



Microbiologists M.R. Sharipova and A.M. Mardanova are Talented Students and Teachers

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Abstract

The history of the formation and development of the microbiological discipline at the Imperial Kazan University began in the middle of the XIX century. Then the first attempts were made to control infectious processes in the Kazan province (cholera, influenza, smallpox). With the advent of the microscope, university researchers have gained a new opportunity to observe microorganisms. At the end of the 19th century, the issues of medical and general microbiology were widely discussed in the scientific community of the city. At the very beginning of the twentieth century, the Bacteriological Institute was opened at the Faculty of Medicine, which became the flagship of these studies. However, microbiological research began to develop at other faculties of Kazan University already under Soviet rule (the work of A.P. Ponomarev and his student S.I. Limanova-Kolosova). They mainly dealt with issues of ecological and geological microbiology. At the very beginning of the Great Patriotic War, the University Laboratory of Microbiology was headed by M.I. Belyaeva, who in 1969 achieved the opening of the Department of Microbiology as part of the Biology and Soil Faculty of Kazan State University named after V.I. Ulyanov-Lenin. She was the founder of a new modern direction — the study of enzymes of microorganisms. Her students, who later became professors, R.P. Naumova and I.B. Leshchinskaya, have already educated their talented followers. This article is devoted to a review of the scientific and pedagogical activities of professors M.R. Sharipova and A.M. Mardanova, employees of the Department of Microbiology of Kazan Federal University. [*Bangladesh Journal of Infectious Diseases, December 2023;10(2):104-109*]

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Introduction

The origin and development of microbiology as a separate biological discipline gave hope to mankind to get rid of the numerous epidemics that raged on different continents throughout human history.

Microbiology (in the century before last, the word "bacteriology" was often used) attracted the attention of naturalists of various specialties — botanists, zoologists, doctors. The result of this interest was the opening of bacteriological stations and institutes throughout the Russian Empire, as

well as the emergence of specialized departments and laboratories in classical universities. The history of microbiology, like any other science, is inextricably linked with human destinies. Through the biographies of scientists, one can trace the course of the formation of research and the formation of scientific schools. It is gratifying to note that significant attention has recently been paid to the history of various microbiological schools that were once formed in the Russian Empire and were further developed in the USSR. Many publications are devoted to these issues. Examples include materials on the Department of Microbiology, Virology and Immunology of the V.I. Vernadsky Crimean Federal University¹, the Department of Parasitology, Microbiology and Virology of the Bashkir State Agrarian University², the Department of Microbiology of the Moscow State Medical University named after A.I. Evdokimov³, Department of Microbiology, Virology and Immunology of Orenburg Medical Institute⁴, Department of Microbiology, Epizootology and Virology of Kuban Agrarian University⁵, Department of Microbiology of Moscow University⁶, Department of Microbiology, Virology and Immunology of Saratov State Medical University named after V.I. Razumovsky⁷, Department of Microbiology KSMU⁸. There are many more similar examples. At Kazan University, the development of microbiological research went in two directions. Initially, medical bacteriology was actively developed, and already in the early years of Soviet power, geological microbiology began to develop under the leadership of A.P. Ponomarev⁹. Subsequently, this direction evolved in the works of A.P. Ponomarev's student, S.I. Limanova—Kolossova¹⁰. She not only continued to study the microbiota of a number of reservoirs in Tatarstan and the Urals, but also actively expanded the teaching of the discipline for students of the Biological Faculty of Kazan State University. Due to personal circumstances, S.I. Limanova-Kolosova left Kazan in mid-1941. and microbiological research at the university was headed by her student M.I. Belyaeva. A number of articles are devoted to her activities¹¹⁻¹³. It is with her name that the modern stage of the development of microbiology at Kazan University is associated. The purpose of this article is to consecrate the scientific and pedagogical activities of the "second generation students" - M.R. Sharipova and A.M. Mardanova.

Educational Qualification

On April 28, 1969, by order of the Ministry of Higher and Secondary Special Education of the USSR, the Department of Plant Physiology and

Microbiology was divided into 2 departments¹⁴, the intra-university order was issued a little later¹⁵. The first staff of the department included associate professor R.A. Saimanova, acting associate professor R.P. Naumova, laboratory assistant R.A. Gabbasova, teacher I.D. Chasov. Professor Margarita Ilyinichna Belyaeva was assigned to head it. Scientific work at the department at that time was carried out in two directions: 1. Nucleases and their antitumor effect, 2. Bacterial metabolism of products of the organic synthesis industry in order to intensify wastewater treatment. On October 7, 1976, M.I. Belyaeva retired due to age, and the leadership of the department passed to Associate Professor Rimma Pavlovna Naumova. In the description of R.P. Naumova dated December 23, 1976, given at the competition for the position of head, it was noted that R.P. Naumova cooperates with microbiologists from the universities of Dnepropetrovsk and Odessa, employees of various research institutes – VNIIPIM (Tula), VNIIPAV (Shchekino), NIIHP, Orgsintez plant, SK (Kazan)¹⁵. January 27, 1977 R.P. Naumova was approved for the position of head of the Department of Microbiology¹⁵. Under the leadership of R.P. Naumova, over 65 theses and 3 PhD theses were defended (two of which were in the Academic Council of Moscow State University), over 60 publications were published, developments on the technology of biological wastewater treatment of chemical enterprises with an economic efficiency of about 500 thousand rubles were introduced¹⁵. The results of R.P. Naumova's work were put into practice at the Zarya, Orgsintez, and Nizhnekamskneftekhim plants. In 1992, R.P. Naumova was awarded the title of Honored Scientist of Tatarstan¹⁵.

Since 1983, Prof. I.B. Leshchinskaya became the head of the department. Earlier, on October 3, 1973 Inna Borisovna defended her doctoral thesis in the specialty "Microbiology". The academic title of professor in the Department of Microbiology Inna Borisovna was awarded by the decision of the Higher Attestation Commission under the Council of Ministers of the USSR on June 25, 1982¹⁵. For almost 20 years, I.B. Leshchinskaya has been developing and expanding the Department of Microbiology, educating the younger generation. During her management, the places of industrial practice have significantly expanded – these are enterprises of the Medical Industry (Kazan, Krasnoyarsk, Kurgan, Efremovo, Vysny Volochek, Astrakhan), the agro-industry of Tatarstan (state farms "Maysky", "Kazan greenhouse", IOFH named after. Arbuzova (Kazan), IBFM RAS (Pushchino), Institute of

Epidemiology and Microbiology (Kazan), NGO Soyuzneftekhim, Department of Biotechnology, KSC RAS (Kazan), KHTI (Kazan), sewage treatment plants of the Orgsintez plant, urban, district SES of Kazan, Nizhnekamsk, Naberezhnye Chelny. Under her, 4 research laboratories functioned at the department - these are the Institute of Biosynthesis and Bioengineering of Enzymes (head – I.B. Leshchinskaya), the Institute of Engineering Enzymology (head – Prof. B.M. Kurinenko), the Institute of Environmental Biotechnology (head – Prof. R.P. Naumova), the Institute of Biotransformation of Organic Compounds (head – Associate Professor E.N. Officers), all NILS were financed from the state budget¹⁵. In the report of the department at that time it was written: "The Department of Microbiology was involved in the implementation of agreements of Kazan University on creative cooperation with two universities of Germany – Leipzig and Giessen. In addition, the department has established contacts with the following foreign organizations National Institute of Health, Begezdy, USA, Maryland, University of Houston, USA, Texas, Technical University, Lingbi, Denmark, Institute of Toxicology of the University of Zurich, Switzerland, Hanover Medical Institute, Germany and University of Tübingen, Germany¹⁵

I.B. Leshchinskaya was replaced by O.N. Ilyinskaya, a graduate of the Department of Microbiology at KSU¹⁶⁻¹⁷. Her colleagues are Margarita Rashidovna Sharipova and Aislu Mirkasymovna Mardanova, now professors of the Department of Microbiology. Margarita Rashidovna Sharipova, after graduating from Kazan University in 1978, began her scientific activity under the guidance of I.B. Leshchinskaya. The co-heads of scientific work at the graduate school were G.I. Kleiner and T.I. Volkova Institute of Organic Synthesis of the Academy of Sciences of the Latvian USSR, Riga, as well as S.M. Zhenodarova Institute of Biophysics of the Academy of Sciences of the USSR, Pushchino¹⁸. M.R. Sharipova's scientific work was devoted to the preparation of *B. intermedius* RNase preparations. In 1983, M.R. Sharipova was encouraged to study intracellular enzymes of bacteria. In 1984. Under the guidance of Inna Borisovna, she defended her PhD thesis "Secreted ribonuclease and related enzymes of *Bacillus intermedius* ER (synthesis features, preparation and characterization)". The material of the candidate's work was reflected in the article "Study of intracellular and extracellular ribonucleases of *Bacillus intermedius*¹⁹.

In 1985, M.R. Sharipova won the competition of scientific papers among young scientists of KSU, and in 1988, together with other scientists of the Department of Microbiology, she was awarded an Honorary Diploma of the USSR Academy of Sciences for a series of scientific papers *Bacillus intermedius* ribonuclease. Biosynthesis and biotechnology. In 1989, M.R. Sharipova interned at the University of Leipzig (Germany). In 1993, she received a Soros grant¹⁸.

In 2000, M.R. Sharipova presented her doctoral dissertation "Bacillus intermedius hydrolases: isolation, properties, localization". The materials included in the doctoral dissertation were published in the journals "Microbiologists", "Scientific reports of the higher School. Biological Sciences", "Biochemistry", "Biochemistry and Molecular Biology International", "FEBS Letters", "Dadianji Jishu/Large Electric Machine and Hydraulic Turbine", "Questions of Medical Chemistry", "Microbios", "Medical Science Monitor". Since 2003, M.R. Sharipova has been acting as a professor of the department, and in 2008 she was awarded (together with O.N. Ilyinskaya and B.M. Kurinenko) The State Prize of Tatarstan in the field of science and technology for the work Hydrolases of microorganisms as potential therapeutic drugs¹⁸. On December 17, 2008, M.R. Sharipova was awarded the academic title of professor.

M.R. Sharipova's active scientific work continued after defending her doctoral dissertation. Since 2000 To date, Margarita Rashidovna has published several dozen articles in the journals "Biochemistry", "Microbiology", "Medical Science Monitor", "Enzyme and Microbial Technology", "Journal of Basic Microbiology", "Microbiological Research", "Molecular Biology Reports", "Molecular Biology", "Annals of Microbiology", "Russian Journal of Bioorganic Chemistry", "FEBS Letters", "Microbial Cell Factories", "Cell Transplantation and Tissue Engineering", "Scientific Notes of Kazan University. Natural Science Series", "Genes and Cells", "Genome Announcements", "Brain Research Bulletin", "Biomedical and Pharmacology Journal", "Biology Bulletin", "Biology and Medicine", "Research Journal of Pharmaceutical, Biological and Chemical Sciences", "Applied and Environmental Microbiology", "Izvestia Academy of Sciences. Biological Series", "Research Journal of Applied Sciences", "Standards in Genomic Sciences", "BioNanoScience", "BioMed Research International", "Scientifica", "Current Microbiology", "Agricultural Biology", "Frontiers in Plant Science",

"Data in Brief", "Frontiers in Cellular and Infection Microbiology", "Russian Journal of Plant Physiology", "World Journal of Microbiology and Biotechnology", "Nature Communications", "PLoS ONE", "Open Microbiology Journal", "Frontiers in Microbiology", "International Journal of Molecular Sciences", "Animal Nutrition and Feed Technology", «Archives of Microbiology», «3 Biotech», «mSphere», «Rhizosphere», «International Microbiology», «Genes», «Poultry Science Journal», «Antibiotics», «Opera Medica et Physiologica», «Metabolites», «Microorganisms». The number of citations of M.R. Sharipova's works (linked to the author's profile 7004088420 in the Scopus database) exceeds 1000, the Hirsch index of Margarita Rashidovna is 15.

In 2004, M.R. Sharipova was awarded the Certificate of Honor of KSU for her great contribution to the training of specialists, significant successes in scientific work, in 2005 – the Gratitude of the rector of KSU for her active work in the management of research and development, in 2011 – the Gratitude of the Rector of KFU for many years of scientific and pedagogical activity and in connection with the anniversary. In the same 2011, she was awarded the title of "Honorary Worker of Higher Professional Education of the Russian Federation". In 2016, M.R. Sharipova was awarded with gratitude for many years of fruitful scientific and pedagogical activity.



Figure I: M.R. Sharipova (far right) and A.M. Mardanova (far left) at the Museum of Zoology of Kazan University

M.R. Sharipova supervised the implementation of the following PhD theses: 2012 – "Decoding the mechanisms of regulation of serine proteinase genes of bacilli", A.A. Toymentseva; 2014 - "Mechanisms of regulation of expression of serine proteinase genes of *Bacillus pumilus* 7p", A.M. Cheremin; 2015 - "Biological effects of bacillary proteinases", Yu.V. Danilova; 2016 G. - "Heterologous expression of microbial phytase genes in plants of *Arabidopsis thaliana*", Nyamsuren Chuluuntsetseg; 2017 – "Production of transgenic plants of *Arabidopsis thaliana* with the phytase gene of microbial origin under the control of a viral promoter", L.R. Valeeva; 2019 – "Factors influencing the formation of biofilms in bacilli",

Dinh Thi Lan; 2020 – scientific consulting of the doctoral dissertation "New proteinases of gram-negative and gram-positive bacteria: characteristics, properties and practical application", A.M. Mardanova; 2023 – "Histidine acid phytase of *Pantoea breneri*: expression in methylotrophic yeast, properties and practical application", D.S. Bulmakova; "Phosphate-mobilizing bacteria as the basis of new promising biofertilizers", D.L. Itkina.

Currently, M.R. Sharipova teaches courses "Genetic Engineering", "Genomics and proteomics", "Mechanisms of microbial cell adaptation", "Mechanisms of regulation of microbial metabolism". Aislu Mirkasymovna Mardanova,

who also holds the position of professor of the Department of Microbiology at the present time, graduated from the university in 1986 and began her career in the Research Institute of Biochemistry and Bioengineering of Enzymes¹⁸. Her research interests were also related to *B. intermedius* enzymes. Later, she was sent for an internship at the Institute of Cytology of the USSR Academy of Sciences, where, working in the Department of Cell Cultures under the supervision of S.Yu. Haitlin, started her PhD thesis on the proteinase of *E. coli* ("*Escherichia coli* A2 proteinase, specifically cleaving chitin"¹) and defended at St. Petersburg State University in January 1992. A year later, Aislu Mirkasymovna interned at the Belka Institute in Montpellier (France). In 2000, she was awarded the academic title of associate professor. Since 2004, A.M. Mardanova has been responsible for the scientific work of students at the Biology and Soil Faculty of KSU¹⁸.

In 2020, A.M. Mardanova defended her doctoral dissertation "New proteinases of gram-negative and gram-positive bacteria: characteristics, properties and practical application"². On August 2, 2022, she was awarded the title of "Honorary Worker of Education of the Russian Federation". A.M. Mardanova supervised the following dissertation research: 2007 "Proteinases and aldolases: fundamental approaches to the production of practically significant bacterial enzymes", L.A. Malikova; 2016 "Comparative characteristics of the invasive and proteolytic activity of *Proteus mirabilis* and *Morganella morganii*", N.M. Zamalyutdinova, 2020 "Comparative characteristics of virulence factors of uropathogenic strains of *Morganella morganii*", L.F. Minullina; 2021 "Fusarium as a key taxon in the microbiota of potato roots", Akosakh Yav Abaye.

Currently, as a professor of the department, she lectures and conducts practical classes in the following disciplines: "Current problems of medical microbiology", "Genetics of microorganisms and viruses", "Medical Microbiology", "Molecular biology of the microbial cell". In addition, A.M. Mardanova continues to actively engage in scientific research. After defending her doctoral thesis, her scientific articles were published in the journals "Genome Medicine", "Microorganisms", "3 Biotech", "Opera Medica et Physiologica", "BioNanoScience", "Poultry Science Journal", "Genes", "International Microbiology", "Rhizosphere", "mSphere", "Animal Nutrition and Feed Technology", "Microbiology", "Research on Crops". Her article "Glutamyl endopeptidase of

Bacillus intermedius, strain 3-19" has the largest number of citations²⁰.

Conclusion

Currently, the Department of Microbiology is headed (since 2003) by Professor O.N. Ilyinskaya. There are two more professors on the staff of the department M.R. Sharipova and A.M. Mardanova. During their long time at the department, they have both educated their own students, who continue to develop their own research. The tradition of mentoring continues to live, which is necessary for the university.

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