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RESEARCH AREA

"1) *In vitro* measurements

The transplanted organ (graft) undergoes warm and cold ischemic periods during surgical removal from the donor and the cell damage during storage is further exacerbated by reperfusion injury during the reestablishment of the circulation. During ischemia the oxidative phosphorylation is inhibited due to lack of oxygen and the Ca^{2+} overload results in a reduction of the efficiency of the mitochondrial electron transport and the formation of reactive free radicals. In the clinical practice static and dynamic preservation techniques are used and our goal is to increase the efficiency of transplant solutions by using biological active gases which may contribute to better graft survival and improved recovery of function. Methane (CH_4) is widely considered to be biologically inert, but many recent studies have shown that exogenous CH_4 affects cell pathways involved in oxidative and nitrosative stress responses. To date, the effect of CH_4 on the outcome of organ transplantation and graft damage has not been studied, and the effect of CH_4 on graft survival or other postoperative effects is unknown.

2) *In vivo* measurements

Behavioural studies provide important information for modelling various human neurological pathologies, various forms of cognitive impairment, including postoperative sepsis-associated encephalopathy and for testing the efficacy of therapies in the experimental phase. One group includes methods and tests that examine the animal's spontaneous, self-produced behavior. The other large group consists of methods for studying learning / memory. Our laboratory has widely accepted non-invasive, repeatable, "real-time" data tools for testing the cognitive functions of rodents. Spatial memory, spontaneous discovery activity, coordination, sense of balance, anxiety, and depression are examined using a variety of tests.

(in an organ bath). *Ex vivo* monitoring and analysis of cell and mitochondrial respiration using a high-resolution respirometer. Measurement of the activity of several inflammatory biochemical markers and enzymes. Methods of data processing, statistical analysis of data.

SELECTED PUBLICATIONS

Horváth, T., Jász, D.K., Baráth, B., Poles, M.Z., Boros, M., Hartmann, P. (2021) Mitochondrial Consequences of Organ Preservation Techniques During Liver Transplantation. **Int J Mol Sci** **22**: 2816.

Horváth, T., Hanák, L., Hegyi, P., Butt, E., Solymár, M., Szűcs, Á., Varga, O., Thien, B.Q., Szakács, Zs., Csonka, E. et al. (2020) Hydroxyapatite-coated implants provide better fixation in total knee arthroplasty. A meta-analysis of randomized controlled trials. **PLoS One** **15**: e0232378.

Papp, A., **Horváth, T.**, Igaz, N., Gopisetty, M.K., Kiricsi, M., Berkesi, D.S., Kozma, G., Kónya, Z., Wilhelm, I., Patai, R. et al. (2020) Presence of Titanium and Toxic Effects Observed in Rat Lungs, Kidneys, and Central Nervous System in vivo and in Cultured Astrocytes in vitro on Exposure by Titanium Dioxide Nanorods. **Int J Nanomedicine** **15**: 9939-9960.

Horváth, T., Papp, A., Igaz, N., Kovács, D., Kozma, G., Trenka, V., Tiszlavicz, L., Rázga, Zs., Kónya, Z., Kiricsi, M. et al. (2018) Pulmonary impact of titanium dioxide nanorods: examination of nanorod-exposed rat lungs and human alveolar cells. **Int J Nanomedicine** **13**: 7061-7077.

Horváth, T., Vezér, T., Kozma, G., Papp, A. (2018) Functional neurotoxicity and tissue metal levels in rats exposed subacutely to titanium dioxide nanoparticles via the airways. **Clinical Neuroscience** **71**: 35-42.

TECHNIQUES AVAILABLE IN THE LAB

Participation in animal experimental work, acquisition of surgical techniques (surgical and microsurgical techniques) in anesthetized rats. Professional application of the use and evaluation of behavioral test methods and the drawing of conclusions. Functional testing of isolated organs *in vitro*