UNIVERSIDAD AUTÓNOMA DE MADRID

33205 - THERAPEUTIC TARGETS IN NEUROPSYCOHARMACOLOGY

Syllabus Information

Code - Course title: 33205 - THERAPEUTIC TARGETS IN NEUROPSYCOHARMACOLOGY

Degree: 721 - Máster en Investigación Farmacológica (2018)

Faculty: 106 - Facultad de Medicina

Academic year: 2019/20

1.Course details

1.1.Content area

It is intended to give a deep insight into one of the basic elements of the systems that neurons use to communicate with each other, that is, the electrical signals that generate the movements of cations and anions through the ion channels located in the soma, dendrites and nerve endings. To this end, knowledge of ion channels is essential for the research and development of new psychotropic drugs and for the identification of new targets to treat neuropsychiatric diseases. The student will also become aware of the electrochemical language of neurons, that is, how neurons communicate with each other and with the cells they innervate, using a language based on electrical and chemical signals. To decipher that electrochemical code, aspects related to cellular neuroanatomy, myelin, transport through membranes, electrical excitability of membranes, neurotransmitters and their receptors and transporters, intracellular signals, calcium signals and the machinery of exocytosis and endocytosis will be analyzed. Likewise, all these concepts will be integrated into issues related to the codes of electrical signals that neurons use to communicate with each other and to control the physiological functions of the organism.

Once familiar with the techniques and the cellular, tissue and animal models used in research in neuropsychopharmacology, students will understand the neurochemical and electrophysiological foundations of synaptic transmission, cellular communication and the organization and functions of the nervous system. Therefore, they will be able to understand the neurochemical and neuropharmacological bases of neuropsychiatric diseases. Thus, the synaptic and biomolecular alterations responsible for diseases of the nervous system will be studied and the identification of therapeutic targets for the research, development and clinical use of a wide range of neuroactive drugs will be facilitated. The student will also become aware of the possible new targets for research and development of new compounds with therapeutic potential in diverse neurological diseases (neurodegenerative, depression, pain, stroke, schizophrenia. etc).

1.2.Course nature

Optional

1.3.Course level

Máster (MECES 3)

1.4.Year of study

1

1.5.Semester

Second semester

1.6.ECTS Credit allotment

5.0

1.7.Language of instruction

English

1.8.Prerequisites

Previous attendance to the General Module of the Master. Level B2 in English is required since the subject will be taught in that language.

1.10.Minimum attendance requirement

Minimum assistance 80% (theoretical and practical classes).

1.11.Faculty data

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Contact hours: Previous e-mail appointment is required

** changes can occur depending on the availability of the professors*

1.12.Competences and learning outcomes

1.12.1.Competences

BASIC AND GENERAL

GE1 - Acquire the knowledge, skills and abilities necessary to carry out an innovative quality research in Pharmacology.

CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.

CB7 - Know how to apply the acquired knowledge and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of interest

CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on social and ethical responsibilities linked to the application of their knowledge and judgments.

CB9 - That the students know how to communicate their conclusions and their knowledge to specialized and non-specialized publics in a clear and unambiguous way.

CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.

TRANSVERSAL

T2 - Ability to carry out effective scientific and technical communication, both in a specialized environment and in more general environments, including the educational.

T1 - Ability to carry out a self-learning plan, perform an autonomous consultation of the bibliography and databases at the scientific, technical or regulatory level.

SPECIFIC

ES-4 - Know the most common therapeutic targets in cardiovascular disease or diseases of the nervous system and assess their physiological significance and their therapeutic projection.

ES-5 - Be able to identify potential new therapeutic targets in cardiovascular and central nervous system diseases, assess their biological significance and their therapeutic potential.

ES-6 - Know and apply the most common experimental techniques and models, both in research in Cardiovascular Pharmacology or in research in Psychoneuropharmacology

ES-10 - Design and develop research plans in Pharmacology

1.12.2.Learning outcomes

In this course, the student will enhance the knowledge in a more specific topic of pharmacological research, such as neuropsychopharmacology. Advanced aspects of pathophysiology, cellular and molecular biology, and pharmacology will be analyzed, discussing with the students the latest pharmacological discoveries and therapeutic approaches in neuropsycopharmacology.

1.13.Course contents

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

** some of the titles may change depending on the professor?s requirements*

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 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 scie ntific 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.

1.14.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 Associate s. ISBN: 0-87893-321-2
- Single channel recordings. 2nd Ed. Edited by Bert Sakmann and Erwin Neher. Plenum P ress. ISBN: 978-1-4419-1230-5.
- Principles of neural sciences, 4th Ed. Edited by Erik R. Kandel, James Schwartz and Tho mas M. Jessell. Mc-Graw Hill. ISBN: 0-8385-7701-6
- Neuroanatomia. By Luis Puelles López, Salvador Martínez Pérez, M. Martínez de la Torr e. Editorial Panamericana. 2008
- BRS Neuroanatomy. By James D. Fix. Ed. Wolters, Kluwer, Lippincott, Williams and Wilki ns.
- The synaptic organization of the Brain. By Gordon M. Shepard. Ed. Oxford. University P ress. 1990
- Cholinergic Neurotransmission: Functional and Clinical Aspects. By SM Aquilonius and P G 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. G ermany. 2006.
- Neurotransmitter Release and its Modulation: Biochemical Mechanisms, Physiological Fu nction and Clinical Relevance. By. David A. Powis and Stephen J. Bunn. Ed. Cambrid ge 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 Neuro biology. By Brady, Siegel, Albers & Price Ed. Academic Press (2011)

2.Teaching-and-learning methodologies and student workload

2.1.Contact hours

TOTAL HOURS OF THERAPEUTIC TARGETS IN NEUROPSYCOPHARMACOLOGY			
		Nº of hours	%
Activities	Lectures	40	44
	Interactive sessions	6	
	Presentations of scientific literature related to the subject	9	
Independent study time	Weekly study (5 hours x 3 weeks)	15	56
	Reading and analysis of scientific papers (10 hours x 3 weeks)	30	
	Preparation of Presentations and interactive sessions	25	
Total student workload: 25 hours x 5 ECTS		**125**	

2.2.List of training activities

LECTURES

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 teachers 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.

INTERACTIVE SESSIONS

Several therapeutic targets will be selected for te treatment of neurological diseases. The students will be divided into 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.

PRESENTATION OF SCIENTIFIC LITERATURE RELATED TO THE SUBJECT

Students will be asked to look for a scientific publication (SCI) related to the contents of the subject and they will have to present it orally and discuss it with their class mates and teacher.

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

3.1.Regular assessment

The evaluation will include two main components.

Continuous evaluation will attend assistance and the active participation in the academic activities

Presentations:
(1) **Interactive Sessions** related to determined topics will be presented in groups and individually
(2) **Individual Presentations** of scientific literature

3.1.1.List of evaluation activities

Attendance and Continuous assessment 20 %
Evaluation of the **Interactive sessions**: 30 %
Evaluation of the **Individual presentation**: 50 %

**The mark for attendance and continuous evaluation will be maintained in the extraordinary evaluation.*

3.2.Resit

The same requirements as for the Regular assessment apply in this case.

3.2.1.List of evaluation activities

The same list of evaluation activities as for the regular assessment apply in this case.

4.Proposed workplan

Timetable and workplan will be indicated in the website:
https://www.uam.es/ss/Satellite/Medicina/es/1242667165286/subhome/Master_Universitario_en_Investigacion_Fa
or at moodle: https://moodle.uam.es/