

Protein studies at the IIMCB in Warsaw

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The International Institute of Molecular and Cell Biology in Warsaw was founded as innovative research centre, with rules of operation similar to the leading scientific institutions in the world. The parliamentary bill to create the Institute was based on the agreement between UNESCO and Polish Government. The Institute's International Advisory Board, the rules of recruitment of all faculty members through international competition and lack of tenure employment make it unique among Polish research institutions. The main Institute's goals are: high quality research, the creation of the best possible conditions for ambitious, motivated group leaders and their staff, implementation of modern biotechnology, as well as education and popularization of molecular medicine and human genetics.

The Institute's research topics cover the wide area of bioinformatics and computer modeling, protein structural biology, protein biochemistry and cancer biology, molecular immunology, cell biology and neurobiology. One group is involved in both bioinformatics and biochemistry. They develop methods for protein structure prediction/determination based on heterogeneous low-resolution experimental data and use them to analyze and engineer various enzymes involved in repair, degradation, and modification of DNA and RNA. The other, biomodeling group, is working mainly on membrane proteins. They do modeling of rhodopsin together with other G-protein Coupled Receptors, analyzing activating and deactivating processes these receptors are involved in. Modeling of their complexes with effector proteins is integral part of this research. It includes also oligomerization and drug design. Lately, this group started modeling of membrane proteins called presenilins that are involved in Alzheimer disease. A search for a functional bio-marker of familial Alzheimer disease is being studied by another group. They concentrate on structure-function studies of presenilin complexes present in human lymphocytes of Polish patients with familial and sporadic Alzheimer's disease. Another group is focused on crystallographic protein structure determination, especially the proteins involved in protein degradation: the ubiquitin system and bacterial proteases possibly involved in bacterial virulence. The scientific objective of another group is a role of molecular chaperones in cell transformation. Using highly purified recombinant human proteins they identified intermediate reactions that lead to assembly of molecular chaperone complexes with wild type or mutant p53 tumor suppressor protein. There is also a group studying the mechanism of expression of cytokines during exposure of cells to environmental xenobiotics and works on development of cellular chip (genetically modified mast cells), which are used to study pollutants. A new system for testing immunotoxic effects of chemicals *in vitro* has been developed. Patent pending technology called "Fluorescent Cell Chip" does not involve experimental animals but instead is based on a number of immortalized genetically modified cell lines representing different phenotypes of cell regulating immune response *in vivo*. A research of newly established group of cell biology is focused on the interface between two intracellular processes, namely vesicular transport and signal transduction. The aim of the multidisciplinary program coordinated and partly conducted at the Institute is entitled "Environmental and Genetic Factors of Polish Centenarians' Longevity". Its goals are to collect information concerning the determinants of healthy ageing in centenarians and to provide material to study several aspects of longevity including protein-protein interaction and signaling in lymphocytes, and genetic determinants of healthy aging.

The Institute started its activities in 1999. At present it employs 67 researchers including 35 Ph. D. students. The Institute is already well recognized for publications of its staff members, their participation in European grants (5 EU within 5th FP and 2 within 6th FP), and in organization of workshops and conferences. The Institute holds a status of the Centre of Excellence in Molecular Bio-Medicine given by the European Union within the 5th Framework Program. Since 1999 there were 122 papers published with the address of the Institute in the journals such as Nature, Journal of Biological Chemistry, EMBO Journal, Blood, Cancer, FASEB Journal, Gene, Proteins, PNAS USA.