Universitat Autònoma de Barcelona

2017/2018

Neuroanatomy and Cell Neurobiology

Code: 42909
ECTS Credits: 9

Degree	Type	Year	Semester
4313792 Neurosciences	OB	0	1

Contact

Name: Alfonso Rodríguez Baeza
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Use of languages

Principal working language: english (eng)

Teachers

Berta González de Mingo

Joaquim Martí Clúa

Juan Tony de Sousa Valente

Cristina Manjon Castro

María Luisa Ortega Sánchez

Prerequisites

Requirements are those of access to the master. You must have a level of English sufficient for classes that are taught in this language. Other languages used will be Spanish and Catalan.

Objectives and Contextualisation

The general aim of this module is to learn the basic cellular, structural and anatomical characteristics of Central and Peripheral Nervous System, in order to achieve a basic knowledge to understand any field of neuroscience research and the basis of neural pathologies.

Skills

- Conceive, design, develop and synthesise scientific projects in the field of neurosciences.
- Continue the learning process, to a large extent autonomously
- Explain the basis of treatments for pathologies of the nervous system.
- Recognise the anatomical and cellular structure of the nervous system, the cell biology of the different types of neuron and of the glial cells, and formulate experimental approaches to their study.
- Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.

Learning outcomes

1. Continue the learning process, to a large extent autonomously
2. Design optimal contrast methods to observe the cell types of the nervous system
3. Identify the anatomical nuclei affected in the principal pathologies of the nervous system.
4. Identify the cell types affected in the principal pathologies of the nervous system.

5. Identify the different cell types of the nervous system in histological preparations and know their functional characteristics.
6. Identify the principal anatomical structures of the nervous system and their interconnections.
7. Seek out information in the scientific literature using appropriate channels, and use this information to formulate and contextualise a research topic.
8. Show skill in the histological processing of nerve tissue and in the use of an optical microscope.
9. Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.

Content

Theory and practical skills

DEVELOPMENT OF THE NERVOUS SYSTEM (Alfonso Rodríguez-Baeza)

Zygote, Morula and Blastula. Gastrulation. Primary and secondary neurulation.

Spinal cord formation.

Early vesicles and flexures: Rhombencephalon, Mesencephalon and Prosencephalon.

Secondary vesicles and derivatives: Myelencephalon, Metencephalon, Mesencephalon, Diencephalon and Telencephalon.

Cerebral cortex formation. Basal nuclei formation. Hippocampal formation.

Neural crest and derivatives. Ectodermal placodes.

Peripheral nervous system formation: spinal and cranial nerves.

Autonomic nervous system formation.

Overview of the sense organs formation.

The perinatal nervous system.

CELLULAR NEUROBIOLOGY (Juan Tony de Sousa Valente / Berta González de Mingo)

Cytology of neurons. Neuronal cytoskeleton: mechanisms of axonal transport.

Dendritic arborisation and synaptic terminals.

Astrocytes: metabolism, cytoskeleton, function and cell subtypes.

Structure and function of blood-brain barrier.

Microglia: metabolism, functions and cell types.

Radial glia: Characteristics and functions.

Ependymocytes and tanycytes: localization, characteristics and functions.

PNS satellite glia.

Myelinating glia: oligodendrocytes and Schwann cells.

CNS and PNS myelination.

Molecular structure of myelin. Paranode and fissures.

Ranvier node in CNS and PNS.

Glia-glia and neuron-glia communication: contact and soluble factor signaling.

NEUROGENESIS AND GLIOGENESIS (Joaquim Martí Clua)

Embryonic and postnatal neurogenesis. Migration and neuronal positioning

Gliogenesis. Stem and progenitor cells.

Embryonic origin of stem cells. Neuroepithelial cells, radial glia and adult neural stem cells.

Germinative zones and neurogenesis in the adult brain: animal and human models.

Neural stem cells and development of the malignant brain tumors.

NEUROANATOMY (Alfonso Rodríguez-Baeza).

Introduction to the anatomical organization of the CNS.

Overview of the brain: lateral, vertical and basal aspects.

Overview of the skull and cranial meninges organization.

Cerebrum: cerebral hemispheres, basal ganglia and diencephalon.

Brain stem: medulla oblongata, pons and midbrain. Cerebellum

Reticular formation.

Spinal cord: morphology and overview spinal nerves systematization.

Overview of the spine and spinal meninges organization.

Ventricular system and cerebrospinal fluid circulation.

Cranial nerves: nuclei of origin, pathway and overview of the peripheral distribution.

Overview of the special senses: olfaction, vision, taste, hearing and balance.

Overview of the autonomic nervous system: sympathetic and parasympathetic.

Overview of the ascending and descending pathways.

CNS vascularisation: arteries and veins.

Basic notions of comparative neuroanatomy.

NEUROHISTOLOGY (Juan Tony de Sousa Valente / Berta González de Mingo)

Basic structure of nervous tissue.

Microscopic structure of peripheral nerve and ganglia.

Spinal cord: organization of grey and white matter.

Cerebellum: Organization of grey and white matter. Cortical citoarchitecture.

Brain. Neocortex. Cytoarchitecture of neocortical layers.

Brain. Limbic system. Hippocampal cytoarchitecture.

Ventricles and choroid plexus.

Meninges: organization and structure.

PRACTICAL SESSIONS IN LAB

Neurohistology Lab (Juan Tony de Sousa Valente /Berta González de Mingo)

Analysis of microscope slides of topographic histological and immunohistochemical techniques. Study of specific cellular markers in neuropathological tissues.

Dissection Lab (Alfonso Rodríguez-Baeza and Marisa Ortega):

Observation of human anatomical structures in dissected samples and topographic sections.

Methodology

GUIDED ACTIVITIES:

THEORETICAL CLASSES (type TE) Teaching essentially expository and is typically done in a classroom at a time previously scheduled. The students acquire knowledge own module attending lectures and complimenting them with study subjects taught staff.

LABORATORY (type PLAB) Activity that involves carrying out assignments that require students to use a particular infrastructure (dissection and histology labs). It is performed in a specifically equipped premise within a specific time, with the assistance of permanent staff. Programmed on a schedule and within its own premises. In dissection lab of the Faculty of Medicine is compulsory to wear gowns and gloves, and never allowed to take photographs and / or videos to the dissection room.

SUPERVISED ACTIVITIES:

Virtual classes (type VIRT) Teaching imparted without presentiality in the classroom using information and communication technologies (ICT) intensively. Students have a website (accessible through the Virtual Campus UAB) with supplementary teaching materials for different activities.

AUTONOMOUS ACTIVITIES:

Comprehension and reading articles. Personal study, implementation of schemes and summaries, conceptual assimilation of the course content.

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
Cellular Neurobiology, Neurogenesis and Gliogenesis, and Neurohistology	26	1.04	7, 8, 2, 5, 4, 1, 9
Neuroanatomy and development of Nervous System	26	1.04	7, 3, 6, 1, 9
Type: Supervised			
On line activities	52	2.08	7, 5, 3, 4, 6, 1, 9
Type: Autonomous			
Personal study, comprehension and reading articles, conceptual assimilation of	113	4.52	7, 2, 5, 3, 4, 6, 1,

Evaluation

EVALUATION

Evaluation of the module will have an exam (80% of the final score) and a complementary evaluation (20% of the final score).

It is compulsory to get a minimum score of 5/10 in each part (Neuroanatomy and Neurobiology).

Exam (80% of the final score):

Assessment will be done through of short questions and/or objective questions, and could include the interpretation of images.

Complementary evaluation (20% of the final score):

- Attendance to the theorical and practical activities (minimun attendance 80%).
- Assignment and presentations related to Neurobiology.
- Evaluation at Histology Lab.
- Evaluation at Anatomy lab.

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Complementary evaluation	20%	4	0.16	7, 8, 2, 5, 3, 4, 6, 1, 9
Theoretical exam	80%	4	0.16	7, 2, 5, 3, 4, 6, 1, 9

Bibliography

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