VNIVERSITAT DE VALÈNCIA

Course Guide
43082 Regulation of the circulation. Role of the endothelium

COURSE DATA

Data Subject	
Code	43082
Name	Regulation of the circulation. Role of the endothelium
Cycle	Master's degree
ECTS Credits	4.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
2141 - Master's Degree in Physiology	Faculty of Medicine and Odontology	1	First term

Subject-matter

Degree	Subject-matter	Character
2141 - Master's Degree in Physiology	2 - Cardiovascular physiology	Obligatory

Coordination

Name	Department
ALDASORO CELAYA, MARTIN	190 - Physiology
VILA SALINAS, JOSE M	190 - Physiology

SUMMARY

The endothelium, located in a strategic place between the circulating blood and the smooth muscle, behaves like a sensor that receives neurohumoral signals against which it synthesizes and releases substances, relaxing and contractile, capable of modifying vascular tone. From this point of view, it is responsible for at least three mechanisms that regulate blood flow under physiological conditions: through the nitric oxide system, that of prostacyclin and through the hyperpolarizing factor. To these mechanisms it is worth adding the contractile mechanisms in which endothelin and thromboxane are involved. The alteration of these endothelial mechanisms that are present in various pathologies that present vascular problems, suggests that endothelial dysfunction may constitute a common basis for all. Therefore, the aim is to inform students of the latest advances that make it possible to understand the mechanisms involved in endothelial function and its alterations in endothelial dysfunction.

General objectives:

- Know the basic mechanisms involved in regulating blood flow and blood pressure.

- To know the role of the substances released by the endothelium in the regulation of vascular tone

- Identify endothelial dysfunction as the basis of vascular disorders present in various pathologies.

- Learn the common methodology used in the study of vascular reactivity.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

It is recommended to know the physiological bases of the cardiovascular system, structure, function, hemodynamics and circulation regulation systems.

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

2141 - Master's Degree in Physiology

- Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.
- Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.
- Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.
- Students should demonstrate self-directed learning skills for continued academic growth.
- Students should possess and understand foundational knowledge that enables original thinking and research in the field.
- Know how to write and prepare presentations to present and defend them later.
- To acquire a critical attitude that allows you to make reasoned judgments and defend them with rigor and tolerance.
- Search, order, analyze and synthesize scientific information (databases, scientific articles, bibliographic repertoires), selecting the pertinent to focus current knowledge on a topic of scientific interest in Physiology.
- Assess the need to complete the scientific training, in languages, computer science, ethics, etc., attending conferences or courses and/or carrying out complementary activities, self-evaluating the contribution that the performance of these activities implies for their comprehensive training.

- Describe the neurohumoral and endothelial mechanisms responsible for regulating blood flow under physiological and pathophysiological conditions.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

Learning outcomes:

Know the basic mechanisms that regulate blood flow.

Relate regulatory mechanisms to different endothelial factors.

Plan and select the most appropriate techniques for studying the mechanisms of regulation of blood flow.

Plan and design experiments to study vascular function and interpret the results obtained.

DESCRIPTION OF CONTENTS

1. Regulation of blood flow

NERVOUS FACTORS: Baroreceptor, chemoreceptor, and low pressure reflex. HUMORAL AND RENAL FACTORS: Catecholaminergic system, Vasopressinergic system, Renin-angiotensin II-aldosterone system. Functions of the atrial natriuretic peptide.

2. Endothelium derived relaxing and contractile factors

Relaxing factors: Nitric oxide, Prostacyclin and hyperpolarization derived from the endothelium. Contractile factors: Endothelin and thromboxane A2.

3. Role of the COX in the regulation of circulation
B

Biosynthesis. Isoforms. Metabolism. Vascular functions. Mechanism of action

4. Endothelium-derived hyperpolarization

Structure. Mechanism of action. Functions in peripheral vascular beds.

5. Pathologies with endothelial dysfunction

Endothelial dysfunction in cardiac ischemia, hypertension and obesity. Description of the vascular alterations in the different pathologies. Imbalance of endothelial factors: nitric oxide, prostacyclin and endothelin among others.

6. Endothelial dysfunction in liver function

Characteristics of the hepatic circulation. Portal circulation. Hyperdynamic imbalance. Participation of endothelial substances. Role of guanidine substances.

7. Role of endothelial factors in diabetes

Development of the disease. Vascular complications of diabetes. Decreased endothelial relaxing capacity. Increased contractility. Effects of physical exercise.

8. Role of endothelial factors in tumors

Nitric oxide participation. Role of endothelin and its receptors. COX participation. Role of endothelial growth factor and its receptors.

9. Cardiorespiratory adaptations to altitude

Ventilatory response to hypoxia. Maximum oxygen consumption. Cardiovascular function. Pulmonary hypertension. Lung and cerebral edema in height. Muscle wasting.

10. The role of alpha adrenergic receptors in the vascular response

Types. Mechanism of action. Functions in different vascular beds

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	24,00	100
Tutorials	3,00	100
Other activities	2,00	100
Development of individual work	20,00	0
Study and independent work	15,00	0
Readings supplementary material	5,00	0
Preparation of evaluation activities	15,00	0
Preparing lectures	6,00	0
Resolution of case studies	10,00	0
TOTAL	**100,00**	

TEACHING METHODOLOGY

Teaching methodology

- Theoretical classes of participatory master class.

- Conferences of experts in the subjects.

- Debate and directed discussion on the work done.

- Face-to-face and electronic tutoring with teachers.

EVALUATION

Evaluation system:

- Written exam consisting of multiple choice questions: evaluation up to 5 points.

- Preparation of an individual work related to the subject: evaluation up to 5 points.

Minimum passing grade: 5 points.

REFERENCES

Basic

- CONTI, F. Fisiología Médica. (2011). Ed. McGraw Hill Interamericana Editores S.A.
- GANONG. Fisiología Médica. (2013). Ed.McGraw Hill Interamericana Editores S.A.
- GUYTON & HALL. Fisiología Médica. (2016). Ed. Elsevier.

Additional

- LEVICK, J.R. Cardiovascular Physiology. (2000). Ed. Hodder Arnold.
- LÜSCHER, T.F. The endothelium in cardiovascular disease. (1995). Ed. Springer.
- Revisiones en Pubmed.