

TRANSLATIONAL MEDICINE

STUDY PLAN 2022-2023

Coordinated by Dr Josep M Llovet Professor of Medicine-Hepatic Oncology & Director, Master in Translational Medicine; Professor of Research-ICREA; IDIBAPS-Hospital Clínic Barcelona; University of Barcelona. Professor of Medicine & Director, Mount Sinai Liver Cancer Program.

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GENERAL INFORMATION

Subject Name	Genomics and Translational Medicine
Code	573669
Type	Compulsory
Teaching	First semester
Coordinator	Prof. Josep M Llovet, Dr Roser Pinyol
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ECTS credits	8

OBJECTIVES

The purpose of this subject is to provide students with scientific, conceptual, methodological and practical knowledge about translational medicine. Specifically, the genomics and epigenomic bases will be assessed, as well as their applications in translational research. These concepts will be integrated with the study of the signaling pathways involved in various diseases and their functional role.

The overall objective is to provide a scientific basis for the design and implementation of translational research, and the knowledge related to relevant methods, techniques and applications in biomedicine.

COMPETENCES TO BE GAINED DURING THE STUDY

Generic

G1: Capacity for learning and responsibility (capacity for analysis and synthesis, to adopt global perspectives and to apply the knowledge acquired/capacity to take decisions and adapt to new situations).

G2: Learning skills that are necessary to undertake further research studies with a high degree of autonomy.

Specific

S1: Understand the basic, clinical and therapeutic principles of different pathologies

S2: Learn the procedures and methodologies used in translational studies

S3: Become familiar with the development of biomedical research and learn the basic tools for translational research

S4: Ability to explain the basic molecular principles underlying pathologies, ability to understand the role of genes in human cancer and the basic concepts of oncogenes and targeted therapies.

THEMATIC BLOCKS

1. Basic Principles

- Introduction
- Role of epigenetics in human diseases
- Personalized medicine in oncology
- Molecular pathology in oncology
- Principles of genetic engineering
- Immunology and cancer
- Principles of experimental Design
- Bioinformatics and Managing of Big Data

2. High throughput technologies

- Gene expression
- SNP array, CNVs and GWAS
- Exome sequencing
- Methylome analysis
- Single Cell Genomics
- Proteomics

3. Signaling pathways

- Signaling pathways.
- Resistance to molecular therapies
- TGF-beta signaling in liver cancer

4. Genomics in cancer and immunotherapies

- Molecular classification of hepatocellular carcinoma
- Targets for therapies in pancreatic cancer
- miRNA in human diseases and digestive cancer
- Angiogenesis: Drugs & mechanisms of resistance
- Colorectal cancer: genetics and genomics
- Molecular classification of breast cancer
- Molecular therapies and immunotherapy in melanoma
- Immunotherapies in cancer
- CAR T cells in cancer
- Role of adult stem cells in cancer

5. Genomics in other diseases

- Next generation sequencing in hematological diseases
- Pluripotent cells in translational medicine: recent advances and open problems
- Chronic Hepatitis C: from genotyping to therapies
- Liver portal hypertension and fibrosis
- Inflammatory disease / Crohn's disease
- Inflammatory bowel disease (IBD)
- Translational medicine in Alzheimer disease
- Translational medicine in Parkinson disease
- Translational research in psychiatric disorders
- Genomics in Multiple Sclerosis
- Genomics in autoimmune encephalitis.
- Genomics in autoimmune diseases
- Endocrinology
- Translational medicine in renal diseases
- Fetal and perinatal translational medicine
- Translational research in cardiovascular diseases
- System biology in lung diseases

6. Trial design and Biomarkers

- Innovation in translational medicine
- Translational medicine: implications in trial design
- Statistical principles for clinical trials
- Trial design and innovation.
- From Bench to Spin off

METHODOLOGY

All lessons will be face to face.

Total training hours: 8 credits ECTS x 25h/credit = 200h

- a) Face-to-face (72h): Lectures and Seminars
- b) Home training (128h): Individual and group work

EVALUATION

Evaluation criteria:

Attendance: The attendance will count 50% of the overall grade, and it will be evaluated as follows:

- 100% - 95% → 50 points
- 95% - 80% → 40 points
- 80% - 50% → 30 points
- 50% - 30% → 20 points
- < 30% → Subject Failure

Written exam: The score obtained in the written test will count 50% of the final score. The written exam will be based on a multiple option test.

To pass the subject, students will have to fulfill three requisites:

- a) Attendance-score $\geq 20/50$ points,
- b) exam-score $\geq 20/50$ points,
- c) and overall score (attendance + exam) $\geq 50/100$ points.

Reevaluation: In case of failing the ordinary evaluation (overall-score $\leq 50/100$), students that have a minimum of 1/3 of the exam questions correct will have the chance to be re-evaluated. For that, they will need to present a critical appraisal of 3 scientific articles in front of an evaluation committee. The re-evaluation final score will never get over 50 points.

REFERENCES

Books

- Handbook of Translational Medicine. Edicions de la Universitat de Barcelona, Barcelona-B-16.985-2016. ISBN: 978-84-475-4030-3. Ed: Josep M Llovet.
- Translational Medicine: The Future of Therapy?
Autors: James Mittra and Christopher-Paul Milne
Data: Apr 17, 2013
- Genomic and Personalized Medicine, Second Edition: V1-2
Autors: Geoffrey S. Ginsburg and Huntington F Willard PhD
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- Translational Medicine and Drug Discovery
Autors: Bruce H. Littman MD and Rajesh Krishna PhD FCP
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Articles

- Albani S, Prakken B. The advancement of translational medicine-from regional challenges to global solutions. Nat Med. 2009;15:1006-9.
- Berger B, Peng J, Singh M. Computational solutions for omics data. Nat Rev Genet. 2013;14(5):333-46.
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- Koh, G., Degasperis, A., Zou, X. et al. Mutational signatures: emerging concepts, caveats and clinical applications. Nat Rev Cancer (2021).
- Díaz-Gay M, Alexandrov LB. Unraveling the genomic landscape of colorectal cancer through mutational signatures. Adv Cancer Res. 2021
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- Sia D, Hoshida Y, Villanueva A, Roayaie S, Ferrer J, Tabak B, et al. Integrative molecular analysis of intrahepatic cholangiocarcinoma reveals 2 classes that have different outcomes. *Gastroenterology*. 2013;144(4):829-40.
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