



INSTITUTE OF NEUROSCIENCE AND PHYSIOLOGY

NEU001 Neurochemistry, 6 credits

Neurokemi, 6 högskolepoäng

Second Cycle

Confirmation

This course syllabus was confirmed by Institute of Neuroscience and Physiology on 2021-04-27 and was last revised on 2021-07-07 to be valid from 2022-01-17, spring semester of 2022.

Field of education: Medicine 30%, Pharmacy 10% and Science 60%

Department: Institute of Neuroscience and Physiology

Position in the educational system

Freestanding course at second cycle level. The course may be included in a master's education in medicine, biomedical laboratory science, biology, biochemistry, chemistry, pharmacy or pharmaceutical science.

Main field of studies

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Specialization

A1N, Second cycle, has only first-cycle course/s as entry requirements

Entry requirements

Student with Degree of Bachelor in biology, biochemistry, medicine, biomedical laboratory science, chemistry, pharmacy or pharmaceutical science is qualified to the course. Furthermore, English B are required/English 6 or the equivalent level of an internationally recognized test, for example TOEFL, IELTS.

Learning outcomes

Upon completion of this course, students should be able to:

Knowledge and understanding

- explain the different mechanisms of neurotransmission for different neurotransmitter systems,
- describe in detail the different neurochemical mechanisms underlying the pathology of neurodegenerative- and psychiatric diseases,
- explain and compare the principles and application areas of neurochemical techniques and what kind of chemical changes can be studied with each of these,
- describe and compare different neurochemical methods that are used for diagnosis of brain diseases,
- explain and compare advantages and challenges of different cell- and animal models for studying neurochemical processes and neurological diseases.

Competence and skills

- demonstrate understanding of different neurochemical processes in general and in particular synaptic neurotransmission,
- choose and motivate the choice of appropriate techniques for studying neurochemical processes,
- interpret results from neurochemical analyses and relate these data to specific pathological mechanisms in neurological diseases.

Judgement and approach

- discuss around ethical aspects of neurochemical experiments such as design of cell- and animal experiments as well as patient's ethics,
- delineate neurochemical aspects that are relevant to single disease pathologies.

Course content

The course intends to communicate an extensive overview of different neurotransmitter/receptor -and the signaling circuits in the nervous system. This includes amino acid-based neurotransmitters (such as e.g., dopamine, glutamate and serotonin), neuropeptides (e.g. endorphin) and other neuroactive compounds. The

course focuses on pre- and postsynaptic events in neuronal signaling and the associated molecular mechanisms. A further topic are neurotoxic effects of drugs, drugs of abuse and environmental toxins that affect neuronal signaling.

Another central topic of the course will be on neurochemical methods to study synaptic mechanisms including mainly electrochemical techniques (electrophysiology, amperometry, fast scan cyclic voltammetry, FSCV), in vivo micro dialysis, super resolution microscopy, electron microscopy as well as mass spectrometry methods (LCMS, CEMS, imaging MS).

The course further aims to provide a concise theoretical background on neurochemical mechanisms underlying neurodegenerative- and psychiatric diseases. Several different cell- and animal models will be discussed as well as various neurochemical methods for studying disease mechanisms in vivo and in situ. Furthermore, it will be placed strong emphasis on clinical aspects of neurodegenerative and psychiatric diseases, their pathology, risk factors, genetics, diagnosis and established and new treatment strategies. Here a particular focus will include clinical neurochemistry strategies for the development of novel biomarkers for these diseases and to establish those markers in clinical routine.

Form of teaching

The course is taught through lectures and one mandatory group work, including seminars.

Language of instruction: English

Assessment

Course examination is carried out by written exam and oral presentation of the group work. The written exam is given three times a year: one regular opportunity at the end of the course and two re-examinations for students that didn't pass the previous exam.

The group work is mandatory and requires active participation for passing and is examined with an oral presentation of the course participants in front of the teachers and the other course participants. Students that failed the group work will be given another opportunity to present their group work before the next term the course is taking place.

If a student who has failed the same examined component twice, wants to change examiner before the next examination, they should submit a written request to the department responsible for the course. The request shall be granted unless there are special reasons to the contrary (Chapter 6, Section 22 of Higher Education Ordinance).

If the University of Gothenburg has decided that a student is eligible for special study support, the examiner may, provided it is compatible with the aim of the course and it can be done within the scope of available resources, decide to offer the student an adjusted examination or a different examination format.

In cases where a course has been discontinued or has undergone major changes, the student should normally be guaranteed access to at least three opportunities for examination (including the regular examination session) during a period of at least one year, but at the most two years after the course has been discontinued/changed.

Grades

The grading scale comprises: Pass (G) and Fail (U).

Course evaluation

Course evaluation is carried out with respect to the course teaching content and execution and will take place at the end of the course through an individual, anonymized questionnaire. The results and potential changes within the course setting are to be announced to both the students that carried out the evaluation and to students that are about to take the course.