



DEPARTMENT OF NEUROBIOLOGY, CARE SCIENCES AND SOCIETY

H1F5539 Alzheimer's Disease: Clinical Features and Pathogenic Mechanisms, 3 credits (hec)

Alzheimers sjukdom: sjukdomsbild och molekylära mekanismer, 3 högskolepoäng

Third-cycle level / Forskarnivå

Approval

This syllabus is approved by the The Committee for Doctoral Education on 2023-12-11, and is valid from Spring semester 2024.

Responsible department

Department of Neurobiology, Care Sciences and Society, Faculty of Medicine

Prerequisite courses, or equivalent

Course in Basic Neuroscience or corresponding knowledge

Purpose & Intended learning outcomes

Purpose

The purpose of the course is to enable doctoral students to obtain a broad knowledge of Alzheimer's disease, covering cellular mechanisms as well as clinical features and diagnosis. Experts in the field are invited to give the lectures securing communication of up-to-date knowledge about the disease. Students will also get the opportunity to obtain deeper knowledge on specific sub-topics during the planned group assignments. The second part is created to enhance the practical knowledge about brain development, brain anatomy and connectivity and AD and dementia neuropathologies.

Intended learning outcomes

At the end of the course the students are expected to:

- 1) have acquired up-to-date knowledge of different aspects of Alzheimer's disease from clinical symptoms and diagnosis to molecular mechanisms and future therapeutic approaches.
- 2) understand the neuroanatomical base of unique feature of human brain development: specific lamination, cellular elements and timing of developmental events.
- 3) identify and understand the macroanatomical and microscopical structures of adult human

brain and their interconnections.

4) recognize, to discuss and to differentiate the pathomorphological hallmarks between the different neurodegenerative/dementia disorders.

Course content

A) Development of human brain from foetal to newborn and perinatal period. A specific emphasis towards a transient foetal lamination pattern, migration and differentiation of the neurons, foetal neuronal circuits and plasticity in the foetal brain. The normal brain tissue and pathological lesions will be demonstrated on microscope and on MRI images.

B) development and distribution of the connection in the brain with specific emphasis on the frontal cortex circuits in the normal development, adulthood and in the neurodegenerative diseases such as Alzheimer Disease. The tracing method will be discussed.

C) The main histological features of adult human brain, cytoarchitectonic differences between different regions and importance of thalamic and basal ganglia projection to the cortex. A specific emphasis to comparative anatomy of the cortex between different species: rats, dolphins, camel, macaque, pig and sheep will be presented on stained sections.

D) Neuronatomical features of the neurodegenerative diseases such as Alzheimer disease, Parkinson Disease and Frontal lobe dementia. The extensive microscopic exercises will help students to analyze neuropathological features using diverse staining techniques. At the end of the course students will be examined theoretically and practically using microscope and macro-photographs.

Forms of teaching and learning

The pedagogic framing is based on:

- 1) lectures by invited Swedish and international scientist who will cover the topics of clinical signs and symptoms, diagnosis, pathology, epidemiology, genetics, molecular mechanisms, animal models, therapeutic strategies.
- 2) group work with themes related to the lectures, preparation of seminars and presentation of group work.
- 3) microscopy exercises and demonstrations.

The first week consists of lectures given by leading clinicians and basic research scientist. In parallel, group assessments will be run directly connected to the topics of the lectures. The second week is aimed for practical microscopy exercises and demonstrations to obtain hands-on knowledge about brain development, brain anatomy, brain connectivity and AD and other dementia neuropathologies:

Language of instruction

The course is given in English.

Grading scale

Pass (G) /Fail (U)

Compulsory components & forms of assessment

Compulsory components

Lectures, group work, practical exercises and demonstrations are compulsory. Absence from any of these should be compensated for by essay(s) on the topic(s) missed, in agreement with the course director.

Forms of assessment

Group presentation and oral examination of the topics by an examiner. The practical skills will be examined by written examination that consists of 4 parts: questions, recognition, drawing, microscopy.

Course literature

Scientific reviews, as well as recent articles. The material will be distributed to the course participants at the beginning of the course.