neu190 - Biochemical concepts in signal transduction

Module label: Biochemical concepts in signal transduction
Module code: neu190
Credit points: 15.0 KP
Workload: 450 h

Used in course of study:
- Master's Programme Neuroscience > Background Modules

Contact person:
- Module responsibility: Karl-Wilhelm Koch
- Authorized examiners: Alle hier genannten
- Module counseling: Alexander Scholten

Entry requirements:
Skill to be acquired in this module:
- Neurosci. knowlg. Expt. methods
- Independent research + Scient. literature + Social skills
- ++ Interdiscipl. knowlg. Maths/Stats/Progr. + Data present./disc. + Scientific English
- Ethics

Upon successful completion of this course, students:
- Know fundamental principles of molecular mechanisms of signal processing in cells
- Know the properties and functional roles of proteins involved in signaling pathways
- Have a basic understanding of structure-function relationships of receptor molecules (e.g. G-protein-coupled receptors) and their down-stream targets
- Know the main hypotheses and their experimental confirmation in selected signal transduction pathways
- Are able to discuss and present current concepts and knowledge of cellular signaling
- Learn by selected experiments, how to study experimentally protein function in signaling
- Are able to assess experimentally prepared data sets and have a good command of how to present them scientifically
- Have a basic knowledge how to plan and perform a sequential set of experiments in molecular life sciences
- Have a basic knowledge how to operate and use scientific equipment like spectrophotometer, fluorescence spectrophotometer, clean benches in cell culture and chromatographic systems (HPLC)

Module contents:
Lecture on the molecular fundamentals of cellular signal processes
Lecture topics:
- Introduction to the concept of signal transduction
- G protein-coupled receptors
- G proteins and effector molecules
- Biochemical properties of secondary messenger molecules
- Down-stream targets of secondary messengers and physiological responses
- Calcium and signaling networks
- Nitric Oxide and nitric oxide synthases
- Tyrosine-Kinase-receptors
- Signaling cascades of monomeric G proteins
- Molecular regulation of the cell cycle
- Biochemical aspects of sensory cells, their receptors and signaling pathways

Seminar:
Signal transduction
Students prepare presentations and discussions on current reviews written by leading experts in the fields; topics include: structural basis of G-protein coupled receptors, G proteins, adenylate cyclases, cyclic nucleotide research, calcium signaling, signal transduction in vision, ion channel function, nitric oxide synthase function.

Exercises:
Students perform experiments on cellular signal transduction and enzymology; they learn to express proteins in heterologous cell systems; they learn how to purify proteins and characterize them in subsequent assay systems.

Reader's advisory:
Current reviews on topics of signal transduction as preparation for the presentation in the Seminar; list of reviews will be adjusted every year;
Textbooks of cell biology and biochemistry.
Alberts et al., Molecular Biology of the Cell, 5th edition or later; Stryer, Biochemistry, 7th edition or later; these textbooks are updated almost every 3 or 4 years.
Current literature on topics of signal transduction (as announced in the preparatory meeting).

Links
Language of instruction English
Duration (semesters) 1 Semester
Module frequency jährlich
Module capacity unlimited
Reference text Course in the second half of the semester
Regular active participation and seminar presentation(s) are required to pass the module.

Modullevel
Modulart Wp (Wahlpflicht)
Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination Time of examination Type of examination
Final exam of module within 2 months after the end of the course 50% written exam of 90 min., 50% report(s)
Paper(s) are to be read.
Regular active participation is required for the module to be passed.

Course type Comment SWS Frequency Workload attendance
Lecture 1.00 WiSe 14 h
Exercises 8.00 WiSe 112 h
Seminar 1.00 WiSe 14 h
Total time of attendance for the module 140 h