

Doctoral Program in Neuroendocrinology

Mandatory subjects

Program Director: *Dr. Habil. Zsolt Bagosi, associate professor*

Neuroendocrinology I: The role of Neuropeptides in the Central Nervous System (Lead instructor: Dr. Habil. Zsolt Bagosi; 28 hours/6 credits, semester 1)

Neuroendocrinology II: Function of Neuroendocrine Systems under Normal and Pathological Conditions (Lead instructor: Dr. Habil. Zsolt Bagosi; 28 hours/6 credits, semester 2)

Chemistry of Biopolymers (Lead instructor: Prof. Dr. Gábor Tóth; 28 hours/6 credits, semester 2)

Course description

Informing students on course requirements

Program: PhD full-time training
Course: Neuroendocrinology I: The Role of Neuropeptides in the central nervous system
Course Code: EODI-NEUEN-01
Academic year/Semester: 2025/26 – 1 st semester
Educator and contact details (e-mail): bagosi.zsolt@med.u-szeged.hu
Type of course: <u>lecture</u> /seminar/practice/laboratory
Weekly hours of the course: 2 hours
Credit value of the course: 6
Type of examination: final exam at the end of semester, practice exam, other: <u>written five-step report</u>

DESCRIPTION

Neuroendocrinology is an interdisciplinary field that studies the functions of the nervous and endocrine systems under normal and pathological conditions. The nervous system produces protein-based substances called neuropeptides, which can enter the bloodstream and regulate the function of endocrine glands, thereby maintaining the body's internal balance. However, genetic and environmental factors can upset this balance, resulting in various diseases. For example, among the systems we study is the hypothalamic-pituitary-adrenal (HPA) axis, which is the central regulator of the stress response; excessive stress can lead to anxiety or depression, which are associated often with an imbalance of neuropeptides. The primary aim of our preclinical research is to discover the physiological and pharmacological effects of these neuropeptides, but our long-term goal is the clinical application of peptides or peptide fragments with therapeutic effects.

TOPICS

Part 1: Neuropeptides: classification, synthesis and co-localization with classical neurotransmitters (Dr. Zolt Bagosi)

Part 2: Regulation of food intake and energy balance (Dr. Júlia Szakács)

Part 3: Regulation of hypothalamic-pituitary-target organ systems (Dr. Katalin Eszter Ibos)

Part 4: Receptors for peptide hormones, neuropeptides and neurotransmitters (Dr. Miklós Jászberényi)

Part 5: Classical neurotransmitters (Dr. Zolt Bagosi)

Part 6: Neurotransmitter and neuropeptide control of hypothalamic and pituitary hormones (Dr. Krisztina Csabafi)

Source: Wilkinson & Brown: An Introduction to Neuroendocrinology, 2nd Edition, 2015

REQUIREMENTS

This PhD course presents the role of neuropeptides found in the central nervous system (e.g., urocortins, kisspeptins) through 14 two-hour lectures, followed by a two-hour consultation and a half-hour test consisting of 20 multiple-choice questions.

Course description

Informing students on course requirements

Program: PhD full-time training
Course: Neuroendocrinology II: Function of Neuroendocrine Systems under Normal and Pathological Conditions
Course Code: EODI-NEUEN-03
Academic year/Semester: 2025/26 – 2nd semester

Educator and contact details (e-mail): bagosi.zsolt@med.u-szeged.hu
Type of course: <u>lecture</u> /seminar/practice/laboratory
Weekly hours of the course: 2 hours
Credit value of the course: 6
Type of examination: final exam at the end of semester, practice exam, other: <u>written five-step report</u>

DESCRIPTION

Neuroendocrinology is an interdisciplinary field that studies the functions of the nervous and endocrine systems under normal and pathological conditions. The nervous system produces protein-based substances called neuropeptides, which can enter the bloodstream and regulate the function of endocrine glands, thereby maintaining the body's internal balance. However, genetic and environmental factors can upset this balance, resulting in various diseases. For example, among the systems we study is the hypothalamic-pituitary-adrenal (HPA) axis, which is the central regulator of the stress response; excessive stress can lead to anxiety or depression, which are associated often with an imbalance of neuropeptides. The primary aim of our preclinical research is to discover the physiological and pharmacological effects of these neuropeptides, but our long-term goal is the clinical application of peptides or peptide fragments with therapeutic effects.

TOPICS

Part 1: Disorders of the hypothalamus and pituitary gland (Dr. Zsolt Bagosi)

Part 2: Disorders of the adrenal cortex and medulla (Dr. Katalin Eszter Ibos)

Part 3: Disorders of the female and male reproductive tract (Dr. Krisztina Csabafi)

Part 4: Thyroid disease (Dr. Júlia Szakács)

Part 5: Disorders of the parathyroids, calcium and phosphorus metabolism (Dr. Miklós Jászberényi)

Part 6: Disorders of the endocrine pancreas (Dr. Zsolt Bagosi)

Source: Hammer & McPhee: Pathophysiology of Disease: An Introduction to Clinical Medicine, 7th Edition, 2014

REQUIREMENTS

This PhD course presents the neuroendocrine systems (e.g. HPA axis, HPG axis) through 14 two-hour lectures, followed by a two-hour consultation and a half-hour test consisting of 20 multiple-choice questions.

Course description

Informing students on course requirements

Program: PhD full-time training
Course: Chemistry of Biopolimers
Course code: EODI-NEUEN-02
Academic year/Semester: 2025-26 2 nd
Educator and contact details (e-mail): Prof. Dr. Tóth Gábor toth.gabor@med.u-szeged.hu
Type of course: <u>lecture</u> /seminar/practice/laboratory
Weekly hours of the course: 2
Credit value of the course: 6
Type of examination: final exam at the end of semester
Preliminary requirements (preliminary academic performance or completed course required to fulfill the purposes and requirements of the course): none
Purpose of course: The aim of the course is to familiarize students with the possibilities of synthesis, chemical properties, analysis, and biochemical behavior of biopolymers (proteins, polysaccharides, nucleic acids).
Outcome requirements of the course (specific academic results to be established by the course): The expected outcome of the course is that students will become familiar with the basic chemical and biological properties of the building blocks of living organisms (proteins, peptides, nucleic acids, carbohydrates). There are no prerequisite courses for enrolling in this course.
Topics: Building blocks of biopolymers, their production possibilities, labeling, precursors. Peptide linking methods, synthesis strategies, advantages and limitations. Use of protective groups, types, construction, removal, compatibility. Principles of solid-phase synthesis, automation options, carriers. Synthesis of post-translationally modified peptides.

Biologically active peptides, agonists, antagonists. The relationship between protein conformation and pathological conditions. Synthesis of oligonucleotides. Carbohydrates. Protein structures and their testing possibilities. Application of biopolymers in research, potential uses in the pharmaceutical industry. Possibilities for isolating and confirming the structure of synthetic biopolymers. Predicting protein structure. Protein structure, simulations, ligand binding.
Supporting methods to achieve learning outcomes: Teaching is supported by presentations in PDF format accessible to students, as well as lists of required and recommended reading.
Evaluation of the acquisition of expected learning outcomes:- Requirements: - Examination requirements: Attendance at classes is compulsory. There are no mid-term exams. The requirements for the oral/written exam are in line with the learning outcomes, demonstrating the expected basic knowledge
Mandatory reading list: There is no required reading list.
Recommended reading list: - Notes and lecture materials available on the institute's website. Proteins with a thousand faces ISBN: 9789633314586