GUIA DOCENT

COMUNICACIÓ I FUNCIÓ CEL·LULAR

Coordinació: TARABAL MOSTAZO, OLGA

Any acadèmic 2016-17

COMUNICACIÓ I FUNCIÓ CEL·LULAR 2016-17

Informació general de l'assignatura

Denominació	COMUNICACIÓ I FUNCIÓ CEL·LULAR
Codi	14707
Semestre d'impartició	1R Q(SEMESTRE) AVALUACIÓ CONTINUADA
Caràcter	<table><tr><th>Grau/Màster</th><th>Curs</th><th>Caràcter</th><th>Modalitat</th></tr><tr><td>Màster Universitari en Investigació Biomèdica</td><td>1</td><td>OPTATIVA</td><td>Presencial</td></tr></table>
Nombre de crèdits ECTS	4
Grups	1GG
Crèdits teòrics	2.2
Crèdits pràctics	1.8
Coordinació	TARABAL MOSTAZO, OLGA
Departament/s	CIENCIES MEDIQUES BASIQUES,MEDICINA EXPERIMENTAL
Distribució càrrega docent entre la classe presencial i el treball autònom de l'estudiant	40% presencial 60% autònom
Informació important sobre tractament de dades	Consulteu aquest enllaç per a més informació.
Idioma/es d'impartició	Anglès, Català, Castellà
Distribució de crèdits	Teòrics 2.2 ECTS Seminaris 0.6 ECTS Pràctics 1.2 ECTS

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Professor/a (s/es)	Adreça electrònica professor/a (s/es)	Crèdits impartits pel professorat	Horari de tutoria/lloc
CALDERO PARDO, JORDI	jordi.caldero@mex.udl.cat	,2	
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EGEA NAVARRO, JOAQUIN	joaquim.egea@cmb.udl.cat	,4	
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ESPINET MESTRE, CARMEN	carme.espinet@cmb.udl.cat	,2	
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LLOVERA TOMAS, MARTA	marta.llovera@cmb.udl.cat	,4	
RIBERA CALVET, JOAN	joan.ribera@mex.udl.cat	,2	
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Objectius acadèmics de l'assignatura

1. To know the processes involved in cell signalling that regulate cell proliferation and differentiation.
2. To know the structure and function of ion channels involved in membrane excitability and the techniques used for study.
3. To advance knowledge of the process of synaptic transmission.
4. To know the intracellular pathways related to cell survival or death processes.
5. To know the process of programmed cell death during development, the apoptotic death, the excitotoxic death and the cellular and molecular mechanisms that control these processes.
6. To know the signaling mechanisms related to axon guidance.
7. To understand the mechanisms of cell communication mediated by gases.

Competències

CB1 Possess knowledge and understanding that provide a basis or opportunity for originality in developing and / or applying ideas, often within a research context

CB2 Being able to apply the acquired knowledge and have the ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study

CB5 Possessing learning skills to enable them to continue studying in a way that will be largely self-directed or autonomous

CG1 Knowing how to select and apply different analytical methods at the molecular, biochemical, cellular, genetic and phenotypic level for the diagnosis and study of the diseases.

CG5 Ability to prepare process and interpret the results rigorously and applying appropriate technologies

CS7 To identify the molecules and processes important in the functioning of cells and recognize the mechanisms of integration of external signals that regulate complex functions such as differentiation, proliferation and survival

CT2 Mastering a foreign language

CT3 Mastering ICT

Continguts fonamentals de l'assignatura

1. Overview (Mario Encinas, 2 hours)

Introduction to cell signaling. General principles of cell communication. G-protein coupled receptors. Cyclic AMP and protein kinase A. G-proteins and calcium signaling. G-proteins and ion channels. Tyrosine kinase receptors: docking proteins and modular signaling. Ras and other small GTPases. The MAP kinase and PI3-kinase pathways. Serine-threonine kinase receptors: the Jak-STAT and TGF? pathways. Proteolysis and signaling: Notch and Wnt pathways, Sonic hedgehog, NFkB signaling. Nuclear receptors.

2. PDK1, the major transducer of PI 3-kinase actions (Jose Ramón Bayascas, 2 hours)

PI3-K pathway in the context of insulin signaling. PDK1 action as a master kinase phosphorilating and activating differentially its up to 23 different substrates. Study of PDk1 pathway by knock-in mutation and its role regulating metabolic responses to insulin.

3. Autophagy in the pathology of the Central Nervous System (Anna Garcerà, 2 hours)

Autophagy pathways in neurons. Autophagy involvement in pathogenesis of neurodevelopmental and neurodegenerative disorders. Autophagy as a therapeutic target.

4. The neurodegenerative disease as a prion-like proteinopathy. (Sara Hernandez, 2 hours).

Neurodegenerative diseases and proteinopathies. Prion and prion-like phenomena. Spreading mechanisms of

misfolded proteins. Prion-like spreading in ALS.

5. Nuclear receptors. The vitamin D receptor and its role in cardiovascular diseases (José Manuel Valdivielso, 2 hours).

Nuclear receptors and their function regulating the rate of gene transcription. Review of the preclinical and clinical data that support a key role of vitamin D receptor activation in cardiovascular health.

6. Intracellular pathways related to neuronal cell survival or death: role in neurodegenerative diseases (Rosa Soler, 2 hours)

Neurotrophic factors and their specific receptors: activation. Intracellular pathways: from the external signal to their effect in the cell. Supressors or activators of intracellular proteins in neurodegenerative diseases.

7. Sprouty proteins as negative regulators of RTK signaling (Mario Encinas, 2 hours)

The Spry family members: from Drosophila to mammals. Functions of Spry genes as defined by gene targeting. Mechanisms of action: many open questions. Role of Spry proteins in tumor suppression. Novel functions of Spry genes and perspectives.

8. Pro-neurotrophins and neurodegenerative diseases (Carme Espinet, 2 hours).

Pro-NGF and pro-BDNF as ligands of p75NTR. p75NTR signaling pathways, intracellular interacting molecules and interaction with co-receptor partners. p75NTR processing and internalization. Pro-NGF/p75NTR modifications in Alzheimer's disease. pro-BDNF/p75NTR involvement in familiar depression.

9. Programmed cell death in spinal cord motoneurons during development (Jordi Calderó, 2 hours).

The process of naturally (programmed) cell death of neurons, particularly of motoneurons. Apoptotic death. Cellular and molecular mechanisms that control these processes and the role played by specific neurotrophic factors as modulator agents.

10. Excitotoxicity and selective motoneuron vulnerability (Olga Tarabal, 2 hours).

Glutamate receptors expression in neurons. Excitotoxic molecular mechanisms. Excitotoxic necrosis: the organotypic culture of chick embryonic spinal cord as a model to study excitotoxic necrosis. Chronic excitotoxicity and degeneration. Acute and chronic excitotoxicity in the model of chick embryo in vivo.

11. Signaling mechanisms of axon guidance receptors (Joaquim Egea, 4 hours)

Description of the signaling mechanisms of Eph receptors and the mouse genetic approaches used to address their relevance in vivo.

Eixos metodològics de l'assignatura

Development and homeostasis of metazoan organisms is absolutely dependent on communication between their building blocks, the cells. Such communication is usually achieved by the use of small, extracellular signaling molecules which act locally or globally to coordinate growth, differentiation, survival or metabolism of cells. Signaling molecules exert their actions on target cells through binding to specific receptors usually but not always located at the cell surface. Receptor binding causes a plethora of molecular responses, known as signal transduction pathways, meant to produce a characteristic biological response. In this course we aim to provide a general view of the vast field of signal transduction. Rather than systematically presenting current knowledge on the field, we will provide a first-hand view of specific topics, which will be presented by specialists who are actively developing their research on that particular aspect of the field. A practical block introducing state-of-the-art laboratory techniques will complement the theoretical sessions.

Sistema d'avaluació

Attendance to lectures, practical and seminar sessions (20%).

Presentation and discussion of scientific articles. Activities related with lectures, seminars and practices. (80%)

Bibliografia i recursos d'informació

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Bus RR, Sun W Oppenheim RW Adaptative roles of programmed cell death during the nervous system development (2006) Annu. Rev. Neurosci. 29, 1-35.

Cadigan KM, Liu YI. Wnt signaling: complexity at the surface (2006) J Cell Sci 119(Pt 3), 395-402.
Ciani L, Salinas PC. WNTs in the vertebrate nervous system: from patterning to neuronal connectivity (2005) Nat Rev Neurosci 6(5), 351-362.

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Cooper JR, Bloom FE, Roth RH. The biochemical basis of neuropharmacology
(2003) Oxford University Press.

Davis KL, Martin E, Turko IV, Murad F. Novel effects of nitric oxide **(2001)** Annual Review of Pharmacology and Toxicology. 41: 203-236.

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Kandel ER, Schwart JH, Jessell TM. Principles of Neural Science (2000) 4ªEd. McGraw Hill, USA.

Li R, Gundersen GG. Beyond polymer polarity: how the cytoskeleton builds a polarized cell (2008) Nat Rev Mol Cell Biol. 9, 860-73.

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323-350.

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Michaelidis TM, Lie DC. Wnt signaling and neural stem cells: caught in the Wnt web (2008) Cell Tissue Res 331(1), 193-210.

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Nykjaer A. p75NTR-live or let die (2005) Curr. Opinion in Neurobiology. 15:49-57.

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Yuan J, Lipinski M, Degterev A. Diversity in the mechanisms of neuronal cell death (2003) Neuron 40, 401-413.

INTERNET RESOURCES

The Wnt webpage: http://www.stanford.edu/~rnusse/wntwindow.html

http://www.ionchannels.org/

http://www.nature.com/nrm/focus/polarity/index.html

Blue Native Electrophoresis Protocol. MitoSciences

http://www.mitosciences.com

Dr. Louis Ignarro Explains Nitric Oxide:

http://www.youtube.com/watch?v=DcIWX8C91s4 i http://www.youtube.com/watch?v=NBPjZJSHr4A

MBF ImageJ webpage:

http://www.macbiophotonics.ca/imagej/

Olympus Confocal Microscopy Tutorials

http://www.olympusfluoview.com/java/index.html

Olympus FRET webpage

http://www.olympusfluoview.com/applications/fretintro.html

Nikon FRET webpage

http://www.microscopyu.com/tutorials/java/fluorescence/fpfret/

Interactive tutorial explores various combinations of fluorescent proteins as potential FRET partners and provides information about critical resonance energy transfer parameters, as well as suggestions for microscope optical filter and light source configuration.