COURSE DATA

DATA SUBJECT

Code: 43088
Name: Physiology of perinatal development
Cycle: Master's Degree
ECTS Credits: 4
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
2141 - Master's Degree in Physiology	Facultat de Medicina i Odontologia	1	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
2141 - Master's Degree in Physiology	Optional subject	ELECTIVES

COORDINATION

SERNA GARCIA EVA

TORRES CUEVAS MARIA ISABEL

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

COMPETENCES / LEARNING OUTCOMES

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Be able to integrate knowledge and deal with the complexity of forming judgements based on incomplete or limited information including reflections on the social and ethical responsibilities linked to the application of knowledge and judgements.

Describe the main functional differences between men and women, as well as the specific mechanisms of disease production, the basis of therapeutics, and the means for maintaining and preventing health.

Describe the pathophysiological modifications of the functioning of the neural pathways associated with Alzheimer's disease and apply intervention strategies aimed at its treatment.

Have a proactive attitude towards possible changes that may occur in their professional and/or investigative work.

Have the learning skills needed to continue studying in a largely self-directed or independent manner.

Know how to apply knowledge and problem-solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to the field of study.

Know how to communicate conclusions and the knowledge and rationale behind them to both specialised and non-specialised audiences clearly and unambiguously.

Know how to write and prepare presentations to present and defend them later.

Possess and understand knowledge that provides a foundation or opportunity to develop and/or apply original ideas often in a research context.

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.

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.

To acquire a critical attitude that allows you to make reasoned judgments and defend them with rigor and tolerance.

To prepare a clear and concise memory of the results of your work and the conclusions obtained.

Understand and differentiate the physiological, pathophysiological and therapeutic aspects in the cardiovascular system and in the cerebral circulation.

Use different presentation formats (oral, written, slide presentations, boards, etc.) to communicate knowledge, proposals and positions.

Valorar la necesidad de completar su formación científica, en lenguas, en informática, asistiendo a

conferencias o cursos y/o realizando actividades complementarias, autoevaluando la aportación que la realización de estas actividades supone para su formación integral.

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 transsuphurization 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

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	3,00
Theory	24,00
Total hours	**27,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	2,00
Individual or group project	20,00
Independent study and work	20,00
Preparation of lessons	6,00
Preparation for assessment activities	15,00
Resolution of case studies	10,00
Total hours	**73,00**

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

- 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

- 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