Subject: Therapeutic Targets in Neuropsychopharmacology
Code: 32512
Centre: School of Medicine
Master in Pharmacological Research
Level: Master
Type: Optional
Nº de credits: 5
Academic Course: 2017-2018

1. COURSE TITLE

Therapeutic targets in neurophycopharmacology

1.1. Course number

32512

1.2. Content area

Neuropharmacology

1.3. Course type

Compulsory subject

1.4. Course level

Master Degree (posgraduate training)

1.5. Year

First

1.6. Semester

Second

1.7. Imparting language

English

1.8. Prerequisites

Knowledge of Biochemistry and Molecular Biology at the undergraduate level in Biochemistry, Biology, Chemistry, Medicine, Pharmacy, Veterinary Medicine or equivalent degree. Level B2 in English is required since the subject will be taught in that language.

1.9. Minimum attendance requirement

Mnimum assistance 80% (theoretical and practical classes)

1.10. Faculty data

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Contact hours: Previous e-mail appointment is required

1.12. Course objectives

Basic and general

- To acquire and understand basic knowledge allowing to the development and/or application for new ideas in a research context
- The students should be able to integrate knowledge and suggest an opinion, from information that can be incomplete or limited, including considerations abut social and ethic related responsibilities related to such knowledge and opinion
- The students should be able to communicate their conclusions, and the knowledge and reasons
- The students should acquire the learning abilities for studying in a self-directed and autonomous manner
- To acquire the knowledge, abilities and skills required for develop an innovative and high quality research in Pharmacology

Transverse

- Ability to develop a self-teaching plan and to perform an independent bibliographical or database reference in scientific, technical, or regulatory sources
- Ability to perform a correct scientific or technical speech, both to an specialized environment or to general public, including the academic one

Specific

- To know the main therapeutic targets in nervous system diseases, analyzing its physiological significance and therapeutic possibilities
- To identify new potential therapeutic targets nervous system diseases, analyzing its biological significance and therapeutic possibilities
- To know the more widely used techniques and research experimental models Pharmacology and Psychoneuropharmacology
- To design and develop research plans in Pharmacology

1.12. Course contents

The program consists of a theoretical and a practical part. The theoretical lessons are related, to the ionic composition of biological fluids that constitute the basis of the membrane potential and the triggering of action potentials, essential for neuronal communication. The main characteristics and the mechanism that regulate the activity of the different ionic channels of excitable membrane will be reviewed. The concepts of structure, anatomy and organization of the CNS. Thereafter, the different neurotransmitter systems will be explained as well as their regulation.They will obtain information that will allow them the comprehension of the neurochemical and neuropharmacological basis of different neurological, neurodegenerative and neuropsychiatric diseases. They will study the synaptic alterations responsible of diverse diseases of the CNS. This will help they identify therapeutical targets used for the design of drugs for the treatment of diseases of the CNS. At the end of this period the student will have gained the ability to tackle a problem by him/herself. This will allow him/her to identify and orient his/her PhD thesis. The theoretical classes will be accompanied by critical lecture and presentation of scientific literature relevant to this program.

The practical part will consist in the presentation and critical analysis of different publications related to the control neurotransmissions systems explained in the theoretical classes.

Theoretical Classes:

1. Structural organization of neurons and glia. Dynamic structure of neuronal membrane
2. General concepts on the organization of the CNS
3. Main sensorial and motor systems

4. Action potential (I)
5. Action potential (II)
6. Sodium and Potasium Channels
7. Calcium Channels
8. Calcium channels: modulation
9. Electrical activity in neuronal circuits
10. Release of neurotransmitters by exocytosis
11. *Coupling-excitation-exocytosis: Dysfunctional regulation in diseases*
12. Chloride and GABA channels
13. Nicotinic receptors
14. Molecular basis of learning
15. Learning and memory
16. Brain development. Trophic factors
17. Glia and cerebral function
18. Neuroplasticity in neuronal-glial circuits.
19. Pathophysiology of Cerebral metabolism.
20. Autophagy in health and disease
21. Endoplasmic reticulum and mitochondrial calcium
22. Calcium and celular death
23. Oxidative stress and neuronal pathology
24. Common mechanisms in neurodegenerative diseases
25. Neuroinflammation and neurodegeneration
26. Stem cells to treat neurodegenerative diseases.
27. Ischemic stroke: therapeutic bases and current strategies.
28. Update in the psychopharmacological treatment of Schizophrenia
29. Update in the treatment of Depression and other Mood disorders
30. Multiple sclerosis: physiopathology and treatment
31. Therapeutic strategies in Alzheimer´s disease
32. Endocannabinoide signalling and neurodegeneration in AD
33. Parkinson´s disease: new therapeutic strategies
34. Fredric ataxia: new therapeutic strategies
35. Therapeutic strategies in ALS
36. Therapeutic strategies in Huntigton´s disease
37. Perception of pain
38. Models to study drugs for stroke
39. Models to study drugs for AD
40. Models to study drugs for other neurodegenerative diseases

Practical classes:

The practical program consists in 2 activities:

1.- **Interactive sessions**: several therapeutic targets will be selected for te treatment of neurological diseases. The students will be divided into two groups. Each group will have to make a general presentation on the therapeutic target selected, thereafter each student of the group will have to present a scientific manuscript with an example of a drug used to treat a specific neurological diseases.

2.- **Presentation of a scientific paper**: Students will be asked to look for a scientific publication (SCI) related to the contents of the theoretical program and they will have to present and discuss it with their class mates and teacher.

1.13. Course bibliography

- Students will be provided with scientific literature that will be uploaded in the Moodle platform
- Ionic channels of excitable Membranes. 3rd Ed.. Edited by Bertill Hille. Sinauer Associates. ISBN: 0-87893-321-2
- Single channel recordings. 2nd Ed. Edited by Bert Sakmann and Erwin Neher. Plenum Press. ISBN: 978-1-4419-1230-5.
- Principles of neural sciences, 4th Ed. Edited by Erik R. Kandel, James Schwartz and Thomas M. Jessell. Mc-Graw Hill. ISBN: 0-8385-7701-6
- Neuroanatomia. By Luis Puelles López, Salvador Martínez Pérez, M. Martínez de la Torre. Editorial Panamericana. 2008
- BRS Neuroanatomy. By James D. Fix. Ed. Wolters, Kluwer, Lippincott, Williams and Wilkins.
- The synaptic organization of the Brain. By Gordon M. Shepard. Ed. Oxford. University Press. 1990
- Cholinergic Neurotransmission: Functional and Clinical Aspects. By SM Aquilonius and PG Gillberg. Ed. Elsevier
- Neurodegeneration: The Molecular Pathology of Dementia and Movement Disorders, 2nd Edition. Dennis Dickson and Roy O. Weller. ISBN: 978-1-4051-9693-2
- Neurotransmitters and Neuromodulators: Handbook of Receptors and Biological Effects by Oliver von Bohlen und Halbach and Rolf Dermietzel. Ed. Wiley VCM Verlag. GmbH. Germany. 2006.
- Neurotransmitter Release and its Modulation: Biochemical Mechanisms, Physiological Function and Clinical Relevance. By. David A. Powis and Stephen J. Bunn. Ed. Cambridge University Press
- Molecular Neuropharmacology: A Foundation for Clinical Neuroscience by Eric J Nestler. ISBN-13: 978007148127
- Basic Neurochemistry, 8th Edition. Principles of Molecular, Cellular, and Medical Neurobiology. By Brady, Siegel, Albers & Price Ed. Academic Press (2011)

2. Teaching methodology

Lectures will provide organized and structured information elaborated by the teacher. The lecture content will include an initial review of the topic followed by the exposition of the teacher's own research work. The content will be research in course and will include original papers and relevant reviews. Lectures will take 50 minutes, with an additional time for discussion with the students. Different teaching methodologies will be used, such as visual presentations that can be available in the teaching web page.

3 Student workload

		N	%
	Research topics	45 h	44%
	Test about the contents	2 h	
	Presentations of therapeutic targets in neuropharmacology	3 h	
	Oral presentations	5 h	
Independent study time	Weekly study **(5 hours x 3 weeks)**	15 h	56.0 %
	Reading and analysis of scientific papers **(10 hours x 3 weeks)**	30 h	
	Preparation of presentations	25 h	
Total student workload: 25 hours x 5 ECTS		**125 h**	

4. Evaluation procedures and weight of components in the final grade

The evaluation will include two main components. First, continuous evaluation will attend assistance and the active participation in the academic activities (10% of the final mark). The second part of the evaluation will result from: (1) answering the questions related to the theoretical classes (20%); (2) evaluation of the preparation, presentation and defense of the interactive session (20%); and (3) evaluation of the preparation, presentation and defense of a scientific manuscript related to neuropharmacology presented orally (50%). The mark for continuous evaluation will be maintained in the extraordinary evaluation.

5 Course calendar

Timetable will be indicated in the website:
https://www.uam.es/ss/Satellite/Medicina/es/1242667165286/subhome/Master_Universitario_en_Investigacion_Farmacologica.htm