time of the Ancient Rus'. "Domostroy", the famous guide describing how a Russian family should live (a monument of Russian literature of the 16th century), gives the basics of proper food storage, cleanliness and tidiness.

In the 18th century, Peter the Great did a lot to protect the health of the public and prevent spread of the diseases when the epidemiological situation was difficult in Russia. In April 1699, he issued a decree "On the observation of cleanliness in Moscow and on the punishment for throwing rubbish and all kinds of litter into streets and alleys." There were created nurse jobs and sanitary bureaus opened; by the end of the 19th century, there were more than twenty of them. This is when

the sanitary culture in Russia has officially began to evolve [20]. In 1718, the health protection right was enshrined, rules ensuring proper sanitary and hygienic conditions for everyday life and trade introduced, sewers built and trashcans installed on the streets. The shaving decree has reduced the incidence of head lice in the population. Peter the Great made public baths as accessible as possible, limited the sale of alcohol, introduced many regulations pertaining to the protection of health and environment, established the record of incidence of various diseases, launched the health department for military personnel.

Subsequently, Catherine II continued to improve sanitary conditions: she forbade dumping of waste and sewage into the Moscow River and other rivers flowing through the city.

Many Russian doctors of the 18th–19th centuries underscored the special importance of measures aimed at prevention of high morbidity among the population. M.Ya. Mudrov (1776–1831), professor of pathology and therapeutics at the Moscow University, personifies a whole age of improvement of medical sciences and a combination of hygienic and therapeutic approaches in Russia. His students became a special generation of highly educated Russian doctors. M.Ya. Mudrov developed the patient survey and examination routines, introduced medical histories and student practice in the wards and also proposed methods for treating diseases with the help of the healing powers of nature. He was the first Russian doctor to start practicing percussion and auscultation; M.Ya. Mudrov described medical history and formulated the ethical principles of a doctor [21]. He always considered patients in close connection with the environment, the factors that are the sources and causes of diseases, and practiced individual approach to treatment. To reveal the roots of a pathology, M.Ya. Mudrov interviewed his patients carefully to find out all the details of their lives [22]. He introduced anamnesis into medical records and also developed the plan of its registration. Throughout his practice, M.Ya. Mudrov collected more than 20,000 patient histories, and his approach has been used and improved for 200 years [22]. He developed the preventive vector of medicine. The idea of disease prevention through reduction of the harmful effects of the environment was developed in works on military hygiene. His first work, "The Principles of Military Pathology in Relation to Gunshot Wounds and Amputations on the Battlefield, or the Consequences of Bedside Treatment", was about military medicine. M.Ya. Mudrov covered medical care in the army, hospital management, principles of evacuation of the wounded, the most common operations in wartime and common diseases, and also taught students how to apply bandages. "The Word on the Benefits and Problems of Military Hygiene" was reprinted three times; for a long time, this work was the guiding book for students and doctors.

Relying on the experience of prevention and treatment of cholera, which has grown into an epidemic in 1830–1831, M.Ya. Mudrov and I.E. Dyadkovsky wrote the "Treatise on Cholera, an Extremely Contagious Disease." The rules of prevention and control of epidemics given in that work were taught to hygienists in a separate training course at the Moscow University [23].

M.Ya. Mudrov is rightfully considered the founder of original Russian medicine, which was further developed in the works of such scientists as N.I. Pirogov, G.A. Zakharyin, S.P. Botkin, A.A. Ostroumov [24].

N.I. Pirogov (1810–1881), the outstanding surgeon of the Russian Empire, wrote: "I believe in hygiene. This is the true progress of our science. The future belongs to preventive medicine" [25–27].

Professor G.A. Zakharyin (1829–1898), another well-known Russian clinician and founder of the Moscow Therapeutic School and School Hygiene, noted in his 1873 speech: "The more mature a practicing doctor is, the better he understands the power of hygiene and the relative weakness of treatment and therapeutics... Only if the patient possesses certain medical skills can the therapy be most successful" [28]. G.A. Zakharyin introduced laboratory examination methods, compiled the pulmonary tuberculosis classification, described the liver cirrhosis treatment method, provided a scientific justification of bloodletting, developed the patient interview algorithm and basics of balneotherapy.

S.P. Botkin (1831–1889) was the founder of the St. Petersburg Therapeutic School. He considered the human body from the point of view of its external environment, attached great importance to the state of the nervous system during development of a disease, emphasized the importance of personalized approach to treatment, "in order to treat not the disease, but the patient." S.P. Botkin also founded field therapy and initiated admission of women to higher medical education curricula. In 1861, he opened the first free-of-charge outpatient clinic.

A.A. Ostroumov (1844–1908), an outstanding Russian therapist, believed that the nervous system plays the key part; he considered the body as a whole and stated that disorders of one organ affect the entire body and change functioning of other parts of the body.

It is important to mention other doctors that contributed tangibly to the development of hygiene.

Development of hygiene curricula and establishment of hygienic school in Russia

In Russia, hygiene as a forensic medicine was taught at the Medical Surgical Academy (St. Petersburg) from the very outset of its operation, that is, from 1798. At the beginning, it was called "Medical Police", and from 1835 — "Medical Police and Hygiene". The Russian Academy of Hygiene and the first independent department of hygiene were opened in 1871 under the guidance of A.P. Dobroslavin (1842–1889), a private professor [29]. He set up an experimental laboratory at the department, established the first school for hygienists in Russia, wrote the first Russian hygiene textbooks [30].

The wide spread of epidemic diseases aggravated the urgency of opening of departments of hygiene. In the second semester of the 1864–1865 academic year, the first ever regular course of hygiene as an independent discipline was launched at the medical faculty of the Imperial Kazan University.

A.I. Yakobiy (1827–1907) was the first teacher of hygiene in Russia. His contemporaries wrote in their memoirs about his public lecture "On happiness from the point of view of hygiene", which A.I. Yakobiy gave in the spring of 1869. What the listeners found interesting is the golden thread he run through the lecture: the idea that "it is only through hygiene that mankind can reach happiness" [31].

The first teacher of hygiene at the Imperial Medical Surgical Academy and the first head of the department of hygiene was I.M. Sorokin (1833–1917). His specialties were hygiene as it applies to toxicology and forensic medicine.

Prevention has been considered in designs of medical institutions also since ancient times, which disallows considering the history of rise of hygiene and its relationship with therapeutics without factoring in hygienic measures adopted by therapeutic establishments because they affect the results of treatment significantly.

History of development of preventive approach in designs of medical institutions

The history of development of hospitals can be traced back to ancient times, when the first medical establishments were opened in the temples of Egypt and Ancient Greece. Later, guest houses were used for pilgrims and wanderers, and they also served as hospices for the crippled and the incurable. They were called "Houses of the Lord" in France, "Refuge of Saint Lazarus" in Italy. In Rus', hospitals were established at the Kiev Pechersk Lavra, the Trinity Lavra of St. Sergius etc. in the 11th century.

Western-style hospital buildings were built during the reign of Peter the Great in Moscow, St. Petersburg and other cities. The first hospitals had enfilade architecture with large rooms filled with 60–100 beds each. Back then, healthcare professionals did not yet realize the need to isolate patients, and the only inconvenience was the sewer running through corridors. Later, such buildings were replaced by more modern hospitals, the design of which reflected the desire to isolate certain categories of patients.

Hospitals that resembled pavilions were quite common back in the 19th century. This kind of design was a step forward in the prevention of nosocomial infections. Searching for a better hospital building project, in the middle of the 19th century doctors chose the most primitive design, that of barracks, which proved effective during the Crimean War in Russia and the American Civil War. They were single-storey wooden buildings without a ceiling. The roof had a monitor comprised of glass frames. The barracks were positioned at a certain distance from each other. Each had a large room/cell accommodating 20 to 40 people.

In the middle of the 19th century, hospital departments and hospitals themselves started to specialize by diseases and, in the first place, by age, and thus children's hospitals appeared.

In case of children, isolation of the patients by their diseases proved to be ineffective, which necessitated development of individual isolating boxes. The first designs of such boxes were developed in France, but the first real boxes were made in Russia (Melzer system boxes). Strict isolation of each infected patient allowed concentrating patients with various infections in one hospital, provided the sanitary and hygienic rules are observed.

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