Universitat Autònoma de Barcelona

2023/2024

Cellular Culture

Code: 100887
ECTS Credits: 3

Degree	Type	Year	Semester
2500252 Biochemistry	OB	2	2

Contact

Name: Laura Tusell Padros

Email: laura.tusell@uab.cat

Teaching groups languages

You can check it through this link. To consult the language you will need to enter the CODE of the subject. Please note that this information is provisional until 30 November 2023.

Prerequisites

There are not

Objectives and Contextualisation

Cell Culture course is taught in the 2nd semester of the 2nd year of the Biochemistry 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

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Apply general laboratory security and operational standards and specific regulations for the manipulation of different biological systems.

- Apply the principal techniques used in biological systems: methods of separation and characterisation of biomolecules, cell cultures, DNA and recombinant protein techniques, immunological techniques, microscopy techniques, etc.
- Collaborate with other work colleagues.
- Design and prepare laboratory protocols, including health and safety aspects.
- Design experiments and understand the limitations of experimental approaches.
- Interpret experimental results and identify consistent and inconsistent elements.
- Process cells and tissues to obtain purified sub-cellular organelle preparations, and characterise them biochemically and structurally.
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
- Think in an integrated manner and approach problems from different perspectives.

Learning Outcomes

1. Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
2. Apply techniques for culturing eukaryotic cells.
3. Assess experimental data in relation to the values published in the scientific literature.
4. Collaborate with other work colleagues.
5. Design experiments and understand the limitations of experimental approaches.
6. Explain the fundamental theory behind basic and advanced techniques in biochemistry.
7. Explain the fundamental theory behind microscopy and centrifuging techniques, and the instrumentation used.
8. Interpret experimental results and identify consistent and inconsistent elements.
9. Monitor and interpret experiment protocols from a critical perspective.
10. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
11. Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
12. Think in an integrated manner and approach problems from different perspectives.
13. Use the appropriate methodology for studying the different types of biological samples.
14. Use the established methods for eliminating the different types of waste products from a biochemistry and molecular biology laboratory.

Content

THEORY CLASS PROGRAM: It basically consists of knowing the equipment, facilities, materials and techniques necessary for the manipulation and culture of animal cells and the use of biological material in sterile conditions.

Block I_INTRODUCTION

Topic 1. Brief history of cell cultures

Block II_ BASIC PRINCIPLES OF ANIMAL CELL CULTURES

Topic 2. 2D cultures: production and maintenance of cells

Topic 3. Physicochemical conditions of cell culture

Topic 4. Design of facilities and equipment

Block III_BASIC TECHNIQUES IN ANIMAL CELL CULTURES

Topic 5. Quantification, cytotoxicity test and cell death

Topic 6. Cryopreservation of cells

Topic 7. Contamination of crops

Topic 8. Characterization and authentication of cells

Block IV_ADVANCED TECHNIQUES IN ANIMAL CELL CULTURES

Topic 9. Selection and purification of cells

Topic 10. Cell cycle analysis and cell synchronization

Block V_STUDIES IN ANIMAL CELLS

Topic 11. Cell lines and models with greater physiological relevance

Topic 12. Applications of cell cultures

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

- Subculture of animal cell linesin a biological safety cabinet.

- Establishment of a cell growth curve.

- Immunofluorescent detection of microtubules and observation in the epifluorescence microscope.

- Freezing and thawing of cells: recovery and survival rate.

- Induction and analysis of apoptosis.

- Alteration of the cell cycle by different drugs.

- Discussion of results.

Methodology

Given its theoretical-practical aspect, the Cell Cultures subject consists of both theoretical lectures -10 hours- and practical classes in the laboratory -16 hours- (see table of training activities).

- Theoretical classes are usually scheduled for the first three weeks of the second semester. The master classes will be carried out using audiovisual material prepared by the teaching staff, material that the students will have at their disposal in * pdf format in the *Moodle* of the subject before the start of the sessions. It is recommended that students consult the audiovisual material and the books recommended in the Bibliography section of the teaching guide or class slides to consolidate the contents explained in class.

- The practical classes of the subject are designed so that students learn to use laboratory instruments and complete their theoretical training. These practices are not associated with the Integrated Laboratory IV subject, since, as mentioned, the cell culture subject is theoretical-practical.

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. For each one of the groups, a

presentation session of the practices will be programmed, which will be of mandatory attendance the week before the start of the practices. The list of students in each turn will be published in the *Moodle* of the subject. Group modifications are accepted but require exchange of students among groups.

The practice script will be available in * pdf format in *Moodle.* For the proper functioning and understanding of the practices, students must read the practice scriptcorresponding to each session and watch the recommended videos. Each day an exercise (via *Moodle)* or a questionnaire (in the classroom) must be handed at the beginning of each practical session on issues related to the day's experiments. These activities will be evaluated and will have a weight in the final grade of the subject. Delays in arriving at the practical sessions will lead to not being able to complete the questionnaires.

The students will work in groups of 2 people, and on a daily basis they will have to fill out a results sheet/form with the obtained data. The results obtained by the couple will be evaluated and will have a weight in the final grade of the subject. On the last day of practices, the results obtained in each of the practices will be assessed and discussed.

- The tutorials will be carried out in a personalized way in the teacher's office (door C2/050 and hours to be agreed). The tutorials should be used to clarify concepts, settle the knowledge acquired and facilitate the study by the students, among others.

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			
Laboratory practices	16	0.64	1, 10, 2, 3, 4, 9, 8, 14, 13
Lectures	10	0.4	2, 3, 9, 5, 6, 7, 12
Type: Supervised			
Tutorials	6	0.24	2, 3, 4, 9, 5, 6, 7, 8, 12, 14, 13
Type: Autonomous			
Study	35	1.4	2, 3, 4, 9, 5, 6, 7, 8, 12, 14, 13

Assessment

The evaluation will consist of activities corresponding to the theoretical part of the subject (65% of the overall grade) and to the practical part (35% of the overall grade). Thus, the evaluation will consider both the scientific knowledge acquired by each of the students individually and the results obtained and worked on in groups during the practices.

Specifically, there will be:

Theory: it will consist of 2 differentiated parts that will evaluate the knowledge acquired on different concepts taught in theory classes and a practical case to be solved where different experiments or techniques will have to be determined to be applied to reach the expected results.

1) Theory exam (55 % of the mark).

2) Practical case to solve (10 % of the note).

Practices

3) Questionnaires and laboratory exercises (10 % of the grade).

4) Results of practices (10 % of the note).

5) Exam of practices and discussion of results (15 % of the grade).

Students who do not hand in the questionnaires and/or results of the practices will have a zero for this part of the course. Students who follow the single assessment will take the practice exam on the same day as the theory synthesis exam.

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 course, a minimum grade of 4,0 out of 10 is required in the multiple choice exam of the theoretical assessment and that the weighted average of all 5 grades is equal to or greater than 5,0 points out of 10.

Recovery Activities

Students who initially do not pass the course may take the retake process. However, to participate in the recovery, students must have been previously evaluated in a set of activities whose weight is equivalent to a minimum of two thirds of the total grade for the subject (67%).

In summary, the recovery will consist of a multiple choice exam, which will evaluate the achievement of the training objectives corresponding to the written-theory tests. All those activities corresponding to the practices are excluded from the recovery process.

The different assumptions to appear for recovery may be:

- That the grade on the theory exam has been less than 4,0 (out of 10).

- That the weighted average of the written + practical tests is less than 5,0 points (out of 10).

Only the tests corresponding to the theoretical part of the subject may be recovered: multiple choice exam (1) and/or case study (2). Each of them will have a weight equivalent to that of the initial tests. Attention, the practical part of the subject is excluded from the recovery: sections "Questionnaires and laboratory exercises (3)", "Laboratory results (4)" and "Practice exam and discussion of results (5)".

Finally, those students who -having passed the course- want to present themselves to raise their grade, may do so as long as they notify the teaching staff one week in advance. It should be noted that, in this context, students waive the grade obtained in the previous written tests.

NB: This text has not been proofreading by a native English, so incase of any doubt or incongruity, the information provided in the Catalan/Spanish version will prevail.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes

Laboratory exercices and questionnaires	10%	0.5	0.02	2, 7, 13
Laboratory results	10%	4	0.16	1, 10, 2, 3, 5, 8
Practices and results discussion exam	15%	1	0.04	2, 3, 4, 9, 6, 7, 8, 12, 14, 13
Resolution of a problem / case	10%	1	0.04	3, 7, 8, 14, 13
Theory test exam	55%	1.5	0.06	11, 9, 5, 6, 7, 8, 12, 13

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 software is used