



LUNDS UNIVERSITET

Medicinska fakulteten

**Biomedical, medical and public health training
board (NBMFU)**

COURSE SYLLABUS

Ref 1(3)

M 2007/1759

M2011/167

Adopted by the NBMFU on 17 October 2007

Valid from spring term 2008

Revised on 4 June 2008

Revised on 24 Jan 2011 by the Program Director

Valid from spring term 2011

BIMM54 Molecular and Experimental Neurobiology

15 higher education credits

Second cycle

General Information

Main field

Biomedicine

Subject

Neurobiology

Type of course

The course is an optional specialisation in the Master of Medical Science programme in Biomedicine and is taught in term 2.

Language of instruction

English

Learning Outcomes

Knowledge and understanding

On completion of the course, students shall be able to:

- explain neurobiological phenomena using scientifically correct language;
- describe the functional anatomy of the brain, including the visual system, basic ganglions and cortex, the cell types found in the CNS and their function, and neurogenesis and its importance for normal brain function;
- explain the human brain's cognitive functions, synaptic transmission and the probable mechanisms for different forms of synaptic plasticity in the CNS;
- describe the probable mechanisms of cell death in the CNS, the origin of neurodegenerative diseases and epilepsy and therapeutic measures used against these diseases;
- describe the experimental bases and ethical problems with new methods based on neuroprotective and regenerative treatments;
- explain how electrophysiological experiments are carried out in acute brain sections *in vitro* using field- and whole-cell patch-clamp recordings.

Skills and abilities

On completion of the course, students shall be able to:

- describe and evaluate the immunohistochemical methods applied to brain sections;
- present, critically evaluate and discuss scientific papers in the field of neurobiology.

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Judgment and approach

On completion of the course, students shall be able to:

- reflect on ethical approaches in neurobiology research.

Course Content

The course is based on the latest scientific and technical developments in neurobiology. Students are exposed to experimental findings in different main aspects of the field. The platform of the course is the critical evaluation and analysis of current knowledge. The course consists of three main stages: 1) Introduction to CNS anatomy and function, 2) description and mechanisms of various acute and chronic neurological diseases, and 3) general therapeutic methods for neurodegenerative diseases. The course covers the following subjects:

- The CNS: Cellular morphology and function
- The different types of cells in the CNS and their function
- Nociceptive receptors and their function in motor coordination
- Neurogenesis and its importance during embryonal development and normal brain function in adults
- Trophic factors and their role in brain plasticity
- Cognitive function in the human brain
- Synaptic transmission in the CNS and different types of synaptic plasticity
- Somatosensory systems and pain
- Emotional systems, depression
- Basic ganglions, cerebellum and motoric systems
- An overview of neurodegenerative diseases with a special focus on the cellular/molecular mechanisms in Alzheimer's, Parkinson's and Huntingdon's diseases, and amyotrophic lateral sclerosis
- Cellular/molecular mechanisms in epilepsy
- Mechanisms for cell death in the CNS
- Experimental bases for new treatment methods which are based on neuroprotection and regeneration (neuroprotective drugs, gene therapy, and cell transplants) in neurodegenerative diseases and ethical aspects of these treatments.

Instruction and Examination

The course is based on problem-based learning (PBL) and consists of week-long themes. Instruction consists of the following elements:

- Overview lectures which are related to the week's theme in the course.
- PBL cases which are related to the week's theme in the course.
- "Journal Clubs" where students present scientific papers in detail, i.e. logical basis, experimental design, main findings and conclusions. The papers will be recently published papers in neurobiology.
- Practical exercises, in which a number of modern techniques used to study the CNS are demonstrated.
- A laboratory experiment in which immunohistochemical methodology is applied to brain sections.

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Examination of the course objectives is done through a written examination where one part consists of multiple choice questions and the other part consists of questions which require narrative answers testing the understanding of neurobiological theory and method.

Other course requirements: Active participation in PBL-exercises, all laboratory work and the "Journal Clubs".

Grades

The grades awarded are Pass or Fail.

Admission Requirements

Molecular medicine (BIMA51) or at least 120 higher education credits in scientific subjects, which must include 15 credits of basic chemistry (any of the courses KEMA00, KEMA01, KEMA02, KEMA03), 15 credits of cell biology (BIMA12, MOBA02 or equivalent), and 15 credits of physiology (BIMA34 or BIOC01).

Literature

Purves D et al (eds) "*Neuroscience*", Sinauer. Scientific papers will be distributed during the course.

Further Information

The course replaces the earlier BIM081.