

ANIMAL PHYSIOLOGY

Modulation of immune response by probiotic bacteria in colorectal carcinogenesis

supervisor: doc. RNDr. Monika Kassayová, CSc.

study form: full time

Annotation: Slovakia is one of the five countries in the world with the highest incidence and mortality of colorectal cancer. Modulation of intestinal flora by regular consumption of probiotic bacteria appears to be an effective strategy of colorectal cancer prevention. Probiotics may influence local (intestinal) or systemic immune response of the host. These changes can play a key role in the intestinal malignant transformation. The mechanisms of probiotic action, however, are not sufficiently investigated yet and strongly depend on the probiotic strain used. Therefore, the detailed testing of probiotic preparations is essential. The aim of the work is to study properties of the combination of *Lactobacillus plantarum* and *Lactobacillus salivarius* strains in the form of a new probiotic product designed for fermentation of human foods. Effects of lactobacilli will be evaluated using *in vitro* models of immunocompetent cells, enterocytes and colorectal cancer cells as well as *in vivo* using chemically induced colorectal carcinogenesis in rats. Changes in cytokine production and tumour microenvironment will be studied.

Use of metabolomics in early diagnosis of pathological changes in the brain

supervisor: prof. RNDr. Beňadik Šmajda, CSc.

consultant: RNDr. Terézia Kisková, PhD.

study form: full time

Annotation: The metabolome represents a complex of all metabolites which are the end-products of processes present in the cell, tissue or the whole organism. It characterizes the current state of the organism and manifests not only the expression of genes, but reflects also the influence of environmental factors. Monitoring of metabolomic alterations may serve in diagnosis of neurodegenerative disorders such as Alzheimer's diseases, Parkinson's disease and depression, or brain tumors whose early diagnosis can extend and improve the life of patients. The aim of the research will be to induce pathological changes in the brain of laboratory rats and to monitor the metabolomic changes in their biological fluids (blood and urine). Furthermore, the aim will be to outline the most important metabolites altered in the studied cerebral diseases to use this knowledge in their early diagnosis in the clinical practice.

Convergent osteo-physiological patterns in the evolution of the flapping flight: Pterosaurs (Reptilia) versus bats (Mammalia)

supervisor: doc. RNDr. Martin Kundrát, PhD. - CIB UPJŠ

consultant: prof. Lü Junchang - Chinese Academy of Geological Biosciences, Peking, Čína

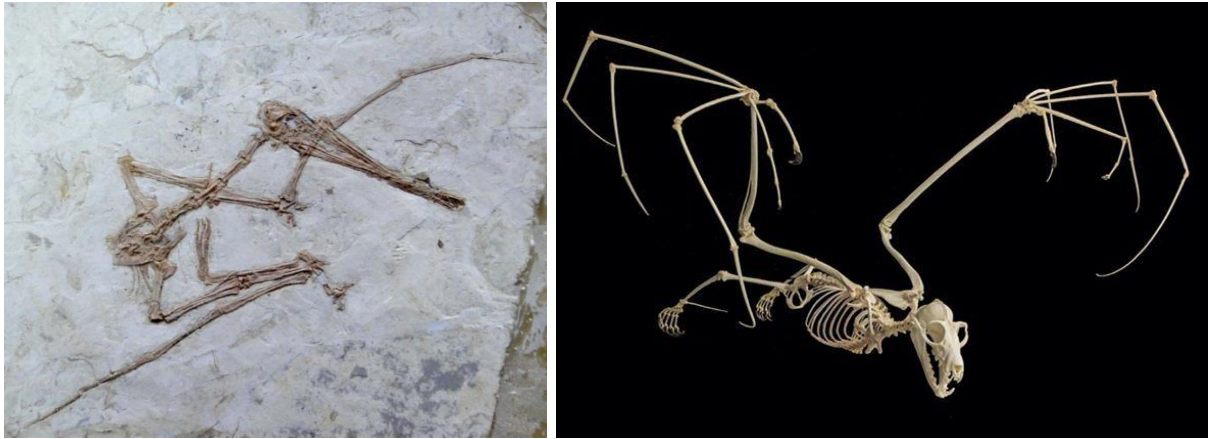
consultant: prof. RNDr. Beňadik Šmajda, CSc. - ÚBEV PF UPJŠ

study form: full time

Annotation: There are three groups of vertebrates that colonized aerial environment: pterosaurs (Reptilia), avialan dinosaurs (Aves), and bats (Mammalia). Apart from distinct ancestry, bats and pterosaurs are the well-known example of functional convergence of forelimb in the evolution of flapping flight. In contrast to birds, the wing airfoil is formed by skin membrane called patagium in bats and pterosaurs. Patagial wings consists of the same bone elements, however, their active involvement into flying mechanics was specially modified in each group, respectively. Furthermore, pterosaurs and bats exhibit ability to employ the patagial wing in quadrupedal locomotion.

This doctoral project is centered for evaluation of adaptive changes of the wing bones of pterosaurs and bats at the microscopic scale. Bone tissue is considered here as a functional interface useful for correlation of osteonal bone patterns with growth dynamics, locomotor

performance, metabolism and thermoregulation. The main aim of the project is the reconstruction of physiological characteristics in the evolution of the first active flying vertebrates - pterosaurs. We expect the applicants to be fluent in spoken and written English, to show high work engagement, to work along and in a team, in lab as well as in field, to handle correctly fixed biological material and fossils, and being interested in 3D imaging, phylogenetic and statistic methods.



Selected aspects of physiology of ticks with emphasis on *Borrelia miyamotoi* transmission

supervisor: RNDr. Viktória Majláthová, PhD.

study form: full time

Annotation: *Borrelia miyamotoi* is a zoonotic spirochete transmitted by ticks and belongs to the group of Borreliae causing relapsing fever syndrome. *B. miyamotoi* was described only recently and just little is known about its eco-epidemiology. The aim of dissertation thesis is to identify reservoir hosts which are part of transmission cycles in natural focus. On localities with proved occurrence of this spirochete all groups of vertebrates will be captured and the presence of *B. miyamotoi* will be assessed.

In ticks, vectors of *B. miyamotoi* the impact of the infection on neuropeptide transcript level in tick synganglia as well as the proteins in hemolymph, salivary glands and gut will be investigated. Here we aim to employ the quantitative real-time PCR (qRT-PCR). The possible impact of infection on behavior of ticks will be monitored the same time together with the confection rate.

Bioefficacy and antioxidant activity of phytoadditives and zinc in animals

supervisor: RNDr. Klaudia Čobanová, PhD.- Institute of Animal Physiology Slovak Academy of Sciences Košice

study form: full time

Annotation: To ensure animal health, its reproductive potential and maximize the production the feed of livestock is supplemented with various feed additives. Introduction of new organic compounds as source of microelements into the diets of farm animals represent one of a many current trends in the animal food production. Zinc as the essential microelements is structural components of several metalloenzymes which play an important role in biological processes. Polyphenolic compounds of plant additives are known for their many beneficial effects on health, mainly for their antioxidative properties. The dissertation thesis will be focused on the evaluation of the antioxidant potential of various medicinal plants as well as the effect of phytoadditives and dietary organic zinc on the parameters of antioxidant status of ruminants and monogastric animals will be determined too. Since the mechanism of action for bioactive compounds of plant additives on mineral metabolism is not precisely elucidated, aim is to obtain new information on this subject. For this reason the impact of phytoadditives on zinc utilization and tissue deposition will be investigated in farm animals. The specific metalloenzymes activities and metalloproteins levels

in animal tissues will be measured too. All analytical methods for evaluation of antioxidant and microelements status are routinely used in our laboratory.

Experimental peripheral nerve regeneration.

supervisor: MVDr. Ivo Vanický, PhD. - Institute of Neurobiology Slovak Academy of Sciences
Košice

study form: full time

Annotation: Peripheral nerves can regenerate after injury. After extensive tissue loss, tubulization techniques can be used in order to bridge the gap between the proximal and distal stumps of the transected nerve. However, the distance of regeneration is limited. In our experiments, we are using a rat model of ventral caudal nerve transection, and with tubulization techniques, the different conditions are tested to stimulate the regeneration of the injured nerve. The experiments require microsurgical techniques and the regeneration is evaluated quantitatively using histological and electrophysiological analyses.

In Vitro Systems for Modulation of Spinal Cord and Brain Injury and their Use in the Study of Repair of Damaged Nervous Tissue.

supervisor: RNDr. Lucia Slovinská, PhD. - Institute of Neurobiology Slovak Academy of
Sciences Košice

study form: full time

Annotation: Traumatic CNS damage generates a sequence of destructive processes in cells, resulting in tissue damage. There are currently a lot of animal models allowing to modulate a large number of different diseases and CNS damage. Organotypic slices- OTS- represent a transient system between cell culture screening in vitro and animal models in vivo. This system is accessible to experimental manipulations, with inducing the neurodegeneration by many mechanisms.

Study of the ability of natural intestinal microflora biomodulators to affect the integrity and functionality of the epithelial barrier and the immune system during intestinal inflammatory diseases.

supervisor: prof. RNDr. Beňadik Šmajda, CSc.

consultant: RNDr. Vlasta Demečková, PhD.

study form: full-time

Annotation: The human gut microbiota comprises approximately 100 trillion microbial cells and has a significant effect on many aspects of human physiology including metabolism, nutrient absorption and immune function. Disruption of this population has been implicated in many chronic and degenerative diseases, including intestinal inflammatory diseases, allergies, colorectal carcinoma, metabolic syndrome, diabetes and obesity. Idiopathic inflammatory bowel disease (IBD) refers to a group of chronic inflammatory diseases of the gastrointestinal tract with alternating relapses and remissions. Crohn's disease (CD) and ulcerative colitis (UC) are two major manifestations of IBD. These two forms of IBD differ mainly by localization of inflammatory deposits in the digestive tract and the extent of histopathological changes in the intestinal wall. High morbidity, serious early and late complications of the disease with potential disability, shortening the life of the patient with significant reduction of the quality of life are the reason for finding new options for prevention, rational diagnosis and treatment of IBD. The aim of the thesis is to gain new knowledge about the composition and function of intestinal microflora in patients with IBD and to propose new and more effective methods in the prevention and treatment of inflammatory diseases of the digestive tract. Part of the work will, in addition to *in vitro* experiments, also study the effect of transplantation of the microbiota of healthy humans on the composition and function of intestinal microbiota in *in vivo* conditions by induction of inflammatory bowel disease in the experimental rat.