

**COURSE DATA****Data Subject**

Code	34501
Name	Physiology of aging
Cycle	Grade
ECTS Credits	4.5
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
1204 - Degree in Medicine	Faculty of Medicine and Odontology	3	First term

Subject-matter

Degree	Subject-matter	Character
1204 - Degree in Medicine	18 - Optional subjects	Optional

Coordination

Name	Department
BORRAS BLASCO, CONSUELO	190 - Physiology

SUMMARY

The subject of Physiology of Ageing has as the general objective the knowledge of physiological changes in the body and of the physical and chemical laws governing these functions; the acquisition of the necessary methodology for its study; and the skills development versus maintenance of health, prevention and treatment of a growing sector of the population, the elderly.

On this subject the functional changes of different organs and organ systems with ageing and the changes they undergo both elderly men and women are studied.

Physiology of Ageing is very important for the study of preventive and curative medicine.

PREVIOUS KNOWLEDGE



Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

OUTCOMES

1204 - Degree in Medicine

- Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.
- Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.
- Understand and recognise the effects of growth, development and aging which affect individuals and their social environment.
- Proper organisation and planning of the workload and timing in professional activities.
- Team-working skills and engaging with other people in the same line of work or different.
- Criticism and self-criticism skills.
- Capacity for communicating with professional circles from other domains.
- Acknowledge diversity and multiculturality.
- Consideration of ethics as a fundamental value in the professional practise.
- Working capacity to function in an international context.

LEARNING OUTCOMES

The study of this subject should enable the student:

- To understand the behavior of physiological systems at all levels of organization and resolve issues related to the functions of the different organs and body systems and their regulatory mechanisms during ageing.
- Overall, to know demonstrate sufficient knowledge to understand and describe the functions of the systems and apparatus of the healthy human body at its different levels of organization, as well as its modifications associated with ageing. All this as a basis for further understanding of the changes that occur in the pathophysiology and mechanisms of disease production, the basis of therapeutics and the ways and for maintain and prevent of health.



- To know how to demonstrate the skills to understand and describe the basic methods of functional exploration of the different organic systems described in Competence section.
- To know the changes in the different apparatus and systems during ageing.
- To know the different applications for the prevention and treatment of diseases associated with ageing.
- To acquire the necessary skills to evaluate the physiological changes that occur during ageing.
- To acquire the skills for the development of intervention strategies aimed at treatment of pathophysiological changes that occur during ageing.

DESCRIPTION OF CONTENTS

1. Introduction: ageing as a stage of the life-cycle.

Stages of prenatal and postnatal life. Periods of maturity and ageing. Physiological, clinical and intervention considerations.

2. Demographic, comparative and differential ageing.

Demography of ageing. Comparative physiology of ageing. Differential ageing in humans.

3. Ageing and disease.

Degenerative changes in cells and cell death. Complexity of pathology in ageing. Diseases of ageing. Disuse and ageing.

4. Theories of ageing.

Genetic and environmental interactions in ageing. Molecular theories. Cell theories. Systems theories.

5. Cancer and aging

Converging mechanisms and divergent mechanisms between cancer and aging. Role of p53, arf and oxidative stress

6. Ageing of immune system.

Thymus and thymosin. Ageing of cellular constituents. Reversibility of immune dysfunction with age.



7. Ageing of endocrine control systems.

Rating endocrine function. Adrenal cortex. Adrenal medulla. Hypophysis. Neuroendocrine and immune responses to stress of ageing.

8. Ageing of nervous system: biochemical, structural and functional changes.

Neuronal cell loss. Dendritic loss. Synaptic changes. Accumulation of lipofuscin. Neuritic plaques and neuro-fibrillar agglomerates. Neurotransmission and cellular communication. Neuro-trophic factors. Motor changes. Changes in sleep and wakefulness. Memory and ageing. Senile dementia.

9. Ageing of sensory systems.

Vision. Hearing. Somatic sensations. Olfaction. Taste.

10. Menopause and andropause: a physiological phenomenon.

Functional characteristics of menopause. Endocrinology of menopause. Effects of oestrogen deprivation on the response of target organs. Risks and benefits of hormone replacement therapy. Loss of fertility age dependent. Changes in testes related to age. Responses of testes to gonadotropin stimulation. Sexual function.

11. Ageing of the thyroid gland and basal metabolism.

Structural changes in the hypothalamic-hypophy thyroid axis. Endocrine pancreas and metabolism of carbohydrates and glucides. Ageing of endocrine pancreas. Glucagon changes with ageing. Ageing and diabetes mellitus. Ageing of gastrointestinal tract and liver. Gastrointestinal tract: physiological and pathological changes associated with age. Ageing of exocrine pancreas. Ageing of liver. Ageing of blood cells. Ageing of hematopoietic system.

12. Cardiovascular disorders with age: atherosclerosis, coronary artery disease and hypertension.

Causes and pathology. Plasma lipoproteins. Ageing of breathing. Lung changes associated with ageing. Respiratory disorders in old age. Kidney, lower urinary tract, prostate and body fluids. Age-related changes in renal function. Ageing prostate. Distribution of water and electrolyte, and acid-base balance.

13. Ageing of bones, joints and muscles.

Ageing of skeleton. Ageing of joints. Ageing of striated muscle. Responses of aged striated muscle to exercise. Ageing of cardiac muscle.



14. Fragility and dependence.

Concept of fragility. Fragility criteria. Dependence and old age.

15. Skin and connective tissue: changes with ageing.

Ageing of skin. Ageing of skin appendages. Ageing of collagen.

16. Drug treatment in the elderly.

Physiological changes that affect pharmacokinetics and pharmacodynamics. Adverse drug reactions in the elderly. General guidelines.

17. Considerations for a healthy ageing. "Anti-ageing" medicine.

Effects of diet on ageing. Models of dietary restriction. Antioxidant supplementation. Wellness and health promotion. Future prospects in biomedical gerontology.

18. SEMINARY PRACTICAL LESSONS

1. Aging and oxidative stress: Longevity differences between males and females
2. Longevity-related genes
3. Stem cells and aging.
4. Possible interventions against Alzheimer's disease
5. Assessment of sensitivity in aging.
6. Assessment of reflexes in aging.
7. Vision and hearing assessment in aging.
8. Study of cardiovascular responses and adaptations to exercise in aging.
9. Study of respiratory responses and adaptations to exercise in aging.
10. Assessment of frailty in the elderly.

Likewise, a contest will be held to resolve issues after the presentation of the seminars of the subject of physiology of aging. The objective is to promote attention and active participation of students in seminars. Kahoot, a free application, will be used to do the contest, consisting in 5



WORKLOAD

ACTIVITY	Hours	% To be attended
Seminars	26,00	100
Theory classes	19,00	100
Development of group work	11,00	0
Development of individual work	15,00	0
Study and independent work	28,50	0
Readings supplementary material	6,00	0
Preparation of evaluation activities	7,00	0
TOTAL	112,50	

TEACHING METHODOLOGY

In the **theoretical lessons**, the teacher will expose, through master class, the most important concepts and contents in a structured way, to obtain the knowledge and skills that the students must acquire. The students' participation will be encouraged. The teaching materials used by the professor will be available, if he considers it appropriate, through the electronic resource Aula Virtual.

Classroom practices: **seminars**. In reduced groups, the professor will set specialized topics in depth, cases studies, bibliography management, current topics... the group work and the oral presentation will be encouraged. It could be understood as "cooperative learning".

EVALUATION

Theoretical evaluation: 50% of the final grade. It will be carried out by means of a written test that will deal with the contents of the theoretical program and will have the objective of evaluating the acquisition of knowledge. The test will consist of 30 multiple choice questions with 3 possible answers. Each wrong answer will subtract 1/3 of the final mark of the test. Blank answers will not subtract.

Practical evaluation: 50% of the final mark. It will be carried out through the evaluation of the Participation in the different 20% activities: (10% seminar presentation, 10% result of the question resolution contest) and with the completion of a test that evaluates the acquisition of skills related to general and specific (30%). The test will consist of 15 multiple choice questions with 3 possible answers. Each wrong answer will subtract 1/3 of the final mark of the test. Blank answers will not subtract.

It is a requirement to access the advance call for this subject that the student has completed all of his practices. Attendance at practices is mandatory. Unjustified non-attendance to more than 20% of them will mean the impossibility of passing the subject.



The subject is approved with a 5, and it is not necessary to pass each part (theory and practices separately).

A continuous evaluation will also be carried out.

Students are reminded of the importance of conducting evaluation surveys to the entire teachers of degree subjects.

REFERENCES

Basic

- Guyton AC, Hall JE (2011). Tratado de Fisiología Médica. 13ª ed. Madrid. Ed. Elsevier.
- Paola S. Timiras (1997) Bases fisiológicas del envejecimiento y geriatría. 2ª ed. (traducida) Barcelona. Ed. Masson.
- Segura Cardona R (1987). Prácticas de Fisiología. 1ª ed. Barcelona. Ediciones científicas y técnicas, Masson-Salvat.
- Fox SI (2008). Fisiología Humana. 8ª ed. Madrid. Ed. McGraw-Hill Interamericana de España S.A.U.
- ENLACE DE INTERÉS: Sociedad Española de Geriatría y Gerontología www.segg.es/
- Recursos-e Salud: ClínicaKey Student. Elsevier (Scopus, ScienceDirect).
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