

**Endocrinology**

Code: 100860  
ECTS Credits: 6

Degree	Type	Year	Semester
2500252 Biochemistry	OT	4	0

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

**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

**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**

- 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.
- Manage information and the organisation and planning of work.
- Read specialised texts both in English and ones own language.
- 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. Collaborate with other work colleagues.
2. Compare the neuroendocrinology of the following axes: hypothalamic-pituitary-adrenal, hypothalamic-pituitary-thyroid, hypothalamic-pituitary-gonadal and hypothalamic-pituitary-somatic.
3. Describe the endocrine function of the pancreas.
4. Describe the mechanisms involved in the maintenance of body fluids.
5. Describe the neuroendocrinological control of prolactin.
6. Describe the nuclear receptor superfamily: general structure, response elements, how it controls gene expression and non-genomic effects of hydrophobic hormones.
7. Distinguish between the different general families of endocrine receptors and their characteristics.
8. Explain the control of body-weight and the regulation of sexual differentiation.
9. Explain the control of the endocrine system by the hypothalamus.
10. Explain the endocrine control of growth.
11. Explain the nature of hormones, the evolutionary origin of the endocrine system and co-evolution with the receptors.
12. Explain the relationship between growth and calorie intake.
13. Manage information and the organisation and planning of work.
14. Read specialised texts both in English and ones own language.
15. Think in an integrated manner and approach problems from different perspectives.
16. Understand the language and proposals of other specialists.
17. 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. Hypothalamic-pituitary relationship and biological bases of its development. Hypothalamic survival circuits: hunger, thirst, sex ... Programs of action (motivations, emotions) & feelings: ancestral mechanisms; vasopressin and oxytocin as examples.

2- Circadian rhythm and 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 hypothalamo-pituitary-adrenal axis. MR and GR receptors. Stress & fear & anxiety & depression: an example of the importance of epigenetics. "Battle of the sexes" & genomic imprinting. Epigenetic transgenerational inheritance.

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

5- Growth: Heritability and susceptibility. GWAs. Psychosocial dwarfism. Acceleration & deceleration. Growth & development. Main families of growth factors. Saltatory growth. Catch-up. Hypothalamo-pituitary-somatic axis: endocrine and paracrine / autocrine actions of IGF-I.

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

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

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. Biological bases of sexual behavior in animal models. Organization and activation of the CNS by sex steroids. Default sex & masculinization & defeminization: beware of analgesics! Sex steroids & epigenetics.

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

11- Violence: an extraordinary problem. Lethal aggression intra-species: we are not the only ones. Infanticide and paternity dilution. Is there a link between sex and violence?. Sex steroids & neurosteroids & VMH. Monogamy vs polygamy in mammals. Social vs sexual monogamy. Oxytocin & vasopressin & dopamine: pair bonding and other social behaviors.

12- Gender behavior, cognitive sexual differences & evolutionary roles. Gender identity and transsexuality. Gender orientation & homosexuality.

\*Unless the requirements enforced by the health authorities demand a prioritization or reduction of these contents.

## 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.

\*The proposed teaching methodology may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

## Activities

Title	Hours	ECTS	Learning Outcomes
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Type: Directed

Practices	12	0.48	17, 1, 3, 16, 8, 10, 12, 13, 14, 15
Seminars	4	0.16	17, 1, 2, 16, 8, 9, 13, 14, 15
Theoretical classes	35	1.4	17, 2, 5, 4, 3, 6, 7, 16, 8, 9, 10, 11, 12, 13, 14, 15
Type: Supervised			
Preparation of seminars	6	0.24	17, 1, 2, 8, 9, 13, 14, 15
Type: Autonomous			
Elaboration of works related to the classroom	14	0.56	17, 1, 2, 3, 16, 8, 9, 10, 12, 13, 14, 15
Time dedicated to studying	65	2.6	17, 1, 2, 5, 4, 3, 6, 7, 16, 8, 9, 10, 11, 12, 13, 14, 15

## 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 the

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

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

*\*Student's assessment may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.*

## Assessment Activities

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

## **Bibliography**

Reviews and articles selected with electronic access.