ANIMAL PHYSIOLOGY

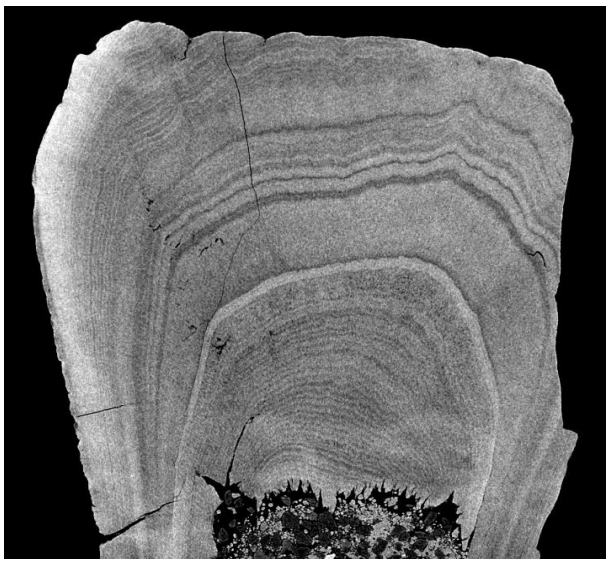
Comparison of behavior of selected species of ticks and parasitic mites in electromagnetic field under influence of pathogens
supervisor: RNDr. Igor Majláth, PhD. (igor.majlath@upjs.sk)
consultant: RNDr. Viktória Majláthová, PhD.
study form: full time
Annotation: Hard ticks from Ixodidae family are exposed to different levels of electromagnetic radiation (EMF) in each environment. This EMF significantly affects the basic elements of tick behaviour, but the tick and its behavioural manifestations are also influenced by other factors of the external or internal environment. Pathogens are transmitted by ticks to such environmental factors with a potential effect on behaviour. Our hypothesis and at the same time the aim of the dissertation thesis is to determine the influence of tick-transmitted pathogens on the behaviour of ticks of the family Ixodidae and the family Varroidae in EMF. Bacterial (Borrelia, Anaplasma / Ehrlichia, Rickettsia) and single cell parasites (Babesia) will be diagnosed by tick-borne pathogens by molecular-genetic methods. Ticks captured from vegetation by flagging and manually collected from colonies from different parts of Slovakia will be subjected to behavioral experiments in RST (radiation shielded test), which is a modified dark / light test under the influence of EMF, and subsequently correlated with the presence of pathogens .

The influence of electromagnetic radiation on gene expresion in synganglium of Ixodidae ticks.
supervisor: RNDr. Viktória Majláthová, PhD. (viktoria.majlathova@upjs.sk)
consultant: RNDr. Igor Majláth, PhD.
study form: full time
Annotation: The hard ticks from Ixodidae family are exposed to different levels of electromagnetic radiation (EMF) in each environment. From behavioral tests, we know that this EMF affects tick behavior, ticks respond to it, but it is not yet known how the physiological processes in the processing and responses of these stimuli take place.
The aim of the dissertation thesis is to study and detect changes in gene expression in tick synganglion by molecular genetic methods by comparing control groups with groups exposed to EMF. In a tick after varying exposure to EMF, the level of neuropeptide transcript expression in synganglia will be monitored by quantitative real-time PCR. These experiments will be realized in the laboratories of molecular physiology at the Department of Animal Physiology at the UPJŠ in Košice and at a partner French institution in Paris at UMR BIPAR, INRA, Ecole Nationale Vétérinaire d'Alfort, ANSES, University of Paris-Est, Maisons-Alfort, France.

Chronophysiology of the dentine and bone tissue in ectotherms and endotherms.
supervisor: doc. RNDr. Martin Kundrát, PhD. (martin.kundrat@upjs.sk)
consultant: prof. RNDr. Beňadik Šmajda,CSc.
study form: full time
Annotation: Formation of skeletal tissues is known to show biological rhythms including seasonal rhythms, and is sensitive to different stressors and climatic events. Dentine increments are usually deposited with finer periodicity whereas bone compacta is usually interrupted by growth marks on a yearly base or lacking any cessations in growth. How these two different tissues develop under the same external conditions in cold-blooded and warm-blooded tetrapods remain unclear when it comes to quantification of micro-structure changes in three dimensions and over million years. The doctoral student is expected to investigate these microstructural specializations on different sets of extant and extinct animals. Particularly, this project has been

centered on organismal types such as: (under)ground dwellers versus gliders/fliers, eastivating versus hibernating specialists, and miniature versus gigantic forms. The student will use both approaches: invasive physical sectioning and non-invasive micro-tomographic imaging (based on both conventional and synchrotron sources). The student will analyze the imaging outcomes by tools of geometric morphometry and biostatistics. The stable isotope spectroscopy datasets will be available for this study as well. Active participation in field work is required. We aim to find significant correlations between osteo-physiology and environmental stresses as well as behavioral specializations on a broad interdisciplinary platform. The project will be funded through the project APVV-18-0251 and several synchrotron-based grants.

Aims:
1. to collect tooth and bones samples of the model organisms as well as to prepare the samples for further experimental manipulation;
2. to scan the samples using micro-CT and synchrotron micro-CT;
3. to produce morphologically exact 3D models based on the scans and to collect quantitative periodic characteristics of dentin and bone compacta;
4. to prepare 2D physical sections from the scanned samples;
5. to photograph and to measure periodical microstructures on the 2D sections;
6. to describe all types of chronophysiological variations in the model organisms and to compare them with each other using stereometry and biostatistics tools;
7. to formulate an evolutionary scenario about innovations that occurred with the origin of mesothermic and endothermic amniotes.



Morphological and physiological changes in the Amazonian hoatzin (Opisthocomus hoazin) locomotor system development
supervisor: doc. RNDr. Martin Kundrát, PhD. (martin.kundrat@upjs.sk)
konsultant: prof. RNDr. Beňadik Šmajda, CSc.
study form: full time
Annotation:
The hoatzin is known as a reptilian bird because it retains functional claws on its wings in juveniles. Newly hatched chicks accordingly exhibit an advanced level of coordination in the use of their wing claws and feet to clamber amongst tree branches. Although the hoatzin is unique amongst modern birds in having adapted its wings for climbing, this locomotor module was likely common in the non-avian dinosaurian ancestors of birds and was certainly functional in basal large-clawed birds during postnatal ontogeny. The locomotor and morphological compatibility of hoatzin and extinct Mesozoic birds therefore provides researchers with an optimal living analogue

for experimental simulations of a grasping forelimb that was subsequently adapted for flight. A hoatzin developmental sequence can also be established to trace the reorganization of bone, muscle, feathers and neurosensitive properties coupled with this shift in forelimb functionality.

Aims:
1. to prepare a basic three-dimensional (3D) anatomical atlas of skeleton, musculature, and CNS;
2. to generate two-dimensional (2D) physical sections of limb bones in tandem with 3D high-resolution imaging of structural changes in cortical segment of the bone and enthuses involving muscle insertions of the flying skeletal apparatus;
3. to analyze ontogenetic changes in feather architecture, microstructure, and coloration.
4. to quantify developmental changes in the 3D arrangement of trabeculae in the skeleton of wing and leg;
5. to test hypothesis that trabecular alignment in the grasping limb of juvenile hoatzins has been re-organized according to the novel mechanical requirements of the flying wing in mature hoatzins;
6. to formulate an eco-physiological scenario for the hoatzin locomotory shift in ontogeny and to understand the impact of this shift on the evolution of flying wing structure.

Molecular mechanisms participating in early embryo cell responses to the factors of environment.
supervisor: RNDr. Štefan Čikoš, CSc. (cikos@saske.sk) – Institute of Animal Physiology, Centre of Biosciences Slovak Academy of Sciences Košice
consultant: RNDr. Alexandra Špirková, PhD. – Institute of Animal Physiology, Centre of Biosciences Slovak Academy of Sciences Košice
study form: full time
Annotation: The preimplantation embryo (i.e. the embryo in the period from oocyte fertilization to implantation of blastocyst into uterus) can finish its development to the blastocyst stage relatively autonomously. On the other hand, recent data indicate that maternal environment influences significantly developmental potential of oocytes, quality of preimplantation embryos, implantation success rate, and can also have long term consequences on the offspring health. Model of laboratory mouse (in vitro as well as in vivo approaches) will be used in experiments. Modern biochemical methods, molecular biology techniques as well as morphological methods will be used to analyse cell receptors, activated signalling pathways and physiological responses of early embryo cells.

The use of organic forms of trace elements in nutrition and their effect on physiological processes in animals
supervisor: RNDr. Klaudia Čobanová,PhD. – (boldik@saske.sk) – Institute of Animal Physiology, Centre of Biosciences Slovak Academy of Sciences Košice
study form: full time
Annotation: Microelements are necessary for healthy animal growth and development, as well as for the function of basic metabolic and immune processes in the organism. 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. We are in a search for alternative

microelements sources which would be bioavailable and absorbed better by the animals in comparison to the traditionally used inorganic sources. Thus, it would be possible to reduce the current needs for mineral additives in the diets. The dissertation thesis will be focused on the evaluation of the utilization and tissue deposition of trace elements in farm animals supplemented with various organic mineral sources. The specific metalloenzymes activities and metalloproteins levels in animal tissues will be measured too.

Activation of the endogenous mechanism in ischemic tolerance.

supervisor: RNDr. Petra Bonová, PhD. (bonova@saske.sk) - Institute of Neurobiology, Biomedical research center Slovak Academy of Sciences Košice

study form: full time

Annotation: Stroke represents a serious socio-economic problem with limited treatment options. Recently, the phenomenon of ischemic tolerance has become an attractive solution for the prevention and treatment of such conditions.

Objectives:

1. Study of mechanisms of ischemic tolerance
2. Defining the role of peripheral blood cells in inducing ischemic tolerance
3. Testing of in vivo and ex vivo conditioning methods
4. Testing of conditioning methods in animal models of ischemic-reperfusion injury of nerve tissue