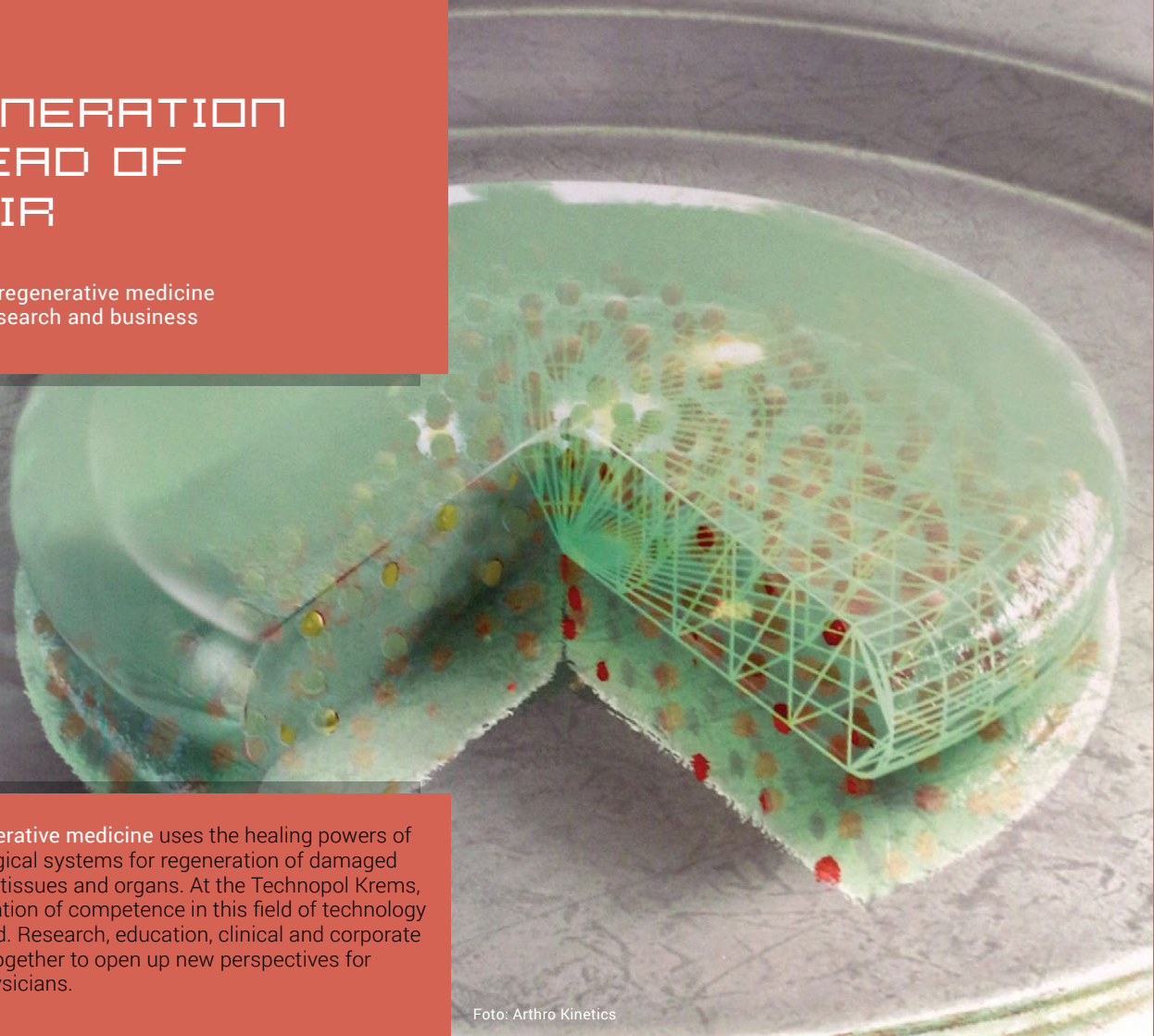


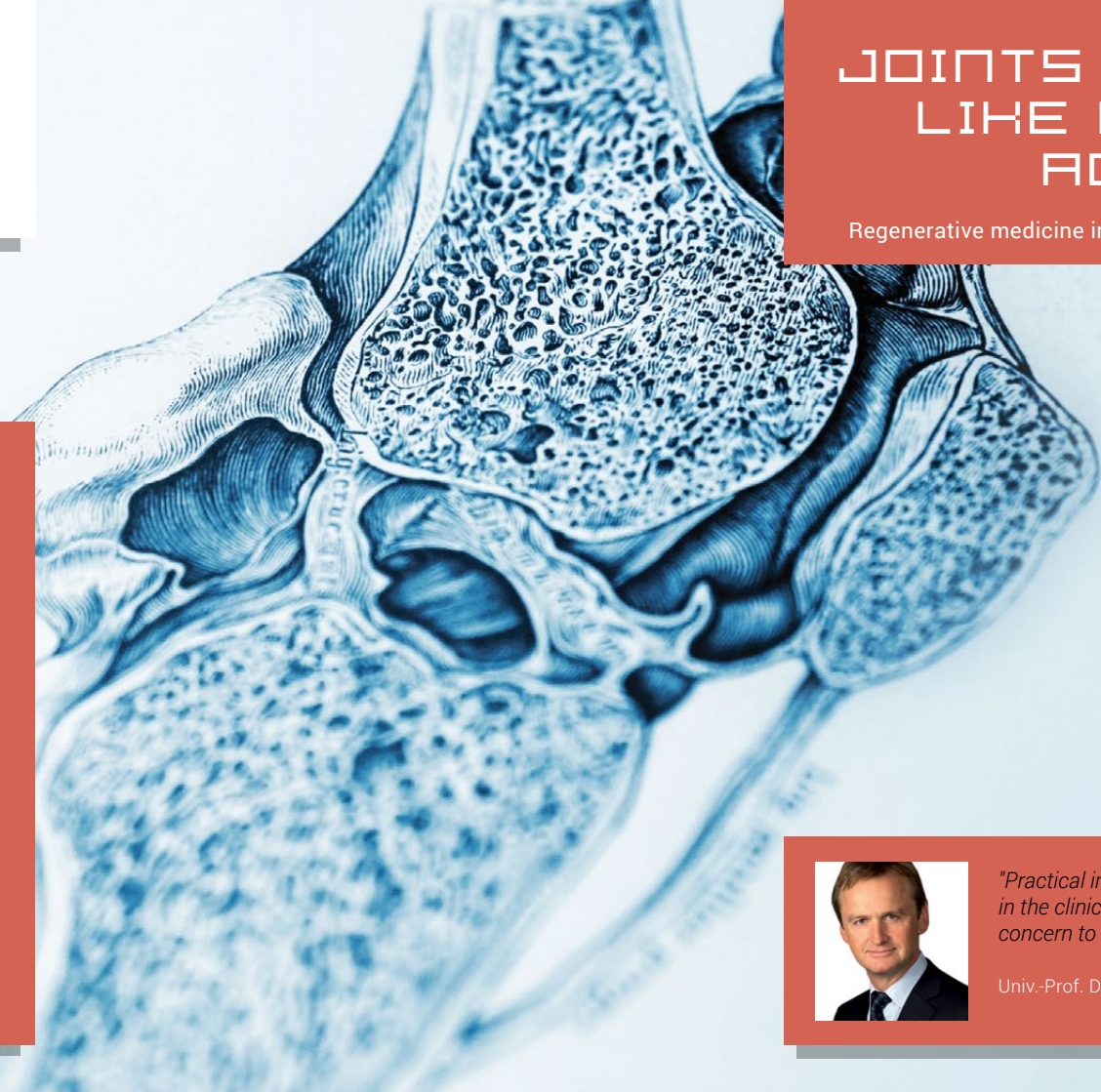
# REGENERATION INSTEAD OF REPAIR

Competence in regenerative medicine  
in education, research and business

**R**egenerative medicine uses the healing powers of biological systems for regeneration of damaged cells, tissues and organs. At the Technopol Krems, a high concentration of competence in this field of technology has been created. Research, education, clinical and corporate activities work together to open up new perspectives for patients and physicians.

Foto: Arthro Kinetics





Fotos: iStockphoto.com/josefmann, Donau-Universität

## A NEW APPROACH

Regenerative medicine restores impaired functions

**C**urrent medical practice is aimed far ahead to repair damage and therapeutically monitor symptoms. Regeneration of damaged cells, tissues and organs, which returns them to a state that is close to their healthy and functioning original state, is, however a relatively new approach. It makes use of the healing powers that the biological systems themselves possess.

The prerequisite for this was the rapid progress of medical biotechnology in recent decades. Today, specific tissue can be grown in cultures ("tissue engineering") and extra-corporeal systems for blood purification can be used. For many components of the musculoskeletal system – bones, cartilage, tendons – high quality substitute materials are available.

At the **Technopol Krems**, competence in the field of regenerative medicine got an early start. On the basis of the research groups at the **Danube University of Krems** (Centre for Regenerative Medicine and Orthopaedics, Centre for Biomedical Technology), as well as the **IMC Krems** (Department of Life Sciences), many companies and research institutions have emerged that are active in this field. The Krems subsidiary of **Fresenius Medical Care** was created as a spin-off of the Danube University. Companies such as **Arthro Kinetics** and **Lacerta Technologies** benefit from the research expertise on-site. **CTBA** and **AlloTiss** are two tissue banks located in Krems. The **Karl Landsteiner Private University of Health Sciences** enriches the location with clinically oriented teaching and research. ■

### Regenerative medicine in Krems INFO

- New treatment for worn out joints:  
Cartilage cell transplantations and visco-supplementation
- Extra-corporeal blood purification with liver damage and sepsis
- Cell-free cartilage implants
- Tissue banks for bone and tendon allografts
- New coatings for bone replacement materials
- Research on musculoskeletal diseases

## JOINTS ARE LIKE NEW AGAIN

Regenerative medicine in orthopaedics

**Q**ue to longer life expectancy, obesity and sport-associated overloading, more and more people suffer from wear and tear of the musculoskeletal system. Most commonly, osteoarthritis disease occurs, during the course of which the cartilage is increasingly damaged, leading to the degeneration of all joint structures. In an advanced stage, in addition to symptomatic pain therapy, usually only the replacement of the joint by an endoprosthesis is possible.

In order to implement a paradigm shift in this field from repair to regeneration, new types of treatments based on tissue engineering are being developed at the **Centre for Regenerative Medicine and Orthopaedics**, managed by Stefan Nehrer. This will allow for the preservation of the natural joint for as long as possible. Much experience has been gained in this regard with the transplantation of autologous cartilage cells, taken from the patients themselves, which are used for the creation of a cell transplant to regenerate the joint surface. With this, the occurrence of osteoarthritis can be significantly reduced. Currently work is being done in a project supported by the Northern Austria Research and Education Society to identify differentiation factors of cartilage cells and to use these to optimise cell transplantation.

Another possibility is to supplement the lost lubrication effect by the addition of hyaluronic acid, the main component of synovial fluid. Several research projects are aimed at improving clinical efficacy by altering hyaluronic acid. In another recent project, research is also extending to bone defects and optimising the integration of external bone grafts (allografts).

In all of these activities, Stefan Nehrer and his team are seeking contact with industry to develop business models that make tissue engineering methods viable, including in terms of socio-economic cost effectiveness. Currently, there are, for example, close collaborations with two companies located at the Technopol Krems, Arthro Kinetics and Lacerta Technologies. ■



"Practical implementation in the clinic is of special concern to us".

Univ.-Prof. Dr. Stefan Nehrer



## TRANSPLANTED AND IMPLANTED TISSUES

The technology of cartilage and tendon replacement

## HEALTHY, HEALTHY BONES

Allografts in medical applications

**T**oday, so-called "allografts" are being used today as replacement material in bone defects, which come from human organ donors. With the **CTBA** (Cells + Tissue Bank Austria), a charitable organisation has established itself over the past decade and is dedicated to supplying patients and hospitals with allogenic bone material. "With ever-increasing regulatory requirements, the costs for establishing their own processing plants have become so high for hospitals and clinics that they can no longer be supported and the availability of allografts is therefore limited", says CTBA CEO Martin Hennes. With the establishment of a network of specialised tissue banks, CTBA occupies a leading position in Europe today and works together with leading companies in orthopaedics and in the field of dentistry. The facility acts as a platform for setting quality standards and offers interested institutions and clinics partnership support in the establishment of adequate quality management systems.

Zsombor Lacza, who works on the improvement of biocompatibility of allografts at the Semmelweis University of Budapest, pursues a new research approach. He has achieved good results through coating with blood-derived proteins. To utilise the idea, Lacza, together with partners, founded the **Lacerta Technologies** company in 2012, which selected its location based on the attractive Austrian funding landscape and the existing infrastructure at the Technopol in Krems. In the meantime, work is already being done on a second product development there: Using a novel device, growth factors can be obtained very fast from platelet-rich fibrin (the substance that is formed in blood clotting). These types of growth factors can be used for numerous indications, but also help bring allografts even closer to their biological counterparts. ■

**I**f injured or worn out cartilage tissue needs to be replaced, the production of biological organ structures is required, which can then be used as implants. **Arthro Kinetics** specialises in the development of these types of replacement materials. Here, the globally active company uses a three-dimensional matrix based on collagen – the protein that is also instrumental in the construction of articular cartilage in the human body. In this matrix, initially cartilage cells are embedded that were previously removed from the patient. A recent development, that is already successful on the market, is "CaReS 1S", a primary cell-free implant, which is populated by cells from the natural environment of the cartilage and is mainly used in knee and ankle joints. With this, the patient can be spared the removal of cartilage cells in a biopsy. Based on this unique technology, the company is pursuing other product developments for the musculoskeletal system.

Transplants are also used in tendon injuries. **AlloTiss GmbH**, a recently established non-profit, specialises in the withdrawal, storage and distribution of "allogenic", i.e. human tissue, but which is not the patient's own. Here, a new process is used, which ensures the safe – i.e. germ-free – withdrawal and preparation of the transplant and which has already proven itself in practice.

At Arthro Kinetics and AlloTiss, several aspects spoke for their decision to be located at the Krems site. Both companies appreciate the existing laboratory infrastructure as well as the proximity to a dedicated Department of Regenerative Medicine. Arthro Kinetics maintains a close cooperation with the Centre for Regenerative Medicine at the Danube University of Krems. Also, AlloTiss has already stated cooperation with research institutions at the Technopol and works with Stefan Nehrer and the Lacerta Technologies. ■

*"Short distances within the community and non-bureaucratic support of the institutions involved are important factors in the selection of a location".*

Sylvia Kessel, CEO of Arthro Kinetics



*"Krems is one of the most important Centres for Regenerative Medicine in Austria".*

Zsombor Lacza,  
CEO of Lacerta Technologies



Fotos: iStockphoto.com/eraniolo, Arthro Kinetics

Foto: Lacerta Technologies



# THROW THE BAD ONES INTO THE POT

Regeneration through blood purification

The Centre for Biomedical Technology of the Danube University specialises in the regeneration of body functions by means of extra-corporeal blood purification. In a manner similar to dialysis, the patient's blood is removed and passed through adsorber materials that bind toxins. With the development of "Prometheus", a device developed in collaboration with Fresenius Medical Care for extra-corporeal support of liver function, the Centre made a name for itself years ago.

Subsequently, the application was transferred to the clinical picture of sepsis. In this systemic inflammatory response by the body, a wide range of molecular components come in to play. The aim of the research is to make the appropriate selection and submit them to an extra-corporeal modulation. The **CD Laboratory for Innovative Therapies in Sepsis**, located at the Danube University of Krems, works in this context with the interaction of blood with biomaterials, with the development of cell culture models for imaging inflammatory processes, as well as with diagnostic procedures for inflammatory mediators. In close cooperation with partners at the Medical University of Vienna, research is dedicated to the highly topical issue of micro vesicles and their multiple roles as signal transducers and markers for cellular activation processes. The transfer of the research into clinical practice takes place by means of the Sepsis Unit at St. Pölten, a joint initiative of the Danube University of Krems, the **St. Pölten University Hospital**, and the Fresenius Medical Care company. A PhD programme, "Regenerative Medicine", is currently undergoing accreditation. ■

## Life sciences research at the IMC University of Applied Sciences Krems **INFO**

The integration of various competencies and disciplines allows for a wide spectrum in biotechnological research at the IMC University of Applied Sciences Krems. Tissue engineering methods are used to establish in vitro models of complex diseases and to use these for testing of novel drugs. Here, a particular focus has been on the development of peptide-based drugs. In addition, research at the University of Applied Sciences is focused on the characterisation and optimisation of bioreactors and production processes for the production of biopharmaceuticals.

# AT THE INTERSECTION OF MEDICINE AND TECHNOLOGY

Research in a new context

With the Karl Landsteiner Private University for Health Sciences (KL), a facility has been established at the Krems site that responds, with its programme of study, to the diversity of novel occupations that are at the intersection of human medicine, medical technology and health economics. In the fields of study of health sciences,

human medicine, psychotherapy and consulting sciences, as well as neuro-rehabilitation, experts are trained to act in key health policy fields. The two-part medical studies programme, based on the Bologna model, is offered for the first time in Austria: Building on the conclusion of the Bachelor's programme in Health Sciences, a strong practice-oriented Master's programme in Human Medicine is completed, with the teaching taking place primarily in small groups at the University Hospitals of St. Pölten, Krems and Tulln.

Accompanying this, a research structure is currently being constructed, which is oriented, like the study programme, in an interdisciplinary manner and addresses in particular issues at the intersection of medicine and technology. One of the research priorities will be on musculoskeletal biomedicine, which considers the disease-producing musculoskeletal aspects from the point of view of diagnosis, treatment and prosthetics. Here, biomarkers for unambiguous identification of a disease are researched as well as the compatibility of materials that are used in prosthetics. In 2014, a professorship was announced for this speciality field, which should be occupied by autumn 2015.

Other focal points of research at the KL will deal with the issues of water and health, as well as blood circulation and inflammation. All these activities are focused on issues of clinical significance. The research groups will work closely with the University Hospitals in Krems, St. Pölten and Tulln. ■



"Our research draws on issues of high clinical relevance and aims at future-oriented health care".

Rudolf Mallinger,  
Rector of the Karl Landsteiner Private University

Fotos: iStock.com/xreiner, KLU/A. Felscher

# TECHNOPOL KREMS



Europäische Union Investitionen in Wachstum & Beschäftigung, Österreich.

At the Krems site, a Technopol for Health Sciences has been created, whose cornerstone is the Danube University of Krems, the IMC University of Applied Sciences at Krems, the Biotechnology Centre of Krems (BTZ) and the RIZ North. At the Technopol, new ground is being trodden in biomedicine, pharmaceuticals and healthcare. The establishment of the Danube Private University for Dentistry and the Karl Landsteiner Private University for Health Sciences is another important impetus.

The special building with clean room labs (over 1000 m<sup>2</sup> of GMP production area) built at the Technopol Krems offers research-intensive companies in medical biotechnology the best conditions. The site also has extensive facility management and offers comprehensive consulting services in the areas of production, certification and implementation of R&D results in the biotechnology sector.

In the technology fields of the Technopol, currently there are **more than 400 people** employed, including around 160 in research and development and around 80 in production. There are a total of around 12,000 students in Krems. Contact: [v.ossmann@ecoplus.at](mailto:v.ossmann@ecoplus.at)



This brochure is also available as an e-paper. Simply scan the QR code or download it at:

[www.ecoplus.at/technopol\\_krems](http://www.ecoplus.at/technopol_krems)

## An overview of contacts

**AlloTiss GmbH**  
[k.kaudela@ectb.eu](mailto:k.kaudela@ectb.eu)

**Arthro Kinetics**  
[s.kessel@arthro-kinetics.com](mailto:s.kessel@arthro-kinetics.com)

**CD Laboratory for Innovative Therapies in Sepsis**  
[viktoria.weber@donau-uni.ac.at](mailto:viktoria.weber@donau-uni.ac.at)

**CTBA**  
[m.hennes@ctba.at](mailto:m.hennes@ctba.at)

**Danube University of Krems**  
Center for Regenerative Medicine and Orthopaedics  
[stefan.nehrer@donau-uni.ac.at](mailto:stefan.nehrer@donau-uni.ac.at)  
Center for Biomedical Technology  
[michael.fischer@donau-uni.ac.at](mailto:michael.fischer@donau-uni.ac.at)

**IMC FH Krems**  
Life Sciences research  
[andreas.eger@fh-krems.ac.at](mailto:andreas.eger@fh-krems.ac.at)

**Karl Landsteiner Private University**  
research department  
[regina.plail@kl.ac.at](mailto:regina.plail@kl.ac.at)

**Lacerta Technologies GmbH**  
[zsombor.lacza@lacertatech.com](mailto:zsombor.lacza@lacertatech.com)

Imprint: Editors - Publisher - Place of publication:  
ecoplus. Niederösterreichs Wirtschaftsagentur GmbH  
(The Business Agency of Lower Austria)  
Niederösterreichring 2 | Building A | 3100 St. Pölten | Austria  
Responsible for the content: ecoplus. Niederösterreichs Wirtschaftsagentur GmbH  
Overall design | Editor: Josef Brodacz Chemiereport.at  
Editorial management: Mag. Georg Sachs | Graphics: Mag. Stefan Pommer  
In this brochure, all person-related statements apply equally to women and men.  
It is merely for the sake of simplicity that the masculine form was selected in the text.



Die Wirtschaftsagentur  
des Landes Niederösterreich