Universitat Autònoma de Barcelona

2022/2023

Cellular Culture

Code: 100929
ECTS Credits: 3

Degree	Type	Year	Semester
2500253 Biotechnology	OB	3	2

Contact

Name: Laura Tusell Padros
Email: laura.tusell@uab.cat

Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Prerequisites

There are not

Objectives and Contextualisation

Cell Culture course is taught in the 2nd semester of the 3rd year of the Biotechnology degree in the Faculty of Biosciences. This is a subject with a certain degree of expertise that is intended to acquire a basic knowledge to work in a cell culture laboratory. It is therefore a subject with an important practical component.

Course objectives:

1) Know the basic equipment of a cell culture laboratory.

2) Know the most used types of cultures

3) Know the basic methodologies used in cell cultures.

Competences

- Apply general laboratory security and operational standards and specific regulations for the manipulation of different biological systems.
- Apply the principal techniques for the use of biological systems: recombinant DNA and cloning, cell cultures, manipulation of viruses, bacteria and animal and plant cells, immunological techniques, microscopy techniques, recombinant proteins and methods of separation and characterisation of biomolecules.
- Describe the molecular, cellular and physiological bases of the organisation, functioning and integration of living organisms in the framework of their application to biotechnological processes.
- Design and implement a complete protocol for obtaining and purifying a biotechnological product.
- Interpret experimental results and identify consistent and inconsistent elements.
- Make decisions.
- Think in an integrated manner and approach problems from different perspectives.
- Work individually and in teams

Learning Outcomes

1. Apply the different waste disposal processes correctly.
2. Apply the general safety rules in place in a a biotechnology laboratory.
3. Describe the fundamental theory behind the basic and advanced techniques for obtaining and characterising biomolecules.
4. Interpret experimental results and identify consistent and inconsistent elements.
5. Make decisions.
6. Recognise the functioning of physiological processes in plants, with a view to using them in biotechnology.
7. Think in an integrated manner and approach problems from different perspectives.
8. Use basic techniques of immunodetection.
9. Use the appropriate methodology for studying the different types of biological samples.
10. Use the techniques for cultivating prokaryote and eukaryote cells and for manipulating biological systems.
11. Work individually and in teams

Content

PROGRAM OF THEORY CLASSES:

Provides the students with the basic knowledge needed for the manipulation and cultivation of animal cells and the use of biological material in sterile conditions.

Block I_INTRODUCTION

Unit 1. Brief history of cell cultures

Block II_ORGANIZATION OF A LABORATORY OF CELLULAR CULTURE

Unit 2. Design of facilities and equipment

Block III_ BASIC PRINCIPLES OF ANIMAL CELLULAR CULTURE

Unit 3. Physicochemical conditions of cell culture

Unit 4. Production of cells and their maintenance

Unit 5. Quantification, tests of cytotoxicity and cell death

Unit 6. Cryopreservation

Unit 7. Contamination of cell cultures

Unit 8. Characterization and authentication

Unit 9. Special techniques: cell synchronization

Block IV_BIOTECHNOLOGY IN ANIMAL CELLS

Unit 10. Cell lines in research and biotechnology production

Unit 11. Scale-up of cell cultures

Unit 12. Red biotechnology: application of cell cultures

PROGRAM OF PRACTICAL SESSIONS: Broadly speaking, the practices consist of the manipulation of animal eukaryotic cells. The 5 laboratory sessions are designed so that the student complements their theoretical training with basic techniques and tools of a cell culture laboratory. In the practical sessions students will work on:

- Subculture of animal cell lines.

- Establishment of a cell growth curve.

- Immunofluorescent detection of microtubules.

-Freezing and thawing: rate of recovery and survival.

- Apoptosis induction and analysis.

- Cell-cycle disturbances.

- Discussion of laboratory results

Methodology

Given its theoretical-practical nature, the subject of Cellular Culture consists of theoretical master classes -10 hours- as well as practical classes in the laboratory -16 hours- (see table of formative activities).

The theoretical classes are usually scheduled for the first three weeks of the second semester. The content of the theory program will be taught mainly by the teacher in the form of master classes. Teacher's presentations will be available in *pdf format in the Moodle platform. It is recommended that students print this material and take it to class to use as support when taking notes.

Given the theoretical-practical nature of the subject, the practical classes are not associated with the Integrated Laboratory 6 subject. Practical classes will be scheduled in 4 turns of students and each one of the turns will consist of 5 sessions with a total of about 16 hours distributed from Monday to Friday. An internship presentation session will be scheduled for each of the groups, which will be mandatory attendance the week before the start of the internship. The list of students by turn will be published in the Moodle platform. Group modifications are accepted but require exchange of students among groups.

The Manual of the practical sessions will be available in * pdf format in the Moodle platform. For the proper operation and understanding of the practices, students should read the script for each practice session and view the recommended videos. Students will need to submit an exercise or complete a questionnaire each day just at the beginning of the session on issues related to the practice of the day. These activities will be evaluated and will have a weight in the final grade of the subject. Delays in the arrival involves not being able to complete the questionnaires.

The students will work in groups of 2 people and, at the end of eachpractice, they should fill a sheet of results. On the last day of the laboratory practices, the results obtained in each of the internships will be evaluated and discussed. Each couple must deliver awork -final report-, where they will show and discuss the results obtained by the couple as well as by the group practices. This work will be delivered via Moodle during the 15 days following the end of the internship.

The tutorials will be carried out in a personalized way in the teacher's office (door C2/050 at arranged hours). The students should contact to the teacher at class or by e-mail to schedule a meeting. The tutorials should be used to clarify concepts, settle the knowledge acquired and facilitate the study by students.

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

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			

Lectures	10	0.4	6, 3, 4, 7, 11
Practices	16	0.64	1, 6, 2, 4, 7, 5, 11, 9, 8, 10
Type: Supervised			
Tutorials	6	0.24	6, 4, 7, 5, 11
Type: Autonomous			
Study and laboratory report	38	1.52	3, 4, 7, 5, 11

Assessment

The evaluation of academic achievements by students will be assessed through four different activities, 2 corresponding to the theoretical part of the subject (65% of the overall grade) and 3 to the practical module (35% of the overall grade). Therefore, the assessment will take into account both the scientific knowledge obtained by each student individually and the results obtained and worked by group during the practices.

Specifically there will be:

Theorical

1) Multiple choice test (50% of the mark).

2) Case study (15% of the mark).

Practices

3) Questions and exercises in Laboratory Practices (5% of the mark).

4) Practices report (15% of the mark).

5) Multiple choice test of practices (15% of the mark).

It is noteworthy that the attendance at practical sessions is mandatory. The absence of one of the practical sessions implies a penalty of 25% of the mark in this section. Students will obtain the "Non-Appraising" qualification when their absence in the practical module exceeds 20% of the programmed sessions (2 or more sessions).

General Considerations

To pass the subject, a minimum mark of 4 out of 10 is required in the multiple choice of the theoretical assessment activities and, that the weighted average of all the activities should be equal to or greater than 5 points out of 10.

Those students who initially do not pass the subject can attend a retake process. However, to do so, the student must have been previously evaluated in a set of activities whose weight equals a minimum of 2/3 of the total qualificationof the subject (67%). Therefore, students will obtain the "Non-Appraising" qualification when the assessment activities carried out have a weighting of less than 67% in the final grade of the subject.

Students will only be required to retake the failed exam. The retake will consist of written exams corresponding to the theoretical part of the subject: multiple choice test and/or case study. Each of them will have a weight equivalent to that of the initial exams. Please note that the practical part of the subject is excluded from the retake: sections "Questionnaires and laboratory exercises", "Practice report" and "Laboratory test type examination".

Finally, those students who - having passed the subject through continuous assessment - want to present themselves to upload a grade, may do so if they inform the teacher one week in advance.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Case study	15%	1	0.04	1, 2, 5, 9, 10
Laboratory exam	15%	1	0.04	1, 6, 2, 3, 4, 7, 5, 11, 9, 8, 10
Laboratory exercices and questionnaires	5%	0.5	0.02	3, 4, 11, 9, 8, 10
Laboratory report	15%	1	0.04	4, 7, 5, 11
Test exam	50%	1.5	0.06	6, 4, 7, 5, 9

Bibliography

-R.I. Freshney. Culture of Animal Cells: A manual of basic technique and specialized applications. 7th ed. Wiley-Blackwell. John Wiley & Sons, Inc. 2016. Free access to 6th ed (2010) for UAB students: https://onlinelibrary.wiley.com/doi/book/10.1002/9780470649367

Specific bibliography is referenced in the class slides.

Software

no aplica