Universitat de Lleida

DEGREE CURRICULUM

STRESS IN BIOLOGICAL SYSTEMS

Coordination: TAMARIT SUMALLA, JORDI

Academic year 2023-24

STRESS IN BIOLOGICAL SYSTEMS 2023-24

Subject's general information

<table>
<tr><td>Subject name</td><td>STRESS IN BIOLOGICAL SYSTEMS</td></tr>
<tr><td>Code</td><td>101657</td></tr>
<tr><td>Semester</td><td>1st 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 Biomedical Sciences</td><td>4</td><td>COMPULSORY</td><td>Attendance-based</td></tr>
</table>
</td></tr>
<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>PRAULA</th><th>TEORIA</th></tr>
<tr><td>Number of credits</td><td>1.1</td><td>1.3</td><td>3.6</td></tr>
<tr><td>Number of groups</td><td>2</td><td>2</td><td>1</td></tr>
</table>
</td></tr>
<tr><td>Coordination</td><td>TAMARIT SUMALLA, JORDI</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>
</table>

STRESS IN BIOLOGICAL SYSTEMS 2023-24

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
BELLI MARTÍNEZ, GEMMA	gemma.belli@udl.cat	,8	
CABISCOL CATALA, ELISA	elisa.cabiscol@udl.cat	1,2	
COLOMINA GABARRELLA, M. NIEVES	neus.colomina@udl.cat	1,7	
ROS SALVADOR, JOAQUIN	joaquim.ros@udl.cat	1,1	
TAMARIT SUMALLA, JORDI	jordi.tamarit@udl.cat	2,1	
TORRES ROSELL, JORDI	jordi.torres@udl.cat	1,5	

Competences

CB1 That students have demonstrated that they have and understand knowledge in an area of study that is based on general secondary education, and is usually found at a level that, while supported by advanced textbooks, also includes some aspects that involve knowledge from the forefront of their field of study

CB2 That students know how to apply their knowledge to their work or vocation in a professional way and possess the skills that are usually demonstrated through the development and defense of arguments and problem solving within their area of study

CE62. Describe the molecular, cellular, genetic and epigenetic bases of diseases such as: cancer, diseases of the nervous system, cardiovascular diseases and related processes such as aging.

CE63. Understand the biological bases of the most prevalent human pathologies, as well as apply this knowledge to design research hypotheses.

CE64. Describe the main lines of research that are been addressed related to the most prevalent human pathologies.

CE66. Recognize the scientific methodology of research.

Subject contents

STRESS IN BIOLOGICAL SYSTEMS 2023-24

THEORY

1. Introduction to the toxicity of oxygen and reactive oxygen species

Strategies for measuring free radicals and molecular damage

2. Response to oxidative and thermal stress. Antioxidant systems. Chaperones. Metals: toxicity and response mechanisms.

3. DNA damage. Repair systems. Genotoxic stress

4. Nutritional stress. The mitochondrial retrograde response.

5. Cellular responses to stress. Adaptation to stress. Protein and lipid repair systems

Yeast as a model of aging: chronological and replicative aging

6. Redox regulation of protein function: enzymatic systems involved

Cellular functions of redoxins. Molecular systems for protein quality analysis.

UPR (unfolded protein response)

LABORATORY (11h)

P1 (2h) and P2 (3h): Study of the function of the DNA damage checkpoint during replicative stress.

P3 (4h) and P4 (2h): Analysis of the sensitivity to stress of different yeast strains deficient in antioxidant systems.

SEMINARS (10 h)

S1: Antioxidants (2h)

S2: Discussion of scientific articles (2h)

S3: Interaction between genotoxic stress and nutritional stress (2h)

S4 and S5: Exhibitions / presentations by students (4h)

COMPUTER CLASSROOM (3h)

I1. Evolutionary conservation of stress response systems (3h)

Methodology

To achieve the objectives and acquire the attributed competencies, the following methodology will be used:

- Theory: master classes: They have the purpose of giving an overview of thematic content, highlighting those aspects that will be useful in
their training.

- Critical review of scientific articles: Several scientific articles will be discussed. The seminars are intended for students to observe how to apply
theoretical concepts to practice and to explore in depth the most relevant and most complex aspects of the subject

-Activities in computer classroom.
The students will carry out some activities with computer in order to apply and work some theoretical concepts

-Practical laboratory. .
The laboratory practices have the purpose to help the students to become familiar with some basic techniques related to stress research. They will be performed in groups of two or three students.

Development plan

The following development plan will be used:
- Theory: master classes
These will be done with all the students and they are not compulsory.
- Critical review of scientific articles.
These will be done with 1/2 of the students. In them, scientific articles related to the topic of the subject will be analyzed.
-Activities in computer classroom.
These will be done with 1/2 of the students and they are compulsatory.
-Practical laboratory. .
These will be done with 1/2 of the students, they are compulsatory. Students who do not perform 90% of the practices will not be evaluated.

LABORATORY SAFETY RULES
In the script of each practice, the required individual protection equipment for each session will be indicated. This script will be available in the "Recursos" section of the virtual campus.
The general safety rules are as follows:
- Maintain the work place clean and tidy. The work table must be free of backpacks, folders, coats ...
- Bring closed and covered shoes during the performance of the practices.
- Keep the lab coat tied to protect against spills of chemical substances.
- Do not wear wide bracelets, pendants or sleeves that can be trapped by the equipment.
- Avoid wearing contact lenses, since the effect of chemicals is much greater if they are introduced between the contact lens and the cornea.
- Do not eat or drink in the laboratory
-Smoking is prohibited within laboratories
-Wash your hands whenever you have contact with a chemical and before leaving the laboratory.
- Follow the teacher's instructions and ask him any question you may have about security

Evaluation

Evaluation will consist of two partial examinations, the presentation of several practical exercises and oral presentations.
The details of how the assessment will be structured will be detailed in the introductory document for the subject,

which can be found in the resources section of the virtual campus. As an indication, each type of exercise will compute the following percentage in the final grade:
- Partial 1, from 39%.
- Partial 2, from 31%.
- Memories and presentations of the activities of the computer classroom, seminars and lab sessions, 30%.

To pass the subject, all the following conditions must be met:
- Overall mark greater than 5
- Weighted average mark of partial exams greater than 5 and minimum mark of each partial superior to 4,5.

Unique assessment

If you opt for the alternative assessment, this will consist of an exam that must be passed with a minimum grade of 5 plus a series of activities proposed by the teachers. The weighting in the final grade will be, 85% exam, 15% activities.

Bibliography

Sies H, Berndt C, Jones DP. Oxidative Stress. Annu Rev Biochem. 2017 Jun 20;86:715-748

Protein Carbonylation: Principles, Analysis, and Biological Implications; Joaquim Ros (Editor). Wiley, 2017; ISBN: 978-1-119-07491-5

Scudellari, M. The science myths that will not die. Nature 528, 322–325 (2015)

Deponte M. The Incomplete Glutathione Puzzle: Just Guessing at Numbers and Figures?. Antioxid Redox Signal. 2017;27(15):1130-1161.

Angelo Azzi JM, Antioxidantes: ¿fármacos milagrosos o pócimas de charlatanes? Revista SEBBM, SEPTIEMBRE 2017

B.L. Hopkins. Redoxins as gatekeepers of the transcriptional oxidative stress response. Redox Biology 21: 101104 (2019)

S.S. Cao and R.J. Kaufman. Unfolded protein response. Current Biology 22: R622-R626 (2012)