

Module Number 5a		Title: Molecular Neuropathology	
Module type: compulsory elective		Language: English	Group Size: 6 students
Study semester: 2		Availability: summer semester	Study semester: 2
Workload: 420 hrs	Credits: 14 CP	Contact time: 123 hrs	Independent Study: 297 hrs
1	Courses a) Lectures and/or Seminars 6 PPW b) Practical Course 5 PPW		
2	Intended Learning Outcomes After completion of this module the students will be able to describe molecular mechanisms underlying diseases of the central nervous system, primarily related to neuroinflammation, neurodegeneration, and neoplastic transformation. The students will be familiar with the clinical symptoms and therapeutic options of such diseases, e.g. Multiple Sclerosis, Stroke, Alzheimer´s disease and brain tumors. They will be able to summarize possible mechanisms of neuronal and glial damage in neuroinflammation and age-associated neurodegeneration, to describe the origins of brain tumors and mechanisms of cellular transformation, and to present links between neuroinflammation, neurodegeneration and brain tumor development. The students will get an insight into clinical routine in the Department of Neurology. The students will be introduced to different systems (ranging from unicellular to multicellular model organisms) and techniques used to investigate neurological diseases at the molecular level. The students will be able to work accurately with laboratory equipment and to perform common laboratory methods in biochemistry, molecular and cell biology. The students will be able to analyse and document experimental results according to good scientific practice standards, and to present, discuss, and defend their experimental results.		
3	Content Lectures The lectures will cover the clinical symptoms, therapy, and prevention of myasthenia gravis, stroke, multiple sclerosis, Alzheimer´s disease, and different forms of brain cancers. The molecular pathology and underlying mechanisms of the diseases (genetics, biochemical and cellular processes) will be discussed. Moreover, the lectures will provide general insights into basic immunology, cell death mechanisms, the aging process, protein folding and misfolding, stem cells in the brain. Practical course The students will perform experiments in the laboratories of the Department of Neurology, the Department of Neuropathology, and the Leibniz Research Institute for Environmental Medicine. Students will perform a variety of methods including the following during the practical course: Isolation and culture of primary cells and eukaryotic cell lines; differentiation of cells; migration assays; phagocytosis assays; pharmacological manipulation of cells and <i>C. elegans</i> ; extraction and quantification of cellular proteins, SDS-PAGE and Western blotting; ELISA quantification of proteins; quantitative real-time PCR; immunohistochemistry and fluorescence microscopy; FACS analysis; recombinant expression of proteins and their purification; induction of stroke via photothrombosis; optical coherence tomography; <i>in vivo</i> behavioral assays to investigate age-associated neurodegenerative disorders in <i>C. elegans</i> .		
4	Teaching methods Lectures with accompanying practicals including hands-on sessions and seminars		

5	Prerequisites Formal: Successful completion of module 1. Proficiency in English level B2 of Common European Framework of Reference for Languages (CEFR) is requested. With regard to content:
6	Examination types Written exam (120 minutes)
7	Requirements for award of credit points Participation in practical courses and seminars, passing the final exam
8	Module applicability (in other study courses) The module is also used for the study program of human medicine.
9	Assessment The mark given will contribute to the final grade in proper relation to its credits.
10	Module convenor and main lecturers Prof. Dr. med. Orhan Aktas, PD Dr. rer. nat. Carsten Berndt, Dr. rer. nat. Michael Dietrich, Dr. med. Michael Gliem, Dr. med. Jens Ingwersen, Dr. rer. nat. Gabriel Leprivier, PD Dr. med. Nico Melzer, Dr. rer. nat. Tim Prozorovski, PD Dr. med. Tobias Ruck, <u>Prof. Dr. rer. nat. Sascha Weggen</u> , PD PhD MD Natascia Ventura
11	Further information A FELASA certificate is recommended and can be obtained by attending Module 2c "Laboratory Animal Course" in advance. The regular attendance at the lectures is strongly recommended. The content of the lectures is prerequisite for the practical course and the seminar.