DEGREE CURRICULUM

BIOMEDICAL BIOTECHNOLOGY

Coordination: SANCHIS MORALES, DANIEL

Academic year 2023-24

BIOMEDICAL BIOTECHNOLOGY 2023-24

Subject's general information

<table>
<tr><td>Subject name</td><td>BIOMEDICAL BIOTECHNOLOGY</td></tr>
<tr><td>Code</td><td>101627</td></tr>
<tr><td>Semester</td><td>2nd Q(SEMESTER) CONTINUED EVALUATION</td></tr>
<tr><td>Typology</td><td>
<table>
<tr><th>Degree</th><th>Course</th><th>Character</th><th>Modality</th></tr>
<tr><td>Bachelor's Degree in Biotechnology</td><td>4</td><td>OPTIONAL</td><td>Attendance-based</td></tr>
<tr><td>Master's Degree in Biomedical Research</td><td></td><td>COMPLEMENTARY TRAINING</td><td>Attendance-based</td></tr>
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<tr><td>Course number of credits (ECTS)</td><td>6</td></tr>
<tr><td>Type of activity, credits, and groups</td><td>
<table>
<tr><th>Activity type</th><th>PRALAB</th><th>TEORIA</th></tr>
<tr><td>Number of credits</td><td>2.4</td><td>3.6</td></tr>
<tr><td>Number of groups</td><td>2</td><td>1</td></tr>
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<tr><td>Coordination</td><td>SANCHIS MORALES, DANIEL</td></tr>
<tr><td>Department</td><td>BASIC MEDICAL SCIENCES</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
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BIOMEDICAL BIOTECHNOLOGY 2023-24

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
COLOMINA GABARRELLA, M. NIEVES	neus.colomina@udl.cat	,4	
DE LA TORRE RUIZ, M. ANGELES	mariaangeles.delatorre@udl.cat	1,1	
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SANCHIS MORALES, DANIEL	daniel.sanchis@udl.cat	3,6	

Learning objectives

In terms of knowledge, the student who passes the subject must:

1. Know the basic scientific terminology applied to biomedical biotechnology in the fields of regenerative therapies and biomedical microbiology.

2. Recognize and classify the foundations and procedures related to regenerative medicine and microbiology in the biomedical field.

3. Know the biological concepts that underpin the biotechnological applications in the biomedical field presented in class.

4. Integrate the different biotechnological applications presented in class.

5. Know the strategies and experimental procedures used for the discovery and development of biomedical tools explained in class.

6. Know the basic elements of a biotechnological laboratory in the biomedical field and the basic guidelines to ensure the reliability of the results and safety in the work in the laboratory.

At the procedural level, the student who passes the subject must:

1. Understand and discuss the experimental procedures that underpin biotechnological discoveries in the biomedical field explained in class.

2. Know how to use the basic elements of a biomedical biotechnology laboratory.

3. Gain experience in time management in the biotechnological laboratory.

4. Understand and know how to use the procedures developed in practice.

5. Analyze and compare experimental results and assess their importance and limitations.

6. Know how to gather basic information about a topic, draw up a summary and present it.

7. Show regular sustainable study habits.

Competences

General skills

GC1 Being able to selectively search for and use sources of information necessary to achieve the training objectives.

GC2 Interpret scientific-technical information with a critical sense, and be able to make presentations based on this information.

GC4 Knowing and adequately using the scientific and technical vocabulary of the different areas of Biotechnology.

GC5 Working in the laboratory applying criteria of quality and good practice.

GC6 Knowing and knowing how to use the specific software and databases in the different fields of biotechnology.

GC7 Using the scientific method to analyze data and design experimental strategies with biotechnological applications.

GC11 Acquiring criteria for choosing the most appropriate analytical techniques for each specific practical case.

Specific skills

CE34 Be able to design the protocol of a specific biotechnological process with the necessary practical requirements to carry it out and its evaluation parameters.

CE44 To know the main fields of application of biotechnology and acquire basic training in some of them.

Subject contents

1. Introduction. (DS, 1h).

2. Gene therapy: basics, technology, ex vivo/in vivo applications. (DS, 3h) Applications. Strategies for gene replacement, gene over-expression, permanent gene repression; types of vehicles used: viral vectors and non-viral vehicles.

3. Basics in cell biology of embryonic development. (JH, 1h) Blastocyst, gastrulation, germ layers and derived tissues.

4. Stem cells: type and origin, physiological functions. (JH, 2h /DS, 1h) Properties. Embryonic stem cells, adult stem cells. Stem cell niches. Gene program for the maintenance of self-renewal. Reprogramming. The cancer stem cell. Organoids.

5. Cell therapy: types, applications, technical and ethical challenges. (JH, 1 h /DS, 3 h) Main basic and technical concepts. Ethical aspects. Strategies in regenerative medicine in diseases of the nervous and cardiovascular system, current applications and perspectives.

6. Tissue engineering: basics, applications, technology. (DS, 2h) Main concepts and applications. Synthetic

matrices, Rapid prototyping, creation of ex-vivo organs.

7. Experimental models of human pathologies. (MLL, 3h) Transgenic mice, knock-out and knock-in. Design and obtaining techniques. Characterization of the phenotype. Practical examples.

8. Other biomedical applications of transgenesis: pharming, xenotransplantation. (MLL, 1h). Use of animals as bioreactors for the production of biopharmaceuticals: "pharming". Potential organ donors for xenotransplantation.

9. Human cloning: cloning methods, reproductive cloning, therapeutic cloning. (MLL, 1h). Strategies for mammalian cloning. Dolly the sheep as an example. Purposes of human cloning: reproductive cloning and therapeutic cloning.

10. Molecular approach to bacterial pathogenesis. (3 hours). Paradigms of host (Human)-parasite (bacteria) interactions.

11. General microbial responses to stress and possible regulatory targets for drug design (2h).

12. Microbial resistance to biopharmaceuticals. Search for new antimicrobials. (4 hours). Types of molecular mechanisms involved in the emergence of antimicrobial resistance. New antibiotics, biomedical and biotechnological perspectives.

13. Microbial genomics. (4 hours). New sequencing methods. Applications of comparative genomics, metagenomics and transcriptomics in the study and identification of microorganisms.

Practical activities

Session in the computer room: design of a vector for the permanent repression of the expression of a given gene using the RNA interference technique. (DS, 2h)

Simulation of gene therapy in vitro: silencing of the EndoG gene in an endometrial cancer cell line (DS, 12h).

Neuronal differentiation from neural precursors (JH, 12h)

Bioinformatics practice: Analysis and interpretation of the results of a microarray (2h)

Methodology

To achieve the objectives and acquire the skills attributed, we program the following activities: Master classes: They are held with all students (20-24). Their purpose is to expose the contents and highlight the most important aspects, guiding the student in his preparation. Laboratory practices: They are carried out in 2 groups (10-12 students). They have two purposes. Review, reinforce and apply theoretical concepts from a practical perspective, as well as present the normal development of activities in a biomedical research laboratory in which different techniques are applied in an overlapping manner over a period of time with an end goal . Seminars: Use of computer media as a tool in the development of biomedical experimentation.

Evaluation

Learning will be assessed by means of 2 written tests containing test-type questions and short development (80% of the mark), the date of which is indicated in the subject's calendar, and a practice test that will be carried out at the end of these, on the last day of each of the 2 blocks (20%). Each theory exam of the subject will be passed with a minimum overall grade of 5 out of 10. Attendance at practicals (computer science and laboratory) is necessary to pass the subject. To pass the subject you will have to get a 5 out of 10 in the grade of each exam. The subject is passed with a 5, as long as (5) each of the 2 partials have been passed. Otherwise, you must retake the unapproved partial. There is a scheduled day, indicated in the calendar, to make up the theoretical part in case the subject is suspended. The student who accepts the alternative assessment modality will have to take a theory exam on the day and time scheduled for the assessment of the rest of the class. These exams count for 100% of the grade. Composition of the exam: the same content as the exam prepared for the rest of the class. The student will be exempt from the obligation to attend the seminars and practicals of the subject.