



EUROPEAN UNION  
European Structural and Investment Funds  
Operational Programme Research,  
Development and Education



# SUMMER COURSE FOR MEDICAL STUDENTS, SEPTEMBER 7-11, 2020

## PROGRAM

### MONDAY, SEPTEMBER 7

#### Introduction to Experimental Cardiovascular Research

**Organized by: Institute of Physiology CAS**

Laboratory of Developmental Cardiology, Laboratory of Experimental Hypertension

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

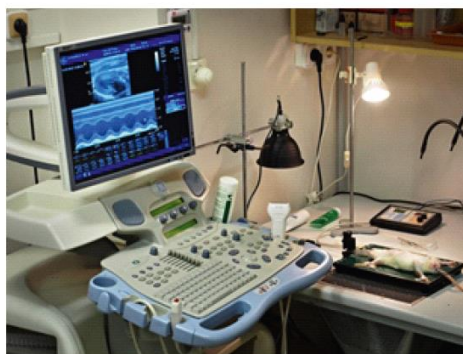
#### 9:00 – 12:00 Lectures

- 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, calcium influx, calcium sensitization (I. Vaněčková)
- pathophysiology of hypertension, end-organ 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
- functional assessment of embryonic cardiovascular system by videomicroscopy
- assessment of contractile properties of vascular smooth muscle



*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*



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# SUMMER COURSE FOR MEDICAL STUDENTS, SEPTEMBER 7-11, 2020

## PROGRAM

### TUESDAY, SEPTEMBER 8

#### Introduction to Experimental Research on Metabolism

##### Organized by: Institute of Physiology CAS

Laboratory of Adipose Tissue Biology, Laboratory of Epithelial Physiology,  
Laboratory of Bioenergetics, Laboratory of Biological Rhythms

**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 diseases (M. Rossmeisl)
- nutrition, types of dietary lipids, dietary interventions using n-3 fatty acids (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



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## PROGRAM

### WEDNESDAY, 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 4

#### 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



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# SUMMER COURSE FOR MEDICAL STUDENTS, SEPTEMBER 7-11, 2020

## PROGRAM

### THURSDAY, SEPTEMBER 10

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

**Chemical biology** in Academia what is probe and what is drug?

- drug repurposing, biochemical
- cell-based and model-organism-based assays
- signaling pathways, target ID
- big data and how to make sense out of it

**Advanced bioimaging** - principles of fluorescence microscopy

- fluorochromes, confocal microscopy
- principles of super-resolution microscopy (STED, SIM, STORM/PALM)
- live cell imaging
- principles of electron microscopy TEM, STEM and SEM for biomedicine,
- cryoelectron microscopy and tomography
- immunodetection of molecules
- principle of analytical ultrastructural methods

#### 12:00 – 13:00 Lunch

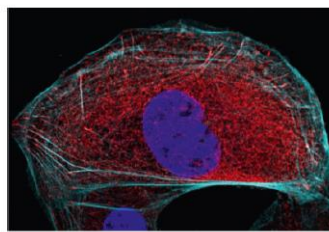
#### 13:00 – 16:00 Demonstrations

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

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

**National Infrastructure (Czech Bioimaging)**

- comparison of various imaging methods, sample preparation for photon microscopy
- demonstration of ultrastructural tomography
- tour around the institute



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## PROGRAM

### FRIDAY, SEPTEMBER 11

#### Introduction to Neuroscience

#### Organized by: Institute of Physiology CAS

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

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

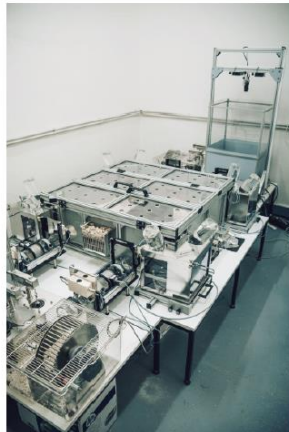
#### 9:00 – 12:00 Lectures

- 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
- registration of spontaneous and evoked electrical activity of the brain



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