

**Basic Translational and Clinical Research Skills**

Code: 42896  
ECTS Credits: 9

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

## Contact

Name: Josep Quer Sivila

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## Teachers

Francisco Rodríguez Frías

## Use of Languages

Principal working language: english (eng)

## External teachers

Ibane Abasolo Olaortua

Ignacio Ferreira González

Jordi Barquinero Máñez

Josép Quer Sivila

## 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.

## Competences

- 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

#### 0. Introduction and Welcome

#### 1.1 Where are you? The Catalan Health System.

#### 1.2 Transversal Facilities for Clinical Diagnosis

#### 1.3 Pharmacology and pharmacy. Vaccine and drug's safety and efficacy evaluations.

#### 1.4 Pathology diagnosis services

#### 1.5 Molecular imaging in drug discovery and development

#### VISIT to Central Laboratories HUVH/ NGS platform

### SECTION 2: TOOLS FOR DIAGNOSIS IN HUMAN PATHOLOGY

#### 2.1 NGS tools to study viral persistence.

#### 2.2 NGS tools for translational biomedical research on emergent, re-emergent and new viral infections. The SARS-CoV-2 pandemics.

2.3 A telecommunications engineer in the Biosciences: From music classification to the computational analysis of sequencing data

2.4 Human microbiome in clinical pathologies

2.5 Exosomes and disease follow up.

2.6 Microarrays, GWAS, Manhattan plots, tools in dementia and other neurodegenerative disorders.

2.7 Liquid biopsy for prenatal diagnosis

2.8 Cell lines in translational research

2.9 Mitochondrial genetics: methods for the study of mitochondrial diseases and translational research to develop new therapies

VISIT TO "Cellex" and VHIR laboratory facilities

2.10 Animal models

2.11 Organoids to reduce animal model experimentation

2.12 Proteomics in diagnosis.

2.13 Proteomics, tool for biomedical research. Development of a cancer kit.

2.14 Advanced Therapies. Gene Therapy. Stem Cells. Fetal Repair.

2.15 Cell therapy for fetal repair

2.16 Single-cell multi-omics and imaging flow cytometry

2.17 Immunotherapy.

2.18 General Introduction to Nanomedicine. Drug delivery systems

2.19 From a clinical problem to a clinical trial. The LIF dilemma.

### SECTION 3: CLINICAL RESEARCH AND CLINICAL TRIALS

3.1 Methods for Clinical Research Methodologies. Observational epidemiologic studies: Design, advantages and disadvantages. Principal bias.

3.2 Clinical trials. Ethical and Legal issues of clinical research

## 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.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

## Activities

Title	Hours	ECTS	Learning Outcomes
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Type: Directed

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

## Assessment

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

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

Test exam 35%

Attending a minimum of 80% of the classes is required for taking the exam and passing the course.

To be eligible for the retake process, the student should have been previously evaluated in a set of activities equaling at least two thirds of the final score of the course or module. Thus, the student will be graded as "No Available" if the weighthin of all conducted evaluation activities is less than 67% of the final score

## Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Attendance and participation in class	10%	0	0	4, 9, 10, 11
Delivery of research project	30%	0	0	1, 4, 5, 7, 6, 8, 2, 9
Oral presentation of the project	30%	1	0.04	1, 4, 3, 5, 7, 6, 8, 2, 9, 11
Test exam	30%	2	0.08	4, 3, 5, 7, 2, 9, 10, 11

## Bibliography

At the Bench: A Laboratory Navigator. Updated Edition. Kathy Barker. Cold Sprinh 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](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](http://www.gen-es.org/12_publicaciones/docs/pub_63_d.pdf)

The Human Protein Atlas ( [www.proteinatlas.org](http://www.proteinatlas.org))

## **Software**

No Procedeix