**Faculty of Medicine**
**International Master Program**
**Molecular and Developmental Stem Cell Biology**

RUHR UNIVERSITÄT BOCHUM RUB

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| **Title of module** | **III Stem Cell Practical Courses (Wahlpflichtmodul)** |
| **Modulecoordinator** | **Prof. Dr. I. Dietzel-Meyer** |

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| **Credit points** | 4 x 4 = 16 | **Semester(s) in which the module is taught** | 1 |
| **Contact hours** | 20 | **Workload** | 480 hours |

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| **Lecturer(s)** | Adamietz/Bühler; Behr, Brand-Saberi, Böing, Bühler, Förster, Heumann/Neumann, Jacobson, Klump, Lang, Theiss, Sengstock, Wiese, Winklhofer, (more from Department). |
| **Type of teaching** | Two weeks advanced laboratory courses with integrated seminars, guidance and supervision of experimental performance. Supervision of protocols<br><br>Active participation in seminars, completion of practical tasks and detailed protocols. Feedback regarding understanding the scientific background of the experiments<br><br>Team work. Discussing the feasibility and necessity of using stem cells in biochemistry, biology and medicine |
| **Relation to curriculum** | Compulsory; every student has to choose 4 different courses out of a large number offered by different scientific groups of the ISTEM supervisors For master students of Biochemistry of RUB also suitable as elective lecture. |
| **Recommended prerequisites** | No prerequisites from curriculum;<br>Students taking this module will be expected to have a basic understanding of cell biology, biochemistry and molecular genetics |
| **Aims** | Students will become familiar in theory and practice with specific techniques related to stem cell biology and will gain the competence to apply them as required. |
| **Learning outcome** | Knowledge:<br>Students have gained knowledge of different basic techniques related to stem cell research, depending on the host labs visited.<br><br>Skills:<br>The Students have acquired basic skills to perform these techniques. They will learn how to present their experimental data.<br><br>Competencies:<br>Students should have gained<br>a) Awareness of the latest scientific findings and literature pertaining to the questions addressed in the host labs.<br>b) Competence to interpret the obtained results.<br>c) Competence to relate a particular method or a spectrum of methods to solving of particular scientific problems in stem cell biology.<br><br>Representative example I (Brand-Saberi)<br>After completion of the laboratory course the student will have acquired the basic skills associated with the isolation of muscle fibres from the EDL muscle of mice. Furthermore, they have learned culturing, fixation and immunohistochemical (IHC) staining protocols to stain muscle stem cells. Culturing of C2C12 muscle cell line and IHC using several myogenic markers has also been a part of their practical training. The latest scientific findings and reviews pertaining to satellite cell population of muscle stem cells has been reviewed during the practical training period. |

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| | Representative example II (Wiese)<br>After completion of the laboratory course the students will have an insight into the culture of mouse embryonic stem cells in vitro. They have learned differentiation protocols on these cells towards neural progenitor cells. This includes also the analysis of central markers for neural differentiation as well as the quality control for the undifferentiated cells. On the level of methods the students will learn the techniques for Western Blot, RT-PCR, and Immunhistochemistry. |
| **Contents of module** | Muscle stem cell biology,<br>Embryoid bodies,<br>Investigating the expression pattern of developmental control genes by in situ hybridization<br>Ionophores as selective inhibitors of tumor stem cells and first approaches to clarify the underlying mechanisms<br>Cultivation & Characterization of novel multipotent human stem cells<br>Protein purification and transduction,<br>Investigations on adult hippocampal neurogenesis in transgenic mice<br>Mesenchymal Stem Cells for Regenerative Medicine<br>Epigenetics Changes in Tumor Cells<br>Immunohistochemisty of adult stems cells in the SVZ<br>Lab Rotation - Regenerative Medicine in Plastic Surgery<br>Isolation and culturing of mouse embryonic stem cells<br>Culture and differentiation of neural precursor cells |
| **Study and examination requirements; Forms of examination** | Active participation in seminars, completion of practical tasks and detailed protocols are required.<br><br>The assessment is based on a written report. |
| **Literature** | "Vertebrate Myogenesis", Beate Brand-Saberi (ed.) Springer-Verlag 2001, Problems and Results in Cell Differentiation<br>“Vertebrate Myogenesis: Stem Cells and Precursors” Beate Brand-Saberi (ed.) Springer-Verlag 2014, Problems and Results in Cell Differentiation<br>Yusuf F. and Brand-Saberi B. (2012). Myogenesis and muscle regeneration. Histochemistry and Cell Biology, 138(2):187-199<br>Lafenetre P, Leske O, Wahle P, Heumann R. (2011).The beneficial effects of physical activity on impaired adult neurogenesis and cognitive performance. Front. Neurosci. doi: 10.3389/fnins.2011.00051.<br>Manns, M., Leske, O., Gottfried, S., Bichler, Z., Lafenetre, P., Wahle, P., and Heumann, R. (2011). Role of neuronal ras activity in adult hippocampal neurogenesis and cognition. Front Neurosci 5, 18. Full text pdf<br>Squire, Berg, Bloom, du Lac, Ghosh, Spitzer. Fundamental Neuroscience, 3rd Ed. AP (2008) |