

Degree	Type	Year	Semester
4313794 Biochemistry, Molecular Biology and Biomedicine	OT	0	A

Contact

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Teachers

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Ibane Abasolo Olaortua

Ignacio Ferreira González

Immaculada Fuentes Camps

Isabel Novoa García

Joan López Hellín

Joaquim Vives Armengol

Use of languages

Principal working language: english (eng)

Jordi Barquintero Máñez
Lluís Montoliu José
Mar Borregán Prats
Maria Antònia Arbós Via
Marta Rosal Fontana
Ramón Martí Seves
Ramón Vilallonga Puy
Rosa Prieto Sánchez
Santiago Pérez Hoyos
Victor Franco Punes
Xavier Cañas Perea
Yolanda Fernández Amurgo

Prerequisites

- Requirements to be admitted to the master's degree.
- English Level B2.

Objectives and Contextualisation

This module aims to approach the students to the functioning of research in a tertiary hospital, by showing the different medical states from diagnostic to care of diseases.

The aim of the module is to enable students to acquire the basic knowledge on the ethical, methodological, regulatory and logistical aspects used in translational and clinical research, to be able to plan experiments in human pathology based on Genomics, Proteomics, Cytomics and Metabolomics, to acquire the knowledge to identify the transferability of the results of their research to the market, and to understand the bases and the application of new diagnostic tools (massive sequencing, magnetic resonance imaging, microarrays, nanotechnology, etc.) and advanced therapies in human pathology.

Skills

- Analyse and explain normal morphology and physiological processes and their alterations at the molecular level using the scientific method.
- Apply techniques for modifying living beings or parts of these in order to improve pharmaceutical and biotechnological processes and products or develop new products.
- Communicate and justify conclusions clearly and unambiguously to both specialist and non-specialist audiences.
- Conceive, design, develop and synthesise scientific and/or biotechnological projects within biochemistry, molecular biology or biomedicine.
- Develop critical reasoning within the subject area and in relation to the scientific or business context.
- Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
- Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
- Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
- Use and manage bibliography and IT resources related to biochemistry, molecular biology or biomedicine.
- Use scientific terminology to account for research results and present these orally and in writing.

Learning outcomes

1. Apply knowledge of the molecular mechanisms underlying human diseases in order to make a diagnosis in problem cases.
2. Communicate and justify conclusions clearly and unambiguously to both specialist and non-specialist audiences.
3. Design and conduct a research project in the field of biochemistry, molecular biology or biomedicine.
4. Develop critical reasoning within the subject area and in relation to the scientific or business context.
5. Distinguish the processes by which pre-clinical research is conducted into new therapy agents.
6. Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
7. Propose the use of pre-clinical animal models and cell models in advanced therapies.
8. Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
9. Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
10. Use and manage bibliography and IT resources related to biochemistry, molecular biology or biomedicine.
11. Use scientific terminology to account for research results and present these orally and in writing.

Content

Section 1: Introduction to clinical practice in the hospital environment

- 1.1. The Health System in Catalonia: function, structure and management of the Institut Català de la Salut (ICS).
- 1.2. Pathology of the major and minor syndromes
- 1.3. Diagnostic methodologies.
 - 1.3.1. Role of laboratory in the diagnosis of disease. Biochemistry and Microbiology
 - 1.3.2. Immunological diagnosis
 - 1.3.3. Anatomopathological diagnosis.
- 1.4. Pharmacology and pharmacy
- 1.5. Surgery
 - 1.5.1. Experimental breakthroughs in the field of surgical processes
 - 1.5.2. Translational research and experimental models in surgery

Section 2: Clinical research and clinical trials

- 2.1. Methodologies for Clinical Research.
- 2.2. Clinical trials.
- 2.3. Legal and ethical issues of clinical research.
- 2.4. Observational epidemiologic studies: Design, advantages and disadvantages. Principal bias.
- 2.5. Operational aspects. How to manage with clinical trials. Most frequent problems

Section 3: Preclinical research

- 3.1. Introduction to Core Facilities High-Tech Equipments

3.2. Biobanks. Biomedical Research with human biological samples

3.3. Animal House Facility

3.4. UAT-UEB-USMIB. Omic technologies for personalized medicine.

3.5. Overview: Use of genetically modified animal models.

Section 4: Tools for diagnosis in human pathology

4.1. Massive sequencing past present and future

4.1.1. Virus. Hepatitis A, B, D & E virus

4.1.2. Virus. Hepatitis C virus

SEMINAR: "Studying the bases for viral persistence"

4.1.3. Use of sequencing technologies to investigate the human microbiome.

4.2. Cytogenetics. Prenatal diagnosis

4.2.1. Clinical genetics

4.2.2. Cytogenetic Prenatal Diagnosis: past and present trends.

4.3. GWAS & Microarrays

4.3.1. Genome wide analysis (GWAS) in dementia and other neurodegenerative disorders.

4.3.2. Identification of Biomarkers using microarrays.

4.4. Proteomics. Organelles

4.4.1. Proteomic techniques for the identification and validation of biomarkers.

4.4.2. Proteomics, a general purpose tool for the biomedical research laboratory.

4.4.3. Tools to study subcellular organelle alterations.

Section 5. Advance Therapies

5.1. Preclinical Evaluation of New Therapeutic Agents.

5.2. Cells

5.2.1. Introduction to Advanced Therapies. Stem Cells

5.2.2. Therapies with mesenchymal cells

5.2.3. Cell therapy for fetal repair.

5.2.4. Immunotherapy

5.2.5. Hematopoietic transplantation

5.3. Nanotechnology

5.3.1. General Introduction to Nanomedicine. Drug delivery systems

5.3.2. Inorganic Nanoparticles with applications in medicine

Methodology

Theoretical classes. Discussion of problems in class. Visit laboratories. Stimulate the interest of the students to solve real or putative clinical problems. Reading articles to propose a team based research project. Discussion of projects.

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
Theory classes	65	2.6	1, 5, 7, 6, 9
Type: Supervised			
Mentoring	3	0.12	4, 3, 5, 7, 8, 2, 6, 9, 10, 11
Type: Autonomous			
Study	154	6.16	1, 4, 3, 5, 7, 8, 2, 6, 9, 10, 11

Evaluation

Writing a project based on a clinical problem (team work) 30%

Defence of the project in front of all the students and evaluators 35%

Answer online questions to look for the information 35%

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Answer online questions	35%	2	0.08	4, 3, 5, 7, 2, 9, 10, 11
Delivery of research project	30%	0	0	1, 4, 5, 7, 8, 2, 6, 9
Oral presentation of the project	35%	1	0.04	1, 4, 3, 5, 7, 8, 2, 6, 9, 11

Bibliography

At the Bench: A Laboratory Navigator. Updated Edition. Kathy Barker. Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York, 2005.

GeneReviews (<http://www.ncbi.nlm.nih.gov/books/NBK1116/>)

Edited by Roberta A Pagon, Editor-in-chief, Thomas D Bird, Cynthia R Dolan, and Karen Stephens. Seattle (WA): University of Washington, Seattle; 1993-.

Molecular Diagnostics: Techniques and Applications for the Clinical Laboratory. 2009. Edited by: George P. Patrinos and Wilhelm J. Ansorge. 2nd ed. p. 616. Academic Press. 1st ed. p. 736. Academic Press.

Molecular Pathology: The Molecular Basis of Human Disease. 2009. 1st ed. p. 664. Academic Press.

Transforming Clinical Research in the United States: Challenges and Opportunities, Workshop Summary, Forum on Drug Discovery, Development, and Translation Board on Health Sciences Policy, Institute of Medicine of the National Academies, The National Academies Press, Washington D.C.
<http://fastercures.org/train/resources/documents/TransformingClinicalResearchintheUnitedStates.pdf>

Biología Aplicada a la Identificación y Validación de Dianas Terapéuticas. Informe de Vigilancia Tecnológica, Genoma España, http://www.gen-es.org/12_publicaciones/docs/pub_73_d.pdf

Impacto de la Biología en el sector Sanitario (SECURED), 1er Informe de Prospectiva Tecnológica, Genoma España http://www.gen-es.org/12_publicaciones/docs/pub_63_d.pdf

The Human Protein Atlas (www.proteinatlas.org)