Universitat Autònoma de Barcelona

2023/2024

Endocrinology

Code: 100860
ECTS Credits: 6

Degree	Type	Year	Semester
2500252 Biochemistry	OT	4	2

Contact

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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.

Teachers

Francisco Javier Carrasco Trancoso

Elisenda Sanz Iglesias

Gemma Comes Orpinell

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.
- Collaborate with other work colleagues.
- Demonstrate an integrated vision of the function of hormones, neurotransmitters and growth factors in the control of gene expression and metabolism.
- Describe intercellular and intracellular communication systems that regulate the proliferation, differentiation, development and function of animal and plant tissues and organs.
- Introduce changes in the methods and processes of the field of knowledge to provide innovative responses to the needs and demands of society.
- Manage information and the organisation and planning of work.
- Read specialised texts both in English and one's own language.
- 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.
- Understand the language and proposals of other specialists.
- Use ICT for communication, information searching, data processing and calculations.

Learning Outcomes

1. Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
2. Collaborate with other work colleagues.
3. Compare the neuroendocrinology of the following axes: hypothalamic-pituitary-adrenal, hypothalamic-pituitary-thyroid, hypothalamic-pituitary-gonadal and hypothalamic-pituitary-somatic.
4. Describe the endocrine function of the pancreas.
5. Describe the mechanisms involved in the maintenance of body fluids.
6. Describe the neuroendocrinological control of prolactin.
7. Describe the nuclear receptor superfamily: general structure, response elements, how it controls gene expression and non-genomic effects of hydrophobic hormones.
8. Distinguish between the different general families of endocrine receptors and their characteristics.
9. Explain the control of body-weight and the regulation of sexual differentiation.
10. Explain the control of the endocrine system by the hypothalamus.
11. Explain the endocrine control of growth.
12. Explain the nature of hormones, the evolutionary origin of the endocrine system and co-evolution with the receptors.
13. Explain the relationship between growth and calorie intake.
14. Introduce changes in the methods and processes of the field of knowledge to provide innovative responses to the needs and demands of society.
15. Manage information and the organisation and planning of work.
16. Read specialised texts both in English and one's own language.
17. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
18. Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
19. Think in an integrated manner and approach problems from different perspectives.
20. Understand the language and proposals of other specialists.
21. Use ICT for communication, information searching, data processing and calculations.

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	21, 2, 4, 20, 9, 11, 13, 15, 16, 19
Seminars	4	0.16	21, 2, 3, 20, 9, 10, 15, 16, 19
Theoretical classes	35	1.4	21, 3, 6, 5, 4, 7, 8, 20, 9, 10, 11, 12, 13, 15, 16, 19
Type: Supervised			
Preparation of seminars	6	0.24	21, 2, 3, 9, 10, 15, 16, 19
Type: Autonomous			
Elaboration of works related to the classroom	14	0.56	21, 2, 3, 4, 20, 9, 10, 11, 13, 15, 16, 19
Time dedicated to studying	65	2.6	21, 2, 3, 6, 5, 4, 7, 8, 20, 9, 10, 11, 12, 13, 15, 16, 19

Assessment

The continuous evaluation process includes four evaluation activities, of three different types, distributed through

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 th

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

Attendance at practical sessions is mandatory; students will obtain the "Non-evaluable" qualification when the ab

A system for recovering the evaluation of the subject is contemplated, ex

To participate in the recovery exam, the students must have previously been evaluated in a set of activities whos

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

Ifboth partials exceed 4,5 but do not reach the average 5, the student will be able to choose the partial exam to re

Single evaluation.

The single evaluation consists of a single synthesis test in which the contents of the entire theory program of the subject will be evaluated. The test will consist of multiple choice questions, such as those of continuous evaluation. The grade obtained in this synthesis test will account for 80% of the final grade for the subject.

The evaluation of practical activities (10%), and seminars (10%) will follow the same process of continuous evaluation.

The delivery of evidence of practical activities and classroom practices will follow the same procedure as in the continuous evaluation.

The single evaluation test will be done coinciding with the same date set in the calendar for the last test of the continuous evaluation and the same recovery system will be applied as for the continuous assessment.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Practices	10%	4	0.16	21, 2, 3, 4, 20, 9, 10, 11, 13, 15, 16, 19
Seminars	10%	4	0.16	21, 2, 3, 4, 20, 10, 11, 13, 15, 16, 19
Theoretical exam	80%	6	0.24	1, 18, 17, 21, 3, 6, 5, 4, 7, 8, 20, 9, 10, 11, 12, 13, 15, 14, 16, 19

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