

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

Code	43088
Name	Physiology of perinatal development
Cycle	Master's degree
ECTS Credits	4.0
Academic year	2023 - 2024

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	4 - Optional subject	Optional

Coordination

Name	Department
SERNA GARCIA, EVA	190 - Physiology
TORRES CUEVAS, MARIA ISABEL	190 - Physiology

SUMMARY

In this module of the course are studied the extraordinary physiological changes that take place in the fetal to neonatal transition, with special emphasis on the enzymatic induction of the last stage of fetal development, key to its adaptation to the relative hyperoxia characteristic of birth. The molecular basis that explains the momentous physiological changes that take place at birth in various tissues, such as the lungs, brain, liver, or heart, will be described. The main diseases related to the fetal-neonatal transition will also be explained, highlighting the pathogenesis and physiopathology of perinatal asphyxia and dysfunctions typical of premature babies. The different therapeutic strategies to be used in these cases will also be addressed, placing special emphasis on resuscitation protocols in premature infants and their limitations.



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 have studied Physiology and Biochemistry.

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.
- Have a proactive attitude towards possible changes that may occur in their professional and/or investigative work.
- Know how to write and prepare presentations to present and defend them later.
- To prepare a clear and concise memory of the results of your work and the conclusions obtained.
- Use the different exhibition techniques oral, written, presentations, panels, etc., to communicate the knowledge, proposals and positions.
- 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.
- Recognize the importance of oxidative stress in the fetal-neonatal transition and describe the action protocols established in the main pathologies of the perinatal period.



LEARNING OUTCOMES

Study the physiological adaptations of the fetal-neonatal transition as well as the main associated pathologies.

Analyze the molecular bases involved in the perinatal period and the associated pathologies.

Know the basic protocols of action against the main pathologies of the perinatal period.

Study the basic and clinical nutritional aspects of the perinatal period.

DESCRIPTION OF CONTENTS

1. Oxidative stress in the fetal to neonatal transition

The physiological oxidative stress characteristic of birth and its aggravation in cases of perinatal asphyxia and premature birth will be described. The limitations of pure oxygen resuscitation will also be indicated and the induction of antioxidant enzymes that takes place at the end of fetal development and their importance for adaptation to hyperoxia at birth will be studied.

2. Hypoxia-reoxygenation in the fetal to neonatal transition: experimental and clinical studies

The hyperoxia associated with the fetal to neonatal transition. These changes in oxygenation induce large biochemical changes in the tissues of organisms, as demonstrated by experimental studies. Similarly, clinical studies that assess the great relevance of this relative hyperoxia is adequate, and the clinical consequences of alterations in it, mainly those observed in cases of prematurity, will be shown.

3. Pain in the neonatal period: physiology, diagnosis and treatment

The importance of pain in the neonatal period will be described given its significant contribution to the care and management of the newborn, as well as its morbidity and mortality. The physiological bases of pain in the neonatal period and its peculiar characteristics will also be discussed. It will also be addressed as the most appropriate analgesic strategies in the newborn

4. Sudden infant death syndrome (SIDS)

One of the most tragic situations in the newborn is sudden death. Sudden death will be defined, the etiology and the pathophysiological mechanisms involved will be indicated in detail. The detection of cases will also be discussed.



5. Preterm nutrition: basic and clinical aspects

The nutrition of premature babies is special since they require non-essential amino acids that are normally synthesized in the adult. Special emphasis will be placed on the deficiency of the transsulfuration pathway, which synthesizes cysteine from methionine, in the case of premature infants, and which would imply the recommendation that the diet be rich in cysteine or require supplementation with derivatives. Special nutrition will also be indicated in cases of neonatal intestinal disease

6. Infections in the neonatal period

The state of the immune system in neonates and premature infants is described, emphasizing the relative immaturity of their immune defense and its causes. The most frequent infections in neonates are indicated, how to treat them and the benefits of using immunoglobulins in the clinic

7. Assessment of neurological development in the neonatal period

Proper care and management of the newborn is shown to be critical for proper neurological development. The most appropriate methods to assess their neurological development are explained. The neurological repercussions of neonates who have suffered diseases in the perinatal period, particularly perinatal asphyxia, are also indicated.

8. The ductus arteriosus in the premature

The extraordinary changes that circulation undergoes at birth are explained and the main pathophysiological alterations that may appear in the premature baby, especially the ductus arteriosus, are indicated in detail. Diagnostic and clinical aspects are indicated, describing the associated manifestations. Treatment of ductus arteriosus is also indicated, addressing the most relevant pharmacodynamic aspects.

**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

Theoretical classes with student participation

Expert conferences on the topics

Debate and directed discussion about the work done.

EVALUATION**Evaluation system:**

- Written exam consisting of multiple choice questions: evaluation up to 5 points.
- Elaboration of a work related to the subject: evaluation up to 5 points.

Minimum passing grade: 5 points.

REFERENCES**Basic**

- Buonocore G, Bracci R, Weindling M. Neonatology. Milan; Springer; 1st edition; 2012
- Martin RJ, Fanaroff AA, Walsh MC. Neonatal Perinatal Medicine. St Louis; Elsevier Mosby; 9th Edition; 2010



- Oh W. Evidence-based Handbook of Neonatology. Singapore; World Scientific; 1st edition; 2010

Additional

- Cote A. Investigating sudden unexpected death in infancy and early childhood. *Pediatr Resp Rev* 2010; 11_219-25
- De Curtis M, Rigo J. The nutrition of preterm infants. *Early Hum Dev* 2012; Suppl1:S5-7.
- Maltepe E, Saugstad OD. Oxygen in health and disease: regulation of oxygen homeostasis-clinical implications. *Pediatr Res.* 2009;65(3):261-8.
- Sehgal A, McNamara PJ. The ductus arteriosus: a refined approach. *Semin Perinatol* 2012; 36:105-13.
- Vento M, Escobar J, Cernada M, Escrig R, Aguar M. The use and misuse of oxygen during the neonatal period. *Clin Perinatol.* 2012;39(1):165-76
- Walter Nicolet E et al. Pain management in newborns: from prevention to treatment. *Paediatr Drugs* 2010; 12:353-65