



DEPARTMENT OF LABORATORY MEDICINE

H5F3089, Cryobiology in Assisted Reproductive Technology, 1.5 credits (hec)

Kryobiologi i assisterad reproduktionsteknologi, 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

No prerequisite courses, or equivalent, demanded for this course. .

Purpose & Intended learning outcomes

Purpose

The aim of the course is to instruct the participants in human and mouse reproductive biology with focus on cryopreservation technology and embryo banking, as well as to give them practical experience through practical demonstrations in cryopreservation of gametes and embryos in IVF technology. To provide understanding of principles of cryobiology and components of culture systems used in assisted reproduction technology (ART). Thus the student can evaluate, troubleshoot and improve existing technology.

Intended learning outcomes

The objectives of this course are that at the conclusion of this course students should have a good understanding of:

Folliculogenesis and Fertilization; Preimplantation Embryology; sperm and oocytes retrieval; criteria of selected or scoring the gametes and zygotes for cryopreservation; liquid nitrogen handling; principles of cryobiology. Students should be aware of the general aspects and implication of the cryobiology research and the potentiality that this represents for clinical

application; The principles of cryobiology; The Cryoprotectants additives and how they protect the cells by stabilizing intracellular proteins; The factors that affect cellular response to freezing; The different cryopreservation protocols and what is ongoing in this field; The cross-contamination of samples in liquid nitrogen; problems in achieving a good result of cryopreservation procedure; The possible epigenetic effects of the cryopreservation procedure; testicular and ovarian tissue cryopreservation procedures; Storage of the cryopreserved samples, the advantages of the cryopreservation and embryo bank.

Finally the students will improve their capacity to produce coherent, logical and concise explanations of data and concepts - both written and oral, through consideration of the course material.

Students will also develop their ability to criticize scientific literature related with cryopreservations technology and reproduction physiology in a constructive and informed fashion; Be aware of potential development of cryobiology and IVF in the future.

Course content

- Sperm-and ovogenesis and Hormonal function
- Main components of the culture system
- Physical-chemical properties of culture system
- Functional characteristics of different tissue culture incubators
- The influence of the laboratory and clinic environment on embryo culture
- The morphology of oocytes, zygotes and cleavage stage embryos as well as morulae and blastocysts
- Developmental milestones
- Biochemical tests for predicting developmental potential
- Possible effects of culture and frozen condition on epigenetics events
- Clinical aspects of frozen embryo transfer
- The potential of the different cryopreservation techniques in clinic application with focus on IVF
- General aspects and implication of the cryobiology in research

Forms of teaching and learning

Divided in lectures and laboratory demonstrations:

Embryology theory (lectures)

Culture system (lectures)

Cryobiology (lectures)

Gametes and embryos quality evaluation (lectures)

Lab.1. Laboratory demonstration in gametes and embryo retrieval; In-vitro fertilization and cryoprotectants additive; Handling with liquid nitrogen (lab).

Lab.2. Evaluation of the quality of the fertilize oocytes and selection for freezing; performed cryopreservation on the selected samples (lab).

Lab.3. Thawing frozen samples and quality assessment (lab).

Genetics and epigenetics aspects (lectures)

Introduction to the different cryopreservation procedures (lectures)

New trends in gametes and embryo cryopreservation (lectures)

Fertility preservation and challenge (lecture)

Future in human cryobiology and ethical aspects (lecture). Course test, evaluation, discussions, examination and closing of course.

Language of instruction

The course is given in English

Grading scale

Pass (G) /Fail (U)

Compulsory components & forms of assessment

Compulsory components

The laboratory demonstrations are obligatory; there will be lectures combined with laboratory demo, but if the student will be absent of one laboratory section, the student should present a literature work related to the subject of the missing activity.

Forms of assessment

Examination on day 5, with individual or group presentations of the literature work related to the contents of the course, discussions and feedback. Every student will be individually assessed and the students has to show that all learning outcomes have been reached.

Course literature

Handbook of Human Oocyte Cryopreservation, Eleonora Porcu, Patrizia Ciotti, Stefano Venturoli. Cambridge University Press, 6 dic. 2012 - 151 pages

Gonadal Tissue Cryopreservation in Fertility Preservation Editors: Suzuki, Nao, Donnez, Jacques (Eds.) 2016

Cryopreservation: Modern Insights Hardcover, 31 Jan 2015 by Marianne Wilde(Editor)

Cryopreservation and Freeze-Drying Protocols, Editors: John G. Day and Glyn N. Stacey .

ISBN: 978-1-58829-377-0 (Print) 978-1-59745-362-2 (Online)

Infertility; Julius Hreinsson, Lars Hamberger, Thorir Hardarson, Studentlitteratur, 2005

IVF LAB ""Laboratory aspects of in-vitro fertilization"" Editor: M. Bras, J.W. Lens, M. H.

Piederiet, P.M. Rijinders, M. Verveld, G.H. Zeilmaker, 1996