

SCUOLA SUPERIORE DI CATANIA

STEM CELLS COURSE

Introduction

Defining stem cells
The unique properties of stem cells
Classifications of stem cells
Scope of this course

Embryonic stem cells

Defining embryonic stem cells
How are embryonic stem cells grown in the laboratory
Differentiation of embryonic stem cells

Hematopoietic stem cells

Isolation of hematopoietic stem cells
Hallmarks of hematopoietic stem cells
Sources of hematopoietic stem cells
Clinical use of hematopoietic stem cells
Hematopoietic stem cell banking

Neural stem cells

Adult neurogenesis
Human neurodegenerative diseases
Strategies to repair the nervous system
Parkinson's disease – a major target for stem cell research
Potential for stem cell therapy for other nervous system disorders

Mesenchymal stem cells

The discovery of mesenchymal stem cells
Characteristics of mesenchymal stem cells
In vitro differentiation of mesenchymal stem cells
Mesenchymal stem cells for tissue repair: site-directed and systemic delivery

Role of gene delivery and manipulation in stem cell research

Genetic manipulation of stem cells
Stem cell-based gene therapy

Cancer stem cells

Definition of cancer stem cells
Identification of cancer stem cells
Implication of the cancer stem cell hypothesis for tumor therapy

Major technologies for *in vitro* and *in vivo* study of stem cells

Methods for the isolation and *in vitro* expansion of stem cells
Xenograft animal models in stem cell research
In vivo imaging technologies

Clinical use of stem cells in regenerative medicine

Principles of regenerative medicine
Evidence supporting the potential of stem cells in tissue repair
Current clinical use of stem cells
Challenging problems and risks
Therapeutic perspectives

Ethics in stem cell research and use

Ethical issues on stem cell research
Current legislation on the use of stem cells