THE COORDINATOR

Josep M. Llovet is Professor of Research-ICREA in the BCLC Group, Liver Unit, IDIBAPS-Hospital Clínic of Barcelona (Spain). Director of the Master in Translational Medicine at the Faculty of Medicine University of Barcelona; Director of the Liver Cancer Program, and Full Professor of Medicine at the Mount Sinai School of Medicine in New York. He has been President of the International Liver Cancer Association (ILCA) and Chairman of the European Clinical Practice Guidelines on the Management of Liver Cancer (EASL-EORTC). He has published more than 260 articles in peer-reviewed journals, 43 book chapters, and has been awarded the AACR–Landon International Award and the International Hans Popper Prize, among others. Josep M. Llovet has devoted his academic career to the study of the molecular pathogenesis and treatment of liver cancer, and has received competitive funding from the European Commission and the US National Institute of Health.

WELCOME FROM THE COORDINATOR

The Official Master in Translational Medicine-MSc from the University of Barcelona will offer you the opportunity to gain an excellent training both in academia and research. It will provide you comprehensive and updated knowledge of the basics, clinical and epidemiological entities associated with major human pathogenesis, examined from a cross-sectional view. Moreover, it will give you access to knowledge and skills necessary to develop translational research projects in the field of biomedicine.

Dr Josep M Llovet i Bayer
Master Coordinator
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GENERAL INFORMATION

The Master in Translational Medicine is an Official Master from the University of Barcelona that allows posterior enrolment to PhD degree. It is a 60 credits Master with 4 compulsory subjects (6 ECTS each), 4 optional subjects (3 ECTS each) and 500 hours (minimum) of research training (Master Thesis, 24 ECTS). The Master is instructed in English and can be completed in 1 or 2 years.

Virtual Campus
The Master is based on lectures, practical sessions and interactive seminars. The “Virtual Campus” is an online tool that contains the updated programs of each subject, the lecturers’ presentations, and other documents related to the master. You can access the “Virtual Campus” through the following link: https://campusvirtual2.ub.edu/my

Each student has its own ID, which is provided by the Secretariat of the University of Barcelona upon registration.

Calendar
Lectures are scheduled from Monday to Thursday from 16h to 20h, from October 2nd 2017 to June 14th 2018, inclusive. Please note that exams might be scheduled differently.

Evaluation
Compulsory and Optional subjects will be evaluated considering attendance (which will account for 50% of the final score) and the students’ performance in a test (which will account for the remaining 50%). Specifically, attendance will be evaluated as: 95%-100% → 50 points: 80% - 95% → 40 points: 30-80% → 20 points: <30% → Subject Failure. The exam will consist on a written test, oral presentation or written report. The maximum score will be 50 points, and the minimum mark requested to pass the subject will be 20 points.

A subject will be considered as passed if ‘exam’ > 20 points, ‘attendance’ > 20 and ‘exam + attendance’ ≥50 points.

The final score of the master thesis will be calculated from the written report mark (50%) and the oral defense mark (50%).
**PRE-ADMISSION REQUIREMENTS**

Students seeking for admission to the Master program should possess any of the following qualifications: Medicine, Biomedical Sciences, Biomedical Engineering, Biology, Biochemistry, Biotechnology, Pharmacy, Genetics and other health-related disciplines.

Students who meet the entry criteria will be assessed according to the evaluation of the following items:

- Curriculum Vitae
- Motivation Letter, explaining the student’s interest on the Master
- High level of English (level B2 CEFR, First Certificate or equivalent)

International students must validate their previous studies to access the Spanish Education System. More information is available on the master’s website.

**MASTER COMMITTEE**

- Master Coordinator
- Subject Coordinator
- Student’s representative

**USEFUL LINKS**

1. Campus useful information: [http://www.ub.edu/monub](http://www.ub.edu/monub)
2. Virtual Campus access: [https://campusvirtual2.ub.edu](https://campusvirtual2.ub.edu)
6. Financial Information: [http://www.ub.edu/acad/matricula/preus.html#master](http://www.ub.edu/acad/matricula/preus.html#master)
8. UB Health Insurance: [http://www.ub.edu/sae/serveis/assegurances](http://www.ub.edu/sae/serveis/assegurances)
12. UB sport services: [http://www.ub.edu/esports](http://www.ub.edu/esports)
# MASTER COORDINATORS

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<td>DR MORALES</td>
<td><a href="mailto:morales@clinic.cat">morales@clinic.cat</a></td>
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<tr>
<td>Molecular Biology in Human Diseases</td>
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<td><strong>SUBJECT 2</strong></td>
<td>DR CLARIA</td>
<td><a href="mailto:jclaria@clinic.cat">jclaria@clinic.cat</a></td>
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<td>Animal Modeling in Translational Research</td>
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<td><strong>SUBJECT 3</strong></td>
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<td><a href="mailto:nuria.lopez@irbbarcelona.org">nuria.lopez@irbbarcelona.org</a> <a href="mailto:david.tamborero@irbbarcelona.org">david.tamborero@irbbarcelona.org</a></td>
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<td><a href="mailto:angela.dominguez@ub.edu">angela.dominguez@ub.edu</a></td>
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<td>DR PRAT DR TORRES</td>
<td><a href="mailto:alprat@clinic.cat">alprat@clinic.cat</a> <a href="mailto:ferran.torres@idibaps.org">ferran.torres@idibaps.org</a></td>
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<td><strong>SUBJECT 10</strong></td>
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* (Animal Experimental Course)
DEADLINES

✓ Pre-registration process:
   From January 11th 2017 to September 15th 2017

✓ Registration process:
   From September 15th to September 29th 2017

✓ Course start:
   October 2nd 2017

✓ Deadline for acceptance to a research group:
   December 1st 2017

✓ Master Thesis short evaluation: (5 minutes oral presentation)
   December 19th to 21th 2017
   Structure:
   1. Introduction (main ideas listed)
   2. Working Hypotheses and Objectives
   3. Material and Methods (draft)
   4. Results (draft)

✓ Deadline to send your Master Thesis written report presentation:
   May 31th 2018

✓ Master Thesis oral presentation: (10 minutes oral presentation + 5 minutes questions & answers)
   June 11th to 14th 2018
CONTACT DETAILS

FACULTY OF MEDICINE SECRETARIAT

Email: secretariamedicina@ub.edu
Location: Casanova street 143 (1st floor)
Telephones: 93 403 52 52 / 51 / 50
Opening hours:
From 9h30 to 13h30 (Monday to Friday)
From 16h00 to 18h00 (Monday to Thursday)
Website: http://www.ub.edu/medicina

MASTER’S SECRETARIAT

Contacts: Ariadna Farré (afarrer@clinic.cat)
Celia Cortez (cortez@clinic.cat)
Location: 3rd Floor CEK Building
(Rosselló street 153)
Telephone: 93 3129469
Opening hours:
From 9am to 5pm (Monday to Friday)
Website:
www.ub.edu/medicina/mesters/traslacional
www.ub.edu/mastertranslationalmedicine
STUDY PLANS & PROGRAMS

COMPULSORY SUBJECTS (6 ECTS x 4= 24 ECTS)................................................................. 24 ECTS

- SUBJECT 1: Molecular Biology in Human Diseases
- SUBJECT 2: Animal Modeling in Translational Research
- SUBJECT 3: Genomics and Epigenomics in Translational Research
- SUBJECT 4: Biomarker Discovery and Validation. Sample Management and Biobanks

OPTIONAL SUBJECTS (3 ECTS EACH; 4 SUBJECTS x 3ECTS=12 ECTS).......................... 12 ECTS

- SUBJECT 5: Bioinformatics in Translational Research
- SUBJECT 6: Imaging in Translational Research
- SUBJECT 7: Entrepreneurship and Scientific Communication
- SUBJECT 8: Public Health and Translational Research
- SUBJECT 9: Clinical Trials Design and Evaluation of Molecular Therapies
- SUBJECT 10: Stem Cell Research
- SUBJECT 11: High-throughput Data Analysis

THESIS MASTER (24 ECTS).................................................................................................. 24 ECTS

TOTAL NUMBER OF CREDITS.........................................................................................60 ECTS
SUBJECT 1 – MOLECULAR BIOLOGY IN HUMAN DISEASES

STUDY PLAN

Coordinated by Dr Manuel Morales Biochemistry and Molecular Genetics Department, Hospital Clinic, IDIBAPS.

GENERAL INFORMATION

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<tr>
<th>Subject Name</th>
<th>Molecular Biology in Human Diseases</th>
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<tr>
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<td>Coordinator</td>
<td>Dr. Manuel Morales</td>
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OBJECTIVES

General training objective

The overall objective of the subject is to provide an interdisciplinary training, deep and updated, on the fundamental mechanisms involved in the repair and maintenance of tissues. For this purpose, four key biological processes are addressed whose interrelationship determines the functional phenotype of the tissue: 1) inflammation, 2) Angiogenesis, 3) tissue remodeling and 4) cancer.

Specifically, the dual objective pursued in this subject is:

- To provide students with a comprehensive and updated on functional, pathogenic and methodological concepts most commonly used in biomedical research on inflammation, angiogenesis, tissue remodeling and cancer theoretical knowledge.

- Provide students with a holistic view of all processes addressing their interrelations in different physiological and pathophysiological contexts.

This course encourages active learning through seminars and drafting research projects.
PRE-SKILLS AND REQUIREMENTS

General
G1: Understand the fundamental basic, clinical and therapeutic principles of pathologies with abnormalities in the mechanisms of inflammation, angiogenesis, tissue remodeling and cancer.
G2: Understand, interpret and discuss with clinicians pathogenic aspects.
G3: Meet the analytical procedures used in the translational study of these biological processes.
G4: Become familiar with advances in biomedical research and learn the necessary tools to access ongoing training.

Specific
S1: Be able to design experimental protocols in vitro and in vivo to study processes related to translational medicine.
S2: Know how to properly formulate hypotheses and research objectives.
S3: Be able to design research projects potentially applicable.
S4: Be able to integrate the acquired knowledge on basic research and clinical research.
S5: Be able to identify public health problems and communicate them to project rating agencies.

Transverse
T1: Reflection, synthesis and release of trials.
T2: Ability to disseminate the acquired knowledge.
T3: Be able to interact with professionals from different medical specialties resolutely.
T4: Learn discussion skills.
T5: Use of English as a global language in science.

THEMATIC BLOCKS

1. Introduction and holistic view of biological mechanisms
   - Basic and advanced topics in cell biology/molecular mechanism and pathogenesis.
   - Physiopathology of metabolic diseases
   - Therapeutic utility of photonics in biomedicine

2. Inflammation
   - Neuroinflammation
   - Cerebral ischemia and reperfusion injury
   - Pharmacologic modulation of inflammation mediated by eicosanoids
   - Mechanisms involved in the regulation of inflammatory response

3. Angiogenesis
   - Role of the PI3-kinase family in the angiogenic processes
   - Angiogenesis in tumor progression and metastasis
   - Endothelial cells in physiology and pathophysiology
   - Molecular basis of angiogenic processes in fibrosis and cancer

4. Tissue remodeling
   - Decoding the function of progenitor cells in tissue regeneration
   - The role of oxidative stress in regulating cell function
   - Extracellular matrix and cardiovascular disease
   - Liver regeneration
   - Cardiac Fibrogenesis
   - Imaging techniques for the diagnosis of hepatic fibrosis

5. Cancer
   - Epigenetic alterations in cancer and therapeutic implications
- Genetic variations in colorectal cancer
- Role of the PI3-kinase/Akt/FoxO3 in tumor progression
- Oncogenesis: cellular and molecular basis
- Growth control and cancer metastasis

6. Photonics and nanotechnology
7. Research projects

**METHODOLOGY**

Total training hours: 6 credits ECTS x 25h/credit = 150h

a) Face-to-face training (48h)
b) Home training (102h):
   - The home training time is intended to studying, drafting a research project, preparing seminar and doubt resolution.

**EVALUATION**

1. - **CLASS ATTENDANCE:** max 50 points

   Specifically, attendance will be evaluated as: 95%-100% → 50 points; 80% - 95% → 40 points; 30-80% → 20 points; <30% → Subject Failure. The exam will consist on a written test, oral presentation or written report. The maximum score will be 50 points, and the minimum mark requested to pass the subject will be 20 points.

2. - **RESEARCH PROJECT:** max 50 points
   - Minimum requested= 20 points
   - Provide a research project that addresses a translational problem in the specific areas of angiogenesis, tissue remodeling, inflammation or cancer (use the file "Project_proposal.doc").
   - Projects submitted in English will be able to qualify for higher ratings.
   - The deadline for submission of the projects is November 25th.
   - email the final version of your project to mmoralesruiz@gmail.com (stating in the subject: “Research Project_MMT”)

To pass the course you must score at least 50 points

3. - **REEVALUATION:** In case of falling the ordinary evaluation, students will have to give a talk dissecting 2 scientific articles. In this case, students can only achieve a final score of 50. The talk should be presented in English and using PowerPoint slides. The analysis should be structured as follows:

   - Introduction: overview of articles’ topics, and state of the art in the field
   - Summary of results of both articles
   - Critical appraisal: breakthrough comparing both articles (1 page)
   - Limitations of each study (1 page)
REFERENCES

1: http://www.ninds.nih.gov/funding/grantsmanship_checklist.htm


4: http://www.nature.com/nature/insights/6835.html

5: http://www.nature.com/nature/supplements/insights/inflammation/

6: http://www.nature.com/nature/supplements/insights/angiogenesis/


In addition to these references, teachers will provide articles, books and electronic resources for each lecture.
# SUBJECT 1 – MOLECULAR BIOLOGY IN HUMAN DISEASES

## PROGRAM

<table>
<thead>
<tr>
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<th>PROFESSOR</th>
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<tbody>
<tr>
<td>Master’s introduction and kick-off (Opening)</td>
<td>Josep Maria Llovet</td>
</tr>
<tr>
<td>“Physiopathology of metabolical diseases” (Opening)</td>
<td>Ramon Gomis</td>
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<tr>
<td>Objectives and methodology of the subject (Opening)</td>
<td>Manuel Morales-Ruiz</td>
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<tr>
<td>Basic and advanced topics in cell biology/molecular mechanism and pathogenesis (Translational medicine, Introduction)</td>
<td>Wladimiro Jiménez</td>
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<tr>
<td>Molecular basis of angiogenic processes in fibrosis and cancer. (Angiogenesis-Cancer-Tissue remodeling)</td>
<td>Manuel Morales-Ruiz</td>
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<td>Neuroinflammation (Inflammation)</td>
<td>Josep Saura</td>
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<td>Cerebral ischemia and reperfusion injury: therapeutic targets for neuroprotection (Inflammation)</td>
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SUBJECT 2 – ANIMAL MODELING IN TRANSLATIONAL RESEARCH

STUDY PLAN

Coordinated by Dr Joan Clària  Senior Consultant at Dept Biochemistry and Molecular Genetics, Biomedical Diagnostic Center, Hospital Clinic, – Professor (agregat), Dept Biomedical Sciences, Faculty of Medicine, University of Barcelona

GENERAL INFORMATION

Subject Name: Animal Modeling in Translational Research
Code: 566657
Type: Compulsory
Teaching: First semester
Coordinator: Dr. Joan Clària
Contact Details: JCLARIA@clinic.ub.es
ECTS cred.: 6

OBJECTIVES

Upon completion of this subject students will be able to:

1. Identify the most appropriate experimental model to investigate mechanisms of a specific disease.
2. Identify the most appropriate methodology of laboratory employed in animal research studies.
3. Describe the strengths and weaknesses of a particular model of experimental disease.
4. Define the value and limitations of in vivo, ex vivo, in situ and in vitro experiments.
5. Understand the technicalities of the cellular and molecular biology methods most frequently used in experimental research.
6. Translate the results obtained in basic research to the diagnosis, prevention and therapy of particular diseases.
7. Understand offspring basic techniques used in genetic engineering of animal laboratories.
8. Understand fundamental aspects of the generation and husbandry of knockouts and transgenic models.
9. Appreciate the main advantages and disadvantages of the most common experimental models of prevalent diseases.
10. Know the basic technical aspects of proper handling in animal laboratories.
11. Understand the ethical and legal provisions of the experimental research.
12. Design organ functioning studies (kidney, heart, lung, etc.) and vascular and hemodynamics function.
13. Correctly design pathophysiological studies ex vivo and in situ.
14. Learn the basic principles of cell culture and manipulation.
15. Design studies in isolated cells, in vitro cell lines and primary cells.
16. Interpret pre-clinical studies and their use in the pharmaceutical industry.
17. Get acquainted with non-mammalian model systems.

PRE-SKILLS AND REQUIREMENTS
General
G1: Knowledge of the main tools for translational research
G2: Knowledge of the scientific biochemical, molecular and genetic basis used in translational research

Specific
S1: Acquire the necessary skills to properly interpret the results obtained with experimental models
S2: Develop the required skills to design a translational study in experimental models of a particular disease
S3: Complement the knowledge and skills acquired in the course of ‘Animal Experimentation at the Laboratory’

THEMATIC BLOCKS

1. Introduction and basic principles of experimental models
2. Ethical and legal dispositions in experimental research
3. Genetically modified animals: transgenic and knockouts
4. Breeding, genotyping, rederivation and cryopreservation of colonies
5. Research studies in large animals
6. Models for "non-mammalian" (Zebrafish) model systems
7. Experimental models for respiratory diseases
8. Experimental models for neuroscience
9. Experimental models for gastrointestinal diseases
10. Experimental models for liver disease
11. Experimental models for respiratory diseases
12. Experimental models for cancer
13. Experimental models for transplantation
14. Methods and Models for endothelial biology
15. Methods and Models in microbiology
16. Methods and models in immunology
17. Chromatographic methods for biomarkers identification
18. Design of pre-clinical studies in biomedical research
19. Screening methods in the pharmaceutical industry
20. Translating experimental studies into the industry

METHODOLOGY

Total training hours: 6 credits ECTS x 25h/credit = 150h

a) Face-to-face training (48h):
   - Lectures
   - Journal clubs
   - Seminars/Group discussion
   - Experimental project presentation
   - Seminars
b) Home training (102h):
   - Individual and group work
- Preparation of journal clubs
- Preparation of experimental project presentations

EVALUATION

To pass the subject, students must obtain a minimum of 50 points. The score will be established as follows:

- **Attendance and participation at the seminars:** 50% of the overall grade
- **Exam:** 40% of the overall grade. The exam is on site and consists of 25 questions with multiple choices (5, only 1 is correct; each mistake -0.2 points).
- **Experimental project oral presentation:** 10% of the overall grade.

Re-evaluation: critical appraisal of two scientific articles

REFERENCES

Bibliography:

- González de Buitrago. Técnicas y métodos de laboratorio clínico. Elsevier España, 2004
- González Hernández, A. Principios de bioquímica clínica y patología molecular, Elsevier España, 2007

Webography:

- http://www.complexttrait.org/
# SUBJECT 2 – ANIMAL MODELING IN TRANSLATIONAL RESEARCH

## PROGRAM

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<td>J. Clària (HCP/UB)</td>
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<td>Genetic engineered transgenic and knockout mice</td>
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<td>Experimental models of respiratory diseases</td>
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<td>Chromatographic methods</td>
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<td>SP chromatography coupled with MS on biomarker discovery</td>
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<td>Methods and models in immunology</td>
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<td>Mathematical models</td>
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<td>Screening methods in academic and pharmaceutical industry</td>
<td>Nuria Marzo (Grifols)</td>
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<td>Zebrafish and other non-mammalian models</td>
<td>C. Pujades (UPF)</td>
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<td>Experimental models in gastrointestinal research</td>
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SUBJECT 3 – GENOMICS AND EPIGENOMICS IN TRANSLATIONAL RESEARCH

STUDY PLAN

Coordinated by Dr Josep M Llovet ICREA Professor, IDIBAPS, University of Barcelona. - Director of the Liver Cancer Program, MSSM (New York) – Professor of Medicine, Department of Medicine, Faculty of Medicine, University of Barcelona and Dr Roser Pinyol – Senior Post-doctoral fellow, IDIBAPS – Associate Professor, University of Barcelona.

GENERAL INFORMATION

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<td>Prof. Josep M Llovet, Dr Roser Pinyol</td>
</tr>
<tr>
<td>Contact</td>
<td><a href="mailto:jmllovet@clinic.cat">jmllovet@clinic.cat</a>, <a href="mailto:rpinyol@clinic.cat">rpinyol@clinic.cat</a></td>
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OBJECTIVES

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

The overall objective is to provide a scientific basis for the design and implementation of translational research, and the most relevant methods, techniques and applications in modern biomedicine. This course also includes theoretical and practical activities such as presenting seminars and translational research projects.

PRE-SKILLS AND REQUIREMENTS

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 oncodrivers 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
   - 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
   - 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**

Total training hours: 6 credits ECTS x 25h/credit = 150h

a) Face-to-face training (48h): - Lectures
b) Home training (102h): - Individual and group work

**EVALUATION**

Evaluation criteria: 50% of the final score will depend on the attendance and active participation in class. The remaining 50% will be obtained through a written exam. The written exam will be based on a multiple option test with 50 questions. To pass the subject, students will have to fulfill three requisites: Attendance-score > 20, exam-score > 20, and overall score (attendance + exam) > 50.

Reevaluation: In case of failing the ordinary evaluation, students will have to critically appraise 3 scientific articles and present the analysis in form of oral presentation in front of an evaluation committee. In the re-evaluation the final score will never get over 50 points. English will be preferred in the presentation, but Catalan or Spanish will be also accepted.

**REFERENCES**

Books

- 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
  Data: Nov 29, 2012
- Translational Medicine and Drug Discovery
Articles

SUBJECT 3 – GENOMICS AND EPIGENOMICS IN TRANSLATIONAL RESEARCH

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SUBJECT 4- BIOMARKER DISCOVERY AND VALIDATION. SAMPLE MANAGEMENT AND BIOBANKS

STUDY PLAN

Coordinated by :

Dr Mercè Brunet
Head of Pharmacology and Toxicology, Biomedical Diagnostic Center, Hospital Clinic - IDIBAPS. CIBERehd. Adjunct medical lecturer - Dept Salut Pública, Faculty of Medicine, University of Barcelona

Dr Anna Bosch
HCB-IDIBAPS Biobank Coordinator. Head of Core Facilities, IDIBAPS

GENERAL INFORMATION

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OBJECTIVES

The overall objective of the subject is to achieve the necessary concepts for the design of translational studies on Biomarker discovery and validation, sample management and biobanks:

- The process of biomarkers discovery, validation and regulatory approval.
- Clinical and Therapeutic Utility of Biomarkers.
- Design of research studies based on new therapeutic targets and biomarkers validation
- Quality and safety in the laboratory
- Biological samples management and processing
- The role of Biobanks in translational research

PRE-SKILLS AND REQUIREMENTS

General
G1: Design of translational studies on Biomarkers
G2: Acquire the ability to design a translational study: population selection, biomarker panel selection, samples selection, platform or other methodologies selection, different phases of validation, clinical qualification and regulatory approval.
G3. Be able to organize a sample collection for future biomarker studies

**Specific**

S1: Design research studies on new predictive, prognostic, diagnostic or pharmacodynamic biomarkers
S2: Clinical Utility of pharmacogenetic, pharmacodynamic and predictive biomarkers: achieving personalized therapy
S3: Clinical benefit of monitoring prognostic and diagnostic biomarkers.
S4: Legal and ethical principles compliance
S5: Ability to report analytical data resulting from studies with statistical packages
S6: Biobanks as a tool to achieve quality compliance
S7: Learn to manage collection samples for research studies

### THEMATIC BLOCKS

1. Biomarker discovery and validation. Predictive and prognostic pharmacodynamic, pharmacogenetic and Genetic biomarkers in transplantation.
3. Translational study design on Biomarkers of immunemediated inflammatory diseases, cancer diseases, HIV vaccines
4. Legal and ethical principles. Quality and safety in the laboratory
5. Sample management and biobanks
6. Results analysis and interpretation

### METHODOLOGY

Total training hours: 6 credits ECTS x 25h/credit = 150h

a) Face-to-face training (48h):
   - Lectures and practical cases
   - Exam

b) Home training (102h):
   - Individual and group work

### EVALUATION

To pass the subject, students must obtain a minimum of 50 points. The score will be established as follows:

- Attendance: 50% of the overall score
- Exam: 50% of the overall score

### REFERENCES

References will be provided at the beginning of the course by each of the lecturers.
# SUBJECT 4- BIOMARKER DISCOVERY AND VALIDATION. SAMPLE MANAGEMENT AND BIOBANKS.

## PROGRAM

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<th>TOPIC</th>
<th>SUBTOPIC</th>
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<tr>
<td>Subject introduction, Objectives, Structure, methodology, and evaluation</td>
<td></td>
<td>Dr. Mercè Brunet, Dr. Anna Bosch</td>
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<tr>
<td>1- Biomarker Discovery and validation. Predictive and prognostic pharmacodynamic, pharmacogenetic and Genetic biomarkers in transplantation.</td>
<td>Biomarker Discovery and validation: regulatory approval</td>
<td>Dr. Sara Pich</td>
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<td>Clinical and Therapeutic Utility of Biomarkers in Transplantation: from bench to clinical practice</td>
<td>Dr. Mercè Brunet</td>
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<td>DSA as prognostic biomarkers of the risk of Ab chronic mediated rejection</td>
<td>Dr. Frederic Oppenheimer</td>
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<td>Biomechanics and tissue regeneration: a new source for obtaining organs for transplantation. Biomarkers of liver function</td>
<td>Dr. Mireia Caralt</td>
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<td>2- Prognostic and predictive biomarkers of cardiovascular risk and treatment response.</td>
<td>Development of biomarkers for Cardiovascular Risk assessment</td>
<td>Dr. Eduardo Salas</td>
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<td>Towards a Gene Therapy for Mucopolysaccharidosis Type IIIA. Predictive biomarkers of treatment response (from Block 3).</td>
<td>Dr. Virginia Haurigot</td>
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<td></td>
<td>Use of experimental models and development of new therapeutic strategies in cardiovascular biology. The role of Biomarkers.</td>
<td>Dr. Mercè Roqué</td>
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<tr>
<td>3- Translational study design on Biomarkers of immunemediated inflammatory diseases, cancer diseases, HIV vaccines</td>
<td>Biomarkers in prostate cancer</td>
<td>Dr. Begoña mellado</td>
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<td>HIV Vaccines. The need for predictive biomarkers of response</td>
<td>Dr. Felipe Garcia</td>
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<td>Biomarkers in Immune-mediated inflammatory diseases (IMID)</td>
<td>Dr. Sara Marsal</td>
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<tr>
<td>4- Pharmacogenetic Biomarkers</td>
<td>Drug transporter pharmacogenetics and clinical impact in anticancer chemotherapy and other therapeutic treatments.</td>
<td>Dr. Marçal Pastor-Anglada</td>
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<td>Pharmacogenetics of metabolizing enzymes and drug targets: clinical impact in personalized therapy</td>
<td>Dr. Mercè Brunet</td>
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<td>5- Legal and Ethical Principles. Quality and security in the laboratory</td>
<td>Scientific and ethical behavior</td>
<td>Dr. Itziar de Leucona</td>
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<td>Seminar: Practical cases and discussion</td>
<td>Dr. Itziar de Leucona</td>
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<td></td>
<td>New legal framework for clinical trials and human data protection</td>
<td>Dr. Pilar Nicolás</td>
</tr>
<tr>
<td></td>
<td>Biomedical Research Act : Authorisation of Investigation Projects and IC document</td>
<td>Dr. Isabel Novoa</td>
</tr>
<tr>
<td>6- Sample management and Biobanks</td>
<td>Biobanks; The HCB-IDIBAPS biobank</td>
<td>Dr. Anna Bosch</td>
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<td></td>
<td>Sample and data harmonisation: the Pulmonary Biobank Consortium</td>
<td>Dr. Cristina Villena</td>
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<tr>
<td></td>
<td>DNA and RNA isolation methods</td>
<td>Dr. Esther Titos</td>
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<td></td>
<td>Tissue microarrays: what, why and how?</td>
<td>Dr. Pedro Luis Fernandez</td>
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<td>Usefulness of biobanks for rare diseases</td>
<td>Dr. Antonia Ribes</td>
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<tr>
<td>7- Analysis and interpretation of the results</td>
<td>Data acquisition and analysis from an experimental study</td>
<td>Elisabet García</td>
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<td></td>
<td>Software tools for biobank management</td>
<td>Jokin Elzo</td>
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<tr>
<td>Final evaluation</td>
<td></td>
<td>Dr. Anna Bosch, Dr. Mercè Brunet</td>
</tr>
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</table>
SUBJECT 5 – BIOINFORMATICS IN TRANSLATIONAL RESEARCH

STUDY PLAN

Coordinated by:
- Núria Lopez-Bigas, IRB group leader, ICREA Research Professor, UPF Assistant Professor, ERC Consolidator Grant.
- David Tamborero, UPF post-doctoral researcher, IRB invited scientist.

GENERAL INFORMATION

<table>
<thead>
<tr>
<th>Subject</th>
<th>Bioinformatics and data analysis for high-throughput data</th>
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<tr>
<td>Coordinator</td>
<td>Dr Núria López-Bigas and Dr. David Tamborero</td>
</tr>
<tr>
<td>Contact</td>
<td><a href="mailto:Nuria.lopez@irbbarcelona.org">Nuria.lopez@irbbarcelona.org</a> and <a href="mailto:david.tamborero@irbbarcelona.org">david.tamborero@irbbarcelona.org</a></td>
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OBJECTIVES

Current technologies enable the examination of biological systems in unprecedented detail. While the use of these technologies has become widely available in clinical and research settings, the interpretation of these data remains an important bottleneck with a diversity of technological and scientific challenges. This module is aimed to review the main computational methods and available resources to analyse high-throughput data generated in biological experiments. We will alternate theoretical concepts with practical exercises in which we will use bioinformatics tools to address specific questions related with the biology of human diseases.

PRE-SKILLS AND REQUIREMENTS

General
G1: Access and use of the available public data sources
G2: Definition of variables at the molecular biology genome level and at the genomic medicine level
G3: Microarray, RNA-seq and Big data analysis
G4: Text Mining
G5: Polymorphisms, proteomics and protein interactions analysis
G6: Genome-scale data linking to clinical data and phenotypes
G7: New questions in biomedicine from the integration of Big data
G8: Networks

Specific
S1: Understand the principles behind high throughput data and the knowledge that can be extracted
S2: Learn how to use available computational resources and methods to analyse these data
S3: Develop skills to address specific questions about human diseases by using the above.

### THEMATIC BLOCKS

1. Introduction
2. Databases and genome browsers
3. High throughput data overview
4. Variant data analyses
5. Expression data analyses
6. Cancer genomics and therapeutic strategies
7. Network analyses
8. Integrative work

### METHODOLOGY

Total training hours: 3 credits ECTS x 25h/credit = 75h

a) Face-to-face training (32h):
   - Lectures
   - Computer sessions
   - Research projects presentation

b) Home training:
   - Individual and group work (43 hours)

### EVALUATION

Oral presentation and written article on the integration of the different practical exercises (integrative work) carried out during the course on the use case (50% of the overall grade, group exercise)

Final exam at the end of the course (50% of the overall grade, individual exercise)

### REFERENCES

References will be provided during the course
## SUBJECT 5 – BIOINFORMATICS IN TRANSLATIONAL RESEARCH

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<tr>
<td>Workshop session I: Biostatistical analysis challenges of “omics” datasets in R platform</td>
<td>D. Cordero- V. Moreno (ICO)</td>
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<tr>
<td>Identification of pathological mutations: from basic principles to clinical applications</td>
<td>X. de la Cruz (VHIR-ICREA)</td>
</tr>
<tr>
<td>Impact of the Peripancreatic Adipose Tissue on Beta-Cell Adaptation to Obesity: An integrated, multi-platform approach</td>
<td>R. Malpique (Sant Joan de Deu)</td>
</tr>
<tr>
<td>Systems analysis of multidimensional high-throughput immunological data for malaria vaccine development</td>
<td>C. Dobaño (ISGlobal)</td>
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<tr>
<td>Workshop session II: Hands-on of transcriptomic data in Muscular Dystrophies</td>
<td>S. Kalko / G. Fernandez (IDIBAPS,UB)</td>
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<tr>
<td>Nanobiomedicine: (bio)informatics challenges and opportunities</td>
<td>V. Puntes (ICEF-ICREA)</td>
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<tr>
<td>Lung Tissue Transcriptomic: a successful intramural collaboration between the Inflammation and Repair in Respiratory Illnesses’ Group and the Bioinformatics Core Facility</td>
<td>R. Faner (CIBERES-FISIB)</td>
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<td>Concepts and methodologies for Chip-seq analysis</td>
<td>G. Castellano (IDIBAPS)</td>
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<td>Personalized care for chronic patients in an integrated care scenario</td>
<td>J. Roca (HC, IDIBAPS, UB)</td>
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<td>Workshop session III: Application of protein-protein interaction networks in biomedicine</td>
<td>B. Oliva (UPF)</td>
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<td>Whole-transcriptome RNAseq analysis: applications and limitations</td>
<td>G. Fernandez (IDIBAPS)</td>
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<td>Workshop session IV: Bioinformatics methods for the functional analysis of high-throughput genomics data</td>
<td>R. Castelo (UPF)</td>
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<td>Epigenomics analysis in normal and neoplastic lymphoid cells</td>
<td>I. Martin (UB)</td>
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<tr>
<td>The need of external validation for metabolomics predictive models</td>
<td>S. Marco (UB)</td>
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<tr>
<td>Translational Research in Neuromuscular Disorders: identification of novel pathways and disease biomarkers in Muscular Dystrophies</td>
<td>C. Jimenez-Mallebrera (Sant Joan de Deu)</td>
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<tr>
<td>Structural bioinformatics in biomedicine</td>
<td>J. Fernandez Recio (BSC)</td>
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<tr>
<td>Genomic and proteomic dissection and characterization of the human sperm chromatin</td>
<td>R. Oliva (UB)</td>
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<tr>
<td>Annotation of novel transcripts and splice forms in both model and non-model organisms</td>
<td>T. Alioto (CNAG)</td>
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<tr>
<td>Bioinformatics applied to proteomics and metabolomics studies. Biomarkers discovery and Integrated Biology</td>
<td>I. Masana (AGILENT)</td>
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<tr>
<td>Improving assessment of lipoprotein profile in type 1 diabetes by 1H NMR spectroscopy</td>
<td>L. Brugnara (CIBERDEM-IDIBAPS)</td>
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SUBJECT 6 – IMAGING IN TRANSLATIONAL RESEARCH

STUDY PLAN

Coordinated by Dr Anna Planas IIBB-CSIC-IDIBAPS Researcher at the team Brain ischemia: Clinical and experimental studies.

GENERAL INFORMATION

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<tr>
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<tr>
<td>Coordinator</td>
<td>Dr. Anna Planas</td>
</tr>
<tr>
<td>Contact</td>
<td><a href="mailto:anna.m.planas@gmail.com">anna.m.planas@gmail.com</a></td>
</tr>
<tr>
<td>ECTS credits</td>
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</table>

OBJECTIVES

The purpose of this subject is to provide students scientific, conceptual, methodological and practical knowledge on biomedical imaging. Students must acquire basic knowledge of a wide range of different imaging modalities applicable in humans and experimental animals. They will be guided by expert teachers from different technologies, acquiring basic knowledge about image analysis. The overall objective of this subject spans from imaging techniques including biological samples for use in microscopy (optical, fluorescence, confocal, and electronics) and flow cytometry, to imaging in vivo including different types of MRI, nuclear medicine techniques (PET and SPECT), optical imaging, fluorescence, chemiluminescence and laser. These techniques will show students the different available tools for biological image, from structure to molecular imaging.

PRE-SKILLS AND REQUIREMENTS

General
G1: Understand, interpret and discuss issues with clinicians
G2: Become familiar with the progress of research in bioimaging and learn the tools necessary to access the continuous training
G3: Read, understand and discuss scientific texts
G4: Use of spoken and written English

Specific
S1: Understand the major diagnostic and therapeutic imaging techniques
S2: Know the latest imaging technology techniques and applications for clinical and basic research as their advantages and limitations
S3: Distinguish, use and analyze various microscopy and biomedical imaging techniques
S4: Gain knowledge on processing, quantification and optimization of various types of biomedical images
S5: Visit different experimental units: confocal microscopy, electron microscopy, flow cytometry, high magnetic field MRI
THEMATIC BLOCKS

1. Introduction to Imaging Techniques and Analyses
2. Microscopy
   2.1 Confocal microscopy
   2.2 Microscopic analysis of living cells
   2.3 Electron microscopy
   2.4 Intravital microscopy
   2.5 Microscopy image processing, optimization, and quantification
3. Optical imaging in living animals and humans: laser technology
4. Bioluminescence
5. Flow Cytometry: technical description and applications
6. Autoradiography
7. Positron Emission Tomography (PET) and Single Photon Emission Computed Tomography (SPECT)
8. Magnetic Resonance Imaging (MRI)
9. PET and MRI image analyses

METHODOLOGY

Total training hours: 3 credits ECTS x 25h/credit = 75h

a) Face-to-face training (32h):
   - Lectures
   - Seminars

b) Home training (43h):
   - Individual and group work

EVALUATION

Evaluation criteria: Attendance and active participation in classes (especially in Seminars) will be worth 50% of the final mark, the remaining 50% will depend on the presentation of a written report whose details will be announced on the first day of class.

Examination reviews: The grades will be announced at the appropriate section of the Virtual Campus.

Re-evaluation: research project.

REFERENCES

Books

- Gonzalez, Woods, Digital image processing. Addison-Wesley

Publications


Links

- http://www.bdbiosciences.com/
- http://www.leica-microsystems.com/
- http://health.siemens.com/
- http://www.microscopyu.com/articles/fluorescence
- http://www.med.harvard.edu/aanlib/home.html
- http://www.cis.rit.edu/htbooks/mri/
- http://www.humanconnectomeproject.org

Software

- Image Processing and Analysis in Java (http://imagej.nih.gov/ij/)
- FMRIB Software Library v5.0 (http://fsl.fmrib.ox.ac.uk/fsl/fslwiki/)
- Statistical Parametric Mapping (http://www.fil.ion.ucl.ac.uk/spm/)
- AFNI (http://afni.nimh.nih.gov/afni)
- The Brain Imaging Software Toolboxhttp://www.bic.mni.mcgill.ca/software/
- Talairach software (http://www.talairach.org/)
## SUBJECT 6 – IMAGING IN TRANSLATIONAL RESEARCH

### PROGRAM

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<td>Introduction to imaging techniques and analyses.</td>
<td>Dr. Anna Planas (IIBB-CSIC, IDIBAPS)</td>
</tr>
<tr>
<td>Optical imaging in living animals and humans: Laser Technology</td>
<td>Dr. Turgut Durduran (ICFO)</td>
</tr>
<tr>
<td>Microscopy image processing, optimization, and quantification.</td>
<td>Francisco Núñez (OLYMPUS)</td>
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<tr>
<td>Flow Cytometry: technical description and applications</td>
<td>Dr. Neus Villamor (Hospital Clinic, IDIBAPS), Dr. Francesc Miró (IDIBAPS)</td>
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<td>Electronic microscopy techniques</td>
<td>Josep Rebled (Cryo-Electron Microscopy Unit of CCIT-UB Centres Científics i Tecnològics UB)</td>
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<tr>
<td>Magnetic Resonance Imaging: Diffusion Tensor Imaging and Tractography / MRI in experimental animal models and Practical demonstration</td>
<td>Dra. Lupe Soria (UB), Dr. Carles Justicia (CSIC, IDIBAPS)</td>
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<tr>
<td>Autoradiography</td>
<td>Dr. Teresa Vilaró (IIBB-CSIC, IDIBAPS)</td>
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<tr>
<td>Imaging by PET and SPECT</td>
<td>Dr. Santi Rojas (Fundació Pasqual Maragall)</td>
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<tr>
<td>Analysis of in vivo images</td>
<td>Dr. Deborah Pareto (Hospital de la Vall d’ Hebrón)</td>
</tr>
<tr>
<td>Confocal microscopy and microscopic analysis of living cells</td>
<td>Dr. Maria Calvo (Serveis Cientifico-Tècnics UB)</td>
</tr>
<tr>
<td>Presentation of new confocal microscopy technologies</td>
<td>Dr. Juan L Monteagudo (LEICA MICROSYSTEMS)</td>
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<tr>
<td>Intravital microscopy</td>
<td>Dr. Azucena Salas (IDIBAPS)</td>
</tr>
<tr>
<td>Imaging through bioluminiscence</td>
<td>Dr Jerónimo Blanco (CID, CSIC)</td>
</tr>
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</table>
SUBJECT 7 – Responsible Research, Innovation and Enterpreneurship

STUDY PLAN

Coordinated by

Dr Pastora Martínez  Vicerector of Globalization and Cooperation, Universitat Oberta de Catalunya.
Dr Joan Bigorra  Director of Innovation at the Hospital Clinic Barcelona, IDIBAPS.

GENERAL INFORMATION

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OBJECTIVES

Part 1: Scientific Communication

This subject has two differentiated blocks and the main objectives are:

1) Scientific communication for a scientific audience
   • Improve the student’s capacity to communicate and disseminate the results obtained from their research in different formats (oral presentations, posters, scientific papers, CV)
   • To contextualize such communications within the different stages of research

2) Scientific communication for a general public (public engagement)
   • Report the key issues from the Responsible Research and Innovation (RRI) actions promoted by the European Commission within the action research program Horizon 2020
   • Skills to delve deeper in systems and mechanisms

Part 2: Enterpreneurship

The overall objective of the subject is to provide students the basic set of knowledge, know-how and skills to understand the basic policies and procedures to capture value from basic and translational research in Biomedicine and Biotechnology.
PRE-SKILLS AND REQUIREMENTS

General
G1: Broader view of biomedicine and biotechnology
G2: Communication, initiative and personal development

Specific
S1: Negotiation skills
S2: Basic biobusiness trends
S3: Learn in a scientific and social context how the research careers develop (Horizon2020 framework)
S4: Learn how to disseminate research results (audiovisual tools, social networking, scientific databases)
S5: Learn the key aspects in what is called public engagement (education, ethics, dissemination, open science...)

THEMATIC BLOCKS

Part 1: Scientific Communication

1. Introduction
2. Block 1: Scientific communication for a scientific audience
   a) Speaking in public: tips for impact presentations
   b) How to write a scientific paper
   c) How to make a scientific poster
   d) Introduction to leadership
   e) Career development in a scientific environment
   f) How a teacher (or a funding agency) will evaluate your résumé
3. Block 2: Scientific communication to the general public (public engagement)
   a) The need for a renewed relationship between science and society: towards responsible research and innovation
   b) Science dissemination 2.0
   c) Ethics, research and public engagement: analysis of case studies
   d) Two other ways of cooperation in science: the open access initiative and the citizen science movement

Part 2: Entrepreneurship

1. Introduction: how does the sector looks like?
2. Public-Private partnerships
3. Patents in Biomedicine and related areas
4. Biopharma: key strategic challenges and future perspectives
5. The Organization of Transfer policies in a University Hospital
6. Creation and development of start-up companies

METHODOLOGY

Total training hours: 3 credits ECTS x 25h/credit = 75h

a) Face-to-face training (40h):
   - Lectures
   - Seminars
   - Research projects presentation
b) Home training (35h):
   - Individual and group work

### EVALUATION

**Part 1: Scientific Communication**

**Evaluation criteria:** how the learned knowledge has been used in a particular case; practical proposals derived from the explained methodological proposals; conclusions obtained and formal aspects of the oral presentation and the written report. The score will be established as follows:

- Attendance 50% of the overall grade
- Oral presentation 50% of the overall grade

**Revaluation:** Submission of a written report

**Part 2: Entrepreneurship**

**Evaluation criteria:** To pass the subject, students must obtain a minimum of 50 points. The score will be established as follows:

- Attendance: 50% of the overall grade
- Test exam: 50% of the overall grade

**Procedure:** Test exam

**Revaluation:** TBC

### REFERENCES

**Part 1: Scientific Communication**

**Biomedical Articles**

• Raymon H. Mulford Library / Medical College of Ohio. Instructions to Authors in the Health Sciences. http://www.mco.edu/lib/instr/libinsta.html. Instrucciones para los autores de más de 3.500 revistas biomédicas, con conexión con la fuente primaria. Incluye otros documentos de interés, como la Declaración CONSORT (normas de preparación de manuscritos para ensayos clínicos controlados) y la última edición de las normas de Vancouver.
• http://www.bmj.com. Ir a “advise to contributors”. Normas de publicación, guías para evaluación de los artículos, editoriales sobre temas de publicación médica de interés.
• http://www.thelancet.com. Ir a “info for authors” (writing for the Lancet). Reflexiones sobre qué quiere y qué espera de los autores la Revista, cuáles son sus secciones, los intereses de sus lectores, etc. El contenido, variando de disciplina, puede ser aplicable a muchas otras revistas.

Peer Reviews

• Ribera JM, Cardellach F, Selva A. Procesos de revisión y de edición en Medicina Clínica. Med Clin (Barc) 2005; 125 (supl.1): 3-7
• Kronick DA. Peer review in 18th-century scientific journalism. JAMA 1990;263:1321-1322.
• The First International Congress on Peer Review in Biomedical Publication. JAMA 1990;263:1317-1441.
• The Third Congress on Biomedical Peer Review. JAMA 1998;280:203-306.
• Silva A, Campillo Artero C. Cómo se deben evaluar los artículos científicos propuestos para publicación. Med Clin (Barc) 1991;97:744-748.

Posters

Official Master in Translational Medicine Secretariat
Rosselló 153, 08036 Barcelona
+34 933129499 traslacional@ub.edu
• Campbell RS. How to present, summarize, and defend your poster at the meeting. Resp Care 2004; 49:1217-21.
• Miller JE. Preparing and presenting effective research posters. Health Serv Res 2007;42:311-328 (articulo de acceso libre).

Biomedical science databases

• Web of knowledge
• Scopus
• Pubmeb

Part 2: Entrepreneurship

• www.biocat.cat
• Nature Biotechnology Journal
## SUBJECT 7 – RESPONSIBLE RESEARCH, INNOVATION AND ENTREPRENEURSHIP

### PROGRAM

### Part 1: Scientific Communication

<table>
<thead>
<tr>
<th>Topic</th>
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<tr>
<td>How to make a scientific poster</td>
<td>Francesc Cardellach</td>
</tr>
<tr>
<td>Career development in a scientific environment</td>
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<td>How a professor (or a funding agency) will evaluate your résumé</td>
<td>Gemma Llaverias</td>
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<tr>
<td>A need for a renewed relationship between science and society: towards Responsible Research and Innovation</td>
<td>Rosina Malagrida</td>
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<td>Ethics, research and public engagement: analysis of case studies</td>
<td>Itziar de Lecuona, Rosina Malagrida</td>
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<td>Science dissemination 2.0</td>
<td>Xavier Lasauca</td>
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<td>Other ways of cooperation in science: the Open Access initiative and the citizen science movement</td>
<td>Ignasi Labastida</td>
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<tr>
<td>Oral presentations</td>
<td>Pastora Martinez</td>
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### Part 2: Entrepreneurship

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<th>Topic</th>
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<tr>
<td>Introduction to the Module. Value generation in Biomedicine and Biotechnology: Academic Centers, Hospitals, Companies</td>
<td>Juan Bigorra</td>
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<td>Public Private Cooperation in R&amp;D</td>
<td>Emilià Pola</td>
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<td>Patents in Biomedicine and related areas (I,II,III)</td>
<td>Prof. Pascual Segura</td>
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<td>• Ethical and legal aspects</td>
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<td>• Patentability</td>
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<td>• How to prepare an application</td>
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<td>• Patent management</td>
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<td>• Patent and know how exploitation</td>
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<td>Elisenda Vendrell, Teresa Lloret, Nunzio Ciffariello, Silvia Cufí</td>
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<td>• Overview</td>
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<td>• Entrepreneurship</td>
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<td>• When to create a Spin-off?</td>
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<td>• Participation Models</td>
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<td>• Types of Agreements</td>
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</table>
- Financing Life Cycle
- Business Angels and Venture Capital
- Entrepreneur support and Meetings
- Case Studies
S8 – PUBLIC HEALTH AND TRANSLATIONAL RESEARCH

STUDY PLAN

Coordinated by Prof. Ángela Domínguez Public Health Departament, Faculty of Medicine, University of Barcelona Epidemiology and Public Health CIBER, Instituto de Salud Carlos III.

GENERAL INFORMATION

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OBJECTIVES

At the end of this subject, students must be capable of:

- To explain the terms cluster, outbreak and epidemic
- To interpret and describe the value of an epidemic curve
- To list reasons for investigating an outbreak that has apparently ended
- To explain why any cases for which the times of onset are inconsistent with the general experience can appear in an outbreak
- To discuss some of the biases that might affect case-control studies
- To discuss some of the biases that might affect cohort studies
- To compare the results of a case-control study and a cohort study and comment the similarities and differences in the computed measures of association
- To calculate the proportion of attributable risk in the exposed
- To calculate the proportion of attributable risk in the population
- To discuss what does the proportion of attributable risk in the exposed and the proportion of attributable risk in the population imply for the practice of public health
- To discuss the criteria for causation in an observational study
- To describe the applications and limitations of matching in case-control studies
- To discuss the reason to match in a case control study
- To explain on which characteristics is useful to match in a case-control study
- To describe the method to analyze matched case-control data
- To calculate the odds ratio for triplets and quadruplets in a matched case-control study
- To identify the potential biases introduced by intense publicity in a case-control study
- To calculate the predictive value of the two sequence tests in a screening programme
- To discuss the criteria considered in evaluating a screening programme in public Health practice
- To define public health surveillance and to identify the key features of a surveillance system
- To discuss the differences between regional surveillance and national surveillance
- To develop a case definition for an outbreak investigation
- To explain how does one generate hypothesis to test in an outbreak investigation
- To discuss the advantages and disadvantages of using a sensitive and/or specific case definition in an epidemic investigation
- To list the factors that can account for a change in the reported incidence of a disease
- To discuss the effect of a different case definition on the sensitivity of a surveillance system
- To discuss the discrepancy observed between hospitalized cases and reported cases
- To calculate the vaccine effectiveness and discuss its interpretation

### PRE-SKILLS AND REQUIREMENTS

#### General
- G1: Be able to design, plan and properly interpret experimental protocols in the field of Translational Medicine
- G2: Be able to dynamically integrate modern knowledge and techniques developed within the field of Translational Medicine
- G3: Be able to interact with professionals from other medical specialties in a creative and decisive way
- G4: Have a clear appreciation of disciplinary actions and communications necessary to establish the link between basic science and clinical medical research

#### Specific
- S1: To be capable of teaching and divulging knowledge in the social environment for expert and non-expert people
- S2: To be capable of integrate knowledge and ways to do in front complex situations and to formulate a judgment with a limited information, but in a reflexive way, taking into account the social and ethical repercussions of them
- S3: To be capable of knowing the bioethical and legal principles of research and professional activities in the field of translational research
- S4: To be capable of using adequate technologies for the design, analysis and interpretation of epidemiological data
- S5: To be capable of identifying problems of public health, to design epidemiological studies and to interpret the results

#### Pre-requisites
- All oral sessions, presentation of lectures and practical sessions will be offered in English, thus students should have a good comprehension and oral English level.

### THEMATIC BLOCKS

1. Introduction to Global Public Health
2. Bioethics
3. Fundamentals of outbreak investigations. Case study: Oswego
5. Sensitivity of a surveillance system. Case study: Paralytic illness in Ababo
7. Prevention impact assessment. Case study: Texarkana-Vaccine efficacy
8. Unmatched and matched case control studies. Case study: Toxic shock syndrome
9. Screening programmes in public health practice. Case study: Screening for antibody to the human immunodeficiency virus
METHODODOLOGY

Total training hours: 3 credits ECTS x 25h/credit = 75h
Classroom activities will consist in sessions which firstly show the conceptual aspects needed for the different types of epidemiological studies and secondly, problem solving using different case-studies. In this way, the students will acquire knowledge and skills to apply translational research to public health and the basics of epidemiology by means of the analysis of real situations.

a) Face-to-face training (32 h):
- Lectures
- Case-studies

b) Home training: Students should prepare the case-studies before each session, to study the concepts explained in classroom and to read the recommended reading until to complete the 75 hours corresponding to the 3 ECTS credits of the subject.

EVALUATION

Assessment criteria
Class participation and performance (50%)
Oral presentation (50%)

Oral presentation: Students present in class an observational study dealing with the association between a risk factor or a preventive measure (primary prevention or secondary prevention) and a communicable disease. Students should conduct a bibliographical research prior to the presentation, and select three or four possible articles of interest that are subject to the lecturer’s consideration. Only one article is chosen for the presentation. The oral presentation must include an introduction to the topic, as well as the research question, objectives, methodology (describing the design of the study and the variables included and the ethical aspects), results, a discussion (including limitations and possible biases of the study) and conclusions. Students should also make recommendations in relation to the author’s conclusions. A pdf file containing the PowerPoint slideshow supporting the oral presentation must be submitted to the lecturer after the presentation. Slideshows are posted in the Virtual Campus.

Repeat assessment: After the final grades have been posted, a multiple-choice examination is set for students who have not met the assessment criteria. There is only one correct answer out of four options per question. Incorrect answers incur a penalty of 25% of the mark given for each correct answer.

REFERENCES

• Miettinen OS (2012). Up from clinical epidemiology & EBM. Heidelberg: Springer.
## SUBJECT 8 – PUBLIC HEALTH AND TRANSLATIONAL RESEARCH PROGRAM

<table>
<thead>
<tr>
<th>TOPIC</th>
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<tr>
<td>Introduction to Global Public Health</td>
<td>Prof. Núria Casamitjana (UB/ ISGLOBAL)</td>
</tr>
<tr>
<td>Bioethics</td>
<td>Prof. Itziar de Lecuona (UB/ Observatori de Bioètica i Dret)</td>
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<tr>
<td>Fundamentals of outbreak investigation</td>
<td>Prof. Núria Torner (Agència de Salut Pública de Catalunya / UB/ CIBERESP)</td>
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<td>Case study: Oswego</td>
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<tr>
<td>Investigation of transmission in infectious diseases</td>
<td>Prof. Núria Torner (Agència de Salut Pública de Catalunya / UB/ CIBERESP)</td>
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<tr>
<td>Case study: Suspected Legionnaires’ disease in Bogalusa</td>
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<td>Sensitivity of a surveillance system</td>
<td>Prof. Núria Torner (Agència de Salut Pública de Catalunya / UB/ CIBERESP)</td>
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<td>Case study: Paralytic illness in Ababo</td>
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<td>Design of analytical observational studies. Impact measures</td>
<td>Prof. Àngela Domínguez (UB/CIBERESP/ISCIII)</td>
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<td>Case study: Smoking and lung cancer</td>
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<td>Prevention impact assessment</td>
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<td>Case study: Texarcana-Vaccine efficacy</td>
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<td>Unmatched and matched case-control studies</td>
<td>Prof. Àngela Domínguez (UB/CIBERESP/ISCIII)</td>
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<td>Case study: Toxic shock syndrome</td>
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<td>Screening programmes in public health practice</td>
<td>Prof. Maria Grau (IMIM / UB)</td>
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<td>Case study: Screening for antibody to human immunodeficiency virus</td>
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S9 – CLINICAL TRIALS DESIGN AND EVALUATION OF MOLECULAR THERAPIES

STUDY PLAN

Coordinated by:

- **Dr Aleix Prat.** Head of genomics and targeted therapies in the of solid tumors group. Institute of Biomedical Research August Pi i Sunyer (IDIBAPS)-Hospital Clinic de Barcelona, Spain. Principal investigator of Translational Genomics Group at VHIO.

- **Coordinated by Dr Ferran Torres.** Scientific director of the Medical Statistics core facility at IDIBAPS (Institut d’Investigacions Biomèdiques August Pi i Sunyer) – Hospital Clinic Barcelona.

**GENERAL INFORMATION**

<table>
<thead>
<tr>
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<td>Coordinator</td>
<td>Dr. Aleix Prat / Dr. Ferran Torres</td>
</tr>
<tr>
<td>Contact</td>
<td><a href="mailto:alprat@clinic.cat">alprat@clinic.cat</a> / <a href="mailto:ferran.torres@idibaps.org">ferran.torres@idibaps.org</a></td>
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**OBJECTIVES**

The purpose of this module is to gain knowledge on the drug development process, and to obtain the basic methodological knowledge to be able to understand the basics of clinical trial design within a product development program.

At the end of this subject, students must be able:

- To list the phases of product development of new chemical entities and understand their objectives.
- To interpret and the type of evidence coming from each phase of product development.
- To understand basic concepts of pharmacokinetics relevant for drug development.
- To discuss the key features of clinical trial design.
- To discuss basic aspects of statistical considerations in clinical trials, including apriorism, protection against errors and multiplicity issues.
- To interpret results for comparison of proportions, means and survival analyses.
- To understand the concepts of superiority, equivalence and non-inferiority.
- To explain the terms exploratory, confirmatory, biomarker and validation.
- To explain the main steps to reach a marketing application approval in Europe.
- To know which are the different interactions with regulatory agencies during a product development process, and
their objectives.
- To have notions on post-marketing surveillance and the adaptive licensing initiatives.

**PRE-SKILLS AND REQUIREMENTS**

**General**
G1: Be able to design, plan and properly interpret clinical protocols in the field of Translational Medicine
G2: Be able to dynamically integrate modern knowledge and techniques developed within the field of Translational Medicine
G3: Be able to interact with professionals from other medical specialties in a creative and decisive way
G4: Have a clear appreciation of disciplinary actions and communications necessary to establish the link between basic science and clinical medical research

**Specific**
S1: To be capable of teaching and divulging knowledge in the social environment for expert and non-expert people
S2: To be capable of integrate knowledge and ways to do in front complex situations and to formulate a judgment with a limited information, but in a reflexive way, taking into account the social and ethical repercussions of them
S3: To be capable of knowing the bioethical and legal principles of research and professional activities in the field of translational research
S4: To be capable of using adequate technologies for the design, analysis and interpretation of epidemiological data
S5: To be capable of identifying problems of public health, to design epidemiological studies and to interpret the results

**Pre-requisites**
All oral sessions, presentation of lectures and practical sessions will be offered in English, thus students should have a good comprehension and oral English level.

**THEMATIC BLOCKS**

1. Introduction and overview of drug development process
2. Drug discovery process
   a. From bench to bed: disease and potential targets
   b. Target identification and validation
   c. Candidate selection
3. Product development
   a. Product development plans and target product profile
   b. Pre-clinical development
      i. Non-Clinical development and early safety tests
      ii. Basic pharmacokinetics
4. Clinical development (phases I to IV)
a. Basis of clinical trial design  
b. Clinical development  
c. Development and validation of biomarkers  

5. Drug approval process (EMA and other drug agencies)  
a. Regular process for Marketing Authorization Procedure  
b. Pre-approval interactions with agencies  
c. Special situations: orphan medicinal products, accelerated procedures  

6. Post-approval research and monitoring  
a. Safety surveillance  
b. Effective assessment and real world data  
c. New initiatives for adaptive licensing  

METHODOLOGY  

Total training hours: 3 credits ECTS x 25h/credit = 75h  

Classroom activities will consist in sessions which firstly show the conceptual aspects and secondly, problem solving using different case studies. In this way, the students will acquire knowledge and skills to apply translational research by means of the analysis of real situations.  

a) Face-to-face training (25h):  
- Lectures  
- Case studies  

b) Home training (50h):  
- Individual and group work: Students will prepare and present one case study, based on the concepts explained in face-to-face training, in addition to the complementary read of key documentation in order to complete 3 ECTS credits of the subject.  

EVALUATION  

Evaluation criteria:  
- Participation and performance in class and practical examples (50%)  
- Final presentation of a group work project (50%). This will be described in detail during the first day of the class  

Examination reviews:  
- The final scores will be announced at the appropriate section of the Virtual Space.  

Reevaluation:  
- For those not reaching the sufficiency in the final exam, a single additional multiple-choice test will be offered with same characteristics of the final examination.  

REFERENCES  

Clinical Trials  
- Bakke OM, Carné X, García Alonso F. Ensayos Clínicos con medicamentos. Fundamentos básicos, metodología y práctica.


**Biomarkers**

- Simon R. Genomic Clinical Trials and Predictive Medicine. Cambridge University Press, National Institutes of Health 2013, New York, USA
- Catenacci DV. Next-generation clinical trials: Novel strategies to address the challenge of tumor molecular heterogeneity. Mol Oncol. 2015 May;9(5):967-96.
- Simon R. Biomarker based clinical trial design. Chin Clin Oncol 2014;3(3):39

**International Conference of Harmonization (ICH)**

- Other ICH guidances can be found at: http://www.ich.org/products/guidelines/efficacy/article/efficacy-guidelines.html

**EMA Guidelines**

Useful links

- Simon Two-Stage Design:
  http://cancer.unc.edu/biostatistics/program/ivanova/SimonsTwoStageDesign.aspx
- Sample Size:
- POWER de Un. IOWA: http://homepage.stat.uiowa.edu/~rlenth/Power/
- Power and sample size de Vanderbilt University, by Dupont WD, Plummer: http://biostat.mc.vanderbilt.edu/twiki/bin/view/Main/PowerSampleSize
# SUBJECT 9 – CLINICAL TRIALS DESIGN AND EVALUATION OF MOLECULAR THERAPIES

## PROGRAM

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<td>Introduction</td>
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<td>Joaquin Delgadillo (Astra Zeneca)</td>
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<td>Drug discovery process</td>
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<td>Jorge Martinalbo PhD (EMA)</td>
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<td>Drug discovery process</td>
<td>Target identification and validation</td>
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<td>Drug discovery process</td>
<td>Candidate selection</td>
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<td>Product development</td>
<td>Product development plans and target product profile</td>
<td>Caridad Pontes, MD PhD (UAB, SWAP-EMA)</td>
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<td>Product development</td>
<td>Non-Clinical development and early safety tests</td>
<td>Ivan Diaz-Padilla MD PhD (Novartis)</td>
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<td>Ferran Torres, MD PhD (IDIBAPS / SAWP-EMA)</td>
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<td>New initiatives for adaptive licensing</td>
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SUBJECT 10 – STEM CELL RESEARCH

STUDY PLAN

Coordinated by Dr Roger Gomis, ICREA Professor and Researcher at the IRB Barcelona.

GENERAL INFORMATION

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OBJECTIVES

The overall objective of this module is to offer next generation scientists a meticulous training in regenerative medicine and stem cell so they can contribute to the stem cells biology knowledge with its clinical and therapeutic applications.

PRE-SKILLS AND REQUIREMENTS

General
The program proposes basic training in cancer biology and its development. The offered methodology intends to provide the necessary knowledge to create study and apply stem cells and its surroundings to experimental treatments in human beings.

Specific
Stem cell biology and methods used for identification. Types of stem cells: adult; hemopoietic: mesenchymal somatic and iPS. Regeneration and homeostasis: cellular therapies expectations. Development of advanced therapies, from the hypothesis to the patient.

THEMATIC BLOCKS

1. Introduction
2. Stem cell Biology
3. Methods for stem cells identification
4. Generating iPS cells
5. Adult stem cell
6. Progenitors and endothelial cells: angiogenesis
7. Production techniques: apheresis
8. Production factory in cell therapy
9. Regulation of the procurement, processing and administration of advanced therapies
10. Stem cell, cancer and development
11. Senescence, aging and reprogramming
12. Intestinal epithelium and Colorectal Cancer Stem Cells
13. Regeneration of hematopoiesis by progenitors transplantation
14. Platelet lysate as a source of cell growth factors
15. Lung Regeneration: pneumocytes transplant
16. Therapeutic vaccines generation: dendritic cell and infectious diseases
17. Mesenchymal cell: regeneration, immunosuppression and tumors
18. Gene Therapy
19. Chimeric antigen receptors generation
20. Future applications in cell therapy

METHODOLOGY

Total training hours: 3 credits ECTS x 25h/credit = 75h

a) Face-to-face training (32h)
   - Lectures
   - Computer sessions
   - Seminars
   - Laboratory Practices (subject to individual’s availability)
   - Presentation of research projects (subject to individual’s availability)

b) Home training (43h)
   - Individual and group work

EVALUATION

To pass the subject, students must obtain a minimum of 50 points. The score will be established as follows:

- **Attendance**: 50% of the overall grade
- **Research project or exam**: 50% of the overall grade

REFERENCES

References will be recommended by each of the lecturers.
# SUBJECT 10 – STEM CELL RESEARCH

## PROGRAM

<table>
<thead>
<tr>
<th>TOPIC</th>
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<td>Applications of cellular therapy</td>
<td>Josep Canals</td>
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<tr>
<td>Stem cells biology, identification methods and practice</td>
<td>Jordi Petriz</td>
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<td>Intestinal epithelium and Colorectal Cancer Stem Cells</td>
<td>Eduard Batlle</td>
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<td>Senescence and reprograming</td>
<td>Manuel Serrano</td>
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<td>Leukemias</td>
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<td>Pablo Menendez</td>
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<td>Maria Abad</td>
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<td>Joan Cid</td>
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<td>Jordi Barquinero</td>
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<td>Alveolar regeneration in idiopathic pulmonary fibrosis</td>
<td>Anna Serrano Mollan</td>
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<td>Maribel Díaz-Ricart</td>
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<td>Esteve Trias</td>
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<td>Hemopoietic regeneration by transplantation</td>
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<tr>
<td>Hemopoietic stem cell collection</td>
<td>Miquel Lozano</td>
</tr>
<tr>
<td>Tumor Immunotherapy</td>
<td>Daniel Benitez</td>
</tr>
<tr>
<td>Chimeric antigen receptors</td>
<td>Julio Delgado</td>
</tr>
<tr>
<td>Literature review/seminars:</td>
<td>Pedro Marín and Roger Gomis</td>
</tr>
<tr>
<td>• Cancer stem cells, do they exist?</td>
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<tr>
<td>• Regeneration vs repair</td>
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<td>• Stem Cells and biomaterials scaffolds</td>
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<td>• Mesenchymal Stem Cells</td>
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<td>• Fetal and Cord Blood Stem Cells</td>
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<td>• Immunotherapy and infectious diseases</td>
<td></td>
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</table>
SUBJECT 11 – HIGH-THROUGHPUT DATA ANALYSIS

STUDY PLAN

Coordinated by Dr Josep Lluis Bedini  Head of Operations Area at Hospital Clinic – Biomedical Diagnostic Center – CORE - Adjunct medical lecturer, Physiological Sciences I Department, Faculty of Medicine, University of Barcelona.

GENERAL INFORMATION

Subject Name: High-throughput Data Analysis
Code: 566666
Type: Optional
Teaching: Second semester
Coordinator: Dr. Josep Lluis Bedini
Contact: JLBEDINI@clinic.cat
ECTS credits: 3

OBJECTIVES

The overall objective of this optional subject is to show students the daily functioning habits of a clinical laboratory in which many different analytical technologies are applied. Similarly, students will work supervised by responsible physicians at each of the laboratory areas, so that they can experience the role of a clinic laboratory within the patient care assistance.

PRE-SKILLS AND REQUIREMENTS

General
G1: Teamwork skills
G2: Critic sense of view

Specific
S1: Knowledge of basic biology and biochemical techniques
S2: Biological sample processing and analysis (plasma, biopsies...)

THEMATIC BLOCKS

1. Introduction at the Core Laboratory. Technology, organization, functioning and patient assistance role.
2. General biochemistry
3. Emergency laboratory
4. Specific biochemistry concepts: electrophoresis and nephelometric
5. Immunoassay: tumor markers and hormones
METHODOLOGY

Total training hours: 3 credits ECTS x 25h/credit = 75h

a) Face-to-face training (6 days 4 hours /day):
   - Laboratory

b) Home training (51 hours):
   - Individual and group work

EVALUATION

The evaluation criteria will be mainly assessed by the student’s interest and dedication during the practical stage at the laboratory, playing an important role the established schedule compliance.

Different physicians will evaluate the students during their stay at the laboratory.

REFERENCES

During the practical stage different references (books, electronic resources, articles, databases and portals) will be provided.

MASTER THESIS

Coordinated by Dr Josep M Llovet ICREA Professor, IDIBAPS, University of Barcelona. - Director of the Liver Cancer Program, MSSM (New York) – Professor of Medicine, Department of Medicine, Faculty of Medicine, University of Barcelona.

GENERAL INFORMATION

<table>
<thead>
<tr>
<th>Subject Name</th>
<th>Master Thesis</th>
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<tbody>
<tr>
<td>Code</td>
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<tr>
<td>Type</td>
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<td>Teaching</td>
<td>Second semester</td>
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<tr>
<td>Coordinator</td>
<td>Prof. Josep M Llovet</td>
</tr>
<tr>
<td>Contact details</td>
<td><a href="mailto:jmllovet@clinic.cat">jmllovet@clinic.cat</a></td>
</tr>
<tr>
<td>ECTS credits</td>
<td>24</td>
</tr>
</tbody>
</table>

OBJECTIVES

To obtain the Master Degree the Master Thesis is compulsory (RD 1393/2007). It consists of a research project, with 24 ECTS credits, resulting from the student individual work during his/her practical training in a research laboratory.

EVALUATION

There will be a mid-term evaluation in December were students will have to briefly present orally their master thesis. Each student with have 5 minutes to introduce the topic, the working hypothesis and objectives of the research work, materials and methods that he/she is planning to use and a brief description of the expected results.

The final score of the Master Thesis will reflect the quality of the master thesis written report and oral defense. **Language:** The written report should be submitted in English and the public defense can be done in Catalan, Spanish or English. **Deadline:** The written report must be submitted by May 31th, with the tutor’s approval. The public defense will take place in front of a panel of experts. The date of the oral presentation will be announced by the Master Secretariat during the first half of June.

The Master Coordination Committee will nominate the Master Evaluation Panels (constituted by professors or researchers) which will evaluate the report submitted as well as the oral presentation. Evaluation panels may request clarifications to the student or his/her tutor regarding the work submitted before, during and after the oral presentation.

**Written Report:** Students will have to submit a digital version of their master thesis to the master secretariat in .pdf form. The evaluation panel will take into account the quality of the written report, whether the objectives were well defined and described and whether they were met or not, the correct presentation and interpretation of the results and the consistency of the findings described in the discussion. The correct citation of reference articles will be also evaluated. The written report will count 50% of the final Master Thesis score.

**Oral presentation:** Students will have defended their work in front of the Evaluation Panel. They might help themselves by using a Power Point presentation (or similar tool). Students will have **12 minutes** to present their work, and **3 minutes** time
for discussion with the members of the evaluation panel. Defending the master thesis in English will be a plus in the evaluation. The written report will count 50% of the final Master Thesis score.

2.- The written report should have the following sections:

1. **Title page** (1 page): This page should contain the title of the research, student's full name, affiliation (Department, Institution or Research Centre where the project is done) and the tutor's name.

2. **Introduction** (2 pages): Outlines the background of the topic and sets the research context.

3. **Working Hypotheses and Objectives** (1 page): This section should be concise.

4. **Material and Methods** (2 pages): This section should be detailed and complete. It is recommended to specify the type of study, sample size, experimental designs, patterns " in vivo " or " in vitro " (if applicable), data collection and statistical processing of the results. If appropriate, they should explain the ethical aspects of the study in this section.

5. **Results** (5 to 10 pages): In this section results will be described. Tables and figures and its corresponding descriptions have to be included if considered necessary.

6. **Discussion** (4 pages): In this section, findings should be discussed and the results should be framed in relation to the known literature in the field.

7. **Conclusions** (1 page): Here the conclusions of the research study have to be listed.

8. **References** (2 pages): References have to be listed in this section. They have to be updated and focused on the data related to the presented project. It is recommended to avoid long collections or literature not mentioned in the project. The citation rules should follow the Vancouver style (Index Medicus).

If you have been involved in a research article, this can be integrated in the "results" section

3.- Total training hours: 24 credits ECTS x 25h/credit = 600h (minimum 500h)

**Formatting guidelines for written project:**
- Font: Arial or Calibri 12pt
- Language: English
- PDF to be sent to translacional@ub.edu before 31st May 2017

**Formatting guidelines for oral presentation:**
- Supported with a Power Point or similar
- Language: English preferred, but Catalan or Spanish will be accepted
- Duration: 10 minutes +5 minutes (questions)
- Scheduled from 11th to 14th June 2017

Scores will be then converted using the following table: from 5 to 6.9, “aprovat”; from 7 to 8.9, “notable” and from 9 to 10, “excel·lent”. To be able to obtain an excellent with distinction, students should have a score above 9.5 and other merits that the evaluation panel and Master Coordination Committee will consider. If students do not obtain a score over 5, they have to pre-register and register again to the subject. They might choose whether they want to improve the same work piece they have presented or rather start a new research project. If a student has published an original paper in an indexed journal as first or second author, this work will be considered equivalent to the written report associated to the Master Thesis. Articles in press will be also accepted. Accompanying the article, students will have to present a 1-page-document describing their contribution to the submitted paper.
Since the Master Thesis is individual, each piece of research work presented may only be submitted by a single student. A student who submits a thesis that was not written by himself/herself or who presents as his/her own any research findings (ideas, words, work) of a third party, is guilty of plagiarism. Any text, passage, excerpt, etc. from a source other than one’s own must be duly and fully identified and acknowledged. Plagiarism will attract the appropriate penalties as provided in the Faculty’s Study Regulations.

Following UB regulation, students need to pass all master subjects in order to be able to defend their master thesis.
LIST OF MASTER THESIS PRESENTED

List of Master Thesis presented in 2016-2017

1. Microglia-like cells as a neuroinflammation model for Parkinson’s Disease
2. Identification of biomarkers of the oncogenic status of the TGF-β pathway in hepatocellular carcinoma
4. Alterations in the development of a M2 phenotype in gial cells: Rotenone in vitro model of Parkinson’s disease.
5. Immunothrombosis: Role of neutrophil extracellular traps (NETs) in the clinical manifestations of antiphospholipid syndrome
6. Prognostic genetic biomarkers to evaluate risk of recurrence in stage II colon cancer
7. Citrullinated peptides for the diagnosis of rheumatoid arthritis
8. Escitalopram impairs platelet response to thrombin
9. Increasing therapeutic potential of MSC.
10. cAMP cascade (Adenyl cyclase, Phosphodiesterases, PKA and Epac) participation on macrophage polarization.
11. Phosphorylation status of tyrosine 74 and 88 of p27 and a strategy to recover its nuclear activity in Colorectal Cancer: An in-vitro and Mass Spectrometry approach
12. The role of exosomes in angiogenesis modulation in acute coronary syndrome.
13. Evaluation of antioxidant and anti-steatotic effects of cerium oxide nanoparticles as promising therapeutic agent in the non-alcoholic fatty liver
15. Ultrasensitive assay to detect low concentrations of KIM-1 in blood
16. Biochemical and functional aspects in ARTAG pathology
17. Quantification of vascular pathology in the aged human brain: association with cognitive impairment and major depressive disorder
18. Hepatobiliary cells in advanced chronic liver disease
19. Identification and characterization of genetic variants in the C/EBPδ gene as potential biomarkers in patients with Parkinson’s Disease

List of Master Thesis presented in 2015-2016

1. Key role of PFKFB3 in hepatic stellate cell activation in chronic liver disease
2. Study of the adult cardiovascular risk susceptibility in a intrauterine growth restricted rat model
3. Characterization of the expression profile of myeloid cells in brain after stroke
4. Identifying novel partners of DYRK1A
5. Cellular and molecular mechanisms of action of albumin in the prevention of Acute-on-chronic Liver Failure
6. Epigenetics in cancer: regulation of histone H1
7. Mechanism of Action of the Anti-Tumorigenic Agent Omomyc in Glioblasto
8. Study of the detection of intrahepatic cccDNA in Hepatitis B Virus (HBV Infection)
9. Effects of nanoporous silica particles on glial cells
10. Study of the role of MFN2 and BNIP3 in autophagy and mitochondrial function in aging skeletal muscle
11. The role of stem cell transcription factors in tumor progression
12. Plant food sensitization in a population with LTP syndrome
13. Engineering the adeno-viral genome for targeting oncolytic adenovirus to pancreatic ductal adenocarcinoma

14. Study of the immune spleen function in human subjects during and after plasmodium falciparum malaria
15. Exosomal miRNA in type 2 diabetes
16. Analysis of protein kinase CK2 expression in hepatic stellate cells and its possible role in hepatic inflammation and fibrosis
17. Prospective Multicenter Study in Pediatric Autoimmune Encephalitis Associated with CNS Antibodies
18. Efficacy of a biologically rational combinational treatment strategy to potentiate the effect of EGFR-TKIs in EGFR mutant small cell lung cancer in vitro

19. Hepatocellular regeneration after major liver resection in a porcine model
20. Investigating the In Vitro Effects of cAMP Analogs and Phosphodiesterase-4 Inhibitors on the Activation Phenotype of Microglia and Macrophages
21. Experimental models of Cholangiocarcinoma and Assessment of Molecular Therapies
22. Evaluation of the yield and specificity of a new differentiation protocol of induced pluripotent stem cells to hepatic stellate cells
23. Glycogen metabolism in POMC neurons and its implications in energy balance regulation
24. Anti-inflammatory and immunomodulatory properties of energy-restricted Mediterranean Diet on Cardiovascular diseases after one year of intervention
25. β1 integrin expression in patients with Marfan syndrome
26. Modulation of cystine lithiasis in cystinuria
27. Molecular predictors of response to sorafenib as adjuvant therapy after resection in hepatocellular carcinoma: Results from BIOSTORM study
28. The role of PTHLH in neuroblastoma

List of Master thesis presented in 2014-2015

1. Characterization of retinoic acid during the differentiation in vitro of pluripotent stem cells to telencephalon progenitors
2. DNA methylation analysis of CD4+ T lymphocytes and CD19+ B lymphocytes from RA and PsA patients
3. Preclinical models assessing the efficacy of BI836845, a novel monoclonal antibody against IGF ligands, in hepatocellular carcinoma
4. Microenvironment effects on epithelial breast cancer cells phenotype
5. Study of neuron and BBB proteome after ischemic stroke
6. Brain activity recovery enhanced by transcranial direct current stimulation (tDCS) in a rat model of stroke
7. Analysis of circulating microRNAs as biomarkers for early detection of pancreatic cancer
8. Using variant calls to check the sex, relatedness and ethnicity of samples within a data set
9. Identification of Mycobacterium tuberculosis using nanostructured particles in broth culture media
10. Characterization of metformin action in the hepatic sinusoid of cirrhotic portal hypertensive rats
11. Relevance of vascular PI3K inhibition in breast cancer
12. Warm ischemia perfusion injury in the liver sinusoid
13. Impact of cigarette smoke on bone marrow mesenchymal stem cells in an animal model of COPD
14. Alzheimer’s disease: screening of drugs that regulate mitochondrial DNA copy number
15. GABAergic septohippocampal pathway in Alzheimer’s disease
16. Processing Hematopoietic Progenitor Cells from bone marrow: from established to new technologies
List of Master thesis presented in 2013-2014

1. Identification of gene variants associated with an inappropriate innate immune response in cirrhotic patients with Acute-on-chronic liver failure
2. Cerebellar ataxia and glutamic acid decarboxylase antibodies: Immunological profile and long-term impact of immunotherapy
3. Identification and characterization of the immune cells that produce IL-17 in the brain following experimental stroke
4. Genetic and Molecular studies in patients with 3-methylglutaconic aciduria
5. Nucleic acid isolation from B and T cells for a methylation analysis in patients with Rheumatoid Arthritis
6. Distribution of adhesion molecules in vestibular calyx and neuromuscular junction in mice exposed to subchronic 3,3'-iminodipropionitrile
8. Association between schizophrenia and genetic variants within the TLR4--pathway in a case--control study.
9. Glucose homeostasis in IGFBP3-KO mice model under conditions to response a high fat diet
10. An in vitro model of ovarian cancer dissemination.
11. Identification of single-nucleotide polymorphisms in drug-related genes involved in Imatinib-induced toxicity/intolerance and response
12. The Impact of Amyloid-β on Secretory Granule-Related Peptides
13. Role and mechanism of action of the transcriptional repressor HDAC7 in leukemia and lymphoma
14. Calcaneal fracture review treated with open reduction and locking screw plate
15. New pathways of pharmacological treatment in preclinical models of diffuse intrinsic pontine glioma
16. Type 1 Diabetes mellitus: potential role of arterial stiffness, diabetic retinopathy and epigenetic factors in predicting silent myocardial ischemia. A case-control study
17. Impact of CYP3A4*22 and CYP3A5*3 in immunosuppressive drug metabolism
18. KLF2 exerts anti-fibrotic and vasoprotective effects in cirrhotic rat livers: behind the molecular mechanisms of statins.
19. Role of platelet derived growth factor receptor beta (PDGFRβ) in proliferation, migration and survival in ovarian cancer SKOV3 cell line
20. Experimental models in liver surgery
21. Role of miRNA LET-7e in renal fibrosis
22. Generation of a dual-regulated oncolytic adenovirus
23. Overexpression of angiopoietin-2 in rats and patients with liver fibrosis. Therapeutic consequences of its inhibition
24. Assessment of the effects of linezolid on bacterial burden of endotracheal tube biofilm from mechanically ventilated patients with methicillin resistant Staphylococcus aureus pneumonia
25. Initial testing of oncolytic adenoviruses targeting the RB1
26. Identifying new Markers and Homing Profiles involved in Lymphocyte Migration to the Female Genital Tract
27. Expression and regulation of AVPR2 and AQP-2 genes in Hepatic Stellate Cells (HSCs)
28. Risk analysis in the clinical laboratory for patient safety
29. Chemopreventive efficacy of a triple kinase inhibitor in a mouse model of hepatocellular carcinoma
30. Outcomes of Bone marrow processes using two blood cell separators Hematopoietic cell laboratory
31. Protein quantitation in donated human milk

Evaluation panel

Each Evaluation Committee included one President (coordinator of a subject) and 1-2 vocal members and 1 secretary. Each student has 12 minutes for presentation and 3 minutes for discussion.
Practical Stage Locations

The Master includes 24 credits for the Master thesis that should be conducted in a Lab for a minimum 500 hours. The students that presented the Master thesis had been assigned to Labs in the following institutions:

- Institut d’Investigacions Biomèdiques August Pi i Sunyer, IDIBAPS
- Hospital Clínic
- Vall d’Hebron Institut de Recerca
- Vall d’Hebron Hospital
- University of Barcelona
- Consejo Superior de Investigaciones Científicas, CSIC
- Centre Nacional d’Anàlisi Genòmica, CNAG
- Institut d'Investigacions Biomèdiques de Barcelona, IIBB
- Institute for Research in Biomedicine, IRB
- FIRHU Vall d’Hebrón,
- Institut Català d’Oncologia, ICO
- Bellvitge Biomedical Research Institute, IDIBELL
- Parc Taulí Sabadell
- Hospital de Bellvitge
- Fundació Sant Joan de Deu
- Institut Germans Trias i Pujol, IGTP
- Industry: Grifols

Please check list of practical stage offers following the link below:

http://www.ub.edu/mastertranslationalmedicine/

Deadline for acceptance to a research group: 1st December 2017
MASTER WEBSITES

www.ub.edu/mastertranslationalmedicine

Welcome from the coordinator

The Master in Translational Medicine-MSc from the University of Barcelona offers the opportunity to gain an excellent training both in academia and research.

- Academic. The Master provides comprehensive and updated knowledge of the basics, clinical and epidemiological entities associated with major human pathogenesis, examined from a cross-sectional view.

- Research. It provides comprehensive access to knowledge and skills necessary to develop research projects related to translational medicine.

The master can be completed in 1 or 2 years, depending on the needs of the students. Total number of credits of the Master is 60 Credits (46.5 €/credit for Spanish citizens - 82 €/credit for foreigners) and the official language of the Master is English. An important part of the Master is dedicated to practical training in research.

The purpose of this Master in Translational Medicine is to provide the basis for a comprehensive understanding of all new cutting-edge technologies and discoveries in biological sciences and be able to understand their translational or clinical application in biomedicine.

Inscriptions are now open until Sept 15th

REGISTRATION NOW!

Official Master in Translational Medicine Secretariat
Rosselló 153, 08036 Barcelona
+34 933129499 traslacional@ub.edu
El Máster Oficial Universitari CELLEX en Medicina Translacional ofrece la oportunidad de obtener una formación de excelencia tanto en el ámbito académico como en el de la investigación. Académicamente, se ofrecen cursos intensivos sobre el conocimiento de bases, moléculas, virus y enfermedades, así como estrategias de diagnóstico, tratamiento y prevención, que permiten que los profesionales de la medicina puedan aplicar la conocimiento a la práctica clínica.

Es imprescindible que los profesionales que deseen una formación avanzada en medicina transicional sean capaces de aplicar la ciencia actualizada a la práctica clínica. El Máster de Medicina Translacional es un programa de formación de avanzado nivel que se centra en la formación de profesionales de medicina que puedan aplicar los conocimientos científicos a la práctica clínica.

El Máster de Medicina Translacional es una formación de alta calidad que permite a los profesionales de medicina avanzar en su formación y aplicar los conocimientos científicos a la práctica clínica.

*Requisitos del Máster CELLEX 2014-15 para estudiantes de aquest Máster

- Título de grado en Medicina
- Examen de acceso a la formación de posgrado
- Examen de acceso al programa de doctorado

* *Máster vinculable al programa de doctorado "Medicina", con Mención de Calidad (AHECA)
VIRTUAL CAMPUS – FACULTY OF MEDICINE, UB

https://campusvirtual2.ub.edu/my/