



Institute of Experimental Medicine – Faculty of Medicine – Pavol Jozef Šafárik University in Košice

Website: <https://www.upjs.sk/en/faculty-of-medicine/research-department/experimental-medicine/>

Description

Institute of Experimental Medicine (IEM) belongs to scientific and research departments at Faculty of Medicine, Pavol Jozef Šafárik University in Košice. The IEM conducts high-quality research focused on the study of the role of human intestinal microbiota in the pathogenesis of chronic diseases and possibilities for their prevention and therapy using targeted modulation of intestinal microbiota. The IEM continuously collaborates with the domestic and foreign Universities, scientific institutions and industrial partners.

The IEM participates in education process of the Faculty by enabling students to cooperate on research projects. The Institute staff tutors PhD students, diploma theses and various student scientific activities.

The Institute is the founding member of the non-profit organisation Cassovia Life Sciences (CLS) which associates research institutes and industrial institutions, particularly in Central Europe. CLS integrates their research potential for participation in international projects, especially under EU programme Horizon 2020.

The interdisciplinary research team includes experts from the field of biochemistry, molecular biology, microbiology and immunology. Up to February 2018, the team consists of nine scientists with a PhD degree (four of them are under the age of 35 years) and two senior scientists with scientific degree DrSc.

The Institute regularly organizes international scientific events, which make contact with the scientific professionals from all over the world. In 2008 – 2015, the Institute organized International Scientific Conference on Probiotics and Prebiotics (IPC), in the years 2009 and 2010 international conference Food and Function and in the 2010 and 2018 International Scientific Conference on Gastro-Intestinal Microbial Ecology (SOMED).

Research interest

IEM vigorously studies the role of human intestinal microbiota in the pathogenesis of chronic diseases and possibilities of the microbiota modulation in prevention and therapy of chronic diseases. An important objective of the Institute is the application of new knowledge for the development of novel probiotics, biotechnological products and establishment the novel approaches targeting gut microbiome dysbiosis. These products and approaches shall be used for targeted modulation of intestinal microbiota, which may lead to more effective prevention and treatment of chronic diseases.

The current main goal of the Institute is to build a cutting-edge research centre focused on the prevention and therapy of chronic diseases associated with gut microbiota modulation, applying an interdisciplinary approach and teamwork. Additionally, there is an effort to apply for EU research projects within the EU Framework Programme Horizon 2020.

Infrastructure / technical equipment:

Infrastructure of the Institute has been completely innovated in 2013. The workplace is equipped with state-of-the-art devices that have been purchased from EU Structural Funds projects. Equipment of the Institute includes molecular, microbiological, biochemical and immunological facilities: real time PCR device, DGGE and TGGE device, PCR cycler, spectrofluorometer, freeze dryer/lyophilisator, GC/MS, biochemical automated analyser, flow cytometer, real time microplate cell analyzer xCELLigence,

microplate multianalyzer Synergy H4, fluorescence microscopes and various devices for cell culture / microbial culture cultivation.

The most important device of the Institute represents **Simulator of the human intestinal microbial ecosystem – TWINSHIME**, which is a unique, scientifically validated dynamic in vitro model of the complete gastrointestinal tract to study physicochemical, enzymatic and microbial parameters in the gastrointestinal tract in a controlled in vitro setting. TWINSHIME® combines two identical SHIME® systems. This setup allows performing either placebo-controlled in vitro studies of probiotic microorganisms and natural compounds, or comparative study of two different products.

In addition to the use of advanced in vitro analyses, the Institute has also solid experience with in vivo animal studies (colon cancer, colitis, gut dysbiosis, atherosclerosis) which are performed at the Laboratory of Research Bio-models within the same Faculty. Undoubted advantage of the Institute is collaboration and connection to the clinical departments of the Faculty and the Louis Pasteur University Hospital in Košice.

Projects

Foreign projects and projects of EU structural funds:

- ITMS 26220220152 PROBIOTECH: Competence Centre for biomodulators and nutritional supplements
Duration: 3/2011 – 2/2015
- ITMS 26220120058 CEMIO: Centre of Excellence for research of factors influencing the health in marginalised and immunocompromised people
Duration: 8/2010 – 7/2013
- ITMS 26220220104 PROBIO: Probiotic microorganisms and natural bioactive substances for healthier population of Slovakia
Duration: 3/2011 – 02/2015
- ISTC project: A study of probiotic properties of Lactobacilli and Bifidobacteria strains for the production of direct-to-the vat starters used in processing industry and agriculture
Duration 11/2009 – 10/2012

Domestic projects

- APVV 16-0176: Targeted modulation of gut microbiota and its transplantation in prevention and treatment of inflammatory bowel disease
Duration 7/2017 – 6/2021
- The institute regularly participates and solves the projects of Scientific Grant Agency of Ministry of Education, Science, Research and Sports of Slovak Republic (VEGA projects).

Submitted projects within the Horizon 2020 or 7th Framework programme

- 2017 CEUBIOME: Support for better understanding of the human gut microbiome in order to develop novel microbiome modulation-based strategies for prevention and treatment of the cancerous diseases in central Europe
Call: H2020-WIDESPREAD-2016-2017
Coordinator: Pavol Jozef Šafárik University, Slovakia
- 2015 DIGESTHEAD: By training towards better research on digestion: increasing potential of life sciences research in Eastern Slovakia.
Call Twinning H2020-TWINN-2015
Coordinator: Pavol Jozef Šafárik University, Slovakia

- 2014 DIADEM: Diseases associated with Inflammation: multimodal approach for disease prevention, health promotion, therapy development, and optimal management of collateral pathologies.
Call: H2020-PHC-2015
Coordinator: Medical University of Vienna, Austria
- 2014 CHRONOS: Chronic diseases – obesity, atherosclerosis and colorectal cancer, common pathways and strategy of their prevention.
Call: H2020-PHC-2015
Coordinator: Pavol Jozef Šafárik University, Slovakia
- 2013 FUHONU: Future horizon of nutrition.
Call: FP7-KBBE-2013-7 7
Coordinator: Florence University, Italy
- 2012 END – HF: Diet nutrients can regulate the epicardial adipose tissue for heart failure prevention or treatment.
Call: FP7-HEALTH-2013-INNOVATION-1 7
Coordinator: Servizo Galego de Saude, Spain
- 2011 FENUFOOD: Production of highly biologically valued functional foods based on a new processing technology of fenugreek, sea - buckthorn and cranberry plants.
Call: FP7-KBBE-2011-5 -CP-CSA 7
Coordinator: University of West Hungary, Hungary
- 2010 EuCellTox: Functionally differentiated human gut, liver and lung models for systemic toxicity testing.
Call: FP7-HEALTH-2010
Coordinator: University of Maribor, Slovenia
- 2009 HEBE: Healthy Bioactive compounds from original and traditional plants for Europe“
Call: P7-KBBE-2009-3 7
Coordinator: University of Maribor, Slovenia

Relevant publications

- Bomba A., Strojny L., Salaj R., Šrofilová J. (2015) Modulation of Gut Microflora in the prevention of Atherosclerosis and Cancer using Probiotics and Prebiotics. In: Beneficial Microbes in Fermented and Functional Foods. Boca Raton: Taylor & Francis Group, ISBN 9781482206623. p. 413 - 435.
- Bomba A., Nemcová R., Strojny L., Mudroňová D. (2012) Probiotics for Farm Animals. In: Lactic acid bacteria: microbial and functional aspects. Boca Raton: CRC Press, Taylor & Francis Group, ISBN 9781439836774. p. 633-670.
- Štofilová J., Langerholc T., Botta C., Treven P., Gradišnik L., Salaj R., Šoltésová A., Bertková I., Hertelyová Z., Bomba A. Cytokine production in vitro and in rat model of colitis in response to Lactobacillus plantarum LS/07. Biomedicine and pharmacotherapy, 2017; 94:1176-1185.
- Hijová E., Kuzma J., Strojny L., Bomba A., Bertková I., Chmelárová A., Hertelyová Z., Benetinová V., Štofilová J., Ambro Ľ. Ability of Lactobacillus plantarum LS/07 to modify intestinal enzymes activity in chronic diseases prevention. Acta Biochimica Polonica, 2017; 64(1): 113 - 116.
- Štofilová, J., Szabadosová V., Hřčková G., Salaj R., Bertková I., Hijová E. Strojny L. Bomba A. Co-administration of a probiotic strain Lactobacillus plantarum LS/07 CCM7766 with prebiotic inulin alleviates the intestinal inflammation in rats exposed to N,N-dimethylhydrazine. International Immunopharmacology, 2015, 24(2): 361-368.
- Ji Y.S., Kim H.N., Park H.J., Lee J.E., Yeo S.Y., Yang J.S., Park S.Y., Yoon H.S., Cho G.S., Franz C.M.A.P., Bomba A., Shin H.K., Holzapfel W.H. (2012) Modulation of the murine microbiome with a concomitant anti-obesity effect by Lactobacillus rhamnosus GG and Lactobacillus sakei NR28. Beneficial Microbes, 2012; 3(1): 13-22.

- Bomba A., Brandeburová A., Ričanyová J., Strojný L., Chmelárová A., Szabadosová V., Pramuková B., Štofilová J., Salaj R., Supuková A., Čokášová D. The role of probiotics and natural bioactive compounds in modulation of the common molecular pathways in pathogenesis of atherosclerosis and cancer. *Biologia*, 2012; 67(1): 1-13.
- Strojný L., Bomba A., Hijová E., Chmelárová A., Mojžišová G., Bertková I., Koprovičová J., Pomfy M., Stropfiová V., Molokáčová M. Effects of a probiotic in combination with prebiotics on intestinal lactobacilli and coliforms and activities of bacterial enzymes in 1,2-dimethylhydrazine exposed rats. *Czech Journal of Animal Science*, 2011; 56(3): 99-106.
- Bertková I., Hijová E., Chmelárová A., Mojžišová G., Petrášová D., Strojný L., Bomba A., Žitňan R. (2010) The effect of probiotic microorganisms and bioactive compounds on chemically induced carcinogenesis in rats. *Neoplasma*, 2010; 57(5): 422-428.

Contact person

DVM. Alojz Bomba DrSc. is a senior researcher and a head of the Institute of Experimental Medicine, Faculty of Medicine, Pavol Jozef Šafárik University in Košice since 2006. He is a mastermind of a research team whose long-term research is aimed at studying the role of intestinal microbiota in the pathogenesis of chronic diseases and its modulation in their prevention and therapy.

Dr. Bomba is an expert in the field of probiotics and he is an originator of the concept of potentiated probiotics. During the years from 2000 to 2015, he was the President of the International Conference on Probiotics and Prebiotics and at the present, he is a chairperson of the organizing committee. During his previous work, he co-founded Laboratory of Gnotobiology, the only laboratory of its kind in Slovakia. During the years from 2004 to 2009, he was responsible investigator of an international project of the 6th EU Framework Programme "Plants and their extracts and other natural alternatives to antimicrobials in feeds" coordinated by Dr. R.J. Wallace from the Rowett Research Institute in Aberdeen, UK. Dr. Bomba authored or co-authored more than 70 CC and impacted publications and 5 chapters in foreign monographs. He co-authored of five patents and utility models. His work has been cited in more than 500 publications published in journals indexed in Web of Science and Scopus databases. Dr. Bomba is a member of the Slovak Academy of Agricultural Sciences and President of Cassovia Life Sciences. In 2003, Dr. Bomba awarded the Diploma for the Development of Science in Veterinary Medicine by the Slovak Academy of Agricultural Sciences. In 2012, the Mechnikov Institute of Microbiology and Immunology of Ukrainian Academy of Medical Sciences granted him the honorary title "Honored Professeur". In the same year, Dr. Bomba awarded the Price of the Košice city Mayor for contribution in establishment of the centre integrating the potential of institutes in research and the use of probiotics and natural bioactive compounds in human and veterinary medicine. In 2015, DVM. Alojz Bomba, DrSc co-awarded the Price for the Transfer of the Technology in Slovakia, in the category Innovation with the best potential for utilisation in practice.