



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## COURSE SYLLABUS

### Stem Cells in Somatic Tissue Cell Homeostasis

2223-1-F0601Q070

---

#### Aims

The aim of this course is to extend and elaborate current notions on somatic stem cells functions, focusing in particular on tissue homeostasis and repairing/regenerative mechanisms. We will discuss also basic elements related to embryonic stem cells, cloning and induced pluripotent stem cells.

1. Knowledge and understanding:

Students will be able to understand how stem cells regenerate our tissues and replace differentiated cells lost by the normal tissue homeostasis and/or tissue damage.

\*2. Applied knowledge and understanding:

In addition, the course will give to the students a scientific background that can be applied to understand projects aimed to the study the molecular basis of neurodegenerative diseases and aging, as well as to studies aimed at developing biotechnological applications of stem cells.

\*3. Making judgments

Students will be able to critically review the scientific bibliography inherent research studies investigating stem cells. In addition, students will be able to develop autonomously an informed opinion on the scientific rationale of stem cells use in biotechnological endeavors and pre-clinical studies.

4. Communication skills:

At the end of the course the students will be able to give a definition of stem cell and describe the functional, morphological and antigenic characteristics that differentiate the different types of stem cells. They will also be able to summarize the mechanisms that sustain tissue homeostasis of various tissues that compose our organism using an appropriate scientific language.

Students will be able to use an appropriate scientific language to define stem cell types and describe their functions, morphology and antigenic properties. Students will be able to describe mechanisms sustaining tissue homeostasis by using appropriate scientific terms.

5. Learning skills:

This course will give to the students the information to achieve a more comprehensive knowledge of the physiology of our tissues.

## **Contents**

Comprehensive knowledge of stem cell field: definition, categories, functional characteristics, definition. General mechanisms and models describing cell homeostasis in somatic tissues. Description of the different stem cells type, considering their developmental origin, their role in tissue homeostasis and potential therapeutic application.

## **Detailed program**

- Cells Genealogies I: Introduction and definitions: differentiation, functional maturation and multipotency.
- Cells Genealogies II: Actual and potential Stem Cells and the concept of cell homeostasis
- Cells Compartments I : Stemness, stemness-inherent functional parameters and stem cells self-renewal
- Cell population compartments II: Transit Amplifying progenitors and their role in tissue and cell homeostasis
- Cell hierarchy models I: Single cells model, spiral-model.
- Clonal succession model, deterministic model, stochastic model
- Stem cell niche
- Proliferation and mechanisms of symmetric and asymmetric cell division
- Somatic Stem Cell model (general informations)
- Neural Stem Cells
- Intestinal Stem Cells
- Hematopoietic Stem Cells
- Epidermal Stem Cells
- Self-renewing tissues without stem cells
- Embryonic Stem Cells
- Induced Pluripotent Stem Cells
- Cancer Stem Cells

## **Prerequisites**

The knowledge of the basic mechanisms of cell biology, human physiology and histology is required.

## **Teaching form**

Lectures

## **Textbook and teaching resource**

Stem cells, di C.S. Potten, Academic Press. Classes are based on original or review articles in English language. Fundamental articles and the ppt slides presented will be available on the e-learning system.

## **Semester**

second semester

## **Assessment method**

Students will be evaluated by three written "open" questions at the end of the course . The questions will be aimed at evaluating both the knowledge of the topics discussed throughout classes and the ability to synthetize the most important elements of each topic. First question will be focused on general aspects of cells homeostasis and stem cells definition. Second and third questions will be focused on one of the stem cells types described. If required by the student or the teacher, a critical discussion of the written assessment will complete the evaluation.

## **Office hours**

Email to [biocell1@libero.it](mailto:biocell1@libero.it) to schedule a meeting.

## **Sustainable Development Goals**

QUALITY EDUCATION

---