

Molecular cytology

Description of gene expression of neurotransmitter biosynthesis in cerebrospinal fluid contacting neurons (CSF-cNs) in rat spinal cord to explore the way of neurotransmission of the neurons.

supervisor: doc. RNDr. Zuzana Daxnerová, CSc.

consultant: RNDr. Ján Košuth, PhD.

study form: full time

Annotation: *The main task of the PhD study is to describe phenotype of cerebrospinal fluid contacting neurons (CSF-cNs) and the possibilities of neurotransmission by these neurons. To achieve the objective expression of genes involved in neurotransmitter and receptor biosynthesis in CSF-cNs will be studied. The student will acquire experience with broad spectrum of immunofluorescence and molecular-biological methods, mainly with techniques for analysis of mRNA expression (RNA extraction, primer design and RT-qPCR) and localization of the transcripts in situ (RNA in situ hybridization).*

To describe the phenotype and spectrum neurotransmitters in spinal cord CSF-cNs during rat postnatal development, i.e.

- *localize CSF-cNs in rat spinal cord based on molecular markers*
- *isolation of CSF-cNs by laser microdissection and extraction of RNA for gene expression study*
- *identification of mRNA transcripts of genes involved in neurotransmitters and receptors biosynthesis and quantification of their gene expression during postnatal development.*

References: recent scientific articles related to following areas of neurobiological research: spinal cord development; neurogenesis; gliogenesis; stem and progenitor cells during development, in adulthood and in vitro conditions; spinal cord injury

Reaction of central canal lining of rat on the minimal spinal cord injury during development and in adulthood with ambition to define its regenerative potential.

supervisor: doc. RNDr. Zuzana Daxnerová, CSc.

consultant: RNDr. Juraj Ševc, PhD.

study form: full time

Annotation: *The regenerative potential of spinal cord central canal lining in rat and its determination depending on the composition and degree of differentiation of individual cell types during early and late postnatal development and in adulthood.*

- *standardization and characterization of the minimal spinal cord injury model in P8 rats*
- *investigation on reaction of spinal cord to minimal injury*
- *investigation on reaction of central canal lining to spinal cord minimal injury*
- *comparison of the processes which take place in the central canal lining during normal and pathologically altered early postnatal development*

References: recent scientific articles related to following areas of neurobiological research: spinal cord development; neurogenesis; gliogenesis; stem and progenitor cells during development, in adulthood and in vitro conditions; spinal cord injury

Physiological and genetic adaptation mechanisms of microbial population to environmental stress

supervisor: doc. RNDr. Peter Pristaš, CSc.

consultant: prof. RNDr. Jana Kaduková, PhD.

study form: full time

Annotation: *Bacteria are continually exposed to the effects of various environmental conditions and are forced to adapt. The effect of environmental stress, involving stress caused by sub-lethal metal ion concentrations is intensively studied at the level of individual microorganisms, however, adaptation*

responses at the level of populations are still very little known. Nowadays, bacterial strains living in the environment with high metal content are often isolated from other, anthropogenically changed, environments including medical environments. In the present time, there is increasing evidence that metal contamination acts as a selective pressure to antibiotic resistance dissemination. However, the role of the environment in the development of antibiotic resistance is essentially unknown and mostly overlooked. The aim of the PhD. thesis will be to study physiological and genetic adaptation mechanisms of microorganisms commonly present in metal contaminated environment at the level of individual species as well as microbial populations and to identify how environmental stress caused by sub-lethal metal ion concentrations can change ecological and physiological characteristics of multitrophic microbial communities.

Identification of resistance mechanisms in chorioallantoic membrane affected by potential anticancer drugs

supervisor: prof. RNDr. Peter Fedoročko, CSc.

consultant: RNDr. Rastislav Jendželovský, PhD.

study form: full time

Annotation: The main task of the PhD study is to characterize the presence and proportional representation of the resistance/repair mechanisms in chorioallantoic membrane (CAM) of the *Coturnix japonica* embryo affected by potential anticancer treatments. The main scope of employment will be:

- cultivation of cancer cell lines
- preparation of 3D cell models (spheroids) from cancer cell lines
- ex ovo cultivation of *Coturnix japonica* eggs
- application of spheroids on CAM and preparation of solid tumours
- optimization of solid tumours isolation from CAM
- optimization of mRNA and protein level detection isolated from solid tumours
- application of existing experimental treatments involving nonactivated hypericin, photodynamically active hypericin, cisplatin, mitoxantrone, proadifen, histone deacetylase inhibitors and their mutual combinations
- analysis of mRNA and protein levels engaged in DNA repair processes
- analysis of methylation levels of genes engaged in DNA repair processes

