

**State Government-Financed Institution of Higher Professional Education
Siberian State Medical University
Ministry of Health and Social Development of the Russian Federation**

Medicine of the future: foresight- based choice of priorities

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Sectors of economy

- Health and Medicine
- Pharmaceutical industry
- Chemical industry
- Biotechnology
- New materials
- Instrumentation and electronics

**RTP
PRODUCTION**

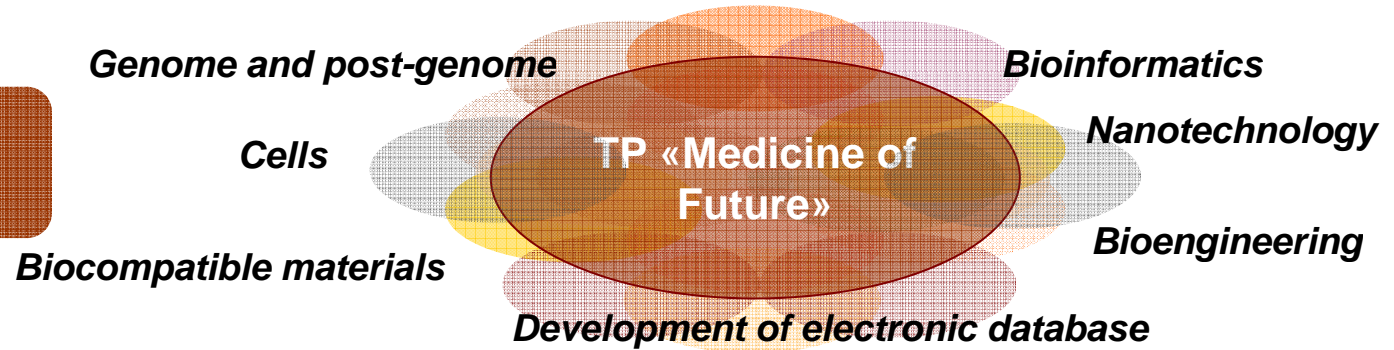
**Innovative
Pharmaceuticals**

**Targeted Diagnostic
Systems**

**New Materials
for Medicine**

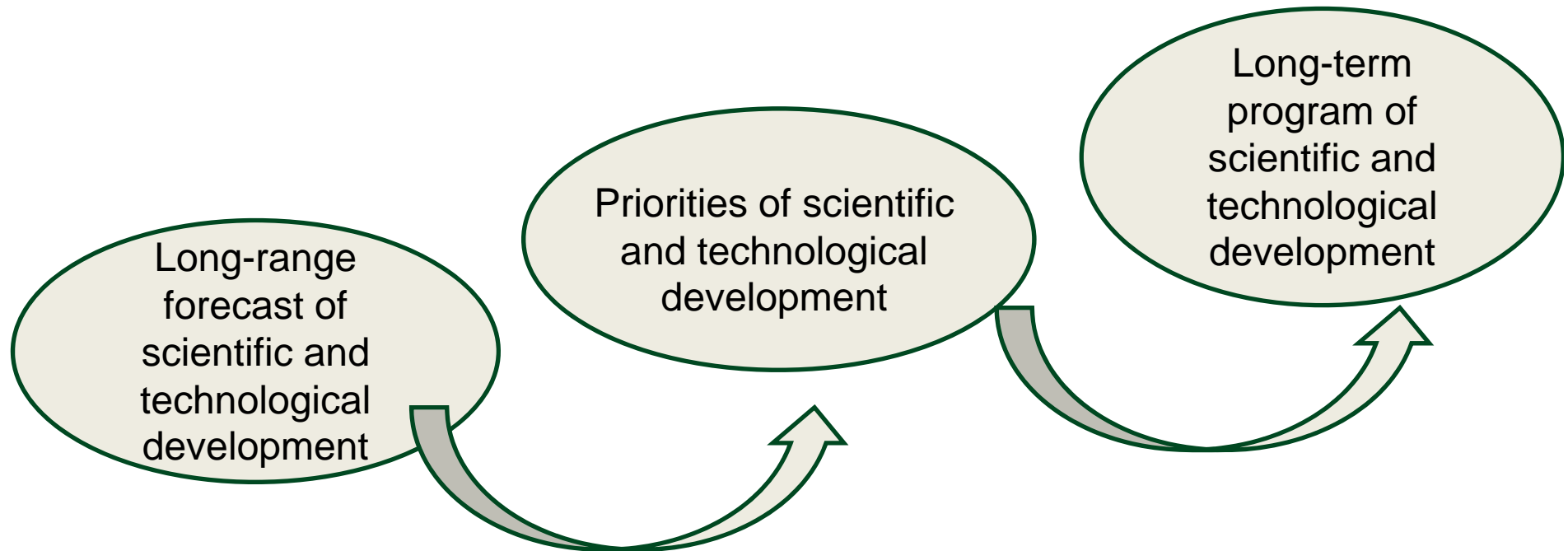
**Equipment
for Diagnostics
and Therapy**

Technology



MEMBERS

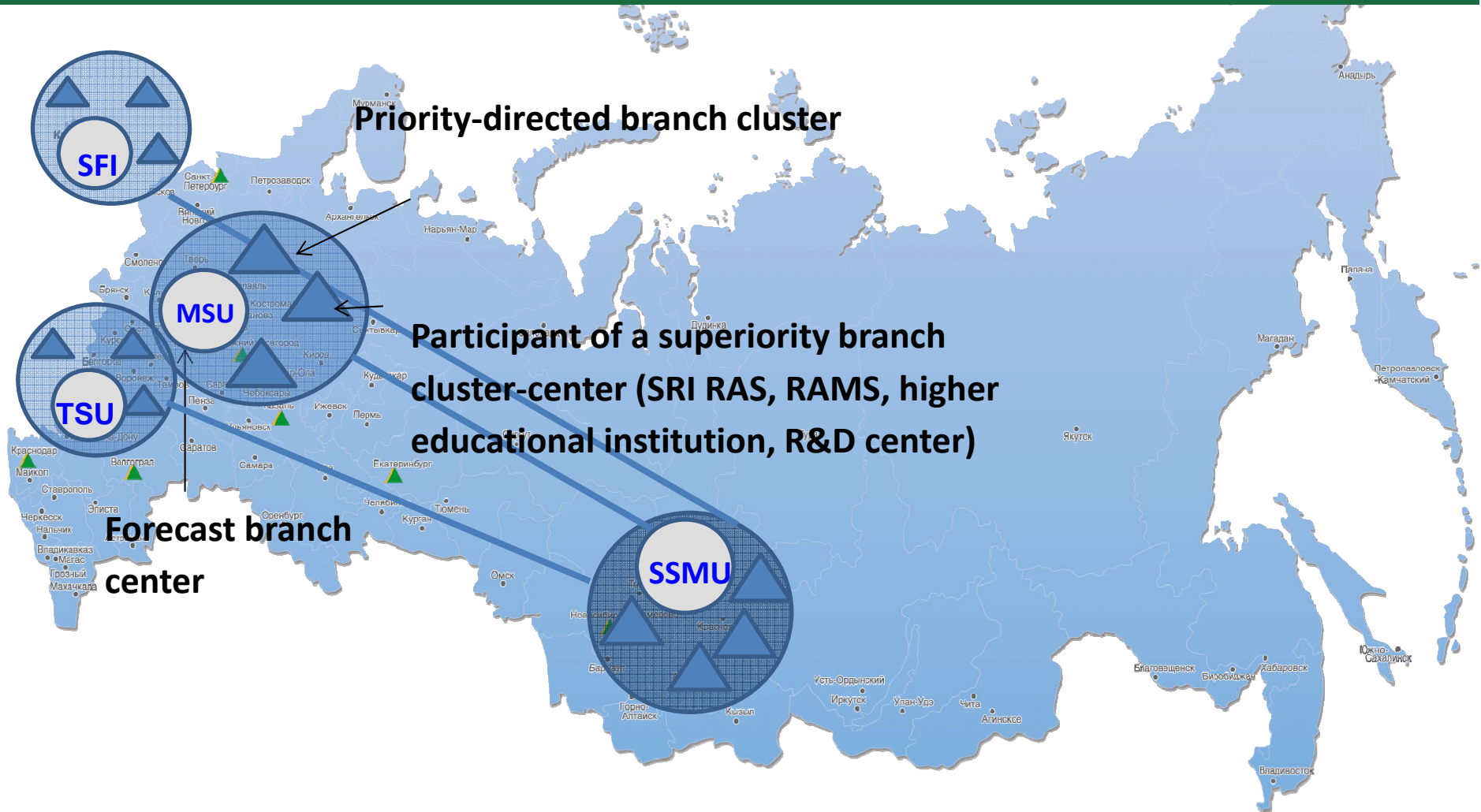
- Universities, RAS and RAMS, R&D centers
- Government organizations: Ministry of Education and Science, Ministry of Health and Social Development, Ministry of Economic Development
- Rusnano, Rosatom, Federal State Unitary Companies
- Business Partners



Objective

Organization of a network of scientific and technological forecast branch centers based on lead Russian higher educational institutions to suit priority directions of scientific, technological, and engineering development in the field of Life Science

Network of forecast branch centers (FBCs)



Main tasks (block 1)

- ✓ To determine specialization of FBCs, directions of their analytical and forecasting activity in the field of Life Science, points of contacts between scientific research and developments, educational activity, and real economic sector;
- ✓ To disclose the most successful and promising institutions and teams (superiority centers) in the main fields of Life Science;
- ✓ To design branch clusters being conglomerates of higher educational institutions, scientific institutions, and enterprises of the real economic sector the activity of which provides solution of the major problems of scientific and technological development;
- ✓ To ensure efficient activity of the network of forecast branch centers through creation of a scientific, methodological, and organizational base.

Organizational and methodological base for efficient activity of FBCs

- ✓ Normative legal support for FBC activity
Procedures for establishment of a FBC and engagement of other institutions in its activity;
- ✓ Educational methodological support for FBC staff;
- ✓ Regulation for selection and incorporation of institutions in the FBC and Branch cluster structure;
- ✓ Description of superiority centers in various fields of Life Science;
- ✓ Expert stratification format.

Educational methodological support for FBC staff

- ✓ Professional development program on the subject “Organization of a network of scientific and technological forecast branch centers around lead Russian higher educational institutions to suit priority directions of Life Science”;
- ✓ Lecture courses on the subjects: “Foresight Methodology”, “Organizational management for cooperation of a forecast branch center with a leading forecast center”, “Organizational management for cooperation of a forecast branch center with experts”, “Organizational management for cooperation of a forecast branch center with participants of the branch cluster”;
- ✓ **Standard instructions** on basic Foresight techniques – **questionnaire, patent analysis** and **expert panels** being the main forecasting tool.

Main criteria for incorporation of an institution in the branch cluster structure

- ✓ Leading positions in scientific research, innovative and production activity;
- ✓ Participation in Federal target programs, Technological platforms, Innovation development programs, state-financed R&D support programs;
- ✓ Experience of success in innovation projects on any scale, experience of bank credits, and good credit history in R&D realization;
- ✓ Positive project appraisal in Rosnano; Skolkovo resident.

Lines of activity of the organized FBC network
in the field of Life Science

Preliminary results

Main data sources on the global and Russian challenges in Life Science

1. Reports of the World Health Organization (<http://www.who.int>) – “State of healthcare in the world”, “World healthcare statistics”.
2. Reports of the Ministry of Healthcare and Social Development of the Russian Federation (<http://www.minzdravsoc.ru/>).
3. Reports of the US Food and Drug Administration (FDA, <http://www.fda.gov/>).
4. Strategy of pharmaceutical industry development till 2020 (<http://www.pharma2020.ru/>).
5. Federal target program “Development of scientific and technological complex of Russia”

Lines of activity of the FBC network in the field of Life Science

Rating of the world's challenges	Urgency (mean score)
1. High mortality due to cardiovascular diseases (CHD, stroke)	5.00
2. Increase in oncologic morbidity and related mortality	4.71
3. Increase in metabolic morbidity (diabetes, obesity, etc.)	4.14
4. Increase in COPD morbidity and related decrease in QL	4.00
5. Increased demand for biotechnological pharmaceutical and medical products	4.00
6. Shortage of organs and tissues for replacement	3.86
7. Spread of diseases due to a low hygiene level (enteric infections, HIV, tuberculosis, helminth diseases, hepatitis, etc.)	3.71
8. Increase in morbidity associated with an increased life span (age-related diseases)	3.50
9. Increase in ecological standards for food industry	3.43
10. Reduction of agricultural production areas	3.33
11. Deficiency of tools and facilities to compensate for congenital and acquired disorders of musculoskeletal system and sense organs	3.28
12. Increase in world demand for foodstuff	3.16
13. Spread of diseases of large cities	3.14
14. Ubiquitous increase in the spread of allergic reactions and pathologies	3.00
15. Decrease in life support level due to a considerable increase in population	2.16

Subject of activity of the FBC network in the field of Life Science

Rating of the Russian challenges	Significance (mean score)
1. High mortality among population	5.00
2. Short life span	5.00
3. Late diagnostics of oncologic diseases	4.71
4. Insufficient cardiosurgery care in the Russian Federation	4.28
5. Low provision of high-technology medical care	4.28
6. Expensive drug therapy of socially significant diseases	4.16
7. Remoteness of modern clinicodiagnostic centers from small populated areas over a large territory of Russia (sparsely populated regions)	4.14
8. Inefficient prevention and early diagnostics of socially significant diseases	4.00
9. Absence of personalized approaches to diagnostics and treatment of socially significant diseases	3.57
10. Decrease in rural population size	3.50
11. Insufficient efficacy of available measures for infection prevention	3.33
12. Low efficiency of agriculture	3.33
13. Absence of reliable diagnostics of bronchopulmonary diseases	2.83

Lines of activity of the FBC network in the field of Life Science

Rating of the world windows of possibilities	Possible involvement (mean score)
1. Increase in the availability of prophylactic and/or therapeutic medications for extremely dangerous diseases (HIV, tuberculosis, etc.)	4.50
2. Medical examination of the population	4.43
3. Development of systemic medicine for active prevention of diseases	4.33
4. Increased international requirements on agricultural products	4.28
5. Convergence of nano-, bio-, and infor-technologies in medicine	4.14
6. Development of stationary substitutional services and reduction of hospital beds	4.14
7. Transition to ecological production, distribution of “green” innovations	4.14
8. Shift of medical research from drug development to regenerative medicine, diagnostics, and surgical techniques	4.14
9. Transition to a new generation of medicines that display high efficacy, directional effect, and low toxicity	3.85
10. Transition to personalized medicine; increased demand for technologies directed toward personalized medicine	3.71
11. Development of unified technological chains of bioengineering, agriculture, and animal husbandry	3.66
12. Use of stem cells in medicine	3.57
13. Entry of Russia into WTO	2.85
14. Change of the diet structure	2.83
15. Development of organic agriculture in advanced countries	2.80

Lines of activity of the FBC network in the field of Life Science

Rating of the Russian windows of possibilities	Significance (mean score)
1. Expiration of Big Pharma patents by 2020	4.57
2. Borrowing of breakthrough technologies from abroad	4.43
3. Development of bioengineering and regenerative medical tools	4.28
4. Development of the national policy in the field of biotechnologies	4.14
5. Development of tools of personalized medicine	4.14
6. Realization of the national policy in the field of innovation of biomedicine and healthcare system	4.00
7. Development of rehabilitation and recreational medicine	4.00
8. Emphasis on reduction of alcoholism and tobacco smoking	3.85
9. Development of standardized and certified bioassay systems for scientific research, quality control, and human safety assessment of drugs, foods, and products	3.85
10. Involvement of specialists from the former USSR republics for more intensive biomedical developments	3.66

Lines of activity of the FBC network in the field of Life Science

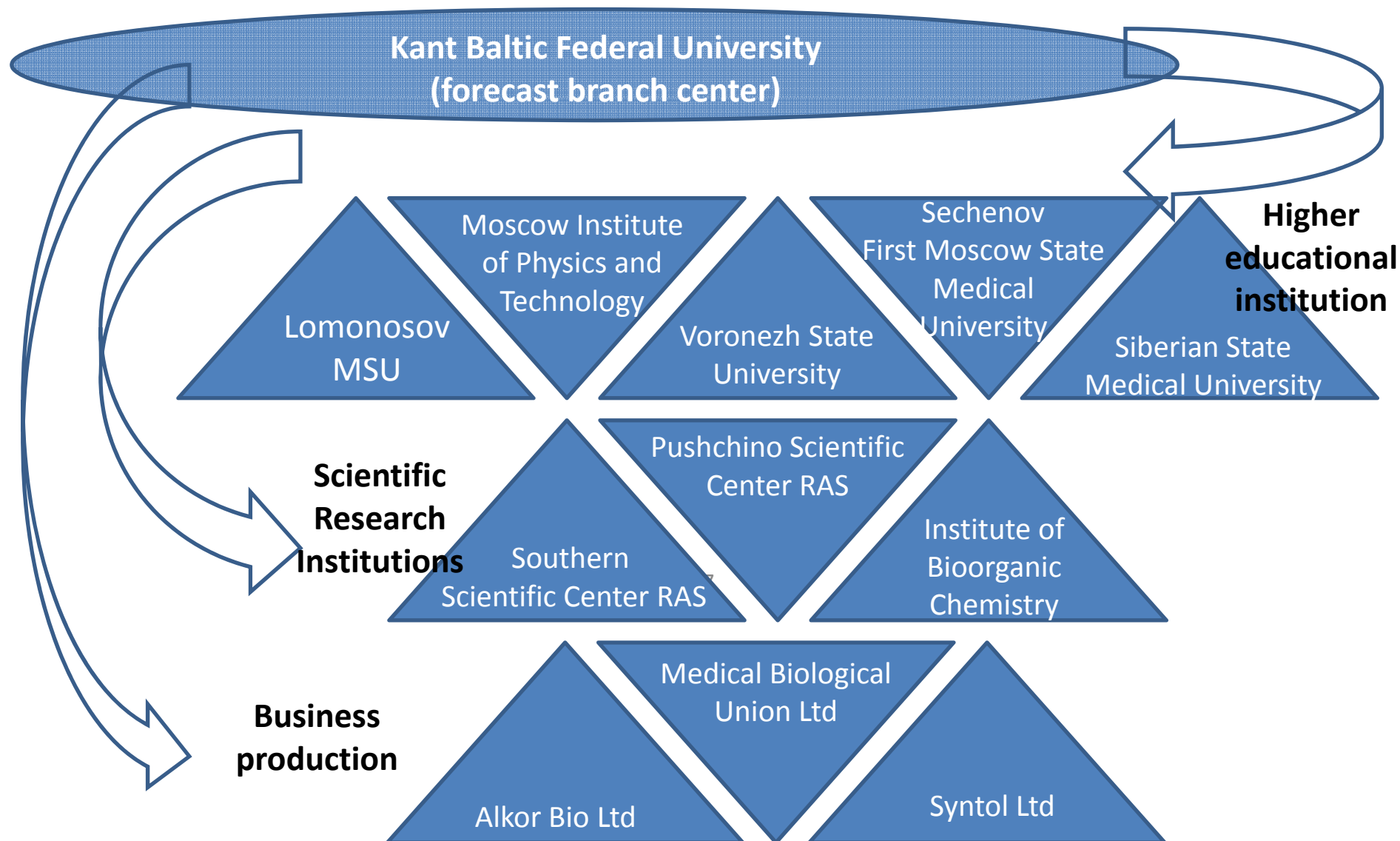
Subject ranges (technological groups):

1. Synthetic biology
2. Genetic and cellular therapy
3. Analysis of the structure and functions of nucleic acids and proteins
4. Biochemistry of low-molecular compounds
5. Regenerative medicine
6. Biodegradable materials
7. Biocompatible non-degradable materials
8. Electronic implants for therapy control and remote diagnostics
9. Artificial equivalent of tissues and organs
10. New-generation pharmaceuticals
11. Delivery system and localization of pharmaceuticals
12. Hardware-software complexes for diagnostics and therapy
13. Neurobiology and neuromedicine
14. Express identification of microorganisms and viruses
15. Facilities for recovery of lost functions

Expected network structure of scientific and technological forecast branch centers in the field of Life Science

1. Kant Baltic Federal University: *Molecular diagnostics*
2. National Research Tomsk State University: *Medical biocomposite materials*
3. National Research Tomsk State University: *Veterinary and agricultural technologies.*
4. Chernyshevsky Saratov State University: *Medical devices*
5. Lomonosov Moscow State University: *Genomic and post-genomic technologies*
6. Lomonosov Moscow State University (Institute of Physiologically Active Compounds RAS, Chernogolovka): *Directed chemical synthesis of innovative drugs*
7. Pushchino State Institute of Natural Science (branch of the Institute of Bioorganic Chemistry RAS): *Biopharmaceuticals.*
8. Lomonosov Moscow State University: *Regenerative medicine technologies*
9. Siberian Branch of RAMS: *Neurobiology and neuromedicine*

Example of a cluster in Molecular Diagnostics



Main tasks (block 2)

- ✓ to establish an expert network incorporating various specialists to meet the lines of activity of forecast branch centers;
- ✓ to prepare information and analytical materials, based on expert examination and monitoring, for long-range forecast of the most promising lines of scientific and technological development till 2030, including systems of road maps for regions involved with forecast branch centers in the field of Life Science.

Expert network

Preliminary results

Preliminary expected list of experts is available: 165 persons from the work teams :

- ✓“Living systems”, “Preclinical research in innovative drugs” under Federal target programs of the Ministry of Industry and Trade and Ministry of Education and Science
- ✓Steering committee of the Technological platform “Medicine of the future”
- ✓Scientific and technical councils of the Technological platform “Medicine of the Future”:
 - “regenerative and cellular technologies”,
 - “post-genomic technologies”,
 - “translational medicine”,
 - “innovative pharmaceuticals”,
 - “diagnostics and treatment systems based on molecular and cellular targets”,
 - “multicomponent biocomposite medical materials”,
 - “diagnostic and treatment devices”.
- ✓Department of Public Health of Tomsk region

Main tasks (block 3)

- ✓ To develop a system for monitoring scientific inventions and achievements, dynamics of development and emergence of breakthrough technologies, creation of new products, etc., that meet the lines of activity of forecast branch centers.
- ✓ To evaluate various business activity in real economic sectors and to define prospects for market and industrial development relevant to the lines of activity of forecast branch centers.
- ✓ To prepare a regular monitoring-based series of informative, analytical, and predictive data on the priority directions of scientific and technological development in the field of Life Science.

Scientific and technological monitoring system in the field of Life Science

Normative documentation of the monitoring system is available:

- ✓ Standard operating procedure No. 001/11 SSMU “Monitoring techniques”
- ✓ Standard operating procedure No. 002/11-SSMU “Data acquisition by questionnaire and expert panels”
- ✓ “Report format by a forecast branch center”

CONCLUSION

1. Long-term planning in Russia makes the project results very urgent and extremely demanded.
2. Professional environment is found unable to develop strategic patterns based on foresight-based fundamental bases.
3. Project meets the challenges of the State in strategic innovative progress of science and technology.
4. More rapid implementation of Foresight tools requires collaboration with national and foreign leaders.

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