

(No.5 2002年2月1日号目次)

## 特集：バイオテクノロジー関連研究開発機関 その1

今号と次号にわたり、ロシアのバイオテクノロジー関連の研究開発機関をご紹介します。

ロシア経済の回復に伴い、これまで低調であったバイオ産業を取り巻く環境は好転してきており、国からの支援の強化、ならびにバイオテクノロジーへの企業投資も増大してきています。

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# 1 . ロシアのバイオ産業の現状と展望

## 現 状

ソ連時代はバイオは原子力や航空宇宙といった分野より軽視されがちで、バイオ関連の研究開発機関が増えたのは1980年代になってからだった。最近の10年間も、経済的な理由から世界におけるポジションを下げているというべきであろう。

国からの資金は科学アカデミー、産業・科学技術省、ロシア基礎研究ファンドから出ているが、金額は少なく、この分野でも頭脳流出が多く見られた。しかし、ロシア経済の回復に伴い、この2～3年の状況は好転している。市場経済にうまく適応する研究開発機関が現れ、国からの支援も強まり、バイオテクノロジーへの企業投資も増大しつつある。バイオテクノロジーに対する関心が世界的にも高まっていることから、国際協力、無償援助も多々見受けられる。

バイオ関連で最近成果が上がりつつあるのは分子ウィルス学、遺伝子工学、バイオポリマー構造学、バイオ情報工学の分野である。

## 国家管理体制

バイオテクノロジー関連の国家機関は次の通りである。

- 産業・科学技術省（医学・バイオテクノロジー局）
- 保健省
- 農業省
- ロシア科学アカデミー（物理・化学生物学部）
- ロシア医学アカデミー
- ロシア農業アカデミー

これらの下に国立科学センター、研究所が全国に約40ある。

中でも有名なのは次の研究開発機関である。

科学アカデミー：分子生物学研究所、微生物学研究所、バイオ有機化学研究所、分子遺伝子学研究所、生物工程センター、蛋白質研究所、遺伝子生物学研究所、細胞遺伝子学研究所

農業アカデミー：農業バイオテクノロジー研究所、農業微生物学研究所

医学アカデミー：生医化学研究所、栄養学研究所、実験医学研究所

保健省：国立ウィルス学バイオテクノロジー科学センター「Vektor」、遺伝学・産業微生物品種改良研究所、応用微生物学研究センター、免疫学研究所

これら研究開発機関は、商業活動のために子会社をつくることもしばしばあり、国がその株主として加わることもある。その場合、国の利益を代表して企業を管理するのは株式会社「バイオペラート」である。例えば、薬品工業では同社が管理する20企業が国産医薬品の30%を生産している。

2001年12月21日付け政府決定 884により、省庁間バイオテクノロジー委員会が設立され、今後この分野におけるコンセプトや短期計画作り、あるいは関係者間のコーディネーター役が期待されている。

同じく、省庁間遺伝子工学委員会も設立済みである。

下院においてはバイオテクノロジーの発展に関する公聴会が開催されており、関心の高さを物語っている。

また政府は、「向こう10年間のバイオテクノロジー発展に関するコンセプト」を策定する計画を持っている。

## ロシアのバイオ研究

ロシア最大のバイオテクノロジーセンターはモスクワ近郊のプーシノで、9つの研究開発機関が集中し、バイオ分野の研究開発の3分の1がここで行われている。石油対策の土壌浄化剤、高感度バイオセンサー、人工血液ペルフトラン等がプーシノから生まれている。

もう一つのセンターは「Vektor」で、分子生物学、エアロバイオロジー、生物工学、バイオ結合、細胞培養、微生物品種改良の6つの研究開発機関を束ねる一大センターである。

遺伝子微生物品種改良研究所では、日本の味の素株式会社との協力によるアミノ酸の開発が進行中である。

ロシアでは遺伝子工学による医薬品製造(人のインシュリンを動物を使って作る計画もある)やワクチンの製造も高いレベルにある。

微生物学研究所では親生物質、バイオ肥料の新たな生産方法や乳漿からアルコールを作る方法、また白血病や肝炎の治療剤が開発されている。

クローン技術に取り組んでいるのは遺伝子細胞学研究所である。

農業アカデミーバイオテクノロジー研究所では英国の研究者と共同で、重金属に強く、土壌を浄化する植物の研究を進めている。

ノボシビルスクの科学アカデミーシベリア支部生物有機化学研究所では遺伝子療法と核酸の研究が、モスクワの抗生物質研究所ではバイオ触媒の研究が盛んに行われている。

## ロシアのバイオ産業

ロシアのバイオ産業の始まりは、1966年にソ連閣僚会議微生物産業総局ができた時とすべきであろう。

ソ連の崩壊により、ロシアにはバイオ産業の60%が残った。しかし、90年代に解消されてしまった工場や、他の分野に鞍替えしてしまっただけの工場もかなりある。

医薬品も輸入品に席巻された状態が90年代は長く続いたが、やっと1999年頃からロシアのバイオ関連企業も独自で、あるいは外資と手を組んで成長軌道に乗るところ

が見受けられるようになった。例えば、「バイオペラート」傘下の企業は2000年にはすべて34%から251%の増産を記録している。商業資本である「Biokad」社が免疫工学研究所の一部を買い取ってインターフェロンやバクテリオファージの生産に乗り出した例もある。

ロシアのバイオ産業はソ連時代からの伝統もあり、強味を持つ分野もあり、研究開発者の維持コストは驚くほど安く、90年代の荒波を乗り切った企業は、今後商業資本との連携を深めつつ、医薬品等の輸入代替、あるいは輸出へと成長して行くであろう。

また、バイオの分野では一つの開発が一つの企業の設立に結び付く例もしばしばあり、そのような中小企業も増えている。

日本企業との共同開発や研究委託の可能性ももっと追究されてしかるべきであろう。

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本稿を書くに当たってIBRクズネツォフ氏、ロシア科学アカデミー生物有機化学研究所シェチャーキン氏とオフチニコフ氏、ロシア科学アカデミー生物工学研究センターの協力を得た。

(社)ロシア東欧貿易会  
モスクワ事務所長  
池田 正弘

## 2 . バイオテクノロジー関連研究開発機関

### 国立ウィルス学バイオテクノロジー科学センター「Vektor」 (ノヴォシビルスク)

State Research Center of The Russian Federation  
State Research Center of Virology and Biotechnology "Vector"

#### I. Name of the Institute (Organization).

**In Russian:** Государственное унитарное предприятие «Государственный научный центр вирусологии и биотехнологии "Вектор" Министерства здравоохранения Российской Федерации»

**In Russian abbreviation:** ГНИЦ ВБ "Вектор"

**In English:** State Research Center Of The Russian Federation State Research Center of Virology and Biotechnology "Vector"

**In English Abbreviation:** SSC RF VECTOR

#### II. Location.

**Official address:** 633159 Koltsovo,Novosibirsk region,Russia

**Mail address:** 633159 Koltsovo,Novosibirsk region,Russia

**Tel.:** +7 (383-2) 36-60-10

**Fax:** +7 (383-2) 36-74-09

**E-mail:** [vector@vector.nsc.ru](mailto:vector@vector.nsc.ru)

**Access (transportation, necessary time):** Novosibirsk international airport, then about one hour by car.

#### III. History.

The history of SRC VB VECTOR dates back to 1974 when it was established as the All-Union Research Institute of Molecular Biology. In 1985, a Research and Production Association NPO VECTOR was established on its basis that later in 1994 was awarded the status of a State Research Center.

The State Research Center of Virology and Biotechnology VECTOR now is a large research and production complex that is comprised of several research institutes, production companies, and other departments. Moreover, the Center is an associated member of a number of unions and associations.

#### IV. Management.

**Kind of organization:** State Scientific Center of Russian Federation

**Ownership:** State property of Russian Federation

**Responsible Ministry:** Russian Ministry of Public Health

#### V. Executives.

**Director General** - Academician of the Russian Academy of Sciences, Doctor of Biological Science - Prof. Lev S. Sandakhchiev

**Deputy Director (Research)** - Sergey V. Netesov, Ph. D., D. Sci., Prof.

## **VI. Current major activities.**

The State Research Center of Virology and Biotechnology VECTOR (SRC VB VECTOR, or Center) is one of Russia's largest research and production facilities whose major activities are focused on carrying out basic and applied research in a wide area of natural sciences, development and manufacture of therapeutic, preventive, and diagnostic products.

The Center's basic research is aimed at generating new scientific knowledge in the areas of molecular biology, virology, genetic engineering, biotechnology, epidemiology, and ecology to meet the needs of the nation's economy.

### **Basic Research of the Center:**

- Study of genomic structures and functions of viruses pathogenic for humans and animals;
- Study of evolution of the most dangerous specific viral pathogens and development of methods for their control;
- Study molecular diversity of viruses and bacteria;
- Theoretical and experimental study of pathogenetic mechanisms of viral infections and search for the corresponding promising diagnostic, prevention, and treatment tools;
- Development of biotechnological methods and their application for creating new biologically active substances and diagnostic, prevention, and treatment preparations of new generation;
- Basic ecological research;
- Bioaerosol research for medical, virological, and ecological purposes; and
- Development of new technologies for manufacturing diagnostic, prevention, and treatment preparations for medicine and veterinary.

### **Applied Research of the Center**

Applied research is aimed at developing new preparations for medicine and veterinary. Development of new preparations is based on the state-of-the-art technologies (including those involving genetic engineering) created at the Center:

- Technology of peptide synthesis is being used for development of peptide preparations (Lyuliberin and desmopressin) (Institute of Molecular Biology);
- Erythropoietin (Institute of Cell Cultures), tumor necrosis factor, and Subalin (Institute of Biologically Active Substances) are being developed using recombinant technology and are now undergoing preclinical and clinical trials. Completion of their development will expand the range of competitive domestic antivirals and anticancer drugs.
- Original technologies created at the Institute of Cell Cultures are used to develop new forms of drugs and vaccines (live measles vaccine for oral administration, recombinant erythropoietin for oral administration, etc.) Development of

preparations suitable for oral administration is a topical problem, first, because of their easy use and, second, as they exclude any possibility of infection with viral agents, such as HIV, hepatitis B, and hepatitis C, unfortunately possible while using their injection forms.

- The biotechnological background developed at the Center allowed a new original approach to production of measles virus to be found. It involves substitution of the substrate used for cultivating the vaccine strain of measles virus (Institute of Cell Cultures). This technology allowed an alternative production of measles vaccine to be organized in Russia.

Tight interconnections between research and development are a specific feature of SRC VB VECTOR. This makes VECTOR one of the most modern scientific and production institutions both in Russia and in the World.

## **VII. Organization chart.**

### **Non-corporate structural units:**

- Institute of Molecular Biology (Director, Corresponding Member of the Russian Academy of Sciences, Doctor of Biological Science, Prof. Sergei V. Netesov)
- Institute of Bioengineering (Director, Doctor of Biological Science Prof. Aleksandr A. Il'ichev)
- Institute "Collection of Cultures of Microorganisms" (Director, Candidate of Biological Science Vladimir E. Repin)
- Institute of Cell Cultures (Director, Candidate of Medical Science Elena A. Nechaeva)
- Institute of Aerobiology (Director, Candidate of Technical Science Vladimir S. Toporkov)
- WHO Collaborating Center on Diagnostics of Orthopoxviral Infections and Repository of Variola Virus Strains and DNA (Head, Academician of the Russian Academy of Sciences, Doctor of Biological Science, Prof. Lev S. Sandakhchiev).

### **Corporate daughter enterprises:**

- Daughter unitary energy-producing unit Promtekhenergo, SRC VB VECTOR (Director, Nikolai I. Sklyarevskii)
- Daughter state Production Unit Vector-Pharm, SRC VB VECTOR (Director, Candidate of Physical and Mathematical Sciences, Sergei N. Targonskii)
- Daughter state unitary pilot production unit Vector-Bialgam (Director, Leonid G. Nikulin)
- Daughter state unitary Pilot Production Agricultural Enterprise Vector-PPAE (Director, D.N. Loktionov)

### **Affiliates operating under charters:**

- Research and Design Institute of Biologically Active Substances (IBAS) (Director, Valentina I. Masycheva)

### **VIII. Number of employee.**

About 2.000 highly-qualified specialists including 160 doctors and Ph.doctors work in the Center.

### **IX. International and domestic relations**

SRC VB VECTOR collaborates with leading research centers and laboratories of USA and EC through grants of Copernicus, Volkswagen Foundation, International Fogarty Foundation, Human Frontier Science International Foundation, US National Institutes of Health, Centers for Disease Control and Prevention, and US Industrial Partnership Program.

In the field of biomedical and biotechnological research, the Center collaborates actively with Centers for Disease Control and Prevention (Atlanta, USA); National Institute of Allergy and Infectious Diseases, National Institutes of Health (Bethesda, USA); Institute for Virology (Marburg, Germany); national laboratories with the US Department of Energy (BNL, PNNL, NREL, and LBNL); and US Department of Agriculture.

Since 1997, SRC VB VECTOR collaborates with national laboratories with the US Department of Energy under the Industrial Partnership Program (IPP).

Presentations of SRC VB VECTOR abroad have been organized according to the initiative and thanks to the support of the Ministry of Science of the Russian Federation. Starting from 1994, the achievements of VECTOR in the fields of virology and biotechnology were presented in Poland, India, Vietnam, Cambodia, and Finland.

The international collaboration under ISTC and IPP projects demonstrated that VECTOR needs adoption of GLP and GMP, so that the products developed would be competitive. This would provide an easier obtaining of western investments and organization of joint plants for their production with the US party on terms of mutual benefit. VECTOR commenced collaboration with FDA and Southern Research Institute to introduce GLP and GMP. Training of VECTOR's staff in GLP and GMP is planned under the program SABIT.

### **X. Major facilities.**

SRC VB VECTOR has unique scientific and experimental facilities, having no analogues in any civil institutions of Russia and the CIS. These facilities allow the experiments with viruses most dangerous for humans and lacking any preparations for preventing and treating the diseases they cause to be performed at the modern level under conditions of the complete safety for the staff involved and the environment.

The Bank of Cell Cultures with SRC VB VECTOR is constantly enriched with new lines of vertebrate, insect, and plant cells. The cell cultures are stored, described, and certified in accordance with the international requirements. The Bank of Cell Cultures supplies completely all the basic and applied research of the Center as well as its manufacture of immunobiological preparations.

The Collection of Cultures of Microorganisms with the Center comprises strains of viruses, including the National Collection of variola virus strains; various isolates of viral strains; recombinant viral strains; and microbial strains (including industrial producer strains). In 1995, the WHO Commission visited the Center and affirmed that the work conditions comply with the international safety requirements. The Collection of Cultures of Microorganisms is recognized internationally: it became a full member of the European Culture Collections' Organization (ECCO).

The Center has facilities for breeding and keeping animals, including primates, which are used for testing the preparations developed. The monkey-breeding house is presently the only one active in the Asian part of Russia.

# 株式会社「BIOCHIMMASH」(モスクワ) Joint Stock Company «BIOCHIMMASH»

## I. Name of the Institute (Organization).

**In Russian:** Акционерное общество открытого типа “Биохиммаш”

**In Russian abbreviation:** АООТ "Биохиммаш".

**In English:** Joint Stock Company «BIOCHIMMASH»

**In English Abbreviation:** JSC «BIOCHIMMASH»

## II. Location.

**Official address:** 125299, Klara Tsetkin st. 4/6, Moscow, Russia

**Mail address:** 125299, Klara Tsetkin st. 4/6, Moscow, Russia

**Tel:** (+7-095) 159-31-46, 159-31-70, 156-29-10

**Fax:** (+7-095) 156-28-97

**E-mail:** [info@bioplaneta.ru](mailto:info@bioplaneta.ru)

**Access (transportation, necessary time):** Moscow international airport Sheremetjevo-2, then about one and half hour by car.

## III. History.

JSC «BIOCHIMMASH» founded in april 1974 as the All-Union Research and Design **Institute of Applied Biochemistry** with the aim of the research and development in the field of the advanced technologies for Microbiological and Pharmaceutical Industry.

Since 1997, the laboratory of space biotechnology was organized at the Institute, that works in close contact with Russian Space Agency, Korolev's Rocket-Space Corporation "Energia" and a series of State Scientific Centers of Russia. There are performed on ground and space experiments on the study of the influence of micro gravitation in space flight conditions on different biological objects with the aim of the production of the strains with the enhanced activity. The works are performed as well as fundamental studies and also in order to solve the applied problems

## IV. Management.

**Kind of organization:** Scientific and Technical Company

**Ownership:** Joint Stock Company

**Responsible Ministry:** Ministry of Science and Technology Russian Federation

## V. Executives.

**Director** – Andrei G.Moshkin

**Science Director** - Anatoly D. Ukraintsev , Ph.D. (med)

## VI. Current major activities.

The Institute has a large portfolio of the performed projects and performs the studies and development on the creation of the new preparations and processes of their manufacturing by biotechnological methods in the following fields:

- Medical biotechnology (Medicinal means on the basis of plant and animal cell cultures, Diagnosticums)
- Biotechnology for agriculture (Microbic means of plant protection, Veterinary preparations, Fertilizers, growth stimulators)
- Space biotechnology
- Biotechnology of ecological purpose
- Biotechnological equipment. (Block-and-modulus fermentation units, drying equipment, Membrane filtration units, Clean rooms according to GMP system on the basis of Russian filtration materials, Cryogenic storage, Shut-off fittings, Vacuum-evaporating units)

Pilot-scale production of the Institute manufactures a series of medicinal, prophylactic and hygienic means

## **VII. Number of employee.**

Personnel - 250 persons

## **VIII. Most Important Achievements.**

### **Biotechnology of ecological purpose**

- The process of the production of bacterial exopolysaccharides in liquid form for the treatment of the drowned oil wells was developed. The application of this technology allows to increase the output of crude oil of one well not less than for 10 %.
- There was developed the technology of biodegradant production for the decontamination of soils from pollution with oil, oil products, dioxins and phosphor-organic substances. There was created at the Institute the collection of strains isolated from ecologically contaminated areas. Strains available in the collection, by their biodegradation ability and by the range of the application of the substrate (oil and oil products) exceed domestic commercial preparations in 100-1000 times while their using as well as in water and in soil with the concentration of xenobiotics, exceeding 15-20%. Duration of the splitting of the substrate to fat acids is 5-7 days at single-dose treatment as compared to 30-40 days of commercial preparations. Rate of biodegradation is 95% at the dilution  $10^6$ - $10^7$ . Besides, the developments on rendering harmless phosphor-organic substances allows to make a contribution to the environmental protection from the consequences of the application of insecticides, herbicides, fungicides, etc.
- Waste processing technology of fish-, meat-, poultry-farming enterprises with the production of feed meal (MKM), amine-containing bases of nutrient media, veterinary preparations. Application: Feed additives for cattle-breeding, nutrient media for medicine and microbiological industry, "Peptamin", "Aviamin" and others.

### **Medical biotechnology**

- **Medicinal means on the basis of plant and animal cell cultures**

A method and process of production of biologically active substances was developed from biomass of plant cells cultured in the fermenters of different capacity by suspension method.

Commercial preparations (ginseng, shikonine and others) were developed. The patent for ginseng strain - DAN-25- was issued.

Development of original medicinal means with anticonvulsory, psychoprotective and immune-correcting properties, produced on the basis of plant raw materials (shikonine) by biotechnological method.

Development of the production process of the substance and finished medicinal form (ointment) of antifungous preparation on the basis of naphthoquinone of shikonine (erythromin) of plant origin.

Process of culturing of cells on microcarriers with the aim of the production of the preparation "Erythropoetin".

On the basis of the culture of animal embryonic tissues, a biotransplantant was produced - for the treatment in male sexual sphere (male sterility, chronic prostatitis, impotence). The patent of Russian Federation is issued. It has been clinically used for 3 years.

New cultural biotransplantants (in particular for the curing of patients with diabetes) are under development.

- **Other medicinal means**

Original process of the preparation "Lidasa" production, allowing to double the purity of the product, to increase the output from the unit of raw material in 4,5 times and to refuse from acetone application as compared to traditional methods. The stage of fractionation is solved by the method of ultra filtration. The patent of Russian Federation is issued.

The preparation increases the permeability of tissues and vascular walls, promotes to diffusion of the liquids, to resorption of scars after burns and surgeries, bloodstrokes and exudations in peritoneal and pleural cavities, it is applied in contracture of joints, in gynecology.

Original process of the production of the preparation - blood substitution - "Infusamin" , that excludes the stages of ion exchange and allows to increase the output of the product from the unit of raw material in 1,8 times. The stage of demineralization is solved by the method of crystallization. The patent of Russian Federation is issued.

Original process of culturing and extraction of beta-karotene on the basis of the culture of microscopic fungus- *Blakeslea trispora*.

The process of production of the preparation - "Acofil". Sobering means, decreasing postintoxication (hangover) state , weakens the state of psychological discomfort.

Original formulation on the basis of chemical and pharmaceutical components.

Spirustim with microelements. Food additive with medicinal- prophylactic properties for the relief of the state at diabetes.

- **Diagnosticums.**

Development of the processes of the suspension culturing of hybridoma for the production of monoclonal antibodies, used as sorbents, diagnosticums and medicinal preparations, to tumor necrosis factor, digoxin, alfa2-, gamma-interferon and others.

Development of immune-enzymatic test-system on the basis of monoclonal antibodies to gamma-interferon in order to determine its concentration in the process of the production and control of immune

# 遺伝学・産業微生物品種改良研究所「GNIIGENETIKA」 (モスクワ)

State Research Center of The Russian Federation  
State Scientific-Research Institute of Genetics and Selection of  
Industrial Microorganisms "GNIIGENETIKA"

## I. Name of the Institute (Organization).

**In Russian:** Государственный Научный Центр Государственный научно-исследовательский институт генетики и селекции промышленных микроорганизмов

**In Russian abbreviation:** ГНЦ ГосНИИгенетика

**In English:** State Research Center Of The Russian Federation State Scientific-Research Institute of Genetics and Selection of Industrial Microorganisms "GNIIGENETIKA"

**In English Abbreviation:** SSC RF GNIIGENETIKA

## II. Location.

**Official address:** 113545 Moscow,Russia,1 Dorozhny pr.,1

**Mail address:** 113545 Moscow,Russia,1 Dorozhny pr.,1

**Telephone number:** (+7 095) 315-3747

**Fax number:** (+7 095) 3150501

**E-mail for representative:** genetika@genetika.ru

**Access (transportation, necessary time):** Moscow international airport Sheremetjevo-2, then about one and half hour by car.

## III. History.

The Institute was founded in 1968 on the base of Radiobiology Department of Institute of Atomic Power named after I.V.Kurchatov. In 1994 Institute became the State Scientific Center of the Russian Federation.

The "GNIIGENETIKA" Institute is a leading state research center of the RF in the field of biotechnology.

The "GNIIGENETIKA" Institute incorporates: the International Depository "The All-Russian Collection of Industrial Microorganisms" (ARCIM) and "The Biotechnology Magazine" Publishing House. The "GNIIGENETIKA" Institute controls the AGRI Research Institute in cooperation with the Japan Company Ajinomoto. The AGRI Research Institute is located in the territory of the "GNIIGENETIKA" Institute. A Representation of the German Company Schtockhouzen is also located in the Institute.

The "GNIIGENETIKA" Institute's licenses for inventions have been purchased by many countries. The technologies developed in the Institutes are used in domestic and foreign industry.

#### **IV. Management.**

**Kind of organization:** State Scientific Center of Russian Federation

**Ownership:** State property of Russian Federation

**Responsible Ministry:** Russian Ministry of Industry, Science and Technology

#### **V. Executives.**

**Director** - Prof.V.G.Debabov.

#### **VI. Current major activities.**

On the base of fundamental researches in the field of genetics, molecular biology, biochemistry, gene and albumen engineering, immunology, biocatalysis, the Institute's experts develop biotechnological processes required for application in agriculture, medicine, pharmacology, veterinary science, chemical, food and light industry, criminalistics, ecology and other branches of economy.

- the fundamentals of genetics of enterobacteria, bacilli, pseudomonades, methylotrophic bacteria, yeasts, actinomycetes, rhodococci and fungi are being established;
- gene and operon structure is under study in enterobacteria, saccha romycetes, methylotrophic bacteria and yeasts, actinomycetes and their phages, phages-transposons of pseudomonades;
- the mechanisms underlying the regulation of biosynthesis of a number of compounds;
- unique vectors with a broad host range for Gram-positive and Gram-negative bacteria, actinomycetes and yeast have been constructed;
- genetic and molecular-biological mechanisms for antigens recognition are being examined;
- the structure-function studies of a large number of proteins were carried out by using the methods of immunology, protein chemistry, protein engineering, site-directed mutagenesis;
- highly active recombinant strains of microorganisms-producers of human leukocyte and fibroblast interferon and also interferon of agricultural animals were obtained. The strain producer of human interferon a2 is utilized in the production of "Realdiron" preparation;
- recombinant strain producing immunomodulators of the human homeopathic system;
- interleukins, growth factors, angiogenin were developed;

- original families of hybridomas - the producers of antibodies - inhibitors of interleukins were created;
- immunoenzyme diagnostics for interferon, interleukins and human insulin were developed;
- a method for establishing the identity of a person was developed and used for tracing the parentage which is based on revealing polymorphism in a number of human chromosomal loci;
- recombinant strains superproducers of amino acids threonine and homoserine which have no analogues world-wide in the level of the product accumulation, and also highly active strains producers of lysine, glutamine, glutamic acid, serine, valine, leucine, phenylalanine, tryptophan were created;
- a recombinant strain producer of vitamin B, has been developed for the first time in the world practice on the basis of *Bacillus subtilis*;
- the strains producers of purine and pyrimidine derivatives (inosine, inosinic acid, thymine, thymidine, uridine, uridine monophosphate) were obtained. A medical preparation "Riboxin" is produced currently on the basis of the strain producer of inosine;
- the strains producers of antibiotics, among them thylosin, bacitracin, chlortetracyclin, grisin, bialaphos were developed;
- the strains producers of enzymes -  $\alpha$ -amylase, metalloproteinase, glucoamylase, p-galactosidase, thymidine phosphorylase, uridine phosphorylase, nitrile hydratase were created;
- the strains producers of entomocidic proteins both with a wide and directed spectrum of insecticide action were constructed with a view to using them for plant protection;
- amylolytic yeast strains - the producers of ethanol were obtained;
- methods were devised for obtaining probiotics, the preparations dispensed on the basis of symbiotic microorganisms;
- ways are being developed for applying enzymes and cells in fine and large-scaled organic synthesis and biodegradation of toxic wastes in chemical industry. The process of industrial transformation of acrylonitrile into acrylamide was brought into commercial practice; the process of transformation of 3-cyanopyridine into nicotinamide is under development and so is conversion of fumaric acid into asparagine, etc.;
- application is underway of microbial proteinases in reactions of peptides synthesis, including an intensive sweetener, aspartame.

## **VII. Organization chart.**

### **Section "Microorganisms genetics"**

- Laboratory of methylotrophic bacteria genetics
- Laboratory of bacteria genetics
- Group of molecular genetics
- Laboratory of molecular genetics, taxonomy and yeast ecology
- Sector of yeast molecular biology
- Sector of methylotrophic yeast genetics
- Laboratory of biodegradation genetics
- Laboratory of bacteriophage genetics
- Laboratory of biochemical genetics

### **Section "Molecular biology"**

- Laboratory of Protein engineering
- Laboratory of immunology
- Laboratory of molecular diagnostics and genome dactyloscopy
- Laboratory of bioinformatics
- V. M. Stepanov Laboratory of Protein chemistry
- Laboratory of molecular biology
- Laboratory of immunochemistry

### **Section "Biotechnology"**

- Laboratory of actinomycetes and actinophages genetics
- Laboratory of microorganisms physiology
- Laboratory of biosynthesis products chemical fractionation
- Laboratory of biopesticides genetics
- Laboratory of technical microbiology

- Laboratory of yeast biotechnology
- Laboratory of fermentation processes optimization
- Laboratory of eucaryote genes structure
- Sector of radiochemical researches

**All-Russian Collection of Industrial Microorganisms (ARCIM)**

**VIII. Number of employee.**

Number of employee - 330. (about 200 persons with Ph.D. and D.Sc. degrees).

**IX. Major facilities.**

The Institute equipped by modern equipment possesses to carry out research on high scientific level.

The Institute boasts two Laboratory blocks, an office bloc and engineering premises with total floor space of 14.000 sq.meters.

シェミャーキン・オブチニコフ生物有機化学研究所  
(モスクワ)

Shemyakin and Ovchinnikov Institute of Bioorganic Chemistry,  
Russian Academy of Sciences

## I. Name of the Institute (Organization)

**In Russian:**

Институт биоорганической химии им. М.М.Шемякина и Ю.А.Овчинникова  
Российской академии наук

**In Russian abbreviation:** ИБХ РАН

**In English:** M.M. Shemyakin & Yu.A. Ovchinnikov Institute of Bioorganic  
Chemistry, Russian Academy of Sciences

**In English abbreviation:** IBCH

## II. Location

**Official address:** Ul. Miklukho-Maklaya, 16/10, 117997 GSP, Moscow V-437,  
Russia

**Mail address:** Ul. Miklukho-Maklaya, 16/10, 117997 GSP, Moscow V-437, Russia

**Phone:** +7 (095), 328-4460, 336-4111

**Fax:** +7 (095) 330-6538

**E-mail:** [ivosi@ibch.ru](mailto:ivosi@ibch.ru).

**Access (transportation, necessary time):**

Moscow International airport Sheremetjevo-2, then one hour driving by car

## III. History

The M.M.Shemyakin-Yu.A.Ovchinnikov Institute of Bioorganic Chemistry of the Russian Academy of Sciences came into existence initially under the name of the Institute for Chemistry of Natural Products by a decree of the Academy's Presidium issued in February, 1959.

The foundation of the Institute and its further development are inseparably linked with the names of outstanding scientists Professor M.M.Shemyakin and Professor Yu.A.Ovchinnikov. M.M.Shemyakin was the organizer of the Institute and headed it up to 1970. From 1970 till 1988 his disciple and successor Professor Ovchinnikov, well-known for his important contribution to the development of physico-chemical biology and biotechnology in Russia, was its director. In 1970 the Institute was named after M.M.Shemyakin and in 1992 was also named after Yu.A.Ovchinnikov in recognition of their services to bioorganic chemistry in this country. Since 1988 the Institute is under the directorship of Professor Vadim T. Ivanov famous for his investigations of the structure and function of peptides - the ubiquitous bioregulators, playing key roles in a number of biochemical processes.

Today the M.M.Shemyakin-Yu.A.Ovchinnikov Institute of Bioorganic Chemistry of the Russian Academy of Sciences is one of the leading centres of physico-chemical biology. As a part of the Academy's Division of Physico-Chemical Biology, the Institute heads investigations of the chemical nature of living matter.

The Institute is a unique complex of buildings designed and equipped for basic studies on physico-chemical biology including genetic engineering and isotope laboratories as well as a modern pilot plant for chemical and microbiological synthesis of biochemical reagents and pharmaceutical products.

The town of Pushchino, Moscow region, houses the Institute's Branch with numerous laboratories including a unique station of artificial climate, laboratories of plant monoclonal reproduction "BIOTRON" and ones for pre-clinic studies of potential drugs "BIOCENTER". In addition, it accommodates a pilot plant for thermic destruction of chemical and biochemical waste products.

#### **IV. Management**

**Kind of organization:** Research Institute

**Ownership:** State property of Russian Federation

**Responsible Ministry:** Russian Academy of Sciences

#### **V. Executives**

**Director of IBCH:** Vadim Ivanov

#### **VI. Current major activities**

Its major trends and activities are:

- chemistry and molecular engineering of proteins, nucleic acids, carbohydrates and low molecular bioregulators;
- novel biologically active substances;
- mechanisms of biomolecular recognition and signal transmission in biological systems;
- molecular immunology and hemopoiesis;
- basic and applied biotechnology;
- novel technologies and materials for biomolecular research;
- high-level education and training of specialists in physico-chemical biology and biotechnology.

#### **VII. Organization chart.**

The Institute and its Branch incorporate 37 scientific laboratories.

- **The Laboratory of Peptide Chemistry** devotes its main attention to: study of peptide bioregulators (studies on the structure-functional relationship in the family of the delta-sleep peptide and its analogs and biochemical mechanisms of their antistress action); studies on the structure-functional relationship in the family of muramylpeptides (GMDP's); synthetic peptide antigens (hepatitis A virus, lymphotropic viruses).
- **The Laboratory of Chemistry of Proteolytic Enzymes** studies proteases that participate in regulation of systems of intercellular proteolysis (ATP-dependent Lon proteases) and protein processing (enterokinase, duodenase, HIV-1 protease,

KEX2 protease). The studies are focused on the mechanisms of substrate recognition and the role of intermolecular (particularly, interdomain) interactions in the functioning enzymes. Special emphasis is placed on the use of the enzymes in biotechnology (proinsulin processing, immobilization of proteases, deglycosylation of proteins). Molecular biology approaches are widely used along with methods of protein and enzymatic chemistry and methods of theoretical conformational analysis.

- **The Laboratory of Hormonal Regulation Proteins** dedicates its main attention to the structure-functional investigation of effector proteins belonging to systems of hormonal and visual regulation and to the search for and investigation of new peptide and protein factors responsible for differentiation and proliferation of the hematopoietic system.
- **The Laboratory of Neuropeptide Receptors** focuses its main interest on elucidation of principles of interactions between nicotinic acetylcholine receptors and various neurotoxins.
- **The Laboratory's of Neuroreceptors and Neuroregulators** main area of research is the study of molecular mechanisms of neuromediator secretion and reception as well as identification and investigation of new neurotoxins modulating the activity of various receptor systems and ionic channels.
- **The Laboratory's of Regulatory Peptides** activity is focused on formatting of biologically active fragments of functional proteins exemplified by the products of endogenous proteolytic degradation of hemoglobin.
- **The Laboratory of Synthetic Vaccines** is mimicking the antiviral and antimicrobial immune response with in attention to research of synthesis of high active and high selective substances - cyclic peptides, peptides modified with artificial amino acids possessing conformationally restricted side chains and mini-analogs (about 5-15 amino acid residues) of such high molecular weight peptides as insulin, parathyroid hormone, leptin et al.
- **The Laboratory of Molecular Bioengineering** works at elucidating of the mechanisms of protein folding inside of the living cell. Other goal is to develop novel protein engineering methods for medicine.
- **The Laboratory's of Biocatalysis** main fields are new biocatalysts, catalytic antibodies towards biopolymers; DNA-hydrolyzing autoantibodies, antibody engineering antibody proteases; enzymes of nucleic acids metabolism; investigation of kinetics of DNA supercoiling; enzymes of amino acid metabolism; changes of reaction pathways; molecular basis of autoimmunity.
- **The Laboratory's of Structure and Functions of Human Genes** main areas of research are: studies of the human chromosome coding regions and structures of functional domains; human endogenous retroviruses roles in genome regulation and evolution; molecular and genetic mechanisms of reparative regeneration in planaria; synthesis of modified oligonucleotides and their use in biomedical

investigations; computer analysis of human genome; structure-functional analysis of mRNA; study of destabilase, a thrombolytic enzyme from medicinal leech.

- **The Laboratory of Gene Chemistry** studies structure-function relationship in human cytokines and colony-stimulating factors and their bacterial expression; synthesis of modified oligodeoxyribonucleotides for reversible immobilization on polymer supports.
- **The Laboratory of Gene Bioengineering** is working at developing of methods for the synthesis of nucleic acids fragments and their analogues, as well as the construction of recombinant peptides and proteins and investigation of their properties.
- **The Laboratory's of Mechanisms of Gene Expression** main areas of research are synthesis and expression of genetic determinants; nonradioactive labeling of nucleic acids; study of transcription apparatus in yeast.
- **The Laboratory of Molecular Bases of Embryogenesis** focuses its activity on investigation of a novel subfamily of homeobox genes controlling early development of forebrain; investigation of a novel epidermis specific secreted factor, XEp-1; searching and investigation of novel genes regulating development of the primary embryonic inductor (Spemann organizer); identification and investigation of genes coding for gap junction proteins, connexins, in early zebrafish embryo.
- **The Laboratory of Transgenesis** creates and studies transgenic animals producing biologically active proteins in the mammary gland.
- **The Laboratory of Carbohydrate Chemistry** studies fundamental problems of glycobiology with the emphasis on a potential medical output, particularly, in diagnostics and therapy. The main directions are the oligosaccharide and glycoconjugate syntheses, carbohydrate-protein and carbohydrate-carbohydrate interactions, structure elucidation of glycoproteins carbohydrate chains, immunomodulating action of carbohydrate chains, search for and study of carbohydrate receptors on human cells, rational design of viral and bacterial adhesion inhibitors, study of selectins, monoclonal antibodies to biologically important carbohydrate antigens, and animal lectins.
- **The Laboratory of Lipid Chemistry** deals with the synthesis of fluorescent and photoaffine lipid probes and their use in membrane studies; synthesis of antiviral and antitumor lipid compounds; studies of the influence of sphingolipids on the cancerogenesis processes.
- **The Laboratory of Oxylypins** investigates oxylypins - lipid bioregulators originated from polyunsaturated fatty acids through at least one step of enzymic oxygenation. Synthesis of natural and modified oxylypins, development of new analytical procedures, investigation of the arachidonic acid cascade and structure-activity relationships in the field of bioeffector lipids are the primary goals.

- **The Laboratory of Organic Synthesis** is engaged in the syntheses of monocyclic and polycyclic aromatic and heterocyclic compounds, as well as macrocyclic ones; the recent works are in the field of organoboron compounds.
- **Division of Immunology** the Laboratory's of Cell Interactions main fields of research are: cell-cell interactions between subpopulations of immunocompetent cells, including interactions between T-helpers 1 and 2; antigen-presenting cells of various origins and T-cells; regulation of cell activation in high-density and low-density cultures and on the molecular level, using inhibitor analysis; disturbances in the immune system of patients with autoimmune diseases including the analysis of lymphocyte phenotype (CD1, CD3, CD4, CD8, HD37), mitogen-induced proliferation, and interleukin-2-dependent processes; immunocorrecting action of biologically active molecules such as GMDP and myelopeptides.
- **The Laboratory of Mediators of Immune System** performs an investigation of myelopeptides (MPs), bioregulatory molecules of the marrow origin. At present the main goal is isolation and structure-functional characterization of individual MPs, study of mechanism of their biological action, and selection, on their basis, of compounds prospective for creating drugs of the endogenous nature having directed correctional action without any side effects.
- **The Laboratory of Immunochemistry** makes an investigation of molecular and cellular mechanisms of the biological activity of glucosaminylmuramyl peptides (in collaboration with the Laboratory of Peptide Chemistry); study of memory T-cells in infection; production and use of monoclonal antibodies for research and biotechnology.
- **The Laboratory of Biotechnology** is working out technology of preparing low-molecular bioregulators; development of methods of the identification of biologically active compounds of the plant origin and the cell culture of plants; technology of chemical synthesis of peptides and nucleotides; biotechnology of recombinant proteins and factors determining the gene expression level in E.coli; studies antigenic properties of viruses of luteo and gordei groups using monoclonal antibodies (MA) in various immunoassay systems and develops highly sensitive test-systems on the basis of the MA obtained.
- **The Laboratory's of Polymers for Biology** activity is focused on development of new chromatographic materials and efficient bioseparation processes; polymeric systems containing immobilized proteins and cells for medicine and biotechnology; systems for biochemical analyses, immunodiagnosics, nucleic acid hybridization analysis, cell receptor marking, and cell separation; polymeric monolayers and Langmuir films this photosensitive proteins and surface-active substances.
- **The Laboratory of Spectral Analysis.** NMR spectroscopy group's key areas of the research include: development of methods for studying the spatial structure and molecular dynamics of the membrane and water-soluble proteins; determination of basic principles underlying formation of the protein structure and relationship between the protein spatial structure, dynamics, and function.

- **Optical spectroscopy group's** research is mainly directed to the development of new techniques basing on such methods of optical spectroscopy as circular dichroism, Raman scattering, fluorescence, resonance Raman spectroscopy (including UVRR), and surface-enhanced Raman scattering (SERS). Their applications to the determination of structure-functional properties of biological molecules and their complexes both in vitro and in living cells are being studied.
- **Protein engineering group** studies interrelations between structure, function and stability of protein molecules as well as molecular mechanisms of protein folding and protein-protein recognition. The major techniques are the gene cloning, directed mutagenesis, bacterial expression and biochemical analysis of protein molecules.
- **Molecular modeling group** workes at molecular modeling of globular and membrane proteins (force field simulations, homology building, structure predictions and threading), studies of protein solvation with a special accent on membrane-mimicking models, quantitative analysis of hydrophobic properties of proteins.
- **The Laboratory of X-Ray Analysis** studies three-dimensional organization and structure-functional relations in proteins as well as low molecular biologically active compounds by the X-ray technique and computational and molecular graphics methods; theoretically conformational analysis of biologically active peptides.
- **The Laboratory of Electron Microscopy** studies biopolymer structures by electron microscopy methods at a molecular resolution level and by atomic force microscopy.
- **The Laboratory's of Protein Chemistry** main fields of research are: studies of structure-function relationships of the proteins participating in visual signal transduction system, viz., cGMP phosphodiesterase, recoverin and rhodopsin kinase from bovine rods; isolation, identification, and structural investigation of an antiadhesion factor from the blood serum; structural features and functional role of the acute phase serum proteins.
- **The Laboratory of Peptide Chemistry** deals with practical evaluation and fundamental studies of the swellographic monitoring technique; new synthetic approaches to variously constrained peptidemimetics.
- **The Laboratory of Neurochemistry** studies molecular mechanism of neurosecretion in mammalian neural cells.
- **The Laboratory's of Plant Biotechnology** main trends of the research are: structural and functional investigation of enzymatic methylation of plant DNA; development of artificial programs for expression of foreign genes in transgenic plants; development of methods for genetic transformation of various plant species; production of transgenic plants with novel, commercially valuable properties.

- **The Laboratory of Protein Structure Organisation** studies processes of the polypeptide chains folding in the course their synthesis on the ribosomes and renaturation in the process of expression gene construction in different expressing systems and also development of the technology synthesis of polypeptides in the cell-free translation system and using it in biotechnology and applied scientific investigations.
- **The Laboratory of Molecular Aspects of Reproductive Immunology** aims its research work at isolation and investigation of cytokinin-binding proteins from etiolated maize coleoptiles.
- **The Laboratory's of Pharmacology** main directions of studies are: mechanisms of action of pharmaceuticals; screening of biological activity of natural and synthetic compounds; preclinical studies of general and specific toxicity of biologically active substances in accordance with the GLP (Good Laboratory Practice) requirements.
- **Division of Bioengineering** the aim of the research are: development of technologies of nucleic acid components and new drugs on their bases; development of methods, instrumentation and software for the solid-phase synthesis of biopolymers and liquid column chromatography.

The main research directions and production activities of Research and Production Section "BIOCENTER" are biotechnology in vitro and in vivo of experimental biomodels (EBM) of animal origin and methodology of nonclinical biomedical investigations, including screening of biological activity of new preparations important for medicine and veterinary, and their safety tests.

The main research tasks of Artificial Climate Station "BIOTRON" are the plant biotechnology together with high-quality virus-free planting material production and its use in industry, as well as modern technologies for plant cultivation in greenhouses. The efficient transformation methods have been developed for apple, pear, sour-cherry, strawberry, actinidia, carrot, chrysanthemum and carnation commercial cultivars. Some genes of different commercial traits were introduced in these horticultural crops: biotic (insects, fungi pathogenes), abiotic (frost, herbicide) stress resistance, improving yield quality (plant architecture, fruit taste, flower colour). The plant hormones function and antisense RNA technology usage for plant metabolism regulation are also the research subject of "Biotron".

The Institute envisages fundamental research of structure and function of biopolymers and low molecular bioregulators developing novel trends in bioorganic chemistry and molecular biology as well as in closely related fields of biochemistry, molecular genetics, neurobiology, immunology, cellular biology, etc. The Institute pays special attention to problems of vital importance for medicine, agriculture and certain industries. The basic studies performed at the Institute provided ground for introduction of modern biotechnologies in Russia such as production of recombinant proteins and other hightech products for medicine and agriculture. These include technologies of medical immunocorrecting preparations "Likopid" and "Myelopid", recombinant human insulin, genetically engineered "Reaferon" and many others.

## **VIII. Number of employee**

Total Number of Regular Staff - 1300

- 450 researchers (280 persons with Ph.D. and D.Sc. degrees).

## **IX. International and domestic relations**

The research performed at the Institute enjoys broad recognition both at home and abroad. Friendly ties and beneficial contracts are successfully developing with foreign scientists and academies, scientific institutions in the USA, Great Britain, France, Japan, Sweden and others. Over years the Institute carries out joint scientific projects in close contact with colleagues abroad. The young scientists of the Institute often visit leading international centres. Many investigations of the Institute are sponsored by international scientific foundations. In recent years, the Institute has extensively collaborated with foreign commercial organisations. There are agreements about joint investigations, and common laboratories are founded.

The leading scientists of the Institute are elected honorary members of academies, honoreis causa doctors of foreign universities, members of international scientific societies and editorial boards.

**オレホヴィッチ生医化学研究所（モスクワ）**  
**V.N.Orehovitch Institute of Biomedical Chemistry of the Russian Academy of Medical Sciences**

**I. Name of the Institute (Organization).**

**In Russian:** Научно-исследовательский институт биомедицинской химии им. В.Н.Ореховича Российской Академии медицинских наук

**In Russian abbreviation:** НИИ БХ РАМН

**In English:** V.N.Orehovitch Institute of Biomedical Chemistry of the Russian Academy of Medical Sciences

**In English Abbreviation:** IBC RAMS

**II. Location.**

**Official address:** Moscow, 119832, Pogodinskaya str. 10

**Mail address:** Moscow, 119832, Pogodinskaya str. 10

**Tel:** (+7-095) 246-6980

**Fax:** (+7-095) 245-0857

**E-mail:** [inst@ibmh.msk.su](mailto:inst@ibmh.msk.su)

**Access (transportation, necessary time):** Moscow international airport Sheremetjevo-2, then about one and half hour by car.

**III. History.**

The Institute of Biomedical Chemistry of the Russian Academy of Medical Sciences (until 1993 - the Institute of Biological and Medical Chemistry, RAMS) was founded in 1944 on the base of the Biochemistry and Organic Chemistry Department of the All-Union Institute of Experimental Medicine.

In 1949, Academician of RAMS V.N. Orechovich (b. 1905), famous for his studies on connective tissue proteins and proteolytic enzymes, was nominated to head the Institute. V.N. Orechovich was the Institute's director for 40 years (1949-1989).

Since 1989 Academician RAMS, Professor Alexander Archakov (b.1940) is elected as the Director of the Institute. Prof. Archakov is the leading scientist, whose basic works in the fields of microsomal oxidation, development of cytochromes P450 database, computer-assisted analysis of protein structure and function are well-known throughout the world. Prof.Archakov headed the Department of Biochemistry at the Medical & Biological Faculty of Russian State Medical University.

**IV. Management.**

**Kind of organization:** Research Institute

**Ownership:** State property of Russian Federation

**Responsible Ministry:** Russian Academy of Medical Science

**V. Executives.**

**Director** - Archakov Alexander Ivanovich

**Deputy Director (General Problems)** - Kun'kov Alexander Sergeevich

**Deputy Director (Research)** - Guseva Mariya Kirilovna

**Deputy Director (Development)** - Ipatova Olga Mikhailovna

## **VI. Current major activities.**

The main Institute's activities are extend info basic and applied researches involve the molecular mechanisms of biological processes in the normal and pathological states of human organism.

In late 2000 the first Russian Proteomics Research center of was set up in the Institute.

At present the Institute is engaged in multidisciplinary studies of biomedical and environmental problems. Applying its wide experience in bioinformatics, computational chemistry & biology, molecular modeling, biochemistry and pharmacology for such specific areas as:

- Research and development of new pharmaceuticals and healthy food supplements for treatment and prophylaxis of liver and cardiovascular disorders
- Diabetes
- Infectious diseases
- Cancer.
- Research of molecular recognition in complexes of biological macromolecules and protein-ligand interaction (cytochromes P450 and its redox partners; new inhibitors of metalloproteinases, monoamine oxidases and guanilate cyclases).
- Development and application of computer programs and databases for bioinformatics and computer-aided creation of bioactive agents.
- Research and development of new means for the targeted delivery of cytostatics and gene therapy medicines.

## **VII. Organization chart.**

At present the Institute comprises 12 laboratories and a scientific-industrial department

- Laboratory of biochemistry and chemical pathology of proteins
- Laboratory of protein biosynthesis
- Laboratory of the biochemistry of ligand-receptor interactions
- Laboratory of biochemistry of amines and other nitrogenous bases
- Laboratory of gene therapeutics
- Laboratory of design and synthesis of functionally active protein fragments
- Laboratory of medical biotechnology
- Laboratory of chemical synthesis of physiologically active compounds
- Laboratory of microsomal oxidation
- Laboratory of physically active peptides
- Laboratory of structure-function based drug design
- Laboratory of molecular graphics drug design
- Treatment and diagnostics center
- Scientific-technological department

- Scientific-organizational department

## **VIII. Number of employee.**

Personnel - 250 persons

## **IX. Product&Services**

Institute provides the following services:

- CPD - Database on Cytochromes P-450
- ONIX - Computer Program for Visualization and Analysis of 3D Structure of Proteins
- PASS - Computer System for Prediction of Biological Activity Spectra for Substances
- KeyLock - Computer database for molecular recognition in protein-ligand complexes

Products Developed in the Institute:

- Phospholiv - is a tablet form, effective and non-toxic preparation, the analog for foreign drugs "Essenciale" and "Lipostabil"; it is used to treat liver diseases and remove the hepatocyte membrane damages.
- Moslecithin - is food complex of irreplaceable vegetable phospholipids and polyunsaturated fatty acids. Lecithin - being the main component of cell membranes and fats emulgent- decreases cholesterol and triglycerids in blood, stabilizes bile and rehabilitates liver structure. The preparation was developed in joint cooperation with German company "STERN".
- Alkecyte - is bioactive food additive on the basis of lecithin. The proper prescription of "Alkecyte" allows to protect liver from the influence of extra alcohol dosages, remove unpleasant sensations, caused by alcohol taking. The preparation's prescription is also original and should be patented.
- Ubikato-flax - is bioactive food additive on the basis of linseed-oil, E vitamin, beta-carotene and Q co-enzyme. The preparation has anti-oxidant properties, protects cells from damage caused by accumulation of free radicals. "Ubikato-flax" holds in the development of such diseases as atherosclerosis, chronic inflammations, cataract and some kinds of tumours.
- Vito-flax - is bioactive food additive on the basis of linseed-oil, E vitamin, beta-carotene and Q co-enzyme. The preparation has anti-oxidant properties, protects cells from damage caused by accumulation of free radicals. "Ubikato-flax" holds in the development of such diseases as atherosclerosis, chronic inflammations, cataract and some kinds of tumours.
- MLIVHOL - is a lyophilized injection form of hepatoprotective drug, the way of its obtaining and the prescription are the original groundworks of the Institute. "Mlivhol" is recommended to treat the acute and serious forms of liver diseases. Accompanied by coma.
- The novel peptides with insulin-like biological activity
- Vanadol - New oral antidiabetic agent

## **X. International and domestic relations.**

In 2000 the Institute has obtained the following grant support for R&D:

### **Russian Grants:**

- Russian Foundation for Basic Research - 23 grants.
- Russian Humanitarian Foundation - 2 grants.
- Principal Federal Research & Technology Projects and Programs - 3 grants.
- Interdisciplinary Research & Technology Program "Vaccines of New Generation and the Diagnostics Systems of the Future" - 2 grants.
- Moscow Committee on Science and Technologies - 3 grants.
- Russian Program for Integration of the Research and High Education Institutions - 2 grants.

### **International Grants:**

- INTAS - 4 grants.
- EU - 1 grant.
- Janssen Research Foundation - 1 grant.
- Royal Society (UK) - 1 grant.
- NATO - 1 grant.
- International Science & Technology Center (USA) - 1 grant.
- Civil Research and Development Foundation (USA) - 1 grant.