

Biochemical school

Department of Biochemistry of Kazan State University – the first Department of Biochemistry in Europe – was founded in 1863 by Professor A. Danilevsky. The first research in medical chemistry, physiology and pharmacology was conducted in the building now famous as “Butlerov” Institute.

In 1871 the work “Research of composition, physical and chemical structure of decay products of albumens and genetic relations between their different species” was published by the department staff. A set of ideas was formulated here which in future laid the foundation for polypeptide theory of albumen structure and contained the idea of reversibility of fermentation. In Kazan University A. Danilevsky held a Chair until 1871. His successors were A. Shcherbakov and A.A. Panormov.

From 1903 to 1929 V.A. Engelgardt headed the Department of Biochemistry. These years one of the most fundamental life processes was revealed within the walls of university - oxidative phosphorylation; it was also found out that cell respiration can lead to ATP synthesis – the main source of energy in cell. This work by V.A. Engelgardt laid foundation for contemporary bioenergy and our perception of ATP role in life processes. Together with V.A. Engelgardt A.A. Baev worked in the Department of Biochemistry during this period, who also became one of the most outstanding biochemists of XX century.

The works began by V.A. Engelgardt and A.A. Baev got their continuation in the works of the department members, headed by Professor I.A. Tarchevsky (1965-1975), an acknowledged expert in studying photosynthesis and phosphorylation processes of plants.

Big influence on the strategy of research in the Department of Biochemistry in the second half of XX century was exerted by D. Watson and F. Krik`s finding of duplex DNA. The main course of the department these years was connected with the study of synthesis, structure and function of nucleic acids and ferments of nucleic interchange.

An important role in formation of this course belongs to the creation of basic research laboratory in Kazan University in 1963 directed by M.I. Belyaeva, concerned with the research of nucleic acids of tumour cells and nucleases as antineoplastic agents.

In this very laboratory the ability of tumour cells to evolve nucleic acids was revealed by candidate V.G. Winter, now heading the Department of Biochemistry.

These sensational findings presented in 1965 during International Congress in Tokio caused lively discussion among scientists and for years were disputed by opponents.

Yet this finding withstood the test of time: nowadays biological activity of extracellular nucleic acids appears to be generally accepted and these findings provided the basis for the topic “Extracellular nucleic acids and their role in the development of autoimmune processes”, being developed at the moment in the Department of Biochemistry (D.G. Ishmukhametova, D.A. Temnikov, T.A. Nevzorova). This research is conducted in cooperation with the Department of Allergology of Medical Academy and Kazan State Medical University. Priority data about the role of DNAase activity of autoantibodies in the development of such diseases as asthma, chronic bronchitis, systemic lupus erythematosus are received.

As a result of profound study of biological activity of nucleases by Professor Z.I. Abramova original data on the participation of nuclear DNAases in replication of DNA were received, what appeared to be theoretical basis for the research in regulatory mechanisms of nucleic acids synthesis, carried out under her direction. Throughout research of the peculiarities of nucleic acids` interchange in plant cell cultures strains of cells of serpentlike rauwolfia (*Rauwolfia serpentina*) are received, which is the producer of cardiac antiarrhythmic drug – ajmalin, perspective for receiving ajmalin by biotechnological method (Associate Professor N.S. Siyanova).

The Department of Biochemistry cooperates productively with other scientific schools of the university. One of the perspective courses of the Department of Biochemistry (headed by Professor V.G. Winter) in collaboration with the Department of Optics and Spectroscopy (headed by Professor M. Salakhov) is a development of nanotechnology of new generation analytical devices production – DNA-sensors based on piezo-quartz resonators, characterized by high selectiveness and sensitivity. DNA-nanosensors may be used for express analysis of antibodies to DNA in blood serum, that has diagnostic and prognostic significance in case of many human diseases.

Current problem of contemporary biochemistry is the study of biological activity of macromolecules. For studying the inherent characteristic of these molecules it is necessary to keep them during experimental process in native state. Atomic power microscopy becomes one of the perspective methods of studying the structural peculiarities of macromolecules and their interaction in real time scale today. According to the possibilities of imaging the object it is comparable to the

level of X-ray structural analysis, while not exposing samples of macromolecules to harsh handling and keeping their biological activity. The method allowed to visualize the interaction of DNA with antibodies and make conclusion of non-processive character of expression of autoantibodies` DNAase activity (D.A. Temnikov, T.A. Nevzorova, V.G. Winger).

During the last decade pharmacological research in natural and synthetic biologically active substances and their effect on nervous and detoxicative systems of organism is being actively developed (A.N. Fattakhova). The research is conducted in collaboration with narcological dispensary and A.E. Arbuzov Institute of Organic and Physical Chemistry.

One of the interesting problems developed within the Biochemical School of Kazan University is identification of the structure of genom, genetic disorders connected with it, types of temper characteristic to Tatarstan nations. The work is conducted in collaboration with the Ministry of Internal Affairs and historians of the republic (A.N.Askarova, N.I.Akberova).

Development of contemporary methods of biochemical research means high level of biochemist specialists training. In this regard in the Department of Biochemistry (Associate Professor D.A. Temnikov) methods of teaching with the use of new informational technologies and technology of creating multimedia educational programs, Internet courses are being developed, which allow to increase the effectiveness of the whole educational process.