UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Biology of Reproduction and Development

2223-1-F0601Q102

Aims

The course aims to describe the complex mechanisms that regulate the reproduction and development of a new animal organism, from a comparative and evolutionary point-of-view.
The students will develop skills related to the main biological mechanisms involved in the gamete formation, fertilization and development of model organisms, in particolar of Mammals and other Vertebrates. Moreover the course will furnish the conceptual instruments to understand the methods used for in experimental embryology and developmental biology studies. These aspects will be of high relevance for the comprehension of the modern environmental and biomedical researches approached by developmental biologists.

Contents

During the course, the steps that regulate the development of a new organism, starting from the gamete production and fertilization, to the development of new tissues and organs, will be described. In particular, the development of model Vertebrates will be addressed, with special emphasis on Mammalians. The main developmental phases, i.e. fertilization, cleavage, gastrulation and organogenesis, will be covered during the course.

Detailed program

Male and female reproductive system.
Gametogenesis: mechanisms that regulate the process of spermatogenesis and oogenesis in Mammals. Morphology of gametes. Classification and comparison of egg cell in experimental models of development.
Fertilization: Activation of the spermatozoon. Interaction, binding and recognition of gametes. Activation of egg cell metabolism and zygote formation.
Cleavage: mechanisms that regulate segmentation in Mammals and comparison with experimental models of

development (sea urchin, amphibians, birds). Morphology of the blastocyst, specification of cell fate in the blastocyst. Mechanisms that regulate the blastocyst implantation.
Gastrulation: cell specification, organization of embryonic germ layers and extra-embryo membranes. Formation of ectoderm, mesoderm and endoderm. Identification of the axes.
Embryonic annexes and placenta: description and functional role of the embryonic annexes in vertebrate embryos; differentiation of the placenta in Mammals.
Organogenesis: mechanisms that regulate organogenesis. Neural tube formation: primary and secondary neurulation. Neural tube differentiation. Differentiation of the presumptive epidermis.Differentiation of paraxial mesoderm: processes that regulate somitogenesis. Determination and fate of the sclerotome, dermatome and myotome.Differentiation of intermediate mesoderm. Differentiation of the mesoderm of the lateral laminae.Differentiation of the endoderm.The development of the tetrapod limb.
Introduction to reproductive and deveopmental toxicology, including teratology.
Experimental models in embryology: environmental and biomedical applications
Environment and Developmental Biology: the Eco-Devo principles

Prerequisites

Cytology, Histology and Comparative Anatomy

Teaching form

Lectures (classroom).
During the course, it will be evaluated the possibility to make the registrations of the lessons available

Textbook and teaching resource

Recommended textbooks:
Biologia dello sviluppo (V ed IT). Aut. S.F. Gilbert, M.J.F. Barresi, Ed. Zanichelli
Developmental biology (XI ed. ENG). Aut. Gilbert and Barresi, Ed. Sinauer.

Manuale di Biologia dello Sviluppo Animale. Aut. Menegola, Bonfanti, Colombo, del Giacco, Ed. EdiSES (2019)

Additional textbooks
Embriologia (III ed.) Aut. Barbieri e Carinci, Ed. CEA
Eco-Devo. Ambiente e biologia dello sviluppo. Aut. Gilbert, Epel. Ed. Piccin
Biologia dello sviluppo. Aut. Giudice, Augusti-Tocco, Campanella. Ed. Piccin

Bibliographic documentation will be suggested during the course.
The teaching material used in classroom (slides) and the scientific papers will be uploaded on the Moodle page

Semester

First semester

Assessment method

Oral examination.
The exam will be based on questions on the different parts of the program and on specific topics from the scientific literature. The candidate should demonstrate to have acquired the basic knowledge on the different embryological aspects, as well as the capacity to link the processes that regulate the development of an organism. Moreover, the ability of the student to critically discuss a paper from the scientific literature will be evaluated.

Office hours

By appointment upon request to the e-mail address:paride.mantecca@unimib.it

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING | LIFE BELOW WATER | LIFE ON LAND