

DANYLO ZABOLOTNY, THE SCIENTIST AND THE CITIZEN Tribute to the 150th Anniversary of Academician D.K. Zabolotny

Glorious names of the scientists, who contributed not only to certain scientific discoveries but also to the course of human civilization for decades and centuries, will be always remembered by generations. The merits of the prominent scientist, one of the founders of modern epidemiology and microbiology Danylo Kyrylovych Zabolotny, whose 150th anniversary we celebrate now, are outstanding. His research of plague, cholera, malaria, diphtheria, typhoid fever and epidemic “jail fever” typhus, syphilis, gas-gangrene and other infections is well known all over the world.

He was born on the 16th of December 1866 in the small Ukrainian village Chobotarka (now Zabolotne) in Ol'hopil'skyi county of Podolia (Podillia) province in a peasant's cottage. His recently freed from serfdom parents Kyrylo Pavlovich and Evgeniya Mironovna gave him a name Danylo meaning “God's judgment”. Father of the future scientist was a highly educated person with the fluency in a few foreign languages and his mother at one time graduated from a female high school.

Day by day, month by month, the years were flying. Danylo Kyrylovych loved nature from childhood. As a boy he collected plants, flowers, various insects creating herbariums and collections. Danylo retained all his life this exceptional love to nature. The first grief struck when Danylo was only ten years old: his father died.

The semi-orphaned Danylo was taken to Rostov-on-Don by his uncle Makar Myronovych from mother's side. There Danylo graduated from a secondary school in 1880. Then he moved to Odessa to his other uncle Vasyl' Myronovych Saulyaka, where he successfully graduated from the Odessa Richelieu High School. As a teenager, Danylo was very interested in natural sciences especially zoology. Not being just satisfied with studying his favorite subject at school, he read and learned himself largely exceeding the school curriculum.

After the high school graduation, having bright propensity to life sciences Danylo Zabolotny unhesitatingly choose to study at the natural science department of Physics and Mathematics faculty of Novorossiysk University in Odessa. In those times the fame of outstanding life scientists who worked at Odessa Novorossiysk University: Sechenov, Tsenkovsky, Kamensky, Kovalevsky etc., was widely spreading around. A little earlier, in 1881-1882, the prominent biological and medical scientist and future Nobel laureate Ilya Ilyich Mechnikov also worked at the chair of Novorossiysk University and disseminated his scientific ideas inspiring students and fellow scientists. Danylo Zabolotny's personality was shaped under the great influence of Mechnikov's ideas. Danylo Zabolotny focused all his studies on biological sciences. From his first years at university he started working at Kovalevsky's department. The first scientific work of Zabolotny was about phosphorescence of Odessa estuaries. In this first student work he showed himself as a thoughtful and gifted researcher.

However, the student's life of Danylo Zabolotny at university became

troubled. During the students riots in 1889 protesting against injustice and abuse, especially the persecution of people on ethnic grounds, Danylo was arrested, jailed and expelled from the university as one of the organizers of the riots. His younger brother put a lot of efforts to overcome the problems with gendarmes and to make Danylo's graduation happened. Danylo brilliantly passed the exams receiving the 1st degree. After that Zabolotny wrote his first scientific review "Hydrogen sulfide and sulfur bacteria and their role in nature" which was inspired by his previous student's work at the laboratory of Novorossiysk University.

In 1886 I.I. Mechnikov organized the first in Russia bacteriological station in Odessa. Zabolotny joined this laboratory after his release from detention and became very interested in bacteriology. There he studied the microflora of snow and hydrogen sulfide bacteria. Simultaneously, continued experiments on estuaries phosphorescence. In 1890 Danylo Kyrylovych started to develop experimental model to research the causative agent of cholera. His experiments with gophers convincingly proved etiological role of *Vibrio cholerae* in the disease development as well as the possibility of enteral immunization of these rodents against cholera. However it became clear that just natural science and biology knowledge was not enough to deal with this medical challenge. With his younger brother's help, Danylo Kyrylovych moved to Kyiv and entered the Medical Faculty of the St. Vladimir University in 1891 and graduated with a medical doctor degree diploma in 1894.

When being in Odessa Danylo Kyrylovych married Lyudmyla Vladyslavovna Radetzky, a highly educated woman who became a true friend until his death. While studying at university in Kiev the couple had a son. Unfortunately, one year later the boy died (Zabolotny had no more children). However, the personal grief did not destroy the scientist.

The experiments with the gophers convinced Danylo Kyrylovych that immunization of humans against cholera could also be possible. To prove it, in 1893 along with I.G. Savchenko, who was a student and employee of the famous Kyiv physician V.V. Podvysotsky, Zabolotny conducted a heroic experiment. The researchers first ingested killed cultures of cholera microbes and then they drank live virulent cholera vibrios. As a result the disease did not occur. This experiment was of the great scientific and practical importance creating for the first time scientific foundation for cholera vaccination.

In 1894, D.K. Zabolotny was working as a doctor in Podolia (Podillia) province fighting against typhoid fever, dysentery and cholera. Zabolotny organized a small laboratory in Kamianets-Podilskyi, where he was carrying out bacteriological research.

Soon, D.K. Zabolotny returned to Kyiv, where in 1895-1897 he served in military hospital. Additionally, he was performing research on bacteriology of typhoid fever and anaerobic infections. In 1897 D.K. Zabolotny carried out the series of his brilliant experiments studying the plague. At that time the main epidemiological patterns of the plague outbreaks remained entirely mysterious. Why in some parts of the world the plague was very frequent but it did not occur in other places? How did the severe plague outbreaks occur if it was impossible to identify any obvious route of infection? In, other words, where was the initial source of plague? It was Zabolotny and his team who answered all these questions of tremendous practical and scientific significance.

The alarming news came from India about the plague outbreak in Bombay in the autumn of 1897. This caused a big concern in many countries. The head of the research team studying the plague in Bombay Kyiv Professor V.K. Vysokovych invited Zabolotny as his research assistant. Zabolotny happily agreed to take part in this expedition. Vysokovych and Zabolotnyi managed to do a great job there. They studied in details the changes that occurred in the organisms affected by plague, discovered that the blood serums of the plague survivors were able to stick together the plague bacteria, and established the monkeys perception to plague.

The trip to India became a great school for young Zabolotny. It defined his scientific and practical interests forever and inspired his irresistible desire to reveal finally the “mystery” of plague. Zabolotny made the right decision to first examine the plague in the places where its outbreaks were constantly observed. Bombay expedition brought him well deserved recognition and he made a number of trips there in the following years.

In the end of May 1898 D.K. Zabolotny moved to Russia where he was offered a job at the Institute of Experimental Medicine in Saint Petersburg as a research assistant of the outstanding microbiologist Professor S.M. Vinogradsky. Professor Vinogradsky being the head of the Department of General Microbiology of the institute was aimed at gathering at his department research in various novel areas of microbiology including medical microbiology.

Before joining Professor Vinogradsky’s team, just after the Indian expedition, Zabolotny had a chance to work under the supervision of I.I. Mechnikov for several months in the Pasteur Institute in Paris. In 1897–1900 he also had expeditions to Arabia, Eastern Mongolia, Mesopotamia, Scotland, Kirghiz steppes, the Volga region and other places to research and fight plague outbreaks.

During those difficult years the talented scientist accumulated the vast experience and knowledge. The scientific results of these trips became outstanding, especially for the expedition in Eastern Mongolia. There Zabolotny stayed about eight months until, in the end, he managed to reveal the main “secret of plague”. It was discovered that the source of plague and its carriers are rodents abundantly inhabiting Mongolian plains, namely: the tarbahans. During this research work Zabolotny himself contacted the plague and survived only thanks to the treatment with a specific serum and the strength of his organism. The most important conclusion of Zabolotny’s work on plague was the finding of plague’s natural source of infection. In addition, Zabolotny proved that bubonic and pneumonic plagues are different manifestations of the same disease. He also discovered the role of insects in spreading of this infection, showed that a plague microbe could survive in frozen corpses for a long time, described the pustular form of plague and found a pseudoplague bacterium.

However, there were no known tarbahans in the south-eastern regions of Russia. So Zabolotny and a number of fellow researchers paid attention to other rodents, especially the gophers. In 1912 doctor I.O. Deminsky isolated a microbial culture from a suspicious group of gophers with the plague symptoms. Then Danylo Zabolotny thoroughly studied this microbial culture. Tragically doctor Deminsky contracted pneumonic plague from the gophers and died. Zabolotny was also infected with the disease but despite all plague

symptoms survived. He wrote: “Thus, the source of the plague in humans is primarily wild rodents (tarbahans, gothers, mice). They maintain the plague in nature”. Apart from his main research work on plague, Zabolotny studied many other serious diseases: cholera, syphilis, typhus, etc., and received extremely important theoretical and practical results. Particularly, in 1909 he published a monograph “Syphilis, its pathogenesis and etiology” which became a basis of his Doctor of Medicine degree.

Danylo Kyrylovych took part in many international congresses and conferences. Zabolotny was a delegate from Russia at the International Conference on plague in Mukden (China) in 1911 and at the International Conference on plague, cholera and yellow fever in Paris in 1912. His works were published in numerous scientific journals.

Danylo Kyrylovych was able to combine skillful scientific work with teaching. He headed the first in Russia Department of medical bacteriology at St. Petersburg Women's Medical University over 30 years. There Zabolotny organized a small laboratory manufacturing typhoid and cholera vaccines.

In January 1918 with the opening of Epidemiological department of the Institute of Experimental Medicine, the first ever anti-epidemic scientific center was created. Epidemiological department was a school providing training for specialized epidemiologists and served as the ground for professional development and epidemiology knowledge expanding for medical doctors. Danylo Kyrylovych organized this department with great enthusiasm. He focused the medical ideas on the development of methodology for intervening the natural course of epidemics. The main idea was that the epidemic development can be stopped at that stage when an epidemiologist intervenes in its course. Epidemiology department developed the methods of such intervention.

Yet the year 1918 was tough for Zabolotny. Life was not treating well his family in Petrograd (former St. Petersburg) in those turbulent after revolutionary times. His wife Ludmila Vladislavovna, who suffered from tuberculosis for a long time, began feeling worse. Zabolotny decided to bring her to his native village Chobotarka in Ukraine. It took them a month to approach the place. However, when Chobotarka was already close, Ludmila Vladislavovna died. Danylo Kyrylovych lost his true friend and soulmate. Being exhausted and ill he spent almost two years in Chobotarka. Nevertheless, he continued medical, social and organizational work there as much as he could. He was loved and appreciated by everyone there.

In 1920 being invited by his friends, Zabolotny got involved in the organization of the Odessa Medical Academy and became its first rector. There he founded the world's first Chair of Epidemiology. This chair was his first own creation of such scale and it was a great joy for Danylo Kyrylovych to head it while staying in Odessa.

Working in Odessa, Zabolotny always was constantly commuting to Petrograd, where he continued to manage the Department of Bacteriology in Women's Medical Institute and Department of Epidemiology at the Institute of Experimental Medicine.

In 1921 Zabolotny got seriously ill. After recovery in 1922, Danylo Kyrylovych returned to Petrograd and continued his research work at the Institute of Experimental Medicine and Women's Medical University. In 1924 Zabolotny founded and headed the Department of Microbiology and

Epidemiology with the course of Disinfection at the Military Medical Academy in Leningrad (former Petrograd). Zabolotny understood the necessity of close and coherent relationships between epidemiology and microbiology and pursued this view in his publications and his scientific and administrative work.

Always being very busy with tense and turbulent research and administration, Zabolotny had not enough time to summarize all his vast scientific and pedagogical expertise of recent years in published works. Zabolotny published the first part of his textbook "Fundamentals of Epidemiology" just two years before his premature death. There were also published stenographic records of his lecture courses delivered at Petrograd Women's Medical Institute in 1908-1909: "General bacteriology" and "Particular bacteriology". D.K. Zabolotny trained a large number of scientists. Almost all prominent Soviet epidemiologists were his followers.

Educational work was always Danylo Kyrylovych's call. Being an excellent speaker, he lectured with great passion, imbuing lectures with the latest scientific knowledge and illustrating them with examples from his own practical experience.

In 1928 D.K. Zabolotny was elected as the President of All-Ukrainian Academy of Sciences. Holding the presidential position, he enthusiastically implemented the re-organization of the Ukrainian academy of sciences based on the perspective directions of the development of the economy of Ukrainian Soviet Socialistic Republic and taking into account the achievements of the world science.

Under difficult conditions, Zabolotny managed to build a team of advanced scientists and to create appropriate and friendly environment while organizing the academic research institutions which were closely related to the social challenges at that time.

The main goal of the Academy led by Zabolotny was identified as the development of science in liaison with solving practical problems. During his presidency in Ukraine, there were elected 33 new academicians including such outstanding scientific and public figures as O.O. Bogomolets, O.H. Shlihter, O.V. Palladin, Ye.B. Paton, O.V. Leontovych, D.K. Tretyakov, P.H. Tychyna, O.M. Dynnyk, G.F. Proskura, M.M. Fedorov, etc. There were also found a number of new biological and technical research institutes. The Academy of Sciences received a substantial financial support from the Government.

In 1928 Zabolotny organized the Institute of Microbiology and Epidemiology in Kyiv (now the Institute of Microbiology and Virology National Academy of Sciences of Ukraine named after D.K. Zabolotny). Being the first director of the institute, Danylo Kyrylovych took a great care of setting the scientific research and its equipping. Along with medical microbiology, Zabolotny dreamed about the development of various areas of microbiology including soil microbiology, technological microbiology, etc.

Zabolotny was also elected as an academician of the Academy of Sciences of the USSR and as a member of governments of the USSR and Ukrainian SSR.

In November 1929 while commuting between Leningrad and Kyiv by train, Zabolotny suddenly got seriously ill with severe flu which was later complicated by pneumonia and general sepsis. Zabolotny passed away on December 15, 1929. When the heart of this outstanding scientist, public figure

and faithful son of Ukraine stopped beating, according to Danylo Kyrylovych's will he was buried in his native village Chobotarka beside his beloved wife.

Mechnikov's student Zabolotny held high the banner of national science and advanced it far ahead. He devoted his life to the progress of science and healthcare of humanity.

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