



DEPARTMENT OF LABORATORY MEDICINE

H5F3080, Gene Regulation in the Early Human Embryo, 1.5 credits (hec)

Genreglering i det tidiga humana embryot, 1,5 högskolepoäng

Third-cycle level / Forskarnivå

Approval

This syllabus was approved by the The Committee for Doctoral Education on 2024-02-08, and is valid from autumn semester 2024.

Responsible department

Department of Laboratory Medicine, Faculty of Medicine

Prerequisite courses, or equivalent

Knowledge in pre-implantation embryology corresponding to the course Embryology I.

Purpose & Intended learning outcomes

Purpose

The aim of the course is to instruct the participants in human reproductive biology with focus on gene regulation and pathways that control the early embryo formation.

To provide understanding in complexity of the molecular mechanisms that involve the successful development of the early cleavage embryo, so that the student can evaluate, troubleshoot and improve existing assisted reproductive technology (ART) systems.

Intended learning outcomes

At the conclusion of this course students should be able to:

1. Show a good understanding of the genetic and epigenetic aspects of the preimplantation period of mammalian development that is crucial for reproductive success.
2. Show a good understanding of the dynamic changes in gene expression during human early embryo development involving differentiation, survival, fragmentation, zygotic genome activation, cell determination, embryo patterning and apoptosis, gene profiling from oocyte development to blastocyst formation.

3. Explain the general epigenetic influence of the laboratory and clinical environment on embryo culture and physical-chemical properties of the specific culture systems.
4. Produce coherent, logical and concise explanations of data and concepts in the field of gene regulation in the early human embryo - both in writing and orally, through consideration of the course material.
5. Discuss scientific literature related to ART and reproduction physiology in a constructive and informed fashion.

Course content

1. Genetics in oocyte maturation and embryo development
2. Importance of epigenetics in embryo development
3. Cell-cell (blastomere) interactions and receptor signaling
4. Gamete interaction
5. Zygotic genome activation
6. Embryo morphology, euploidy, aneuploidy and mosaicism
7. Implantation and post-implantation genetics
8. Genetic aspects of prenatal diagnostics, preimplantation genetic diagnosis and preimplantation genetic screening.
9. General ethical aspects
10. Literature work and discussion in reproductive genetics

Forms of teaching and learning

The course runs for one week with lectures, and literature work as part of the course examination.

Language of instruction

The course is given in English

Grading scale

Pass (G) /Fail (U)

Compulsory components & forms of assessment

Compulsory components

Attendance during the lectures and active part in the literature work.

Forms of assessment

The examination will consist of an individual or group oral presentation on a course topic, followed by a questions and answers session and an individual written exam.

Course literature

Recommended literature:

In vitro fertilization (3rd edition) Elder and Dale, Cambridge University Press, 2010. Textbook of Assisted Reproductive Techniques: Laboratory and Clinical Perspectives, 3rd edition

Gardner DK, Weissman A, Howles CM, Shoham Z, editors. 2009.

Screening the Single Euploid Embryo: Molecular Genetics in Reproductive Medicine 1st ed. Edition, E. Scott Sills, Editor, Springer 2015.

Embryo Cleavage, Edited by Bin Wu, Publisher: InTech, Chapters published September 2017

Genetic Disorders and the Fetus: Diagnosis, Prevention and Treatment 7th Edition by: Aubrey Milunsky, M.D., D.Sc., F.R.C.P., Wiley & Sons UK 2015.