Molecular and cell technologies for medicine and agriculture:
*International cooperation activity of Institute of Biophysics and Cell Engineering of NAS of Belarus*

**Lyudmila Dubovskaya**
Director of Institute of Biophysics and Cell Engineering of NAS of Belarus
THE MAIN SCIENTIFIC DIRECTIONS OF THE INSTITUTE

• molecular and cell biophysics
• tissue and cell engineering
• biology of stem cells
• proteomics
• nanotoxicology
• drug design

The Institute staff consists of 114 members including

- 86 researchers (6 Doctors of Sciences (D.Sc.) and 33 Candidates of Sciences (Ph. D.))
- 8 postgraduate students
- 23 members of administrative and technical staff
Advanced biotechnologies for medicine

- mesenchymal stem cells isolation and cultivation from bone marrow, adipose tissue and olfactory epithelium
- personal cryo-storage and cryo-preservation of mesenchymal stem cells
- liposomal forms of drugs
- novel anticancer drugs and drug design
- cell-based test-systems for drugs
- new genomic and proteomic diagnostic test-systems, nanotechnology based biosensors
- nanomaterials for anticancer gene therapy
Advanced biotechnologies for agriculture

- genomic and proteomic test-systems for animals and plants, biosensors
- transgenic plants, cell-based bioreactors
- stock cultures of agriculturally useful algae
- technology of *Chlorella* and *Spirulina* cultivation
- technology of pre-sowing treatment of seeds and cuttings rooting by protective and stimulating compositions
- methods to improve plant resistance to biotic and abiotic stress factors
- adaptive technologies of spring and winter wheat growing for agriculture
- protective and simulative mixtures for pre-sowing seed treatment and cutting establishment
Republican Scientific and Medical Centre for Cell Technologies was established for elaboration and introducing into clinical practice the techniques of preparation and application of mesenchymal stem cells (MSC) and other cells from organs and tissues to treat the human diseases not responding to the treatments by traditional methods.

The production and cryostorage facilities were certified to comply with requirements of the international GMP standards (certificates from 28.11.2014) and ISO 14644-1-2002 (certificates from 24.03.2014).

The quality management system of Institute conforms to the requirements of STB ISO 9001-2009 (№ BY/112 05.01.077 02944).
1. Technologies of cell cultivation and cryopreservation
- Mesenchymal stem cells (MSCs) derived from adipose tissue
- MSCs derived from bone marrow
- MSCs derived from cord tissue
- MSCs derived from orbital cavity
- Stem cells from olfactory epithelium
- Islet cells of pancreas
- Skin keratinocytes
- Skin fibroblasts
- Limbal stromal cells

2. Technologies of induced differentiation of MSCs in chondro-, osteo-, neuro-, hepato- and cardiogenic directions

3. Tissue engineering constructions based on MSCs and biocompatible scaffolds
- flask-based MSCs culture (2D)
- MSCs immobilized on collagen scaffold (3D)
- MSCs immobilized on polydimethylsiloxan scaffold (3D)
Scientists publication activity

<table>
<thead>
<tr>
<th>Date of publications</th>
<th>Number of publications in international journals</th>
<th>Number of citations</th>
<th>Number of citations without self-citations</th>
<th>Number of citation per article</th>
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<tr>
<td>2010-2016</td>
<td>103</td>
<td>480</td>
<td>394</td>
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according to Web of Science

Implementation of international projects funded by Horizon 2020, 7FP EU, INTAS, UNESCO, ISTC, IAEA, NATO, IAP-TWAS

International travel grants to participate in conferences, congresses, workshops and schools funded by Federation of European Biochemical Societies, International Society for Neurochemistry, International Union of Biochemistry and Molecular Biology, European Biophysical Societies’ Association, Royal Society, European Societies of Toxicology, European Molecular Biology Organization, Federation of European Societies of Plant Biology, Society for Experimental Biology

International partner countries
Russia, Ukraine, Moldova, Armenia, Georgia, Kazakhstan, Lithuania, Latvia, Estonia, Sweden, Italy, Germany, France, Spain, UK, Belgium, Bulgaria, Hungary, Poland, Czech Republic, Korea, USA, Iran, Turkey, Vietnam, Japan
Institute of Biophysics and Cell Engineering hosts
• National contact point (NCP) of the 7th Framework Program of EU for the Health priority since 2007
• NCP of the EU Framework Programme for Research and Innovation Horizon 2020 since 2014

National Contact Point for EU Research and Innovation Programmes “Health, demographic changes and wellbeing”

The Belarus Satellite Centre of Trace Element Institute for UNESCO

Founded in 2004 to solve complex problems of determination of trace elements in different areas of nutrition and health
Workshop was held under the auspices of the Global Network of Science Academies (IAP) is a first attempt to integrate the Academies of Sciences of Central and Eastern Europe into the IAP collaboration network, and has played a coordinating role in expanding links between the academies of the region and launching the different projects on science communication.

The workshop brought together 23 participants from 10 countries including Belarus, Belgium, Czech Republic, Germany, Latvia, Montenegro, Netherlands, Poland, Romania, Ukraine and a representative of European Commission.

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Consortium: Center of Ideas and Technologies (Armenia), Charles University in Prague (Czech Republic), Institute of Biophysics and Cell Engineering of NAS of Belarus (Belarus), I.Javakhishvili Tbilisi State University (Georgia), University of Debrecen (Hungary), University of Rome Tor Vergata (Italy), Independent Expert Consulting Board to promote Scientific Research Activity in Kazakhstan (Kazakhstan), State Medical and Pharmaceutical University (Moldova), Cracow University of Technology (Poland), Lomonosov Moscow State University (Russia), Odessa National I.I. Mechnikov University (Ukraine)

The EECAlink is a coordination action aimed at identification of common research priorities of the European Union and Eastern European and Central Asian countries (EECA) and strengthening collaboration in health sector among them through systematic support to creation of new research consortia for FP7 calls.
The key objective of the project is the coordinated transfer of knowledge and training activities between participating teams in the EU (Riga, Linkoping, Montpellier), in the Ukraine (Odessa and Kyiv) and the Belarus (Minsk) with the aim of strengthening the existing scientific partnerships in field of optical fibre biosensors, aiming towards applications in agriculture and taking opportunities offered by the latest achievements in nanotechnology and biotechnology.

Consortium: University of Latvia (Latvia), University of Linkoping (Sweden), European Institutes of Membranes (France), National University of Life and Environmental Sciences of Ukraine (Ukraine), Odessa National I.I. Mechnikov University (Ukraine), Institute of Biophysics and Cell Engineering of NAS of Belarus (Belarus)

The main objective of project is to provide the tight collaboration of four institutions from European Union, Russia and Belarus in the field of nanomaterials-driven delivery of anti-cancer siRNA into cancer cells.

Consortium: Uniwersytet Lodzki (Poland), Universidad de Alcala (Spain), Immunomodular Laboratory, Hospital Gregorio Maranon (Spain), Laboratory of Coordination Chemistry, Centre National de la Recherche Scientifique (France), Institute of Biophysics and Cell Engineering of NAS of Belarus (Belarus), Institute of Chemical Biology And Fundamental Medicine (Russia)
The project is targeted to strengthen international and interdisciplinary collaboration, sharing new ideas and knowledge transfer from research to market in the field of nanostructured metal oxide optical biosensors for early stage cancer detection.

Consortium: University of Latvia (Latvia), State Research Institute Centre of Physical Sciences and Technologies (Lithuania), European Institute of Membranes (France), NanoBioMedical Centre at Adam Mickiewicz University in Poznan (Poland), Fondazione Bruno Kessler (Italy), Eesti Materjalitehnoloogiate Arenduskeskuse AS (Estonia), Biosensor Srl (Italy), Nanopharma (Czech Republic), Institute of Biophysics and Cell Engineering of NAS of Belarus (Belarus)

The consortium offers effective knowledge transfer and research training in the following research areas: material science and nanotechnology, biotechnology, optical technology, biosensor technology and industrial training.
1) Participation in EU international scientific and technical projects and grant programs provides an opportunity for internships, advanced training for young and experienced researchers, allows the exchange of knowledge, sharing of methodological approaches and equipment, publishing in high-ranking journals and as a result, to solve more complicated scientific and applied problems, to increase scientific excellence and carry out research at a high global level

2) International scientific consortia nowadays are welcomed in the field of cell therapy, personal diagnostics, drug design, gene therapy, brain research and metabolic engineering
3) The scientific excellence is a requirement for each scientist, laboratory and Institution who is intended to participate in European Community programs. Only projects aimed at the most urgent tasks of today's science, having a clear scientific idea, an experienced research team, published in high-ranking scientific journals, and a modern scientific base, receive funding. Only scientific teams that carry out research at a high international level can count on success.

4) Governmental support and funding of basic research and excellent national scientific teams, engagement and stimulation of skilled young scientists, updating laboratory equipment facilities are generally required.
Thank you for your attention!