

INSTITUTIONAL DEVELOPMENT PLAN FOR THE NEXT 4 YEARS

Introduction

National Institute of Research and Development for Microbiology and Immunology „Cantacuzino” (Cantacuzino Institute) is a major leader in public health in Romania, by its contribution to biomedical research, to monitoring, prevention and control of infectious diseases. Cantacuzino Institute is a center of excellence in its field of activity also serving as a platform for training and continuous education in microbiology, immunology and biotechnology.

Vision

Improving human health and welfare through scientific discoveries.

Mission

The mission of Cantacuzino Institute, as stated by its founder, Prof. Ioan Cantacuzino is to promote public health by high quality and competitive interdisciplinary research, by monitoring, prevention and control of communicable diseases.

Core Values

Cantacuzino Institute values multidisciplinary and collaborative scientific research that builds sustaining relationships among researchers who take advantage of high level technologies and creative thinking to meet the ever-changing needs of public health. It promotes research endeavors that are mutually supportive and conducted in collegial environments that welcome integrity, diversity, creativity, and teamwork with the highest ethical standards of practice.

Strategic Context: SWOT analysis

A SWOT analysis has been performed related to achievement of its mission which identified the following main attributes:

Strengths

Staff

- Multidisciplinary staff resulting in trans-disciplinary collaboration
- High level of methodological expertise
- Talented and enthusiastic young investigators

Research topics

- Addressing Public Health issues and concerns
- Focused on important and emerging research themes (molecular approaches to etiologic diagnosis and surveillance of communicable diseases, emergent infectious diseases,

antibiotic resistance, vaccinology etc.)

- Interdisciplinary/collaborative approach to research
- Related to National RDI Strategy for the period 2007-2013

Infrastructure

- Financial support from EU Structural Funds (on going project, approx 4 million Euros)
- Financial support from National Authority for Scientific Research for the Animal facility (RD facility of national interest)

Other

- Long standing tradition and strong national reputation of the institute
- Good European reputation as a member of several European consortia (FP7 and other EU funding research projects; ECDC)
- Good international reputation as a member of Institut Pasteur International Network

Weaknesses

Staff

- Suboptimal number of young researchers
- No institutional PhD programmes
- Suboptimal number of staff that have acquired highly prestigious grants (such EU FP7)

Output

- Insufficient number of articles in ISI journals with relative influence score (average number of papers/year in the last five years:15)
- Insufficient number of patents

Other

- Low level of co-operation in innovation activities, in particular with enterprises
- Excessively heavy, complicated and inefficient administrative support system

Opportunities

Staff

- Enhance links with Internship programs of “Carol Davila” University of Medicine (Laboratory Medicine) and Master programs of Faculty of Biology from University of Bucharest (Biochemistry and Molecular Biology) from which young researchers can be recruited.

Research topics

- Results of research provide reliable information for evidence-based public health, including diagnosis, prevention and control of communicable diseases

Output

- Quality of research provides opportunities for continuous publications in high ranking journals in the relevant fields

Other

- Good opportunities for further collaboration with other national research institutes and academic institutions
- Good opportunities for participation in collaborative projects in Institut Pasteur International Network

Threats

Staff

- Lack of interest in scientific careers among young people
- Increasing migration of young researchers

Research topics

- Dependency on research programming of funding agencies: forced to focus on areas where funding is available rather than on areas where the institute has high competence

Other

- Decreasing availability of research funding due to present national and international economic situation

Strategic Goals

In accordance to the strategic context as resulted from SWOT analysis, the following strategic goals have been defined:

- Increase scientific performance by obtaining internationally competitive scientific results
- Strengthen research capacity and international competitiveness
- Increase the social impact of biomedical research and effectively contribute to evidence-based public health
- Maintain and develop high level of expertise in specific research domains; ensure a multidisciplinary research workforce and offer better career opportunities for young researchers
- Develop research infrastructure for sustainable and competitive research
- Increase national and international visibility of the institute
- Maintain and develop training activities (students, resident physicians, public health laboratory staff etc.)

Strategic scientific objectives and directions

Further development of Cantacuzino Institute research strategy must take into account current domains of

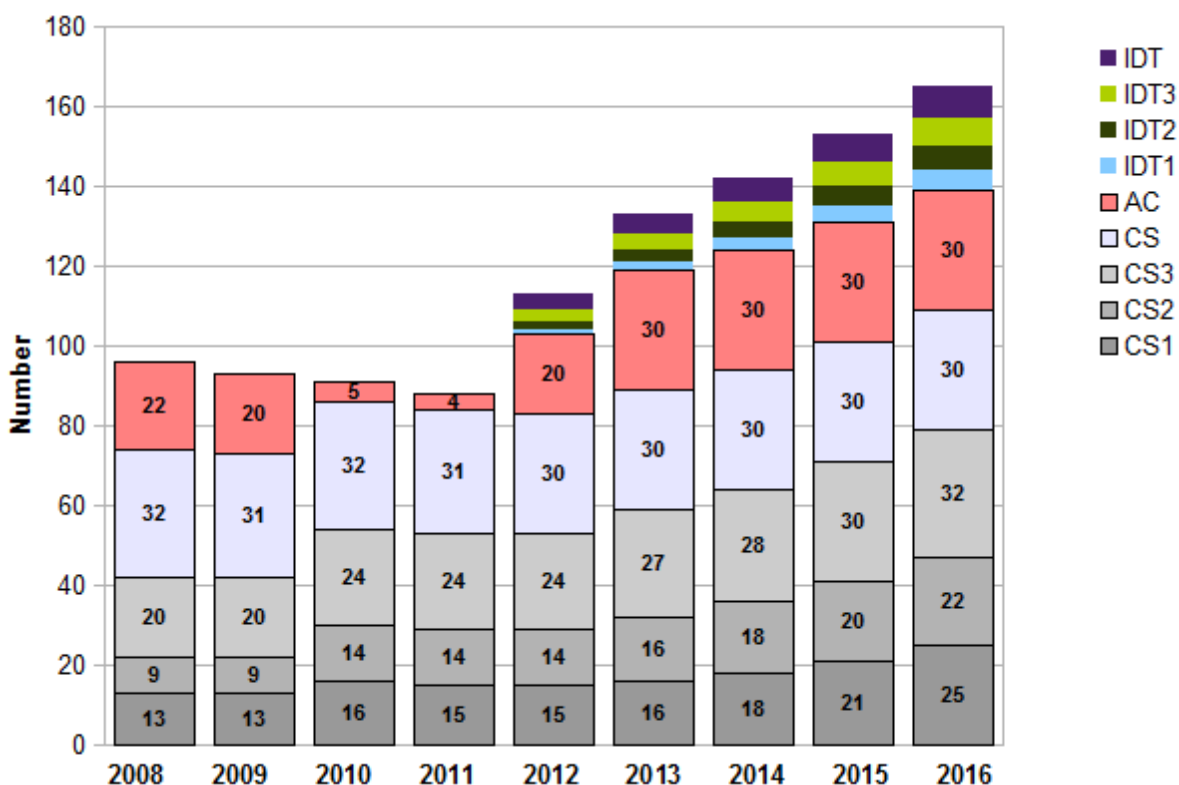
expertise and integration in international collaborative networks allowing at the same time adaptability of infrastructure, methodologies and know-how to the constantly changing requirements imposed by public health challenges. Therefore, our research strategy mainly focus on the following scientific directions:

- performing basic research aiming at identifying unique characteristics of pathogen potentially useful as specific and sensitive targets for diagnosing, monitoring, and treating infectious diseases;
- performing basic research aiming at elucidation of host-pathogen interaction to better understand and enhance immune response, and to identify promising new vaccine targets;
- implementing new cutting-edge molecular diagnostic tools allowing rapid response in public health/bioterrorism microbiological emergencies;
- develop and expand diagnostic technologies that can identify multiple pathogens, distinguish pathogen strains, and detect drug sensitivity and resistance;
- gaining insight into innate/adaptative immunity mechanisms to promote prevention and treatment strategies for infectious or immune mediated diseases;
- studies on new vaccine candidates, including defining of immune COPs (“correlates of protection”);
- designing new immune modulators/adjuvants, based on knowledge about mechanisms of immune adaptative response priming/modulating by innate immunity;
- optimizing preclinical testing methodology for human use biopharmaceuticals (vaccines, adjuvants, immune response modifiers etc.);
- optimizing existing biotechnologies and developing new ones for manufacturing of efficient vaccine and other biological products;
- exploring mechanisms involved in triggering/exacerbating chronic diseases by specific pathogens in order to identify effective prevention tools (vaccines) or treatment for such infections;

Achievement of scientific objectives requires an integrated, interdisciplinary approach joining microbiology and immunology research with complementary areas, such as cell/molecular biology, genomics, proteomics, biostatistics etc. The modernized research infrastructure (see **Infrastructure: investment plan and strategy**) will provide state-of-the-art core services designed to improve efficiency, timeliness, and precision of technical procedures needed for multidisciplinary research.

Human resource strategy:

To achieve the strategic scientific objectives, highly specialized and motivated personnel is necessary. Despite the increasing number of young researchers during the past 5 years, the critical mass has not been achieved yet. Moreover, the decrease of research funding in the last three years limited the possibility to hire new researchers having as direct consequence the decrease of the number of research themes. The number of research personnel in the last 4 years and estimates for the next 5 years is presented in the next figure (where CS: researcher, AC: research assistant, IDT: development engineer, and 1, 2, 3: research grades, 1 being the highest)



As can be seen, the estimated number of research assistants (AC) will increase, to get a more balanced age structure. Also, there is an imperious need to recruit and train young “development engineers” as a requirement to enhance and develop the biotechnology applications.

Recruitment of young people for research activity could be improved by strengthen the collaboration with Universities, such as participation in internship and master programs. As Cantacuzino Institute is a member of Institut Pasteur International Network, the international mobility of young researchers and their access to training programs is and will be possible. Providing a broad spectrum of research training and career development opportunities at various educational and career stages will ensure that highly trained scientists will be available to conduct future research projects. Participation of young research assistants to doctoral programs, including to the new types of “professional doctorates” will be encouraged.

Retention of new personnel depends on the ability of core senior scientists to encourage, motivate

and attract young people to a career in research providing intellectual challenges and incentives. However, retention of young researchers and their promotion depends also on funding availability. Therefore, institutional funding would be extremely useful in providing support for a core of senior, well-established researchers to allow for protected time devoted to research and mentoring, and for young investigators to receive appropriate mentoring and training.

Cantacuzino Institute through its training and mentoring activities will continue to provide students and young researchers with intellectual and technical resources and opportunities to develop leadership, teamwork, and critical thinking skills.

Due to the interdisciplinary character of biomedical research and the rapid technological advancement, there is a need to expand opportunities to train biomedical researchers in advanced technologies. This is especially important in the context of improvement of the research infrastructure through implementation of the project financed from EU structural funds (see **Infrastructure: investment plan and strategy**).

Mechanisms for stimulating the appearance of new research directions

For the Institute to continue fulfilling its mission, it must foster *innovative* research-development activities. This could be done by:

- strengthen scientific collaboration with hospitals and public health laboratories to identify major demands;
- intensification of interactions between disciplines, researchers and programs;
- encouraging new approaches and ideas.

Financial SWOT analysis

Financial strengths

- Highly specialized research personnel increasing the chance to have awarded national and international research grants
- Strategic importance of research areas (e.g. identification and confirmation of the biological agents responsible for both natural epidemics and bioterrorist incidents)
- Ongoing infrastructure project will provide advanced research equipment and facilities

Measures indicated aimed at enhancing the identified strengths

- Permanent research personnel training to increase scientific competitiveness
- Implementing the current research infrastructure project by acquisition of state-of-the-art equipments
- Maintaining and developing the scientific expertise in strategic research areas

Financial weaknesses

- Dramatic funding cuts for ongoing research grants in the last three years
- No open call for application for research grants organized by national funding agency in the last three years

- No income from royalties so far

Measures indicated aimed at improving the identified weaknesses

- Identifying new financing sources
- Developing technologies that could be effectively transferred to the private sector to ensure royalty income

Financial opportunities

- Opportunities to participate in collaborative projects within the Institut Pasteur International Network
- Prospect of basic institutional funding to secure a stable budget and enable long-term planning

Measures indicated aimed at progressing toward the identified opportunities

- Enhancing the visibility within the Institut Pasteur International Network (participation in training, courses, stages etc.)
- Obtaining a good classification to get access to institutional funding

Financial threats

- Concern at the prospect of cuts to national research funding due to national and international economic situation
- Research funds cuts could trigger brain drain
- Loss of eligible candidates for project leader through retirement of senior researchers

Measures indicated aimed at removal of the identified threats

- Identify new international sources research funding (EU programs, international collaboration, private funding)
- Using basic institutional funding to hire young researchers at the desired level and to offer them incentives
- Training young researchers to become future project leaders

Infrastructure: investment plan and strategy: The “technological platform” concept

National Institute of Research and Development for Microbiology and Immunology „Cantacuzino” (NIRDMI “Cantacuzino”) is currently implementing a strategic infrastructure project entitled “**Development of research infrastructure in microbiology, immunology and biotechnology for an increase capacity in investigating diseases with major impact on public health**” co-financed from the European Regional Development Fund (ERDF) as part of the EU Structural Funds (Sectoral Operational Programme “Increasing Economic Competitiveness”), and from national budget. This research infrastructure project aimed at modernization and upgrading the research facilities comprises the following specific objectives:

- (i) Modernization/consolidation of the building pertaining to “Cantacuzino” Insitute that will host shared research facilities clustering state-of-the-art equipments;
- (ii) Design of new research laboratories using the “technological platforms” concept – background for the shared research facilities;
- (iii) Modernization of the existing laboratories by reorganizing and reframing of the research areas and

functional circuits;

(iv) Purchase of state of the art equipments

Reaching these specific objectives will lead to the achievement of the following strategic objectives:

- Applying a novel concept on research units functional reorganization, defined by flexibility and multifunctionality: the “technological platforms” concept
- Adapting research activities (topics, approach, methodology) to present and future challenges encountered by potential beneficiaries
- Developing human resources by creating new jobs/research positions (including attracting scientists from abroad) and supporting scientific career opportunities for young specialists

The reorganization of the research areas within this building will contribute to a better adaptability to research activities, including centralized HVAC system, renewal of electrical circuits, increasing energetic efficiency by cutting losses, effective equipment acquisition and usage management etc.

At present, RD activities span several laboratories of the institute, each laboratory being built up upon a particular research area, but this will no longer be feasible in the future in terms of equipment usage as state-of-the-art equipments prices are escalating. Moreover, it will inevitably lead to equipments and highly specialized personnel redundancy. Thus, the new concept of „multifunctional technological platform” would be better suited to the future challenges because:

- it would enable multiple users to benefit from common facilities (functional modules clustering state-of-the-art equipments)
- it would warrant new interdisciplinary approaches to research activities

The general benefits of the “technological platform” concept are:

- lower development and operational costs
- shorter development time
- reduced systemic complexity
- high-speed network-type information delivery
- increased capacity of keeping projects up to date

Thus, the concept of “technological platform” is obviously more flexible and cheaper by using the resources in a cost-effective manner.

The following functional modules (technological platforms) will be created:

- Functional and Molecular Imaging
- Proteomics and Structural Biology
- Metabolomics and Functional Genomics
- Biotechnologies: Cell Technologies and Microbial Fermentation
- Experimental Medicine and Translational Research
- Bioinformatics

The equipments already purchased are:

- Two-dimensional electrophoresis system

- High resolution scanner/imager for electrophoresis gels and microarray chips
- Surface plasmon resonance system
- Multidetector Microplate Reader for High throughput screening
- Low temperature Freezer (-80 C)

The equipments to be purchased are:

- MALDI-TOF/TOF
- Preparative ultracentrifuge with flow rotor
- Atomic force microscope
- Inverted fluorescence/live cell imaging microscope motorized
- Cell sorting flow cytometer
- Multiparameter biochemical analyzer
- Next generation Sequencer
- Bioreactors (2, one of which “single-use“)
- Liquid handling robot system
- Laminar flow cabinets
- Magnetic device for large scale purification of cells
- Automated RNA/DNA Purification System

Modernization of the research infrastructure will promote the development of several research excellence poles along with national partners (national medical institutes, institutes belonging to the Romanian Academy, other institutes and research centers, Universities of Medicine, business oriented institutions that also perform research etc.) and international partners (institutes belonging to Pasteur Institutes International Network, WHO, ECDC, public health research European institutions etc.). Relationship with such partners will be substantiated through European research networks and joint international projects (through specific program Horizon 2020 - “Excellent science” and “Societal challenges”) or international funds.

A modern research infrastructure will definitely contribute to better scientific results , with higher applicability, that will greatly influence both public health and the scientific community; all these represent “European added value” in the medical field. The exceptional degree of personnel specialization (including the capacity to train young specialists), the membership in international consortia and networks, the strategic importance of the institute within the specific research area are all major factors that will contribute to the institutional sustainability of this infrastructure project.

Technology transfer and the attraction of non-public funds

Biotechnology is one of the fastest developing high technology industry in the world but absence of a strong specific industry in Romania has hindered commercial market transfer of products and technologies resulting from our research. Consequently, development was focused on our own products. Recent expertise gained as a result of partnerships in development and technology transfer (aimed at improving detergent

splitting technology for influenza vaccine, preparation of an oil-in-water emulsion adjuvant and preclinical evaluation of pandemic influenza vaccine) as well as a better biotechnological development infrastructure, will enable proper pilot scale development of current and future products suitable for commercial technological transfer.

Strategic partnerships and visibility: events, communications, collaborations

Institut Pasteur International Network

Since 1991, Cantacuzino Institute is a member of Institut Pasteur International Network (RIIP), which brings together 32 institutes on five continents. United by the same “Pasteurian” spirit and values, these institutes form partnerships and engage in collaborative work for scientific research, training and public health services. RIIP institutes contribute to the prevention and treatment of infectious diseases by research activities focusing on the main transmissible bacterial, parasitic or viral diseases. Special relationships with the laboratories of other institutes belonging to the Network create a link between local concerns and the international scientific community. They also enable technology transfer and the implementation of leading-edge biological methods in environments which would otherwise be unable to have access to such developments. Collaboration within the Institut Pasteur International Network resulted in collaborative projects and training stages (researchers being both trainers and trainees).

Cantacuzino Institute values RIIP membership and is determined to participate actively in future common research, microbiological surveillance and training activities within this network.

European and International Surveillance Networks

Cantacuzino Institute is major player in public health in Romania, and the technical expertise is internationally recognized. The Institute is accredited as a competent body for surveillance, response to epidemics and scientific expertise by the ECDC (European Centre for Disease Prevention and Control). Also, it is member of several European and international surveillance networks:

Viral diseases:

- EISN (European Influenza Surveillance Network) [ECDC]
- EuroFlu (WHO Europe Influenza Surveillance) [WHO Europe]
- GISN (Global Influenza Surveillance Network) [WHO]
- Polio Laboratory Network [WHO]

Bacterial diseases:

- DIPNET (Diphtheria Surveillance Network) [EC-DG SANCO]
- EARS-Net (European Antimicrobial Resistance Surveillance Network) [ECDC]
- Enter-net (Enteric Infections Surveillance Network) [ECDC]
- SeqNet (European Network of laboratories for sequence based typing of microbial pathogens)

Cantacuzino Institute is determined to fulfill its role as an active member of these networks, and to contribute to the improvement of microbiological surveillance and response to new and emerging

microbiological threats.

European Public Health and Research Institutes

Through participation in EU-funded projects FluSecure (“Combating flu in a combined action between the industry and the public sector in order to secure adequate and fast intervention in Europe”, DG-SANCO, 2006-2010) and FastVAC (“A generic framework for FAST production and evaluation of emergency VACCINES”, ongoing) Cantacuzino Institute developed strong partnerships with public health institutes from across Europe with established expertise in all disciplines associated with vaccine development and production, such as: Netherlands Vaccine Institute (NVI), Health Protection Agency/National Institute for Biological Standards and Control (UK), Statum Serum Institute (Denmark), Norwegian Institute of Public Health, National Institute for Health and Welfare (Finland), National Centre for Epidemiology (Hungary), Slovenia National Institute of Public Health (Slovenia), Robert Koch Institute (Germany).

Cantacuzino Institute is determined to strengthen with these institutes and to develop future collaboration with other foreign public research institutes, through participation in common research projects.

Conclusion

Cantacuzino Institute is the largest medical research and development institute in Romania. Its unique expertise and involvement in strategic area of biomedical research represent its defining strengths, along with good national visibility and reputation.

The strategic goals and scientific objectives outlined in this development plan are aimed at strengthen its position according to its vision and mission. It is expected that attainment of these strategic goals will require long-term commitment and collaborative effort of research staff, Scientific Board, Board of Directors. To successfully accomplish these strategic objectives, *specific tactical objectives* have to be defined and *action items* to be taken have to be established. They will be periodically assessed by Scientific Board and updated depending on future needs, funding priorities, and outcomes of previously accomplished objectives.

With the availability of the improved research infrastructure and talented investigators, we are confident that Cantacuzino Institute will continue to play a leading role in advancing knowledge in biomedical research and in accelerating the development of diagnostic, prevention and control strategies to respond to emerging public health threats.