

RESEARCH GROUP

Intensive Care

PRINCIPAL INVESTIGATOR JUNIOR

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KEY WORDS

Sepsis, Septic shock, SIRS, Post-sepsis Syndrome, Oxidative Stress, Biomarkers, Immunology

RESEARCH FOCUS

The Intensive Care Research group (INC) focuses on a clinical patient-oriented investigation of mechanisms of development, progression and outcome of critical illness. Cooperation with several basic research labs provides us wide opportunities for translational scientific approach by combining clinical with cellular and molecular data. Thanks to the cooperation with Cellular and Molecular Immunoregulation group, the project focusing on Immunology of sepsis has been smoothly running and bringing promising results. One of our objectives is to test novel biomarkers of critical illness. Therefore, we investigate several circulating substances and monocytic surface markers in prediction of patient mortality, therapeutic response and onset of complications. Secondary focus of the group is a peri-operative medicine and anaesthesiologic management of at-risk patients.

RESEARCH OBJECTIVES

- ▲ To bring novel insights into immuno-pathophysiology of sepsis, septic shock, MODS and SIRS which could potentially improve treatment of critically ill patients and reduce their mortality.
- ▲ To develop novel biomarkers of critical illness which could better stratify patients with the highest risk and identify individuals suitable for specific targeted therapy.
- ▲ To bring novel findings which could identify patients with increased peri-operative risk and develop novel approaches to optimize patients before, during and after surgery.



● CLINICAL RESEARCH



TRANSLATIONAL RESEARCH



BASIC RESEARCH



CORE FACILITIES

Development of new solutions for prevention, diagnostics and treatment of cardiovascular, neurological and selected oncological diseases and disorders.

MAIN PARTNERS

- ▲ Jan Frič – internal cooperation (CMI, ICRC)
- ▲ Marcela Vlková – internal cooperation (Department of Allergology and Immunology, FNUSA)
- ▲ Jiří Pařenica – University Hospital Brno-Bohunice, CZ
- ▲ Y. S. Prakash – Mayo Clinic, USA

OFFERED SERVICES AND EXPERTISE

- ▲ Recruitment of critically ill patients, collection and analysis of clinical data.
- ▲ Cooperation and expertise in the field of intensive care and peri-operative medicine.

TOP PUBLICATIONS

- ▲ Hortova-Kohoutkova M, Laznickova P, Bendickova K, De Zuani M, Andrejcinova I, Tomaskova V, Suk P, Sramek V, **Helan M**, Fric J.: Differences in monocyte subsets are associated with short-term survival in patients with septic shock. *JCMM*. 2020.
- ▲ Bartman CM, Schiliro M, **Helan M**, Prakash YS, Linden D, Pabelick C.: Hydrogen sulfide, oxygen, and calcium regulation in developing human airway smooth muscle. *FASEB J*. 2020.
- ▲ Hortová-Kohoutková M, Tidu F, De Zuani M, Šrámek V, **Helán M**, Frič J.: Phagocytosis–inflammation crosstalk in sepsis: new avenues for therapeutic intervention. *Shock*. 2020.
- ▲ Parenica J, Kala P, Mebazaa A, Littnerova S, Benesova K, Tomandl J, Goldbergova M, Jarkovsky J, Spinar J, Tomandlova M, Dastych M, Ince C, Lokaj P, Helanova K, **Helan M**, Tesak M, Legrand M.: Activation of the nitric oxide pathway is strongly associated with the risk of acute kidney injury in patients with acute myocardial infarction. *Cardiorenal Medicine*. 2020.
- ▲ Lukeš M, **Helán M**, Šrámek V, Pavlíkova J, Staffa R, Suk P.: Impact of contralateral carotid stenosis on brain tissue oxygenation during carotid endarterectomy. *Cor et Vasa*. 2019.
- ▲ HARTMAN W, **HELAN M**, SMELTER D, SATHISH V, THOMPSON M, PABELICK C, JOHNSON B, PRAKASH Y.: Role of Hypoxia-Induced Brain Derived Neurotrophic Factor in Human Pulmonary Artery Smooth Muscle. *PLoS ONE*. 2015.
- ▲ **HELAN M**, ARAVAMUDAN B, HARTMAN W, THOMPSON M, JOHNSON B, PABELICK C, PRAKASH Y.: BDNF secretion by human pulmonary artery endothelial cells in response to hypoxia. *Journal of Molecular and Cellular Cardiology*. 2014.

OTHER SELECTED RESULTS

- ▲ Changes in monocyte subsets could predict the worse outcome of septic shock patients.
- ▲ Soluble Endoglin could predict mortality in septic shock patients.
- ▲ Nitric oxide pathway biomarkers correlate with the risk of acute kidney injury in patients with acute myocardial infarction.
- ▲ Functions of H₂S on adult and fetal airway smooth muscle.
- ▲ Role of Brain Derived Neurotrophic Factor (BDNF) in hypoxic pulmonary artery endothelium and smooth muscle.