NEUROSCIENCES

Chairman of the Subject Area Board (SAB)
prof. MUDr. Jan LACZÓ, Ph.D.
Department of Neurology
Second Faculty of Medicine
Charles University and Motol University Hospital
V Úvalu 84
150 06 Prague 5
phone: +420 224 436 860
e-mail: jan.laczo@fnmotol.cz

Contact person
ThDr. Jitka Sýkorová, Ph.D.
Department for PhD Study
Second Faculty of Medicine
Charles University
V Úvalu 84
150 06 Prague 5
phone:+420 224 435 836
e-mail: jitka.sykorova@lfmotol.cuni.cz

Characteristics of the study programme

The study programme Neurosciences is concerned with all aspects of the study and research of nerve tissue, both central and peripheral, in its physiologic state and in disease, in basic research and in clinical applied research. The study programme consists of the following parts: Neuroanatomy, Neurophysiology, Neurogenetics, Neuropathology, Neurology, Psychiatry, Neurosurgery, Neuropharmacology, Neurorehabilitation, Neuroimaging.

The goal of the study is that the student may obtain knowledge of the field of neurosciences as a whole, ability of independent scientific work, ability of independent research including of publication of its results in scientific/professional periodicals with a defined IF, all of that with the respect of nerve tissue and its physiology and pathophysiology, and clinical research.

Requirements during the study

- Quality ISP and its proper implementation (checked by the supervisor).
- Completion of the course Advances in Neurosciences. This is a two-week full-day course, which is an overview of current neuroscience research. It takes place at selected workplaces of Charles University and the Czech Academy of Sciences and Na Homolce Hospital. Tolerated absence is one and a half days.
- Another course from the DSPB offer.

The SAB will now recognize the following courses in scientific work and biostatistics:

1. Course of basics of scientific work at the Czech Academy of Science (B90068)
2. Course of basics of scientific activities at the Second Faculty of Medicine CU (DS001)
3. Introduction to the practical methodology of scientific work at the Third Faculty of Medicine CU (CPGS005)
4. Biostatistics course for doctors and PhD students in biomedical fields at the First Faculty of Medicine CU (B90211)

- English language examination (D0400003; Examination at the Department of Languages, Second Faculty of Medicine CU, state language examination or internationally recognized language examination, e.g. TOEFL, Cambridge Certificate)
- State doctoral examination (D0400001)
  Active participation in scientific conferences, congresses and conventions (according to the supervisor's instructions or with his/her recommendation).

  Acquisition of the basics of scientific work so that after graduation the student is capable of performing independent scientific work and publications of its results in internationally recognized journals.

Requirements for internships

In accordance with the Rector's Directive recommends an internship at a foreign institution for a duration of at least one month. However, part of the study abroad can be replaced in justified cases by another form of direct student participation in international cooperation, e.g. participation in a research project.

Listed courses

Basics of scientific work at the Czech Academy of Science (B90068)
Course of basics of scientific activities at the Second Faculty of Medicine CU (DS001)
Introduction to the practical methodology of scientific work at the Third Faculty of Medicine CU (CPGS014)
Biostatistics course for doctors and PhD students in biomedical fields at the First Faculty of Medicine CU (B90211)

Requirements for the State doctoral examination (SDE)

- Completion of the course Advances in Neurosciences (B90005) and another course within the DSPB (compulsory is at least one according to the choice of the student and the supervisor)
- Acceptance / publication of at least one article in a peer-reviewed journal from the RIV database, which, however, need not have an IF. If the student is a co-author, it must be an original article in a journal with a defined IF; if the student is the first

author, it must be an article (original or review). Short messages, letters to the editor, etc. are not recognized for this purpose.
The dates of SDE for the academic year 2020/2021 can be found here.

Examination topics for the SDE

1. Structure and function of the cell membrane
2. Membrane transport
3. Nerve cell excitability and ion channels
4. Membrane and action potential
5. Impulse conduction in nerve fibres
6. Glial cells and their functions
7. Structure and function of the synapses
8. Synaptic receptors
9. Overview of mediators
10. The role of acetylcholine at the neuromuscular junction and in the CNS
11. Catecholamine mediators, serotonin
12. Opioid peptides and their receptors
13. Neuropeptides and functions of the hypothalamus
14. Excitatory aminoacids as synaptic mediators
15. Glutamate receptors
16. GABA and glycine
17. Nitrogenoxide and its role in the CNS
18. G proteins and cyclic nucleotides in the CNS
19. Protein phosphorylation and regulation of the functions of the nervous system
20. Axonal transport
21. Development of the CNS and neural crest – the role of genes
22. Neural plasticity and regulation
23. The effect of ageing on the nervous system
24. Cerebrospinal fluid and blood-brain-barrier
25. Blood circulation in the brain and energy metabolism of the brain
26. Extracellular space of the CNS
27. Structure and functions of the peripheral nervous system
28. Structure and functions of the spinal cord
29. Structure and functions of the vegetative nervous system
30. Sensory functions, overview, general characteristics of receptors
31. Somatosensory system
32. Pain
33. Eye – receptors and nerve cells
34. Anatomy and physiology of the central visual system
35. Hearing – the inner ear and the central auditory system
36. Vestibular system
37. Chronobiology
38. The motor system of the brain
39. The control of movement – the role of the basal ganglia and the cerebellum
40. The brain and emotions – the role of the limbic system

41. The brain cortex and the integrative functions of the CNS
42. The role of the thalamus
43. The electric activity of the brain – electroencephalography (EEG)
44. The electric activity of the brain – slow (evoked) potentials
45. The electric activity of the brain – evoked potentials
46. Functional brain imaging techniques
47. Recording of neuronal and glial activity – extracellular and intracellular recordings
48. Sleep and wakefulness – their regulation and relation to basic physiological functions
49. Ion-selective microelectrodes, the principles of their function and use
50. Brain sections, the principle of the method and its use
51. Basics of brain anatomy
52. Disorders of speech and gnosia
53. Neurophysiology of learning and memory
54. Ischaemia and hypoxia of the CNS
55. Epilepsy
56. Disorders of the basal ganglia and their mediators
57. Alzheimer´s disease
58. The biochemical aspects of mental disorders
59. Behavioural models of learning and memory
60. Neuroendocrinology
61. Disorders of synaptic transmission at the neuromuscular junction
62. The effects of toxic substances on the nervous system
63. Demyelinating diseases
64. Psychiatric diseases – basic characteristics
65. Disorders of sleep and wakefulness
66. Stereotaxy of the CNS, Gamma Knife radiosurgery

Recommended literature

Snell, R. S.: Clinical Neuroanatomy for Medical Students. 5th Edition. Lippincott, Williams and Wilkins, 2001.
Brodal, P.: The Central Nervous System. 3rd Edition. Oxford University Press, 2004.
Bear, M. F., Connors, B. W., Paradiso, M. A.: Neuroscience – Exploring the Brain, 2nd edition, Lippincott, Williams and Wilkins, 2001.
Purves D. et al.: Neuroscience. 2nd Edition, Sinauer Assoc. Sunderland, 2001.
Rosenzweig M. R., Breedlove S. M., Liman A. L.: Biological Psychology. 3rd Edition, Sinauer Assoc. Sunderland, 2002.
R. Cooper, J. R., Bloom, F. E., R. H. Roth R. H.: The Biochemical Basis of Neuropharmacology. 8th Edition, Oxford University Press, 2003

Publication activity requirements

Preparation and implementation of research that leads to the acquisition of results, which are subsequently published and presented in the dissertation thesis. Submission of at least three original works accepted for publication or already published in journals with a defined impact factor, the cumulative value of which exceeds 1.5. The student is the first author of at least one of these publications and the impact factor of the journal of this work exceeds 1.0.

Defence requirements

- SDE
- At least three accepted / published original publications in journals with IF (total sum is higher than 1.5), of which at least one publication with first authorship in a journal with IF higher than 1.0.
- **The Subject Area Board requires a Summary of the Dissertation.**