

Bavarian research & innovation



Bavarian research cooperation ForZebRA – cell-based regeneration of the musculoskeletal system in old age

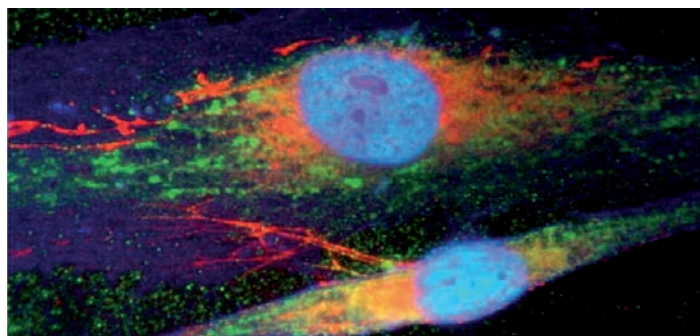
NEW STEM CELL RESEARCH FOR THE AGED

Investigation of new therapies for degenerative diseases of bone, cartilage and tendon

A series of damages occurs in the genetic information of all body cells during ageing. Therefore the complex process of on-going tissue regeneration breaks down. This eventually leads to degeneration – the progressive loss of function of individual organs or of the overall organism. Typical degenerative diseases in the skeletal and musculoskeletal system are osteoporosis and osteoporosis-related fractures, as well as osteoarthritis, intervertebral disc deterioration and degeneration of tendons. Direct costs of more than € 36 billion accrue for this disease in Germany annually, which corresponds to approximately 16% of the overall costs for diseases in the Federal Republic of Germany. Due to ever-increasing life-expectancy, all experts anticipate a considerable increase in the aforementioned degenerative diseases and their respective related costs. Indeed, many advances have been made in the treatment of degenerative diseases, such as the development of artificial joints or the implementation of drug therapy for osteoporosis.

However, none of the currently used therapeutic procedures have been able to rectify damage within the tissue; rather they can merely limit it. In the Research Cooperation ForZebRA the expertise of nine university partners and twelve industrial partners is consolidated, in order to examine in detail degenerative diseases such as osteoporosis, osteoarthritis and tendinopathies in the aged, and to develop innovative therapeutic strategies, such as stem cell-based therapies.

ForZebRA is divided thematically into three platforms: cell-biology/genomics, cell-application/cell-tracking and bio-evaluation/genetically modified large animal models. This wide range of contents and methods allows a detailed analysis of both degenerative processes and the induction of regeneration during ageing. Concurrently, monitoring of new therapy concepts can be conducted effectively. The particular point of scientific interest is the special situation in old patients.



Adult mesenchymal stem cells are particularly suitable to be used within the framework of cell-based therapeutic strategies.
Image: Schieker J Anat 204 (2): 133-135, 2004

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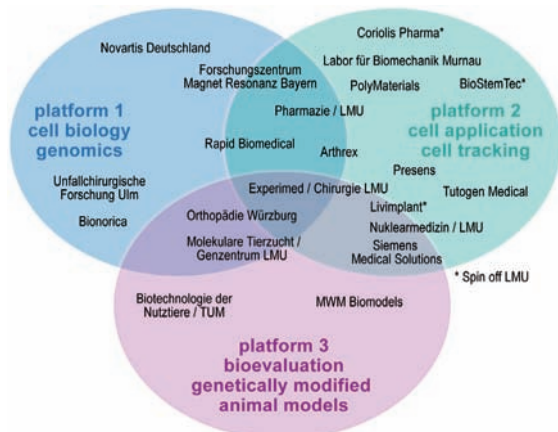
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Funded by the Bavarian Research Foundation with 1.77 m €. Total amount of 3.50 m €.

RESEARCH TOPICS:

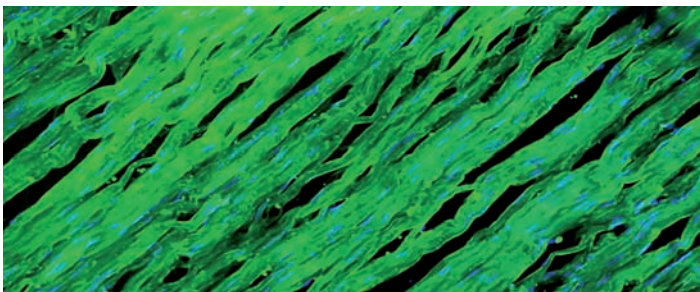


FORZEBRA – research cooperation for cell-based regeneration in old age

This graphic represents the participation of the project partners in the cooperation of the three platforms and illustrates the networking for this research cluster with outstanding scientific and commercial potential.

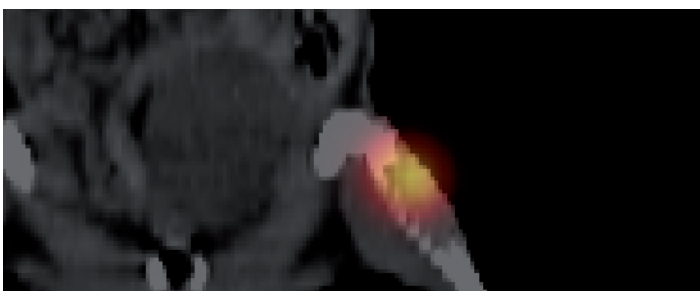
Platform 1: Cell Biology/Genomics

- Development of a data-bank for the comparative representation of the transcriptome of younger, healthier mesenchymal stem cells (MSC) and aged MSCs for detection of key genetic degenerative diseases and induction of regeneration for the aged
- Development of procedures for the inspection of stem cell quality, and avoidance of ageing in the utilized stem cells by means of modulation of the gene expression
- Examination of changes in the gene expression after mechanical manipulation of cells and tissues



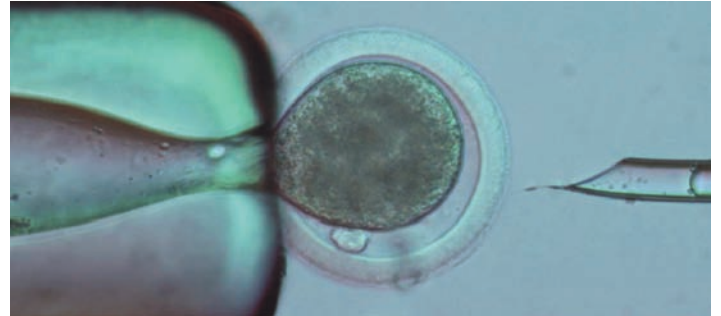
Platform 2: Cell Application/Cell-tracking

- Improvement in the application of stem cells into defect sites using new injectable systems and carrier materials
- Tracking of the introduced stem cells and cell-seeded constructs by means of complex cell-tracking in vivo with the aid of image-guided procedures such as nuclear imaging techniques, magnetic resonance tomography and optical procedures
- Quantitative and qualitative monitoring of the applied cells is the decisive precondition for an assessment of the innovative forms of innovative stem cell-based therapeutic strategies



Platform 3: Bio-evaluation/genetically modified large animal models

- Production of genetically modified, immuno-deficient pigs as model organisms using innovative techniques of gene transfer
- Examination of the efficiency and safety of therapeutic approaches on the basis of human cells or tissue constructs in the large animal model
- Use of the pig model for pre-clinical evaluation studies



Economic Applications:

Enterprises should evolve out of the three platforms, which test and evaluate new therapy concepts from the molecular level to animal models. Following this, their final goal is to commercially offer these new treatment regimes for degenerative diseases in the aged.

Furthermore, detection and evaluation of new targets is possible for pharmaceuticals supporting the healing of musculoskeletal diseases. This can also be marketed through early integration with large industrial enterprises.

Academic Partners:

Clinic of the LMU Munich, Surgical Clinic and Poly-Clinic – “Innenstadt”, Experimental Surgery and Regenerative Medicine (ExperiMed)

Clinic of the LMU Munich, Clinic and Poly-Clinic for Nuclear Medicine – “Innenstadt” and “Grosshadern”
Forschungszentrum Magnet-Resonanz-Bayern e.V. (MRB) and University of Würzburg, Physical Institute, Experimental Physics 5
Gene Centre of the LMU Munich, Chair for Molecular Animal Husbandry and Bio-Technology and Laboratory for Functional Genome Analysis (LAFUGA)

LMU Munich, Department Pharmacy, Pharmaceutical Technology and Bio-Pharmacy

Paracelsus University Salzburg and BG Trauma surgery, Murnau
TU Munich, Scientific Centre Weihenstephan, Chair for Bio-Technology of Animals

University of Ulm, Institute for Trauma Surgery Research and Bio-Mechanics

University of Würzburg, Orthopaedic Clinic in König-Ludwig-Haus, Orthopaedic Centre for Musculoskeletal Research

Industrial Partners:

Arthrex GmbH, Karlsfeld
BIONORICA AG, Neumarkt
BioStemTec, Munich
Coriolis Pharma, Munich
LivImplant, Munich
MWM Biomodels, Tiefenbach
Novartis Deutschland GmbH, Nuremberg
PolyMaterials AG, Kaufbeuren
PreSens GmbH, Regensburg
Rapid Biomedical, Rimpfing
Siemens Medical Solutions AG, Erlangen
Tutogen Medical GmbH, Neunkirchen am Brand