

Zelman Abraham WAKSMAN (on the Occasion of the 50th Anniversary of his Death)

On August 16, 2023, we will mark the 50th anniversary of the death of the well-known American microbiologist and biochemist, Doctor of Sciences, Professor, Nobel Prize laureate, and a native of Ukraine Zelman Abraham Waksman. He was born on July 22, 1888, in the village of Nova Pryluka, Vinnytsia region.

Studies and scientific career

In 1910, Z. Waksman graduated from the Odesa Gymnasium and the following year, together with his family, emigrated to the United States, where he went to study at the Agricultural College of the Rutgers Institute. He graduated in 1915 with a master's degree and started assistant work in the Soil Biology Department. In 1918, Z. Waksman defended his dissertation and received his Ph.D. The following years also proved to be successful for the scientist: in 1925 he became an adjunct professor, in 1930 — professor of soil microbiology, in 1943 — professor of microbiology at Rutgers University. From 1954 until 1958, he headed the Institute of Microbiology, which was later named after the scientist.

Discovery of Streptomycin and Other Antibiotics. Zelman A. Waksman's scientific research began with a master's degree project studying soil fungi and actinomycetes at the New Jersey Agricultural Experiment Station. It was devoted to the properties and distribution of soil microor-

ganisms, the decomposition of organic remains, and the physical and chemical characteristics of soil and composts. The fundamental knowledge, experience, and intuition of the scientist allowed Z. Waksman to focus his attention on mushrooms and actinomycetes as an effective source of antibacterial agents in comparison with other microorganisms. He noticed the death of pathogenic microorganisms in the soil.

The impetus for more intensive work with actinomycetes came from the start of the Second World War, which required more effective means of combating various infections and epidemics.

In 1932, the American National Tuberculosis Controllers Association recommended Z. Waksman to investigate the process of the destruction of tuberculosis bacilli in soil, which, according to the scientist, could be associated with the action of antagonistic microbes. A scientific group consisting of three students, an assistant, and three well-known scientists under the leadership of Z. Waksman received financial support from the Commonwealth of Nations Fund and, in 1940, conducted research on soil antagonistic microbes, focusing on actinomycetes. The isolated red substance actinomycin turned out to be toxic. The next isolated antibiotic was streptothricin, and in 1943 Z. Waksman, in collaboration with A. Shatz and with the support of E. Buji,

isolated streptomycin, which was synthesized by a strain of *Streptomyces griseus*.

Numerous studies of streptomycin for the treatment of brucellosis, plague, tularemia, and intestinal infections have shown its high effectiveness. In 1944, the activity of streptomycin against tuberculosis bacteria was discovered in Waxman's laboratory, which was successfully confirmed in the treatment of a sick person on May 12, 1945, and the antibiotic began to be widely used in clinics around the world.

Patent royalties from the industrial production of streptomycin enabled Z. Waksman to open the Institute of Microbiology in 1951 and create a foundation to support scientific research in microbiology.

With the help of the developed methods, Z. Waksman and his colleagues isolated a number of other antibiotics, including clavacin (1942), grisein (1946), neomycin (1948), as well as phrazidine, candicidin, candidin, and others. The scientist was the first to introduce the terms «antibiotic» and «antibiosis» into scientific circulation.

In 1952, Z. Waksman received the Nobel Prize in Physiology and Medicine for the discovery of streptomycin in 1943, the first antibiotic effective in the treatment of tuberculosis.

For many years, streptomycin has successfully played its role as an effective anti-tuberculosis drug. Today, it occupies the second position because more effective synthetic drugs (isoniazid, etambutol, pyrazinamide) and semi-synthetic antibiotics (rifampicin) have appeared, capable of overcoming the resistance of tuberculosis bacterium to streptomycin and other drugs.

Zelman Waksman and Sergei Wynogradsky

The well-known Canadian microbiologist, public, political, cultural, and educational figure, nationally conscious Ukrainian by birth, Eugene Bohdan Roslycky in the section «True friend is known in trouble» of his book about Sergei Wynogradsky wrote the following characteristic of Zelman Waksman:

«Despite the mistaken and often hostile attitude of Z.A. Waksman to the primordial aspirations of the Ukrainian people, as well as to his long-standing russophile sympathies, which he decisively changed because of Stalin's brutal anti-Semitic policy a few years before his death, for many years he was a loyal and sincere friend of Wynogradsky». In times of financial difficulty, the Pasteur Institute was unable to print the fundamental work of S. Wynogradsky. Fortunately, his true friend Z. Waksman considered his moral obligation to help publish an important work of the scientist. Thanks to Z. Waksman's request, the book publication was paid by the American National Academy of Sciences, of which he was a member. Z. Waksman allocated the necessary five thousand dollars from the royalties earned from the industrial production of streptomycin. In 1949, the fundamental work of S. Wynogradsky «Microbiologie du Sol. Problems et Methodes. Cinquante Ans de Recherches» was published in Paris.

S. Wynogradsky and his daughter Galina were personally familiar with Z. Waksman and maintained correspondence. On February 12, 1945, S. Wynogradsky wrote in a letter to Z. Waksman about his work on the book «Half a Century of Microbiological Experiments»,. In 1950, Z. Waksman visited his longtime friend S. Wynogradsky, who warmly and touchingly met the guest with the words: «You always come here as if a messenger from the outside world — a messenger of goodwill.»

Z. Waksman became one of S. Wynogradsky's biographers publishing the book «Sergei N. Wynogradsky, His Life and Work. The Story of a Great Bacteriologist» (Rutgers University Press, New Brunswick, New Jersey. 1953).

In August 1946, «the father of antibiotics» 58-year-old Z. Waksman visited the USSR and suddenly changed his views because of the repressions he saw and the poor living conditions of the country's population. In 1962, he visited Ukraine and was a welcome guest of the Zabo-

lotny Institute of Microbiology and Virology, NAS of Ukraine

As a graduate student of the Institute and a researcher of the genetics of actinomycetes, I was lucky to see the world-famous scientist alive and hear his memories of his creative path and discovery of many antibiotics of radiating fungi.

The discovery of streptomycin brought Z. Waksman world fame. He was elected a member of the US National Academy of Sciences and the French Academy of Sciences, and a number of world universities awarded him an Honorary Doctor of Medicine, Science and Agriculture. He was President of the American Society of Microbiologists, a member of many associations

of researchers and scientific societies in different countries of the world, and was also awarded numerous orders and medals.

Today, the Waxman Institute of Microbiology is going on conducting fundamental and applied research on microorganisms, plants, and animals, develops and implements new technologies, investigates morphogenesis, cancer, fertility, birth defects, neurological disorders, nutrition, and drug resistance of infectious disease agents.

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