MODULE 1:

TRANSVERSAL SKILLS FOR TRANSLATIONAL RESEARCH IN HUMAN PATHOLOGY

Code: 43643 **Type:** Compulsory

Credits: 9 ECTS **Language:** Spanish/English

Module's Coordinator: Josep Quer Sivila, PhD ✉ josep.quer@vhir.org

Schedule for mentoring: Fridays, from 11:00 to 13:00h.

*Although having this timetable proposal, the **students have to arrange an appointment with the teacher by e-mail.***

OBJECTIVES

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

E01. Identify and use the concepts, tools, techniques and methodologies for translational biomedical research

E01.10. Identify the organizations that regulate biomedical research in hospital environment, as well as, their structure and management organs.

E01.11. Recognize the major syndromes identifying their main physiopathological features, as well as, the methods for diagnostic and research.

E01.12. Learn the techniques and methodologies used for diagnosis of disease in clinical, pathological, imaging and nuclear medicine laboratories.

E01.13. Learn surgical techniques and experimental surgery used in animal models.

E02. Use of modification techniques in living organisms (or part of them) to improve pharmaceutical and biotech processes or to develop new products.

E02.1. Distinguish the processes used in preclinical research of new therapeutic agents.

E02.2. Suggest the use of preclinical animal models and cell models in advanced therapies.

E03. Analyze the pathophysiology at the molecular level using the scientific method and identify its relationship with the clinical process of different diseases.

E03.1. Understanding the changes and processes that underlie the major syndromes and their diagnosis and treatment.

E03.2. Apply the basis of molecular mechanisms underlying human disease for diagnosis in problem cases.

E05. Conceive, design and develop scientific projects in translational research aimed to develop new therapies, diagnostics and prevention methods that can be implemented in clinical practice.

E05.1. Design a scientific project in translational/clinical research by applying knowledge acquired in the module and taking into account legal and methodological frameworks for this type of research.

CONTENTS

SECTION 1: INTRODUCTION TO CLINICAL PRACTICE IN THE HOSPITAL ENVIRONMENT.

0. Introduction and Welcome.

1.1 Where are you? The Catalan Health System.

1.2a Transversal Facilities for Clinical Diagnosis.

1.2b Biobanks

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.

SECTION 2: TOOLS FOR DIAGNOSIS IN HUMAN PATHOLOGY I

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

2.2 NGS tools to study viral persistence.

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.

2.5a Prenatal diagnosis by non-invasive test (NIPT).

2.5b Prenatal diagnosis.

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

2.7 Proteomics in diagnosis.

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

2.9 Exosomes and disease follow up.

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

2.11 Single-cell multiomics and imaging flow cytometry.

2.12 Cell lines in translational research.

2.13 Cell therapy for fetal repair.

2.14 Organoids to reduce animal model experimentation & Intravital microscopy.

2.15 Animal models.

2.16 Advanced Therapies. Gene Therapy. Stem Cells.

2.17 Immunotherapy.

2.18 CAR-T cell therapy.

2.19 General Introduction to Nanomedicine. Drug delivery systems.

2.20 Nanotech in Medicine. Cerium Oxide as a therapeutic tool.

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
Guided visits
Making reports/works
Autonomous study
Reading articles/reports of scientific interest
Presentation/ oral defence of works
Tutorials

EVALUATION

Writing a research project based on a clinical problem (team work)	30%
Oral defence of the research project (team work)	30%
Multiple choice test exam	30%
Attendance and participation in class	10%

Evaluation:

M1 is a comprehensive module designed to equip students with essential knowledge in the ethical, methodological, regulatory, and logistical aspects pertinent to translational and clinical research. This knowledge is crucial in enabling students to effectively plan and execute experiments and develop translational innovative projects.

In order to assess students' acquired knowledge and skills, foster collaborative interaction between them, stimulate an interest in seeking well-validated scientific information, and facilitate engagement with researchers and Principal Investigators (PIs) affiliated with VHIR or any other institution, we require students to develop a scientific project. Importantly, this project is not constrained by financial limitations but must adhere strictly to ethical protocols.

Students, ideally forming groups of 4 but ranging from 2 to 5 members, are tasked with composing a comprehensive project utilizing a format provided by the coordinators. Subsequently, they are required to present and defend this project orally, allocating a 15-minute time slot, in front of a Committee comprising three Principal Investigators from VHIR Institution (master professors).

Concurrently, students are expected to complete an online questionnaire as part of the evaluation process. This multifaceted approach ensures a well-rounded assessment of their understanding and proficiency in translational and clinical research.

Note that:

- This module does not include a single evaluation system.
- Attending a minimum of 80% of the classes is required for taking the exam and passing the course. Unexcused absence of 20% or more mean failing the subject.

Second-chance examination:

- Students who fail the course (grade lower than 5), will be entitled to a second evaluation, provided that they have participated in all the evaluation activities and have a final average grade equal to or higher than 3.5.
- Second-chance evaluation will consist on the delivery of a written work related to the topics studied during the course.
- The maximum grade of the second-chance evaluation will be a pass mark (5).

TEACHING STAFF

Ibane Abasolo Olaortua*, PhD - *ibane.abasolo@vhir.org
Head Drug Delivery and Targeting Research Group. Nanomedicine. VHIR

Jordi Barquinero Mañez*, MD PhD - *jordi.barquinero@vhir.org
Head of Cell and Gene Therapy Research Group. VHIR.

***Ignacio Ferreira González*, MD PhD -** ignacio.ferreira@vallhebron.cat
Head Cardiology Department. Hospital Univ. Vall d'Hebron
Principal Investigator. Diseases Research Group. VHIR

Josep Quer Sivila*, PhD - *josep.quer@vhir.org
Principal Investigator. Senior Researcher. Liver Diseases - Viral Hepatitis. VHIR

ACADEMIC SCHEDULE

Dates: from 27th September to 28th November 2023.
Exam dates: 15-16-17-th November 2023.
See the Master's Degree Schedule for academic year 2023-2024