

## History of the Institute

**Medical Research Centre of the Polish Academy of Sciences** (hereafter: **the Centre**) has been established on 1<sup>st</sup> July, 1967. It comprised several departments which had already been organized by the eminent scientists under the auspices of the Polish Academy of Sciences and existed separately, namely: **Pathomorphology** headed by prof. **Ludwik Paszkiewicz**; **Neuropathology** (formerly **Histopathology of the Nervous System**) initiated by profs **Adam Opalski** and **Ewa Ostetowska**; **Experimental Surgery** headed by prof. **Jan Nielubowicz**; **Neurosurgery** headed by prof. **Lucjan Stępień**; **Occupational Physiology** (formerly **Physiology**) organized by profs **Franciszek Czubalski** and **Włodzimierz Missiuro**; and **Mental Hygiene and Child Psychiatry** headed by prof. **Kazimierz Dąbrowski**. The first Director of the Centre was anatomopathologist prof. **Zygmunt Ruszczewski**. The Centre's aims included consolidation of the research themes, recruitment of scientific staff and purchase/development of scientific equipment. During 50 years of its existence the Centre underwent a range of structural and functional changes which are shortly outlined below.

From the beginning the major issue was that the departments comprising the Centre were scattered around Warsaw and suburbs, at times to not less than ten different locations. Only in 1997 a breakthrough occurred, when almost all departments were moved to the new buildings at 5 Pawińskiego Street. The person particularly praiseworthy for this development was prof. **Mirosław Mossakowski**, neuropathologist and neurologist, Director of **the Centre** (1975-2001) and President of Polish Academy of Sciences (1999-2001). In recognition of his outstanding efforts, already in 2002, one year after he passed away, **the Centre** was named after him, achieving its current name **Mossakowski Medical Research Centre, Polish Academy of Sciences**.

The main broad area of research covered by **the Centre** from the very beginning of its existence is neurobiology and neuromedicine. Following the aforementioned consolidation of the research themes the five “co-founder” units dedicated fully or partially to the neuro-research were created. These were departments of **Neuropathology**, **Neurochemistry** and **Neurosurgery**, **Ultrastructure Laboratory**, and department of **Neurophysiology**.

Research on neuropathology was for some time conducted in two separate units: **Independent Laboratory of Comparative Neurology**, organized by prof. **Ewa Osetowska** in her family house in Mińsk Mazowiecki, and **Laboratory of Developmental Neuropathology** headed by prof. **Maria Dąmbaska**. Finally the **Department of Neuropathology** was organized by prof. **Mirosław Mossakowski** in 1987. After his death the department was headed consecutively by profs **Irmina Zelman**, **Andrzej Kapuściński** and **Janina Rafałowska**. Currently the head of the department is prof. **Ewa Matyja**, and research concentrates on clinical and developmental neuropathology issues, including neuro-oncology. In 1996 Department of Neuropathology gave rise to **Department of Neurotoxicology**, headed for many years by prof. **Jan Albrecht**, and now under the supervision of assoc. prof. **Magdalena Zielińska**. The research conducted in this unit concentrates on hyperammonaemic hepatic encephalopathy and retinopathy, particularly the role of glial cells and tripartite synapses in ammonia neurotoxicity. In 2000 **Department of Neurodegenerative Disorders** was created, headed by prof. **Maria Barcikowska**. Within its framework Alzheimer's Disease Division and

Clinic of Neurology of Central Clinical Hospital of MSWiA attends to diagnostics, treatment, biochemical and molecular background of dementia. A unique patients DNA bank is a Team's asset which serves as the research basis for genetic analyses of Alzheimer's and Parkinson's diseases as well as other neurodegenerative conditions.

The current **Department of Neurochemistry** stems from **Biochemistry Laboratory of the Department of Experimental Pathology**, headed by prof. **Włodzimierz Bicz**. When the Laboratory was incorporated into the Medical Research Centre, the head was taken over by assoc. prof. **Andrzej Gromek**. Research conducted there concentrated on cellular and biochemical mechanisms of ischemic brain damage. Since 1978 the Department was headed by prof. **Jerzy W. Łazarewicz**, who was succeeded in 2010 by assoc. prof. **Elżbieta Salińska**. Currently two units are affiliated to this department: **Laboratory of Pathoneurochemistry** (head: assoc. prof. **Lidia Strużyńska**) and **Laboratory of Pharmaconeurochemistry** (head: assoc. prof. **Elżbieta Salińska**).

Two other units created within Department of Neurochemistry later became independent departments. The first of these, **Department of Cellular Signaling**, initially run by prof. **Joanna Strosznajder**, currently its headed by assoc. prof. **Agata Adamczyk**. Its area of research is mainly focused on cellular signal transmission, free radicals biochemistry and brain ageing. The second was **Laboratory of Molecular Neuropathology** headed by prof. **Krystyna Domańska-Janik**, later converted to **Department of NeuroRepair**, and currently headed by prof. **Barbara Łukomska**. Its research activity aims to determine the background and course of selected neurological disorders and to design potential therapeutic strategies based on somatic stem cells. In 2010 a group from Department of NeuroRepair staff created **Stem Cell Bioengineering Unit** which is headed by prof. **Leonora Bużańska**. The team's scientific work focuses on molecular bioengineering, genetic and epigenetic modification to stem cells isolated from umbilical blood and differentiated into neurons and *in vitro* microenvironment bioengineering towards growth control and stem cells differentiation.

**Department of Neurosurgery** headed by prof. **Lucjan Stępień** initially fulfilled two functions: a neurosurgical clinic and a research unit initially dedicated to studies on aphasia and agnosia (which were supervised by prof. **Jerzy Konorski**). Later the department was headed consecutively by: prof. **Wacław Sierpiński**, assoc. prof. **Tadeusz Słowik**, assoc. prof. **Eugeniusz Mempel**, and prof. **Adam Kunicki** (who was also elected the director of **the Centre**). Research priorities included pathomechanisms of intracranial volume compensation and analyses of drug-resistant epilepsy in surgically treated patients. When prof. Kunicki left the Institute, prof. **Eugeniusz Mempel** headed the Department once more, succeeded by prof. **Zbigniew Czernicki**. Currently the clinical part of the department is no longer affiliated to the Centre, and research conducted there concentrates on preclinical pathophysiology of cerebral arteries. The head of the department is assoc. prof. **Ewa Koźniewska**.

**Laboratory of Nervous System Ultrastructure**, founded in 1968, was headed by prof. **Jerzy Borowicz**, then by prof. **Barbara Gajkowska**, and currently by assoc. prof. **Małgorzata Frontczak-Baniewicz**. Primarily, the laboratory research interests focused on ultrastructural, histochemical and immunocytochemical picture of cerebral ischemia-induced changes. In the course of time, new research directions were initiated and these included i.a. regulation of apoptosis and angiogenesis. In 2015 the unit was renamed to **Electron Microscopy**

**Platform**, which along with their own research programs supports other Institute units with ultrastructural analyses.

**Department of Neurophysiology** was headed by prof. **Wiltold Karczewski** whose scientific interests comprised neural regulation of respiration and circulation. Research on these topics was then continued at the **Department of Neurobiology of Respiration** (head prof. **Mieczysław Pokorski**) and **Laboratory of Respiratory Reflexes** (head prof. **Małgorzata Szereda-Przestaszewska**). Currently, this line of research is continued at the **Laboratory of Respiration Physiology** headed by assoc. prof. **Katarzyna Kaczyńska**. The **Laboratory of Circulation Physiology**, which budded from the **Department Neurophysiology**, was initially headed by prof. **Zbigniew Semerau-Siemianowski** whose research concentrated on catecholamines and their role in coronary circulation. Later the unit was headed by assoc. prof. **Janina Staszewska-Barczak**, and finally by prof. **Krystyna Herbaczyńska-Cedro (Cedro-Ceremużyńska)**. Research was continued on experimental models of myocardial infarction and characterization of myocardial infarction course. In 2003, when prof. Ceremużyńska-Cedro retired, Laboratory was closed. The other unit that budded from the Department of Neurophysiology was the Laboratory of Experimental Pharmacology, currently the **Department of Experimental Pharmacology**, headed by prof. **Paweł Grieb**. Research carried out there included investigation of selected cytotoxic and cytoprotective agents and their functional assessment in models of proliferative and neurodegenerative diseases. Moreover, the Department's scope of research also involves the applications of magnetic resonance imaging techniques and teletransmission of radiological images, which, in 2007, resulted in the foundation of a subunit named **Laboratory of Teleradiology and Magnetic Resonance** (head prof. **Jerzy Walecki**).

Two other “co-founder” units were dedicated to research not directly related to neuro-medicine. The first of these is **Department of Occupational Physiology**, which was initially headed by prof. **Stanisław Kozłowski**, succeeded by prof. **Hanna Kaciuba-Uściłko** and then by prof. **Krystyna Nazar**. At the time the Department was renamed **Department of Applied Physiology** and is now headed by prof. **Andrzej Ziemba**. The main area of research includes neurohormonal, haemodynamic, metabolic and thermoregulatory response to physiological stimuli (exercise, diet, glucose load, hypoxia) as well as pathogenic stimuli in healthy subjects and patients of different age. In the Department of Occupational Physiology, a group of doctors under dr **Lech Ziółkowski's** supervision established **Outpatient Cardiac Rehabilitation Unit** which provided care for cardiology patients. After Lech Ziółkowski's death the management was taken over by his wife, dr **Ewa Wójcik-Ziółkowska**. The unit operated until 2002 as part of the Institute but its cardiology research was continued till 2016 at **Cardiovascular Unit** (head: prof. **Marek Dąbrowski**). The **Department of Renal and Body Fluid Physiology** created also from the Department of Applied Physiology, for many years was run by prof. **Janusz Sadowski** and since 2007 by prof. **Elżbieta Kompanowska-Jeziarska**. Research concerns intrarenal blood flow as a determining factor renal excretory function, bodily fluids homeostasis and arterial blood pressure.

The second “co-founder-department” of **the Centre** conducting research unrelated to neuromedicine was **Department of Experimental Surgery**, headed at the beginning by prof. **Jan Nielubowicz**. In 1976 the Department was divided into two units. The first was **Laboratory of Experimental Surgery** was initially headed by prof. Nielubowicz, and later by

assoc. prof. **Maciej Borkowski** till its disbandment in 80's. It specialized in experimental and clinical research on pathophysiology and treatment of circulatory disorders of extremities. The other one, **Department of Transplantation Surgery** headed by prof. **Waldemar Olszewski** until 2005, was eventually renamed to **Department of Surgical Research and Transplantology**. Research conducted there concerns mechanisms of allogenic transplants rejection, immunological, nervous and endocrine regulation of immune system cells functioning after transplants and traumas as well as in neoplastic diseases, and lymphatic circulation in health and disease. Currently the head of the department is prof. **Marek Durlik** and the research concentrates on pancreatic cancer epidemiology, gene polymorphisms in pancreatic cancer patients and the impact of presurgery clinical nutrition on gene expression of selected proteins which potentially affect cancer treatment.

The list of the units that did not "co-found" the Center but were created later as independent entities begins with **Neuromuscular Unit** started in the 80's, headed by prof. **Irena Hausmanowa-Petrusewicz**, and after her death by prof. **Andrzej Kocharński**. The team's prime objective was to analyze neuromuscular diseases towards high-performance diagnostic and therapeutic methods for the patients with neuromuscular disease genes. Laboratory analyses (morphological, electrophysiological, biochemical and genetic) and clinical consultations for patients from all over Poland are also part of the unit's activities.

**Department of Endocrinology**, created in 1991 and later on renamed to **Endocrinology Research and Treatment Unit**, was housed in Medical University Hospital at Banacha Street and was functionally and personally linked to Endocrinology Department and Clinic of Warsaw Medical University. Prof. **Janusz Nauman** was the head of the department for over 15 years. Among a variety of research subjects, the department highlighted the issues of thyroid hormones pathophysiology. In 2011 it was renamed to **Department of Human Epigenetics**, with prof. **Monika Puzianowska-Kuźnicka** being its head. The research conducted there concentrates currently on the search for genetic and epigenetic factors determining human longevity and obesity.

In 1996 prof. **Andrzej Lipkowski** became the head of a newly-formed **Neuropeptides Laboratory**, which was later transformed into **Department of Neuropeptides**, now headed by prof. **Aleksandra Misicka-Kęsik**. The Department specializes in the design, synthesis and research in pharmacological properties of original analogs of endogenous peptides. This research area is rapidly developing, reflected by establishing **The Integrated Center of Excellence of Neuropeptide Medical Chemistry** which coordinates multidirectional research on neuropeptides aiming at the design of new-generation drugs. The Department has obtained numerous awards and patents both in Poland and abroad.

**Molecular Biology Unit** is another unit which not directly related to the Centre co-founding units. It was created in 2000 and has since been run by prof. **Barbara Zabłocka**. Its initial function was to serve as a so called 'core laboratory' providing to the Centre's employees assistance in selection and implementation of molecular biology methods, training and access to the modern equipment. The Laboratory expanded and currently conducts own research projects concerning molecular mechanisms of neuronal damage and regeneration after short-term cerebral ischemia, and Charcot-Marie-Tooth Neuropathy Type2, with an

emphasis on protein signaling activation and possibilities of pharmacological neuroprotection.

**Department of Cellular and Molecular Nephrology** located in Gdańsk was created in 1999 and headed by prof. **Stefan Angielski**. Currently its head is prof. **Maciej Jankowski**. Research conducted at this unit concerns investigations on cellular and molecular mechanisms of renal functions, particularly with the use of cultured podocytes, cells which play a key role in glomerular filtration.

From 1996 to 2017 **Department of Neuroimmunological Diseases** functioned, located in Poznań, and headed since its beginning by prof. **Mieczysław Wender**, and later on by prof. **Jacek Losy**. The research carried out within the unit concerned immunopathogenesis of neuroimmunological diseases, focusing on chemokines, cytokines and adhesion particles in such diseases as sclerosis multiplex and ischemic or hemorrhagic stroke.

During the recent decade a few important investment projects have been applied for and successfully implemented. **The Centre** is a member of the consortium of 3 universities and 6 institutes of the Polish Academy of Sciences that implemented and runs **CePT (Center of Preclinical Research and Technology)**, a multi-center investment project run by financed by European Union within Innovative Economy Operational Programme (2007-2013). The investments objectives included the creation of instrument base to enable multi-faceted research services for industry and science. As a consequence, the following units were formed: **Laboratory of Genetically Modified Animals**, **Laboratory of Chemical Synthesis** (designed to obtain orphan drugs and small amounts of substances for preclinical and clinical analyses according to the standards of Good Manufacturing Practice), **Laboratory of Toxicology Research** (performing highly-specialized analyses of preclinical safety of new drugs and chemical substances according to toxicology panel requirements) and the unique **Laboratory of Small Animal Magnetic Resonance** equipped i.a. 7T tomograph for small animals resonance imaging.

Within the other investment scheme, **the Centre** joined the Ochota Biocentrum project dedicated to the **Development of IT Infrastructure for Strategic Directions of Biology and Medicine**, also financed through the Operational Programme Innovative Economy. Thanks to this project **Laboratory of Bioinformatics** has been created, headed by prof. **Bogdan Lesyng**. The other development was initiation of **Behavior and Metabolism Research Laboratory**, headed by prof. **Robert Filipkowski**.

Aimed at providing medical practitioners with the application of experimental therapy with stem cells, including adipose tissue-derived stem cells of regenerative potential, **Translative Research Platform for Regenerative Medicine** was created in 2015 followed by the foundation of **Tissue Bank** and **GMP Laboratory** in 2017.

Thanks to prof. Andrzej Lipkowski's effort **the Centre** has been chosen as the institution coordinating **Mazovian Peptide Cluster** and **Pain Treatment Cluster**, two structures aimed at enabling cooperation between scientific, medical and business sectors which shall work together to develop and implement innovations of significant value for public health care. New chemical particles and methods for care for patients struggling with pain are the

examples achieved within frames of these ventures. Mazovian Peptide Cluster functions in partnership with European organization supporting development of healthy food, functional food and environment-friendly industry. The enterprise has already won numerous awards at international invention exhibitions.

Throughout its history, scientists affiliated with **the Centre** published approximately 5000 scientific papers and the number of citations of the papers with its affiliation (according to Scopus and Web of Science databases) invariably amounts to several thousand a year. **The Centre** is also a co-owner of 37 patents. Its activities also include training and further education of researchers. Many BA and MA *theses* are prepared here by students of several Warsaw colleges. The **Scientific Council** of **the Centre** is eligible to confer PhD and habilitations degrees in the area of medical science and medical biology. **The Centre** runs PhD courses and has so far conferred 273 PhD degrees and 62 habilitations, and directed 42 motions for national professorship nominations.

The complexity of the Institute structure, comprising Clinical Research Units, Research Departments and Stations, Environmental Laboratories and Therapy Units, is a testament to its skillful adaptation to the mainstream of world science. The unique character of scientific activity at **Mossakowski Medical Research Centre, Polish Academy of Sciences** results from its researchers' creativity in combining basic research with clinical practice. Their work focuses on the key medical problems solved at the level of the basic bodily and cellular functions. However, many research schemes pertain to clinical issues, the subject matters which go beyond medical practice and apply a variety of experimental models. This is what makes the Institute an uncommon bridge between basic research and clinical needs.

*Paweł Grieb, Andrzej Ziemba*