



## DEPARTMENT OF LABORATORY MEDICINE

### **H5F5562, Stem Cells and Organoids Models with Focus on Regenerative Medicine, 1.5 credits (hec)**

Stamcells- och organoidmodeller med fokus på regenerativ medicin, 1,5

högskolepoäng

*Third-cycle level / Forskarnivå*

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#### **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 purpose of the course is to enable doctoral students to obtain a basic understanding of stem cell biology with focus on production and study of organoids in vitro culture, cell-based therapies, genome engineering and translational medicine. Experts in the field will provide a fresh overview of clinical and pre-clinical research aiming at development of novel treatment possibilities, but also discussing current limitations and general ethical aspects.

In addition the students will be enabled to improve their capacity to produce coherent, logical and concise explanations of data and concepts - both written and orally, through consideration of the course material.

##### **Intended learning outcomes**

At the conclusion of this course students should be able to show a comprehensive view of:

- Preimplantation Embryology

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- Derivation methods and culture conditions of hESCs
- Nutritional requirements of the blastocyst and stem cells
- Functional characteristics of different 3D-tissue culture incubators
- Characterization of the organoids and the importance of the 3D bioprinting of these cells and what is ongoing in this field
- Production of isogenic embryonic stem cells by somatic cell nuclear transfer (SCNT)
- The pluripotency induction of somatic cells by transduction (the iPS cells)
- Know the prospective possibilities of having a good culture system and be aware of potential development of organoids technology in the future.
- Be aware of the general aspects and implication of the stem cells and organoids research and the potentiality that these represent for research and clinical application.

## Course content

1. Preimplantation embryology
2. In vitro culture system
3. Stem cells culture (lectures)
4. Characterization of stem cells & Stem cell-derived organoids
5. Genome engineering
6. Introduction to different cell types and organoids
7. Cell reprogramming and editing
8. Stem cells therapy and organoids challenge today
9. Future in stem cells and organoids models

## Forms of teaching and learning

Lectures from experts in the field, laboratory demonstrations, 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 parts are obligatory. Absence at the laboratory demonstration needs to be compensated for by a literature review in accordance with the instructions from the course leader.

### Forms of assessment

Constructive feedback and evaluation that supports learning (that is formative assessment) is

included during active participation in all parts of the course. A summative assessment including an individual written assignment is carried out at the end of the course.

## Course literature

Recommended literature:

The Global politics of human embryonic stem cell science, Regenerative medicine transition, By, Herbert Gottwels, Brian Salter and Catherine Waldby, Publisher: Palgrave Mac Milan, 2009.

Emerging technology platform for stem cells, edited by Uma lakshmipathy, Jonathan D. Chesnut.... Publisher: John Wiley & sons Ltd, 2009

Guidelines for human embryonic stem cell research, (Authors) Board of life sciences; National academy of sciences, Publisher: National academies press, 2005

Stem cell Research: Medical application & Ethical controversy, Joseph Panno, The New Biology, 2005

Human Embryology, William J. Larsen, Third Edition, Churchill Livingstone, 2001

Organoids, Stem Cells, Structure, and Function, Kursad Turksen, Editors: Springer Lik 2019