

Title of module	I Stem Cell Physiology
Module coordinator	Prof. Dr. Beate Brand-Saberi

Credit points	5	Semester(s) in which the module is taught	1
Contact hours	3	Workload	150 hours

Lecturer(s)	Brand-Saberi, Fragale
Type of teaching	Lecture (2 hours per week) Seminar (1 hour per week) Discussions in context with lectures and seminar; lecturers ask for feedback regarding understanding and progress; Moodle Skills for efficient research interactions will be trained during the seminars which will be taught in a compact course organized as a mini-symposium organized by the students themselves.
Relation to curriculum	Compulsory; For master students of Biology/Biotechnology and Biochemistry of RUB, this module is suitable as an elective lecture.
Recommended prerequisites	No prerequisites from curriculum; Students taking this module will be expected to have a basic understanding of cell biology.
Aims	The module "Stem Cell Physiology" provides a molecular, cytological and developmental basis by which students will acquire a deep insight into the physiology, derivation and characteristics of well-known types of stem cells including complex stem-cell-based in vitro models.
Learning outcome	Knowledge: Students can describe the principles and chronology of vertebrate development and stem cell types and stem-cell-derived 3D models. Skills: Students have understood and are able to explain basic processes of development. They can summarize and interpret developmental and stem cell related primary literature. Students can interpret basic and advanced problems in stem cell biology and relate morphological data. They can discuss the advantages and limitations of organoids in precision medicine. Competencies: Students can integrate and evaluate relevant stem cell-related textbook knowledge and research data at the morphological, developmental and molecular level. They can design and adequately present advanced level Power-Point based talks, relate them to background knowledge and critically discuss new data. They are capable of communicating in a scientific context in front of an international audience.
Contents of module	Cell cycle control and its implications for stem cell biology Principles of vertebrate development Gametogenesis and fertilization Reproductive medicine Early development: cleavage, blastocyst, gastrulation The three germ layers: ectoderm, mesoderm, endoderm and their derivatives Species-specific aspects of development Stem cell classification: - Hematopoietic stem cells

	<ul style="list-style-type: none"> - Mesenchymal stem cells, mesangioblasts - Embryonic stem cells - Fetal stem cells - Adult stem cells - Induced pluripotent stem cells - Stem cell-based 3D culture techniques - Embryoid bodies, Embryoids - Organoids, Organ-on-Chip
Study and examination requirements; Forms of examination	<p>Students performance during discussions and interactions in the context of the lectures and in the seminar with lecturers and fellow students; Presentations during the seminar.</p> <p>The mode of examination will be an end-of-term exam consisting of multiple choice questions with five choices and text question. Each examination will be of one hour and the question paper will consist of 30 MC questions and five text questions.</p>
Literature	<p>Essential Current Concepts in Stem Cell Biology, 2020, Brand-Saberi (Editor), Springer Nature</p> <p>LeSavage, B.L., Suhar, R.A., Broguiere, N. <i>et al.</i> Next-generation cancer organoids. <i>Nat. Mater.</i> 21, 143–159 (2022). https://doi.org/10.1038/s41563-021-01057-5</p> <p>Ma X, Wang Q, Li G, Li H, Xu S, Pang D. Cancer organoids: A platform in basic and translational research. <i>Genes Dis.</i> 2023 Apr 12;11(2):614-632. doi: 10.1016/j.gendis.2023.02.052. PMID: 37692477; PMCID: PMC10491878.</p> <p>Veninga V. and Voest E.E., (2021) Tumor Organoids: Opportunities and challenges to guide precision medicine. <i>Cancer Cell</i> Volume 39, Issue 9, p. 1190-1201</p> <p>Developmental Biology, 9th edition 2010 Scott Gilbert, Sinauer</p> <p>Principles of Development, edition 2010 Lewis Wolpert Oxford University Press</p> <p>Embryology Keith Moore, Vidhya Persaud edition 2007 Elsevier</p> <p>Langman's Medical Embryology, 12th edition 2011 Thomas W. Sadler Lippincott, Williams & Wilkens</p>