

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

Code	43084
Name	Physiology and physiopathology of free radicals and antioxidants
Cycle	Master's degree
ECTS Credits	4.0
Academic year	2019 - 2020

Study (s)

Degree	Center	Acad. year	Period
2141 - M.U. en Fisiología 12-V.2	Faculty of Medicine and Odontology	1	Second term

Subject-matter

Degree	Subject-matter	Character
2141 - M.U. en Fisiología 12-V.2	3 - Oxidative stress and its applications in biomedicine	Obligatory

Coordination

Name	Department
SASTRE BELLOCH, JUAN JOSE	190 - Physiology

SUMMARY**English version is not available**

En esta asignatura se estudia el papel que juegan las especies reactivas del oxígeno y del nitrógeno, especialmente los radicales libres derivados del oxígeno, así como el estrés oxidativo y la señalización redox en Biomedicina. Para ello se impartirán en primer lugar nociones básicas sobre las especies reactivas del oxígeno y del nitrógeno, describiendo las principales especies pro-oxidantes, las reacciones y los orgánulos implicados en su generación, y las principales dianas de los mismos. Se indicarán los biomarcadores más utilizados para detectar la existencia de estrés oxidativo y nitrosativo en muestras biológicas, comentando las técnicas actualizadas y más apropiadas para ello. Además, se describirá el papel central que juega la señalización redox en los mecanismos de adaptación celular, y el estrés oxidativo y nitrosativo en la muerte celular tanto por apoptosis como por necrosis. Se hará especial hincapié en la gran contribución de la señalización redox y del estrés oxidativo a distintos procesos fisiológicos tales como el envejecimiento y el ejercicio físico. Asimismo, se describirá con detalle el papel muy relevante que juegan las especies reactivas del oxígeno a través de la señalización redox y del estrés oxidativo en la patogenia y fisiopatología de diversas enfermedades, tales como enfermedades neurodegenerativas, hepáticas, la diabetes, las debidas a inflamación aguda o crónica, así como



enfermedades raras. Por último, se mostrarán los posibles beneficios de la administración de antioxidantes tanto en el tratamiento como en la prevención de las enfermedades y sus limitaciones.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

Se recomienda haber cursado las asignaturas de Fisiología y de Bioquímica y Biología Molecular y asignaturas relacionadas con la Patología, tales como Fisiopatología y Patología General.

OUTCOMES

2141 - M.U. en Fisiología 12-V.2

- 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.
- 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.
- Manage the basic concepts of oxidative stress and antioxidants, identifying the bases of related cellular processes, in order to solve problems of redox physiology in the healthy organism and in the pathophysiology associated with the presence of free radicals.

**LEARNING OUTCOMES****English version is not available****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**English version is not available****EVALUATION****Evaluation system:**

- Written exam consisting of short questions and / or development and/or preparation of an individual work related to the subject: assessment of 10 points.

Minimum passing grade: 5 points.

REFERENCES**Basic**

- Viña J, Gambini J, Lopez-Grueso R, Abdelaziz KM, Jove M, Borras C. Females live longer than males: role of oxidative stress. Curr Pharm Des. 2011;17(36):3959-65.



- Viña J, Lloret A, Giraldo E, Badia MC, Alonso MD. Antioxidant pathways in Alzheimer's disease: possibilities of intervention. *Curr Pharm Des.* 2011;17(35):3861-4.
- Borrás C, Gómez-Cabrera MC, Viña J. The dual role of p53: DNA protection and antioxidant. *Free Radic Res.* 2011;45(6):643-52.
- Markovic J, García-Gimenez JL, Gimeno A, Viña J, Pallardó FV. Role of glutathione in cell nucleus. *Free Radic Res.* 2010;44(7):721-33.
- Pérez S, Pereda J, Sabater L, Sastre J. Pancreatic ascites hemoglobin contributes to the systemic response in acute pancreatitis. *Free Radic Biol Med.* 2015;81:145-55
- Quintana-Cabrera R, Fernández-Fernández S, Bobo-Jimenez V, Escobar J, Sastre J, Almeida A, Bolaños JP. gamma-Glutamylcysteine replaces glutathione on reactive oxygen species detoxification and neuroprotection. *Nature Comm.* 2012; 6(3):718

Additional

- Pallardó FV, Markovic J, García JL, Viña J. Role of nuclear glutathione as a key regulator of cell proliferation. *Mol Aspects Med.* 2009;30(1-2):77-85.
- Gomez-Cabrera MC, Viña J, Ji LL. Interplay of oxidants and antioxidants during exercise: implications for muscle health. *Phys Sportsmed.* 2009 Dec;37(4):116-23.
- Romagnoli M, Gomez-Cabrera MC, Perrelli MG, Biasi F, Pallardó FV, Sastre J, Poli G, Viña J. Xanthine oxidase-induced oxidative stress causes activation of NF-kappaB and inflammation in the liver of type I diabetic rats. *Free Radic Biol Med.* 2010;49(2):171-7.
- Markovic J, García-Gimenez JL, Gimeno A, Viña J, Pallardó FV. Role of glutathione in cell nucleus. *Free Radic Res.* 2010;44(7):721-33.
- Matheu A, Maraver A, Klatt P, Flores I, Garcia-Cao I, Borrás C, Flores JM, Viña J, Blasco MA, Serrano M. Delayed ageing through damage protection by the Arf/p53 pathway. *Nature.* 2007;448(7151):375-9.
- Escobar J, Pereda J, López-Rodas G, Sastre J. Redox signaling and histone acetylation in acute pancreatitis. *Free Radic Biol Med.* 2012;52(5):819-37

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

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