Universitat Autònoma de Barcelona

2022/2023

Endocrinology

Code: 100809
ECTS Credits: 6

Degree	Type	Year	Semester
2500250 Biology	OT	4	2

Contact

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Use of Languages

Principal working language: spanish (spa)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: No

Other comments on languages

Most of the slides used in the classroom are in English

Teachers

Francisco Javier Carrasco Trancoso
Elisenda Sanz Iglesias

Prerequisites

To have passed the subject of Animal Physiology, as well as of Cell Biology and Biochemistry

Objectives and Contextualisation

The subject "Endocrinology" is an option of the last course in Biology and Biochemistry, so that the student already has a high level of basic knowledge of biology, which will allow to deepen in this matter.

The subject does not structure to the classic mode of "Hormone A, functions B and C", but will analyze several relevant biological aspects in which endocrine / neuroendocrine factors participate. The idea is to give an integrated vision of critical factors in the survival of the individual and of the species: rhythms, stress, growth and longevity, weight control, sexual and maternal behavior. As far as possible we will proceed to the analysis of animal models that help us to understand the human species.

In the classes, articles and scientific reviews of reference journals will be used as much as possible (Nature, Science, Cell, etc.) rather than textbooks. Documentation will be prepared that will be provided beforehand to the student with the fundamental information, indicating the original reference of the publication in case the student needs clarification and wishes to consult it (it will not be indispensable but it will also benefit the

student from the point of view of the domain of the English). The idea is that the student has to complement that basic information with the work in class, acquiring an important method of work.

Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Analyse and interpret the development, growth and biological cycles of living beings.
- Apply statistical and computer resources to the interpretation of data.
- Be able to analyse and synthesise
- Be able to organise and plan.
- Carry out functional tests and determine, assess and interpret vital parameters.
- Design and carry out biodiagnoses and identify and use bioindicators.
- Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
- Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
- Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
- Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
- Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
- Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
- 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.
- Understand the processes that determine the functioning of living beings in each of their levels of organisation.

Learning Outcomes

1. Analyse a situation and identify its points for improvement.
2. Analyse and interpret physiological parameters indicating growth and development in animals.
3. Analyse the sex- or gender-based inequalities and the gender biases present in one's own area of knowledge.
4. Apply statistical and computer resources to the interpretation of data.
5. Be able to analyse and synthesise.
6. Be able to organise and plan.
7. Carry out functional tests and determine, assess and interpret vital parameters in animals.
8. Critically analyse the principles, values and procedures that govern the exercise of the profession.
9. Identify, enumerate, describe, interpret, explain and summarise the structure and functioning of the endocrine system.
10. Identify, enumerate, select, describe, interpret, explain and summarise the practical skills needed to apply diagnosis techniques and decide on the use of bioindicators.
11. Identify, enumerate, select, describe, interpret, explain and summarise the practical skills needed to apply the most common functional study techniques.
12. Propose new methods or well-founded alternative solutions.
13. Propose projects and actions that incorporate the gender perspective.
14. Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
15. Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.

16. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
17. Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
18. Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
19. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.

Content

After the basic concepts of the previous basic subject (Animal Physiology), Endocrinology will proceed to deepen the various endocrine axes, particularly at the neuroendocrine level, its relationship with behavior, and trying to maintain a vision integrated into the major themes:

1. Introduction. General organization of the nervous and endocrine system; local factors. Hypothalamic-pituitary relationship. Hypothalamic survival circuits: hunger, thirst, sex ... Action programmes (motivations, emotions) & feelings: ancestral mechanisms; vasopressin and oxytocin as examples.

2- Circadian rhythm, ancestral mechanism. Suprachiasmatic nucleus. Clock genes. Use of light as a synchronizing mechanism & other possible synchronizers. Living against our circadian rhythm has a cost. Seasonal rhythms & melatonin. Other rhythms

3- Stress and some of its consequences. Anticipatory and reactive pathways control the hypothalamus-pituitary-adrenal axis. MR and GR receptors. Cushing disease & glucocorticoids. Stress & fear & anxiety & depression: interactions with the Immune System, and an example of the importance of epigenetics. Epigenetic intergenerational and transgenerational inheritance.

4- Obesity, the new epidemic?. Body weight control: much more than an aesthetic issue. Diets, drugs and surgical procedures (and their failures & potential hazards). Main factors and pathways involved. Homeostatic & hedonic systems. Body mass index, fat deposits & genome-wide association studies (GWAs) & its limitations. "Battle of the sexes" & genomic imprinting. Obesity & inflammation. Obesity & microbiome.

5- Growth: Heritability and susceptibility. GWAs. Growth & development. Endocrine control of growth. Psychosocial dwarfism & stress. Hypothalamus-pituitary-somatic axis: GH, IGF-I&II.

6- Growth *vs*. longevity: it was not so simple. Size of the species & longevity: strict or flexible law?. Caloric and/or foodintake restriction: apparent relationship with morbidity & longevity. Senescence, telomeres, oxidative stress, mitochondrial DNA, p53 & longevity. mTOR, rapamycin & other "anti-aging pills". What (probably) announces the experiments of parabiosis between old and young animals. Epigenetic clock & longevity.

7- Genetic, gonadal and phenotypic sex. Dmrt1, SRY and other critical factors in sexual determination and differentiation. Gonadal sex is not irreversible. Compensation of the gene dose of the sex chromosomes. XIC: X inactivation center. Somatic sexual identity in mammals?. Internal and external genitalia: main hormones involved. Intersexual states: congenital adrenal hyperplasia & Prader classification.

8- Hypothalamus-pituitary-gonadal axis: integral control of vertebrate reproduction. Importance of the control of GnRH neurons: pulse generator versus preovulatory peak. Sex steroids, kisspeptin & other factors involved. Puberty: everything changes. Menarche & context & kisspeptin & limitations of the GWAs. Puberty & risk behaviors.

9- Sexual differentiation of behavior: Battle of the sexes?. Sexual dimorphism: what does it reveal? Sexual selection: the omission of Darwin. The Coolidge effect. Sex drive and performance. Sexual steroids & oxytocin. Proceptivity & receptivity. Relevance of the hypothalamus.

10- Attractivity (body & facial): what is it and what does it reveal? Main characteristics and factors involved. Some considerations about pheromones & MHC in mammals.

11- Violence: a major problem. Is there a link between sex and violence?. Lethal aggression intra-species: we are not the only ones. Relevance of the hypothalamus. Infanticide & males and paternity dilution. Infanticide & females. Monogamy *vs* polygamy in mammals. Social *vs* sexual monogamy. Oxytocin & vasopressin & dopamine: pair bonding and other social behaviors.

12- Sex, gender & sexual orientation.SNC Organization and activation by sexual steroids in animal models; epigenetics. Default sex & masculinization & defeminization: beware of analgesics! Evidences in humans.

Methodology

The formative activities are composed of:

(a) theoretical classes, with the usual format of master class supported by images usually obtained from scientific articles. Much of this material will be available to the student on the virtual campus

(b) practices, in which the levels of cortisol in skin and saliva are analyzed

(c) seminars, where, as far as possible, functional tests will be carried out with the students

These activities must necessarily be complemented by other supervised and autonomous ones.

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			
Practices	12	0.48	2, 4, 7, 9, 11, 10, 5, 6
Seminars	4	0.16	4, 5, 6
Theoretical classes	35	1.4	2, 7, 9, 11, 5, 6
Type: Supervised			
Preparation of seminars	6	0.24	4, 5, 6
Type: Autonomous			
Elaboration of works related to the classroom	14	0.56	4, 9, 5, 6
Time dedicated to studying	65	2.6	2, 7, 9, 11, 5

Assessment

The continuous evaluation process includes four evaluation activities, of three different types, distributed throughout the course, none of which represents more than 50% of the final grade*.

Partial theory 1: 40% (depending on the course schedule could be higher or lower but never more than 50%)

Partial theory 2: 40% (depending on the course schedule could be higher or lower but never more than 50%)

Practices: 10%

Seminars: 10%

The theory exam will be test type, with 4 possible answers being just one correct, and using the soft penalty in the correction.

The practices will be valued by presenting and discussing results in a memory.

The seminars will be assessed through oral presentation and discussion of results (80%) and test type test (20%).

Participation in the four evaluation activities is mandatory.

Attendance at practical sessions is mandatory; students will obtain the "Non-evaluable" qualification when the absence exceeds 20% of the programmed sessions; use of English will be taken into account.

A system for recovering the evaluation of the subject is contemplated, except for practices and seminars, since due to their eminently practical nature, does not allow it.

To qualify for the recovery exam, the minimum mark in the average of the subject (Endocrinology) will be 3.5. To participate in the recovery exam, the students must have previously been evaluated in a set of activities whose weight equals to a minimum of two thirds of the total grade of the subject. Therefore, students will obtain the "Non-Valuable" qualification when the assessment activities carried out have a weighting of less than 67% in the final grade.

The theoretical knowledge will be evaluated by two partial exams. The student must obtain at least 4,5 if he/she wants to compensate partial exams.

If the recovery test is to be carried out, it may befor the first, second or both partials, depending on the notes obtainedabove. If both partials exceed 4,5 but donot reach the average 5, the student will be able to choose the partial exam to recover, if so he/she wishes. Overall 5 must be obtained to pass the subject. The possibility of 'improving the grade' is not contemplated.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Practices	10%	4	0.16	19, 8, 3, 1, 4, 9, 11, 10, 12, 13, 18, 17, 16, 14, 15, 5, 6
Seminars	10%	4	0.16	8, 3, 1, 4, 7, 11, 10, 18, 17, 16, 14, 15, 5, 6
Theoretical exam	80%	6	0.24	19, 8, 2, 3, 1, 4, 7, 9, 11, 10, 12, 13, 18, 17, 16, 14, 15, 5, 6

Bibliography

Reviews and articles selected with electronic access. Main Journals:

Physiological Reviews: https://journals.physiology.org/journal/physrev

Endocrine Reviews: https://academic.oup.com/edrv

Annual Review of Physiology: https://www.annualreviews.org/journal/physiol

Nature: https://www.nature.com/

Nature Reviews Endocrinology: https://www.nature.com/nrendo/

Nature Reviews Genetics: https://www.nature.com/nrg/

Nature Reviews Immunology: https://www.nature.com/nri/

Nature Reviews Molecular Cell Biology: https://www.nature.com/nrm/

Nature Reviews Neuroscience: https://www.nature.com/nrn/

Nature Medicine: https://www.nature.com/nm/

Science: https://www.sciencemag.org/

Cell: https://www.cell.com/

Current Biology: https://www.cell.com/current-biology/home

Cell Metabolism: https://www.cell.com/cell-metabolism/home

Proceedings of the National Academy of Sciences of USA: https://www.pnas.org/

The Lancet: https://www.thelancet.com/

Neuron: https://www.cell.com/neuron/home

The New England Journal of Medicine: https://www.nejm.org/

Software

Not used