

# SUMMER COURSE FOR MEDICAL STUDENTS, SEPTEMBER 6-10, 2021

# PROGRAM

THE COURSE IS FINANCED FROM THE PROJECT NO. CZ.02.2.69/0.0/0.0/16\_015/0002362:  
INCREASING THE QUALITY OF EDUCATION AT CHARLES UNIVERSITY AND ITS RELEVANCE TO THE NEEDS OF THE LABOR MARKET

## MONDAY, SEPTEMBER 6

### Introduction to Experimental Cardiovascular Research

**Organized by: Institute of Physiology CAS**

Laboratory of Developmental Cardiology and Experimental Hypertension

**Venue:** Institute of Physiology CAS, Vídeňská 1083, Prague 4

#### 9:00 – 12:00 Lectures

- molecular background of pacemaker potential, spreading of action potential in the heart, conduction system, regulation of heart rate, mechanism of arrhythmias (D. Sedmera)
- myocardial hypoxia and ischemia/reperfusion, cardioprotection (J. Neckář)
- myocardial hypertrophy and heart failure (J. Neckář)
- mechanisms of blood pressure regulation, pathophysiology of hypertension, endorgan damage in hypertension and chronic kidney disease (I. Vaněčková)

#### 12:00 – 13:00 Lunch

#### 13:00 – 16:00 Demonstrations

- non-invasive assessment of structural and functional properties of the heart with ultrasound (echocardiography)
- isolated perfused heart and its use in experimental cardiology and pharmacology
- preparation of isolated ventricular myocytes for physiological experiments
- use of telemetry for continuous monitoring of hemodynamic parameters (blood pressure, activity ...)
- acute blood pressure monitoring in conscious animals
- assessment of contractile properties of vascular smooth muscle



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Operační program Výzkum, vývoj a vzdělávání



SECOND FACULTY OF MEDICINE  
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ÚOCHB AV ČR  
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## TUESDAY, SEPTEMBER 7

### Introduction to Neuroscience

**Organized by: Institute of Physiology CAS**

Laboratory of Pain Research, Neurophysiology of Memory, Developmental Epileptology,  
Neurochemistry and Cellular Neurophysiology

**Venue:** Institute of Physiology CAS, Vídeňská 1083, Prague 4

#### 9:00 – 12:00 Lectures

- molecular pharmacology of muscarinic receptors (J. Jakubík)
- glutamate receptors in health and disease (L. Vyklický)
- experimental neurobiology of learning and memory (J. Svoboda)
- pain pathophysiology and mechanisms (J. Paleček)
- pathophysiology of epilepsy and epilepsy-related comorbidities, epileptogenic insults and acquired epilepsies (H. Kubová)

#### 12:00 – 13:00 Lunch

#### 13:00 – 16:00 Demonstrations

- methods in molecular pharmacology of muscarinic receptors
- patch clamp technique to record ion channel activity
- learning and memory in rodents: Behavioral tests and optogenetic approach
- measurement of pain in rodents, spinal cord slice electrophysiology
- epileptic insult and postnatal development: behavioral tests in developing rodents



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## WEDNESDAY, SEPTEMBER 8

### Introduction to Chemical Biology and Advanced Imaging for Biomedical Research

**Organized by: Institute of Molecular Genetics CAS**

**Venue:** Institute of Molecular Genetics CAS, Vídeňská 1083, Prague 4

**9:00 – 12:00 Lectures**

**CZ-OPENSREEN: National Infrastructure for Chemical Biology**  
(P. Bartůněk / D. Sedlák)

**Czech Bioimaging: National Infrastructure for Biological and Medical Imaging  
(Light Microscopy)**  
(I. Novotný)

**Czech Bioimaging: National Infrastructure for Biological and Medical Imaging  
(Electron Microscopy)**  
(V. Philimonenko)

**12:00 – 13:00 Lunch**

**13:00 – 16:00 Demonstrations**

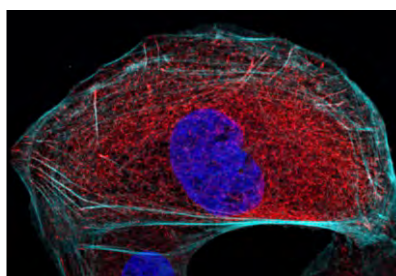
**National Infrastructure for Chemical Biology (CZ-OPENSREEN)**

CZ-OPENSREEN (C. Škuta, M. Popr)

- high-throughput screening - demo of laboratory automation
- high-content screening (image-based, label-free)
- compound storage and logistics – demo of advanced microplate reformatting

CZECH BIOIMAGING (I. Novotný, D. Pinkas)

- comparison of various imaging methods, sample preparation for photon microscopy
- demonstration of ultrastructural tomography



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## THURSDAY, SEPTEMBER 9

### Introduction to Drug Development Process

**Organized by: Institute of Organic Chemistry and Biochemistry CAS**

**Venue: Institute of Organic Chemistry and Biochemistry CAS,  
Flemingovo nám. 2, Prague 6**

#### 9:00 – 12:30 Lectures

- introduction (Z. Hostomský and M. Fusek)
- structure biology (P. Maloy Řezáčová)
- in silico chemistry (P. Hobza)
- medicinal chemistry I (Z. Janeba)

#### 12:30 – 13:30 Lunch

#### 13:30 – 16:00 Lectures and demonstrations

- HBV initiative (I. Píchová)
- medicinal chemistry II (R. Nencka)
- tour around the institute



Bruker Avance III HD, 600 MHz Cryo



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## FRIDAY, SEPTEMBER 10

### Introduction to Experimental Research on Metabolism

#### Organized by: Institute of Physiology CAS

Laboratory of Adipose Tissue Biology, Bioenergetics, Biological Rhythms, Epithelial Physiology and Metabolism of Bioactive Lipids

**Venue:** Institute of Physiology CAS, Vídeňská 1083, Prague 4

#### 9:00 – 12:00 Lectures

- cellular energy provision, intermediary metabolism, mitochondria, and mitochondrial oxidative phosphorylation (T. Mráček)
- mitochondrial myopathies – rare inherited diseases of mitochondrial metabolism (P. Pecina)
- energy balance, adipose tissue, obesity and associated metabolic dysfunction (M. Rossmeisl)
- nutrition and metabolism (O. Kuda)
- Laser Captured Microdissection (LCMD) - general info, options, limits, and processing of LCMD samples (M. Vodička).
- basic mechanisms of circadian regulation (A. Sumová)

#### 12:00 – 13:00 Lunch

#### 13:00 – 16:00 Demonstrations

- metabolic screening using mass spectrometry
- methods for phenotyping metabolism at the whole body level
- preparing tissue for LCMD (staining, cutting, fixation), dissecting regions of interest
- recording of circadian rhythms - from human to Petri dish

