Scope

Stem cells have a major impact on nearly all disciplines of life sciences dealing with eukaryotic cells or organisms. Predictably, a strong demand on young scientists who are able to cope with a highly interdisciplinary approach will arise in the near future. Participants should learn to integrate different types of knowledge such as the chemistry of small molecules, bioinformatics of nucleic acids, protein networks, biochemistry of transcription factors, genetics and epigenetics, systems biology and applied medical sciences from bench to bedside for treating degenerative diseases of the brain, muscle, liver and skin etc.

Recently, it has become possible to reprogram patient-derived cells opening up new perspectives for cell replacement therapy and patient-specific drug development. Defined combinations of transcription factors may even allow trans-differentiation of fibroblasts into neurons. The application of nanoparticles may be useful to enhance penetration of regulatory proteins into cells thus avoiding DNA for reprogramming cells. In general, gaining knowledge in epigenetic mechanisms controlling gene expression is on the priority list of teaching. Inspection of differentiating stem cells with a super-resolution microscope (stimulated emission depletion, STED) will help to advance our knowledge in this rapidly evolving field of molecular stem cell biology. All the above mentioned aspects will be covered both in theory and in "hands on" practical courses in an international environment. If you are interested, send your **application to iSTEM@rub.de**.

Studying in Bochum

Ruhr-Universität Bochum (RUB)

From the first university in Germany's greatest industrial area, the Ruhr, to international excellence: the Ruhr-Universität (RUB) has character and charm, clear research contours and a diverse menu of degree programmes.

It is anchored in the region and yet still cosmopolitan. Its impressive campus is unique and a home to 34,000 students and 5,300 staff, the people who make RUB a living place.

The RUB also offers a wide variety of on-campus activities from sports to drama groups and it has its own university orchestra, choir, photography and painting studios. On campus you will find regular theatre and musical performances (Bochum Symphony Orchestra and organ concerts).

The university is home to a gallery that houses a fine collection of ancient and modern art.

The Ruhr has been designated the "European Capital of Culture" in 2010.

Dozens of industrial sites have been given a new function – theatres, opera houses, galleries, discotheques, museums and a UNESCO world heritage site, all within minutes from the RUB.

RUHR-UNIVERSITÄT BOCHUM
FACULTY OF MEDICINE

INTERNATIONAL MASTER PROGRAM
MOLECULAR AND DEVELOPMENTAL STEM CELL BIOLOGY
iSTEM

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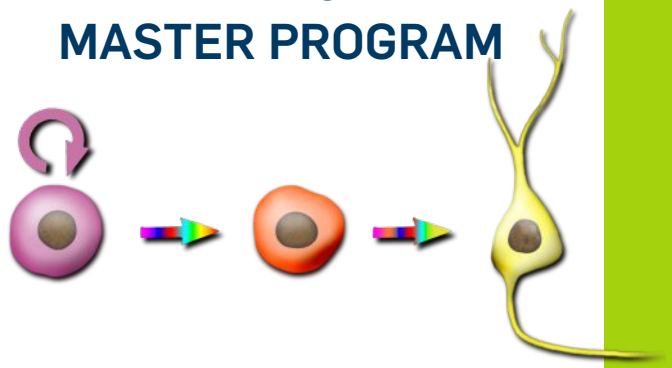
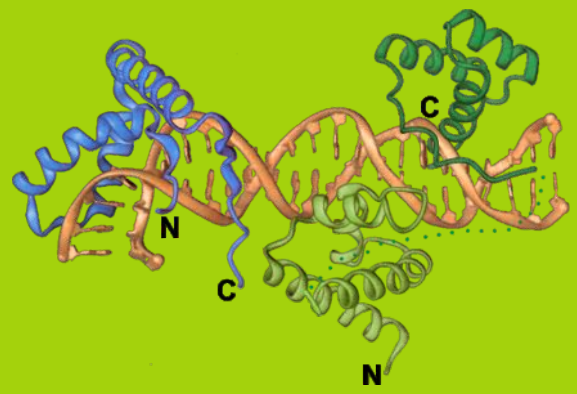
RUHR-UNIVERSITÄT BOCHUM

RUB

INTERNATIONAL MASTER PROGRAM



MOLECULAR AND DEVELOPMENTAL STEM CELL BIOLOGY



Stem cells in biomedical research

In recent years the field of stem cell research has expanded rapidly worldwide. It is to be expected that this trend will continue to generate an important impetus for biomedical research and application also in future. This interdisciplinary master degree course is oriented to cutting-edge research and current markets. The course combines traditional basic disciplines such as cell biology, histology, biochemistry and pathology with recent progress in epigenetics, bioinformatics and developmental biology to secure a broad understanding towards innovative translational approaches in medicine.

Course structure and duration

The course comprises four semesters, including a six-month master thesis. The final degree is a **Master of Science**. The course will be taught in English. The total number of credit points awarded is 120. Collaborations within the **University Alliance Metropolis Ruhr**, the **Stem Cell Network North Rhine Westphalia**, **Aarhus University** in Denmark, the **School of Medicine of Tongji University in Shanghai** and the **Chinese-German Stem Cell Center of Tongji Medical College in Wuhan**, create an international teaching platform that is based in the Medical Faculty of the Ruhr-University in Bochum.

Basics and clinical background

- Stem cell physiology
- Molecular genetic methods
- Biotechnology and tissue engineering
- Pathology of degenerative diseases
- Advances in stem cell research

Professional Skills

- Project organization
- Teamwork
- Scientific responsibility in biomedicine
- Grant writing
- Language proficiency

Research Skills

- Stem cell handling
- Biochemical and molecular methods
- Bioinformatics
- Molecular tracing

Mandatory courses

- Stem cell physiology
- Bioinformatics
- Stem cell practical courses
- Molecular genetic methods
- Biotechnology and tissue engineering
- Pathology of degenerative diseases
- Molecular tracing methods
- Advances in stem cell research
- Scientific responsibility in biomedicine
- Lab rotation
- Lab bench project & grant writing
- Master project
- Language course

Elective choice of labs

The Stem Cell Practical Courses, Lab Rotation, Lab Bench Project & Grant Writing, as well as the Master Project will be held on a rotation basis allowing students a choice from more than 30 laboratories. The Lab Bench Project and Master Project can optionally be carried out in international partner laboratories.

Admission requirements

Applicants are required to have a top bachelor's degree in the life sciences (e.g., B.Sc. in biology, microbiology, biomedicine, molecular biology) or a state examination/master's in a medical subject. The course is thereby ideally suited for graduates of biology and molecular biology, as well as for applicants with a degree in dentistry, medicine or molecular medicine. Proof of good basic mathematical skills is required, as is proof of English language skills at the level of TOEFL test.

Profile of degree holders

Alumni of the Master of Molecular and Developmental Stem Cell Biology course have gained detailed up-to-date knowledge of the classification and origin of stem cells, and can master their harvesting, cultivation and scientifically sound application. They have gained a solid knowledge of the molecular processes involved. The graduates have a thorough understanding of the basic principles underlying the pathology of degenerative diseases and of relevant aspects of regenerative medicine and tissue engineering. They have the ability to critically pursue new developments and to implement them, according to the principles of good scientific practice. They will have developed a comprehensive understanding and carefully considered approach to bioethical aspects. Furthermore, they know how to handle human and animal materials in a responsible fashion. They have furthermore been trained to work in international, intercultural and interdisciplinary teams. Graduates of the Molecular and Developmental Stem Cell Biology degree course are ideally suited to start their career in the pharmaceutical industry, as well as in scientific institutes. They are equally well qualified to continue with doctoral studies in life sciences or medicine.