

Kazan (Volga region) Federal University, Kazan, Russia  
Institute of Fundamental Medicine and Biology

*Master's program*

## **Genetics**

### **I. THEORETICAL BASIS**

The current development stage of biological sciences is based on rapid evolution of genetic research. It is generally accepted that the field of molecular biology emerged from successes of genetics according to the well-known principle “one gene – one enzyme”, as well as major genetic role of DNA. Nowadays, the field of genetics expands its contribution into such areas as medicine, ecology, agriculture and others.

Genetics is the science that describes the laws of heredity and variation. The ideas and methods of genetics traditionally played an important role in agriculture and microbiological industry. In addition, current stage of science makes it clear that predisposition to various diseases largely depends on the genetic characteristics of a person.

Studies in the field of genetics were originally initiated at the Department of Genetics of the Kazan University in 1970s. The research was originally focused on establishing the mechanisms of the so-called "adaptive" mutations, understanding the relationship between various mutagenesis processes, genetic recombination and repair. In the last years the department started employing modern methods of bioinformatics to process large amounts of molecular genetic information.

In 2011 Kazan Federal University joined the federal program "Development of the Pharmaceutical and Medical Industry of the Russian Federation for the period up to 2020 and beyond (otherwise known as “Pharma 2020”). Cooperation in the program provided resources to establish the state-of-the-art Pharmaceutical Research and Education Centre. Department of Gene and Cell Technology is one of the units within the Centre. Work in the Department is focused on developing novel combined methods of gene and cell therapy for treatment of various human diseases such as neurodegenerative diseases, post-traumatic regeneration of organs and tissues, ischemic disease, atherosclerosis, as well as cellular and molecular models for screening and preclinical studies of drugs (antitumor, antiviral, neuroprotective, etc).

### **Intellectual and scientific resources.**

The team of high-caliber scientists working on solving genetic problems includes many members of the Department of Genetics: professors V.M. Chernov, A.A. Rizvanov, O.A.Chernova and M.L.Ponomareva; docents E.V. Babynin, L.L. Frolov, R.G. Khamidullina, O.A. Gimadutdinov, S.V. Malkov, M.V. Trushin; A.N. Akulov and A.R. Kayumov.

Staff at the Department of Genetics is well-suited to tackle difficult scientific problems. There is a number of collaborations set-up with other research institutions including Institute of Cytology and Genetics of Siberian Branch of the Russian Academy of Sciences, University of Giessen (Germany), Whittemore Peterson Institute (USA) and University of Lund (Sweden).

The proposed Master's program is primarily focused on training of specialists in the field of genetics. The curriculum of Master's program in Genetics provides fundamental training in the field of genetics, bioinformatics and modern methods of genome analysis. The students will gain deep knowledge at the intersection of classical and molecular genetics, biomedicine, ecology and bioinformatics. Graduates of the program will have a solid background allowing them to pursue career prospects and be in high demand by the future employers. There is no other university in the Volga Federal District that provides such a high level of education in the field of genetics.

The opening of Masters program in Genetics will allow Kazan Federal University to take one of the leading positions in the Federal District in research aimed at the development and introduction of modern methods of genetic diagnostics, gene therapy, genetic evaluation of ecological and environmental pollution, food quality etc.

## **II. Conditions of implementation of the Master Programme**

### **2.1. Staffing of the educational process**

Implementation of master program in Genetics is provided by highly qualified teaching staff with basic education, corresponding to the profile of the discipline and systematically engaged in research, methodological and clinical practical activities.

The proportion of lecturers with degrees or titles teaching Biology (code 020400.86) is higher than 95%. The percentage of full-time faculty is 96%, and the proportion of teachers with the degree of Doctor of Sciences - 24.4%.

### **2.2. Teaching methods and information support of educational process**

Implementation of the Masters in Genetics program is ensured by appropriate teaching materials: textbooks and manuals, reference books, calendar-thematic plan, methodological brochures for seminars and workshops.

In accordance with the approved working curricula the catalogue of teaching programs for academic disciplines is created. The competences are established in accordance with Federal State Basic Standard of the highest professional education (FSBS of HPE) of the third and third-plus generation.

Implementation of the Masters program is supported by establishing access of each and every student to databases and library collections, put together according to the full list of disciplines (modules) of the program.

Rapid information exchange with domestic and foreign universities, institutions and organizations is provided for Masters students.

### **2.3. Logistical support of the educational process**

The program meets all the requirements of the federal educational standards. In particular, there are specialized classrooms, laboratories equipped for workshops and practical training in all disciplines. Institute of Fundamental Medicine and Biology provides facilities for all kinds of laboratory, disciplinary and interdisciplinary training and research for students, that meets all the requirements of an educational program and corresponds to sanitary and fire safety standards.

Extracurricular work of students is methodologically supported and justified in terms of the time spent on its implementation.

Each student is provided with access to electronic library system that is formed in agreement with the owners of educational and methodical literature and contains publications on key studied subjects.

The electronic library system enables individual access for every student from any place in the world with Internet access.

### **III. EMPLOYMENT**

In accordance with received training the graduates will be able to perform high-level scientific research, industrial design, and will gain organizational, educational and management skills.

Specific types of professional activity are determined by the Masters program within Biology course (code 020400.68), including:

- study and protection of nature, the use of biological systems in economic and medical purposes, rehabilitation and protection of biological resources. The graduates get prepared for the implementation of scientific research and manufacturing.

- the training of graduates to examine structure and properties of chemical compounds that make up living organisms and play role in metabolism and regulation. The graduates also get trained to use a wide range of methods in analytical and bioorganic sciences, as well as molecular biology, biotechnology and histology.

- understanding of heredity and variation at all organizational levels of living organisms, utilization of genetic patterns in breeding, biotechnology, genetic engineering, medicine, environmental protection and human health, in the field of medicinal genetics consulting, genetic control of biosafety of new products and manufacturing facilities. The program also includes getting competences in implementing research methods and evaluating genetic material at the molecular, cellular, organismal, and population levels.

- the graduates also become able to work in the field of molecular modelling of natural and artificial biological systems, to study the properties of matter at the molecular level. They also learn to use methods of molecular biology, bioengineering and get prepared to work in biotech industry, research institutions, in the field of healthcare, commercial and environmental biotechnology.

Graduates of the Masters in Genetics program possess the following professional competences: a) interpersonal professional; b) general professional; c) implementation-professional.

### **IV. Applying for a Masters in Pharmacology Program (Admissions)**

Normative period of implementation of the basic educational training program for Master in Genetics degree is 2 years.

Budget funded places: up to 8 people a year. Tuition fee for the contract form of training is determined in accordance with the defined order of the KFU.

Admission to the Masters program is based on competitive selection procedure.

It is carried out in a form of examination in general genetics with subsequent review of applicant's documentation.

The Admissions Committee, formed by the representatives of the Institute of Fundamental Medicine and Biology, carries out competitive selection procedure. Competition ensures admission to the Masters Program of the most capable students, prepared for their further development.

To enrol into the competitive selection procedure the applicants to the Masters in Genetics program should submit the following documents:

- A personal application form with statement indicating the area of training and the chosen Masters program;
- The original or a copy of the state document about higher education (bachelors or specialist level), with the corresponding annex; or another recognized in the Russian Federation document confirming holding a graduate degree of higher education (state bachelor's diploma, or specialist, or master's diploma);
- A copy of the identity document.

List of additional documents:

- The diplomas, certificates of continuing professional development;
- Diplomas of winners and/or laureates of research projects, design work and student competitions at various levels;
- Scientific work of the applicant in electronic or/and paper form (published or handwritten);
- Documents, confirming awards: scholarships from ministries, agencies, funds, etc.
- In addition, applicants can provide a letter of recommendation from her/his supervisor (recognised expert in the field, lecturer of high school).

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