DFG-Research Center for Regenerative Therapies Dresden

Cluster of Excellence at the TU Dresden

TECHNISCHE UNIVERSITÄT DRESDEN

CRTD
Center for Regenerative Therapies TU Dresden

Five for Life

A science network for the therapies of tomorrow

Researching the self healing potential of the human body and the resulting development of novel regenerative therapies could lead to finding therapies for thus far incurable diseases, such as Diabetes or Alzheimer's.

The DFG Research Center for Regenerative Therapies Dresden - Cluster of Excellence at the TU Dresden (CRTD) is working to find the key to self healing mechanisms.

The CRTD was established in 2006 as a research center of the German Research Foundation (DFG) and was given the Cluster of Excellence award by the German Federal Excellence Initiative in the same year. The CRTD's status as a Cluster of Excellence and the DFG-Research Center was approved in 2012 for another five years. The goal of the CRTD - located at the heart of Dresden's biotechnology sector - is to develop new regenerative therapies.

The CRTD is composed of 15 core research groups, collaborating together with more than 75 research groups from partner institutions in Dresden. This tightly woven interdisciplinary network serves to bring together the broad

Five for life - the title of this brochure stands for the five key aspects of research at the CRTD within the area of regenerative medicine: hematology/immunology, diabetes, neurodegenerative diseases, bone regeneration, and a technology platform.

The amount of time needed to develop regenerative therapies depends on how closely basic research and clinical research cooperate. Synergies within the CRTD network support the efficient transformation of results from basic research into clinical implementation. For instance, it is a reality within CRTD partner clinics to transplant stem cells and bone marrow for the treatment of leukemia as well as to transplant islet cells to treat type 1 diabetes patients. A clinical study on the vaccination of children with type 1 diabetes has already been successfully launched.

Communication is the key to expand the vivid and interdisciplinary network of scientists and to work jointly on the development of regenerative therapies. Regularly occuring international conferences and seminars at the CRTD facilitate lively exchange.

Developing regenerative therapies is an ambitious goal. We are, however, convinced that it is worth facing all the challenges on the way to accomplishing this goal.

Prof. ELLY TANAKA
Director of the CRTD



At the DFG-Research Center for Regenerative Therapies (CRTD) we are on our way to the medicine of the future.

AThe CRTD was established based on its success in a rigorous national competition and was also conferred the Cluster of Excellence award in the Excellence Initiative of the German Federal Government. The CRTD stands for cutting-edge research at the intersection of medicine, developmental biology, and biomaterials.

At the heart of the CRTD is the core center with five professorships and ten junior research groups. The core center complements the existing expertise in the Dresden research sector and serves as the cornerstone for regeneration research in Dresden. In order to offer excellent scientists distinguished career prospects and to keep their expertise at the institute, the CRTD and the TU Dresden have established a tenure-track option. This option offers junior research group leaders at the core center the opportunity to continue their research as a professor. A vivid network clustered around the CRTD's core center exists in the form of more than 90 research groups from the TU Dresden, the Dresden University Hospital Carl Gustav Carus, the Max Planck Institute for Molecular Cell Biology and Genetics, as well as the Max Bergmann Center of Biomaterials Dresden. Since the end of 2011, the new building of the CRTD, in close proximity to the Biotechnology Center of the TU Dresden, provides excellent research conditions for the core groups on 6,700 square meters.

Internationally positioned

The CRTD hosts scientists from more than 30 nations. Close to half of the people working at the CRTD come from outside of Germany. This diversity fosters a lively atmosphere, fruitful exchange, and fresh ideas.

The CRTD as part of Biopolis Dresden

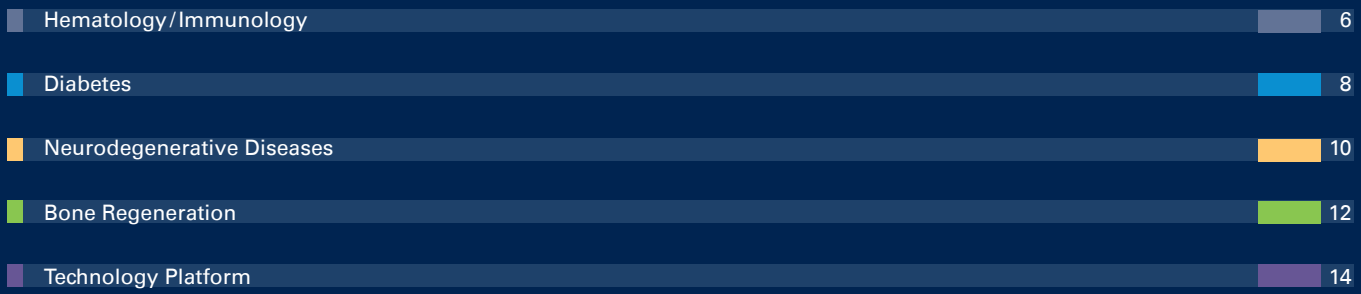
More than 150 partners from the areas of research, business, administration, culture, and finance are part of Biopolis, the innovative network for the promotion of transnational biomedical research. Biopolis, in its current form, is a unique biomedical campus. Due to the proximity of its institutes, it maximizes synergies and scientific cooperation..

Five for life – the five core research areas at the CRTD

As a center for regenerative therapies, researching the regenerative capabilities of the human body and the development of new regenerative therapies are the focus of the research at the CRTD. This means that instead of treating symptoms and consequences, work at the CRTD primarily addresses the cellular and molecular causes of diseases. Scientists at the CRTD focus on five areas: hematology and immunology, diabetes, neurodegeneration, and bone regeneration. The scientists at the CRTD are able to use a central technology platform that provides access to high-tech equipment and supports their research.

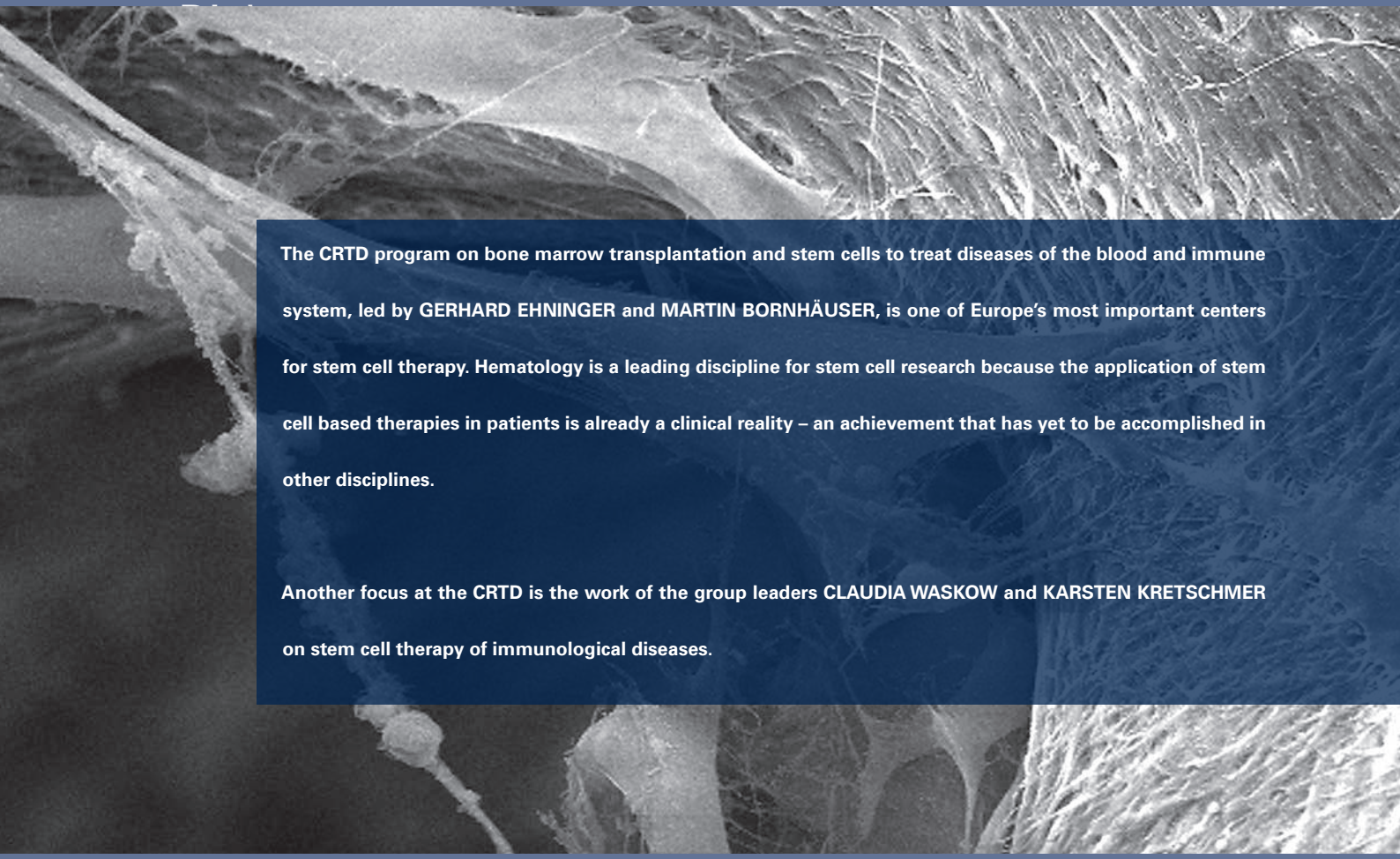
Stem cell research is at the core of research in regenerative medicine. It is also an example for the CRTD's interdisciplinary approach and goes far beyond cell replacement, including strategies for prevention.

Among other approaches, the CRTD's basic research embraces the idea of observing nature in how regeneration and plasticity are possible over an entire lifespan. In this area, many animals are far more capable than humans, such as the axolotl, a Mexican salamander whose limbs and tail are able to regenerate after being severed. The zebrafish also has the remarkable ability to regenerate parts of the heart, brain or retina.



Hematology / Immunology

Mesenchymal stromal cells on a cancellous bone chips. Image by Prof. Dr. Martin Bornhäuser



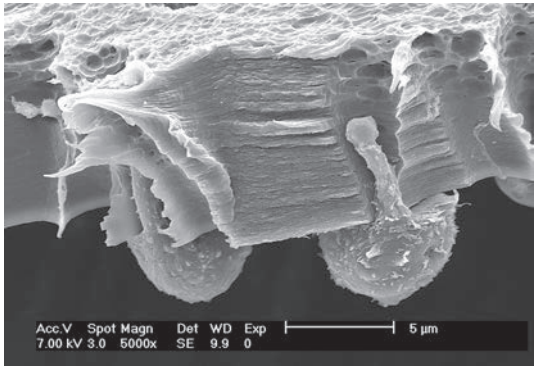
The CRTD program on bone marrow transplantation and stem cells to treat diseases of the blood and immune system, led by GERHARD EHNINGER and MARTIN BORNHÄUSER, is one of Europe's most important centers for stem cell therapy. Hematology is a leading discipline for stem cell research because the application of stem cell based therapies in patients is already a clinical reality – an achievement that has yet to be accomplished in other disciplines.

Another focus at the CRTD is the work of the group leaders CLAUDIA WASKOW and KARSTEN KRETSCHMER on stem cell therapy of immunological diseases.

Good chances against leukemia

The main focus of Prof. Dr. Martin Bornhäuser's and Dr. Claudia Waskow's work is the research and clinical application of hematopoietic stem cells. In particular, acute myeloid leukemia (AML), its pathogenesis, and novel treatment methods are in the focus of their research interests.

Patients are treated at the stem cell transplantation center of the University Hospital Dresden which, under the leadership of Prof. Dr. Bornhäuser, has developed into one of the most important of its kind in Europe over the last years. The cord blood bank of the German Bone Marrow Donor Center is also based at the Medical Clinic I of the University Hospital Carl Gustav Carus. Stem cells for transplantation can be obtained from the umbilical cord blood. For some cases of leukemia, this treatment is the only possibility for a long term cure.



Human hematopoietic stem cell on polycarbonate.
Image by Prof. Dr. Martin Bornhäuser

Dr. Waskow's research group is working on mechanisms to preserve hematopoietic stem cells. Dr. Waskow was able to decrypt the necessary mechanisms for the transplantation of 'foreign' cells into mice. Future research will concentrate on the molecular regulation of these mechanisms. The transplantation not only of human hematopoietic stem cells, but also of so-called leukemic stem cells into mice serves to inform clinicians and scientists on how to keep various stem cells alive in mice and humans.

Help for patients with autoimmune diseases

Our immune system destroys pathogens or defective cells and in that way protects us from diseases. However, if the immune system turns against the human body's own healthy cells, autoimmune diseases, such as type 1 diabetes or multiple sclerosis, can develop.

Another key aspect of Dr. Waskow's working group is decrypting the development of white blood cells that are important for the immune response. The special focus is on the "dendritic cells," a cell type that regulates the immune response and prevents the immune system from turning against the body's own healthy cells.

Prof. Dr. Kretschmer and his working group are interested in regulatory T cells (Treg) that can hinder destructive cells of the immune system. An increase in the number of Treg cells is said to be a promising approach for the prevention and treatment of autoimmune diseases. Further studies by Prof. Dr. Kretschmer show that the delivery of tiny amounts of the body's own antigens is able to deactivate the destructive immune reaction for multiple sclerosis and type 1 diabetes in mouse models. In the future, Prof. Dr. Kretschmer will test whether or not this vaccination against autoimmune diseases is also suitable to ease or even cure a disease after its onset.

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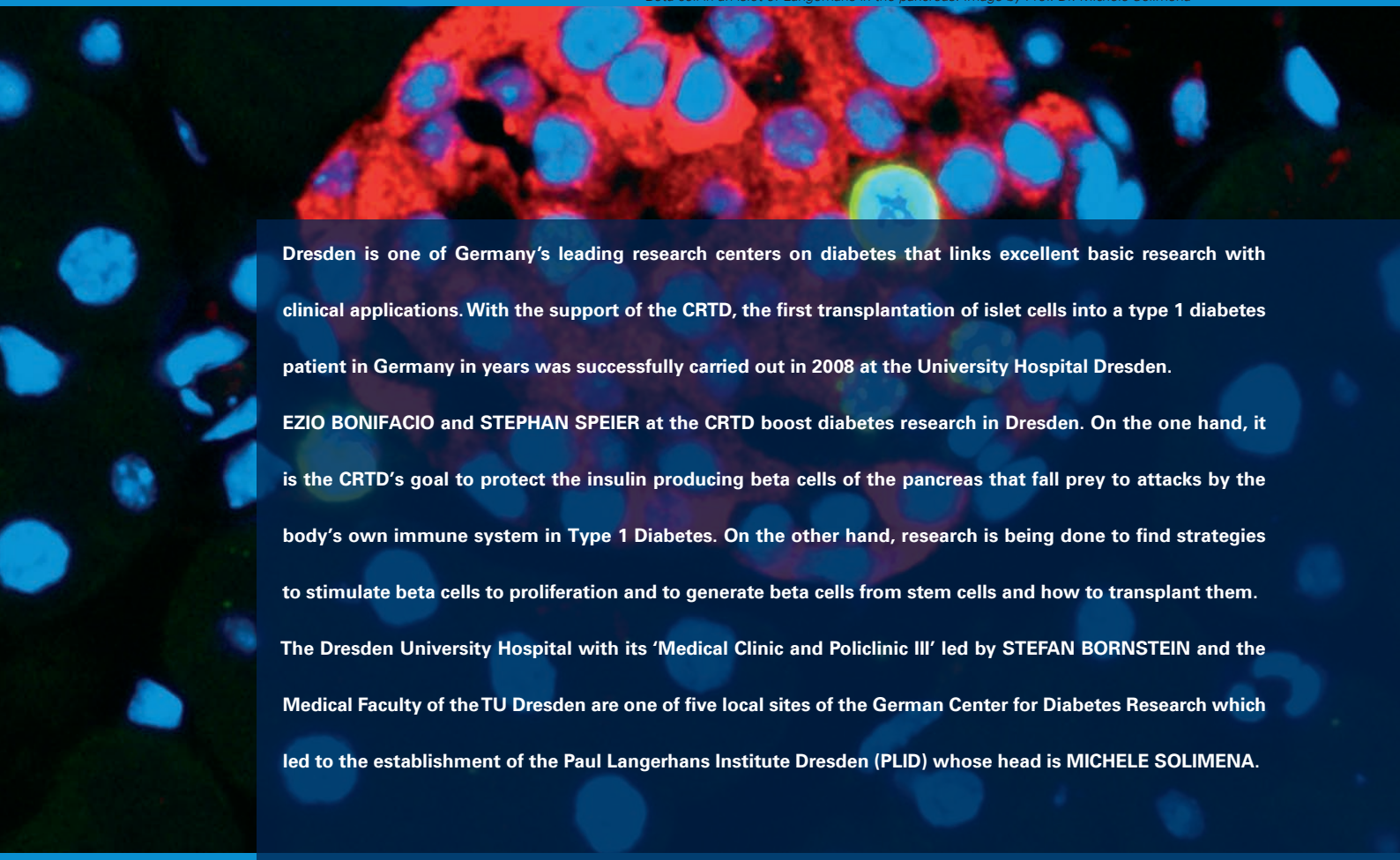
Diabetes



Beta cell in an islet of Langerhans in the pancreas. Image by Prof. Dr. Michele Solimena

Dresden is one of Germany's leading research centers on diabetes that links excellent basic research with clinical applications. With the support of the CRTD, the first transplantation of islet cells into a type 1 diabetes patient in Germany in years was successfully carried out in 2008 at the University Hospital Dresden.

EZIO BONIFACIO and STEPHAN SPEIER at the CRTD boost diabetes research in Dresden. On the one hand, it is the CRTD's goal to protect the insulin producing beta cells of the pancreas that fall prey to attacks by the body's own immune system in Type 1 Diabetes. On the other hand, research is being done to find strategies to stimulate beta cells to proliferation and to generate beta cells from stem cells and how to transplant them.

The Dresden University Hospital with its 'Medical Clinic and Policlinic III' led by STEFAN BORNSTEIN and the Medical Faculty of the TU Dresden are one of five local sites of the German Center for Diabetes Research which led to the establishment of the Paul Langerhans Institute Dresden (PLID) whose head is MICHELE SOLIMENA.

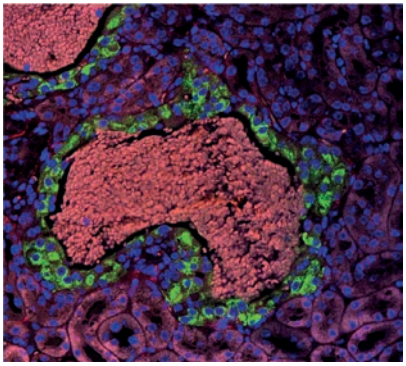
Curing type 1 diabetes permanently

As a professor for preclinical stem cell therapies at the CRTD, Ezio Bonifacio is researching causes and possible therapies for type 1 diabetes. This type of diabetes is the widest spread chronic disease among children in Western countries.

Type 1 diabetes develops because the immune system falsely considers the body's own beta cells as "foreign" and subsequently destroys them. Prof. Dr. Bonifacio's group attempts to uncover this aggressive autoimmune disease at an early stage and to develop new strategies and therapies to prevent the destruction of these insulin-producing cells. One potential approach is through insulin vaccination, whereby protective immunity could be produced. For that purpose, a clinical study of children with a high risk for developing type 1 diabetes is being carried out.

Defective islet cells or the lack thereof are the cause of type 1 and type 2 diabetes. An approach to counteract the low production of insulin in the case of diabetes consists of increasing the number of beta cells which produce insulin. For that process, stem cells are to be stimulated to develop into beta cells which can then be transplanted into the patients. However, in the case of type 1 diabetes, transplanted islet cells will again be attacked and destroyed by cells of the immune system, or so-called autoimmune cells.

Prof. Dr. Ezio Bonifacio is therefore seeking ways to prevent the expansion of autoimmune cells in order to sustain the function of the trans

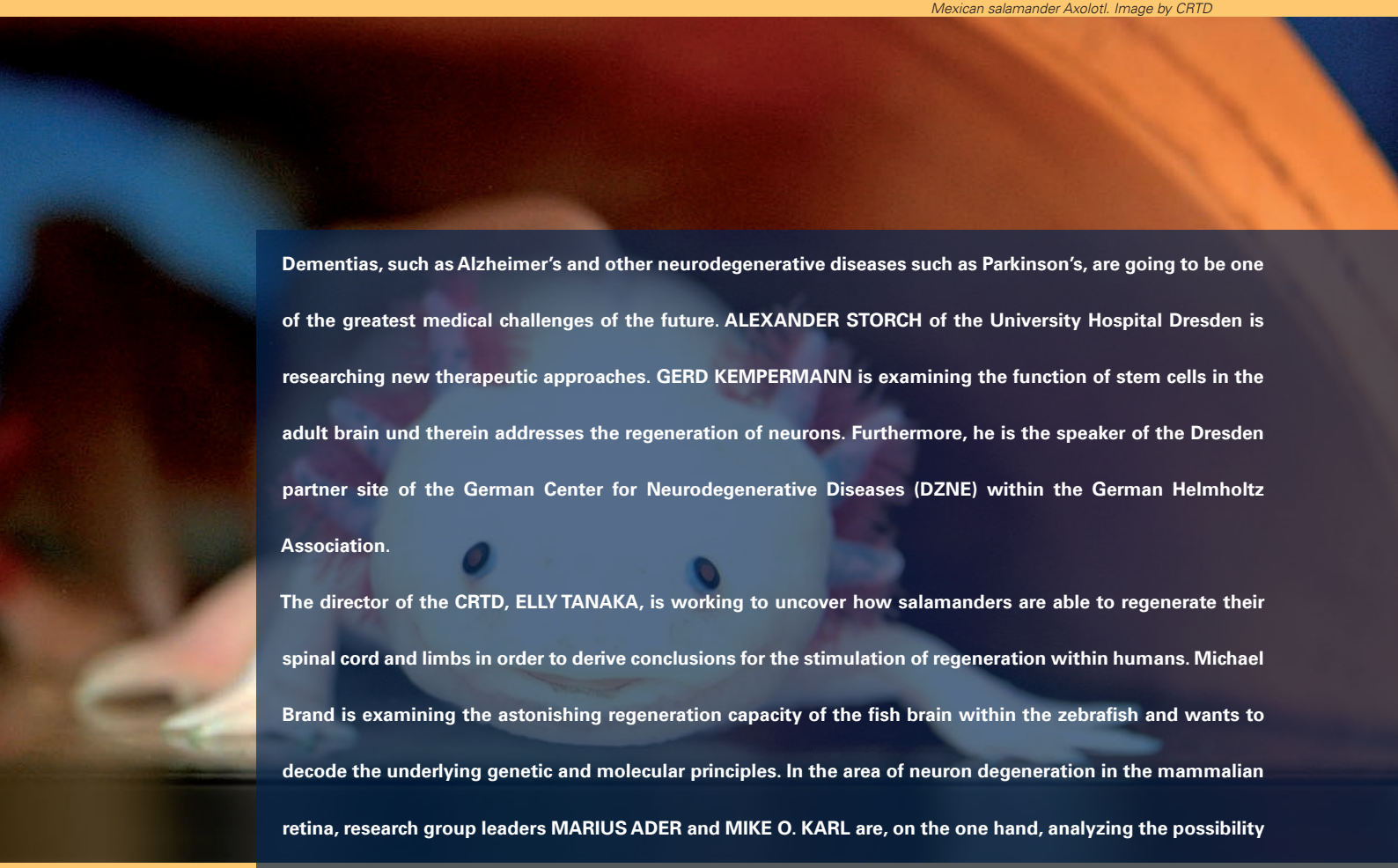


Photography of an islet of Langerhans. Image by Prof. Dr. Ezio Bonifacio und Dr. Danielle Borg

planted islet cells. Regulatory T cells, on whose characterization Prof. Dr. Kretschmer is concentrating (see page 7), offer promising therapeutic approaches.

CRTD research group leader Dr. Speier is using the most modern technology to research the regenerative potential of insulin producing beta cells of the pancreas in living tissues. These methods have allowed for the first time the regenerative processes of single cells within tissue or organisms over to be analyzed over long time periods. Dr. Speier's goal is to understand the underlying mechanisms and to initiate a controlled regeneration of beta cells. One possibility is to stimulate the beta cells into reproducing by introducing certain substances. Other research approaches include the targeted transformation of the body's own stem cells or already mature cells into insulin producing beta cells. The approaches pursued at the CRTD could lead to a lasting cure for type 1 diabetes in the future and also be decisive towards finding a successful therapy for type 2 diabetes.

Neurodegenerative Diseases



Mexican salamander Axolotl. Image by CRTD

Dementias, such as Alzheimer's and other neurodegenerative diseases such as Parkinson's, are going to be one of the greatest medical challenges of the future. ALEXANDER STORCH of the University Hospital Dresden is researching new therapeutic approaches. GERD KEMPERMANN is examining the function of stem cells in the adult brain und therein addresses the regeneration of neurons. Furthermore, he is the speaker of the Dresden partner site of the German Center for Neurodegenerative Diseases (DZNE) within the German Helmholtz Association.

The director of the CRTD, ELLY TANAKA, is working to uncover how salamanders are able to regenerate their spinal cord and limbs in order to derive conclusions for the stimulation of regeneration within humans. Michael Brand is examining the astonishing regeneration capacity of the fish brain within the zebrafish and wants to decode the underlying genetic and molecular principles. In the area of neuron degeneration in the mammalian retina, research group leaders MARIUS ADER and MIKE O. KARL are, on the one hand, analyzing the possibility of cell replacement in the case of retina damage, and on the other hand, the regeneration potential of retina cells.

New nerves for brain and spinal cord

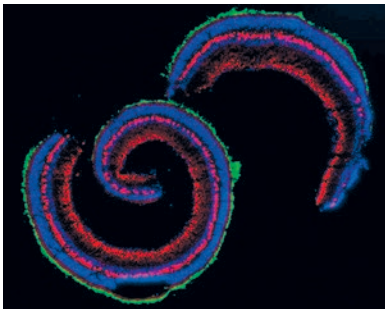
Why is activity "good" for the brain? The research group "Genomics of Regeneration" led by Prof. Dr. Gerd Kempermann examines how stem cells in the adult brain contribute to the life-long adaptability of the brain.

At the center of his research is "adult neurogenesis," the regeneration of neurons in the adult and ageing adult brain. The new neurons seem to be in a close and important relationship with learning and memory processes. "Activity," be it mental or physical, increases adult neurogenesis and contributes to "successful ageing." The goal of the research group is to explain the complex genetic foundations of how "activity" affects the stem cells of the brain which develop into new neurons. The research is medically relevant not only because of the development of new strategies for prevention and therapy of chronic neuropsychiatric diseases, especially against dementias such as Alzheimer's disease, but also because of the research on novel approaches for the successful "normal" ageing of the brain. Prof. Dr. Elly Tanaka is especially interested in why cells of the Mexican salamander Axolotl have the potential to regrow entire limbs or the tail. Long-run research goals of her group are to find answers to the following questions: To what extent can cells that are responsible for regeneration form new stem cells? How is the renewed cell division of fully developed cells conducted and controlled? Thus, how do they acquire the capability to differentiate into the right cell types?

Regeneration of the retina

Retina diseases are one of the most common reasons for vision impairment in Western industrial countries. Dying neurons of the retina are, in most cases, the cause of this impairment.

The loss of neurons of the retina leads to vision deterioration to the point of blindness. Various diseases of the retina exist—all of which affect different cells—such as retinitis pigmentosa, age-related macular degeneration, and glaucoma. In humans, cells that have died are not being replaced and are therefore lost forever.

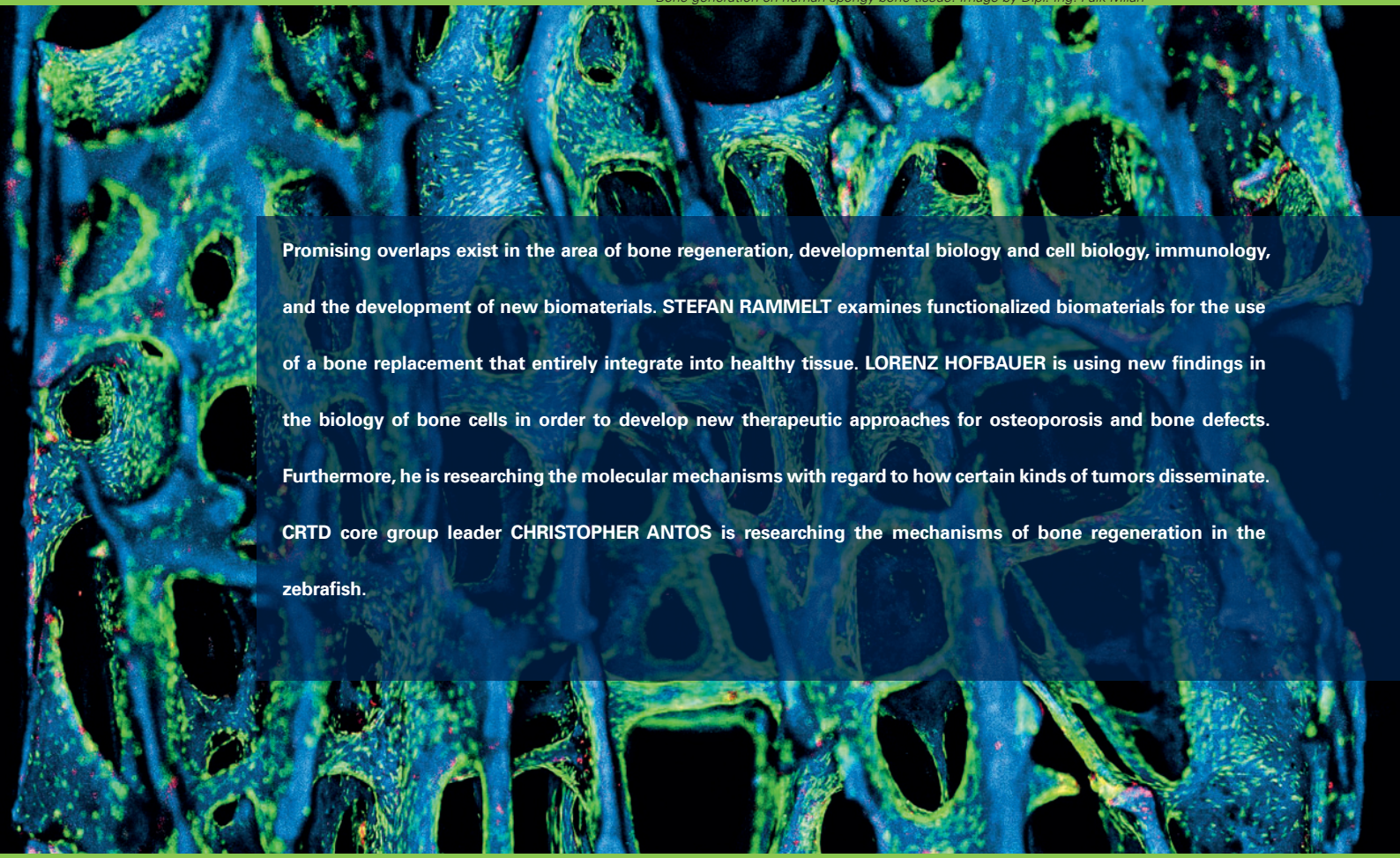


Fluorescence microscope image of a retina section of the mouse. Image by Prof. Dr. Marius Ader

Prof. Dr. Marius Adler, a research group leader at the CRTD, is researching the possibility of replacing the light-sensitive photoreceptor cells of the retina and is testing their functionality in visual processing. Dr. Mike O. Karl examines the basic regenerative mechanisms of the retina cells and wants to develop new strategies for the protection und regeneration of the retina. In order to achieve this, Mike O. Karl is researching the retina cells over their entire life span starting at the stage of embryonic stem cells, the progenitor cells of the retina, all the way to the developing and mature retina cells..

Bone regeneration

Bone generation on human spongy bone tissue. Image by Dipl. Ing. Falk Milan

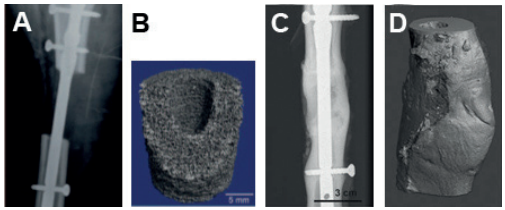


Promising overlaps exist in the area of bone regeneration, developmental biology and cell biology, immunology, and the development of new biomaterials. STEFAN RAMMELT examines functionalized biomaterials for the use of a bone replacement that entirely integrate into healthy tissue. LORENZ HOFBAUER is using new findings in the biology of bone cells in order to develop new therapeutic approaches for osteoporosis and bone defects. Furthermore, he is researching the molecular mechanisms with regard to how certain kinds of tumors disseminate. CRTD core group leader CHRISTOPHER ANTOS is researching the mechanisms of bone regeneration in the zebrafish.

Improved biomaterials for bones

In the last years, Prof. Dr. med. Stefan Rammelt and his colleagues at the Center for Trauma and Reconstructive Surgery at the Dresden University Hospital have been working on clinic-oriented solutions for the replacement of bone tissue constructed on the basis of artificial structures.

At the core are strategies to cure significant bone defects that are derived from biological principles. Prof. Dr. Rammelt coats and "bio-functionalizes" metallic bone replacement materials with naturally occurring particles of the cell surrounding substance, called glycosaminoglycans, which play an important role in inflammatory reactions and early tissue regeneration. By doing this, these regularly inserted implants and bone replacement materials are to be integrated into the body in a faster and more stable way.



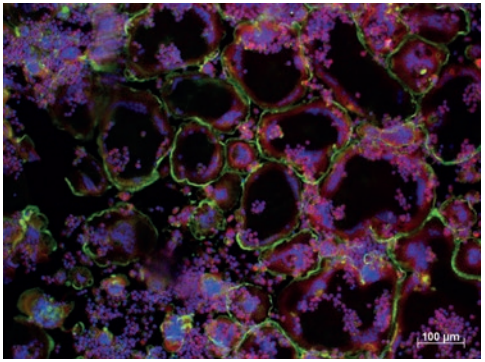
Regeneration of a 3 cm shaft defect of the sheep tibia (A) with a glycosaminoglycans-coated, non absorbable fiber-structure (B) in an x-ray image (C) and a CT (D). Images by Dr. Claudia Rentsch, Prof. Dr. Stefan Rammelt

New balance in the bone

In order for bone formation to go smoothly, cells that build and dismantle bone tissue have to be in balance with each other.

If there are too many bone dismantling cells, the patient will suffer from osteoporosis (loss of bone mass). However, if these cells are missing, osteopetrosis will occur. Bone fractures are the result in both cases. Prof. Dr. Lorenz Hofbauer from the Medical Clinic III of the Dresden University Hospital is examining the molecular and cellular basis of this balance and has researched the active agent Denosumab which has in the meantime been approved as an osteoporosis medication.

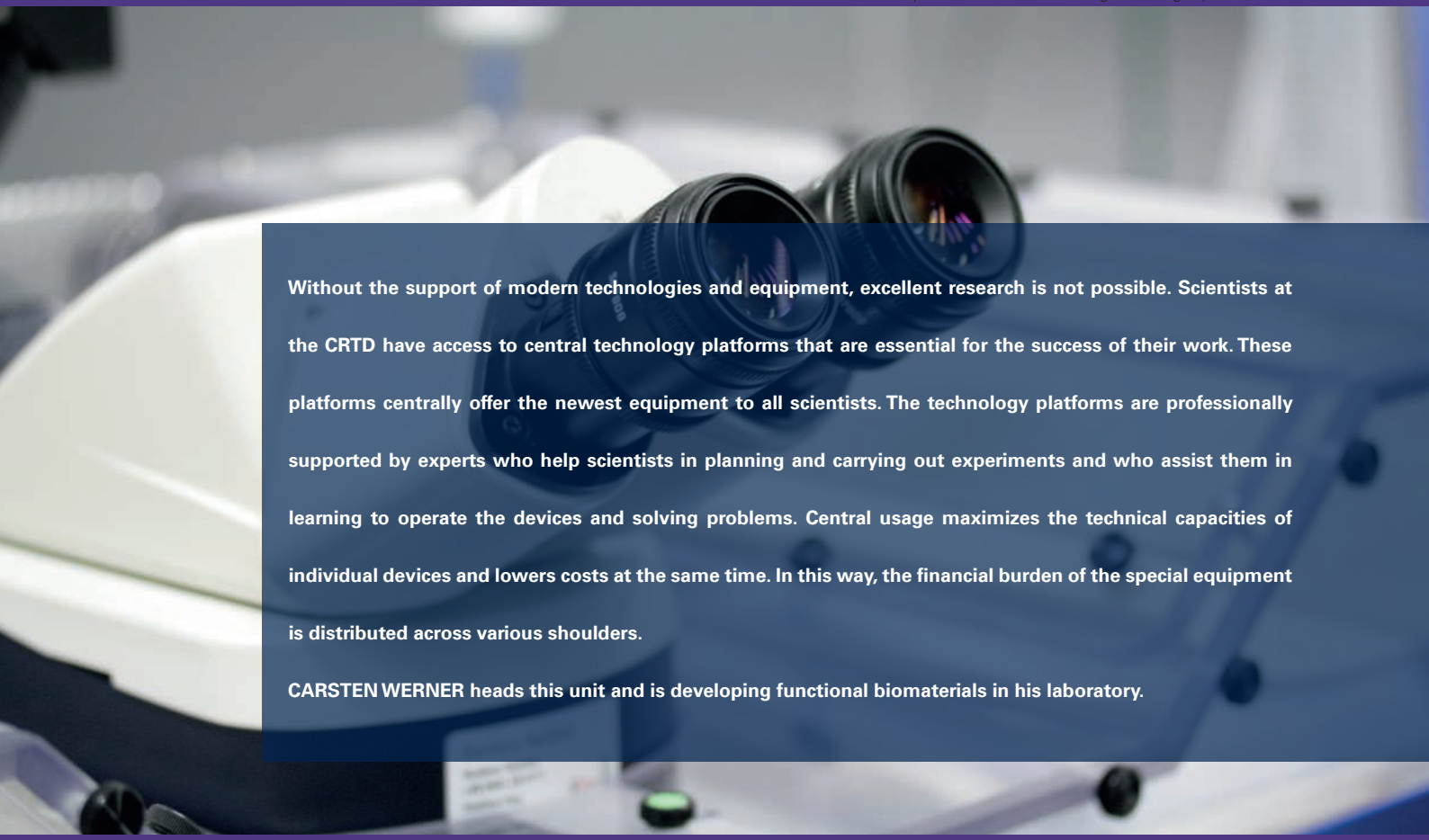
Currently, Prof. Dr. Hofbauer is working on the use of new antibodies against sclerostin. Animal experiments have shown that stability and healing of the bone can be improved by 50%. Clinical studies using this substance are currently being conducted. Furthermore, he currently heads the national research consortium SKELMET which is researching the basics of new diagnostic and therapy procedures for breast and prostate cancer related bone metastases.



Immunofluorescence image of differentiated bone dismantling cells. Image by Juliane Salbach-Hirsch and Prof. Dr. Lorenz Hofbauer Juliane Salbach-Hirsch, Prof. Dr. Lorenz Hofbauer

Technology platform

Confocal microscope for the observation of living cells. Image by CRTD



Without the support of modern technologies and equipment, excellent research is not possible. Scientists at the CRTD have access to central technology platforms that are essential for the success of their work. These platforms centrally offer the newest equipment to all scientists. The technology platforms are professionally supported by experts who help scientists in planning and carrying out experiments and who assist them in learning to operate the devices and solving problems. Central usage maximizes the technical capacities of individual devices and lowers costs at the same time. In this way, the financial burden of the special equipment is distributed across various shoulders.

CARSTEN WERNER heads this unit and is developing functional biomaterials in his laboratory.

Cutting edge technology is centrally vailable

The CRTD network is in possession of centralized technology platforms in the areas of light and electron microscopy, genetics and cell analysis, antibody production, biomaterials as well as a clean room laboratory for micro structuring.

In **light microscopy**, scientists find high quality imaging systems combined with professional support in the configuration of their experiments. This platform offers modern techniques, such as stereomicroscopy, fluorescence video microscopy, structured lighting systems or confocal microscopy.

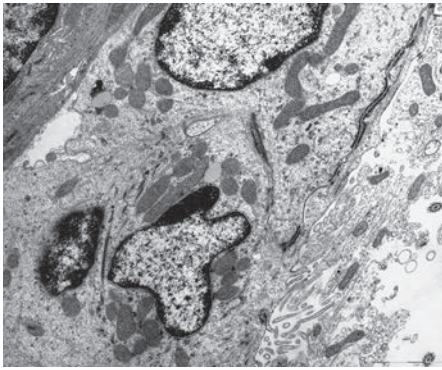
The resolution of light microscopes, however, is limited. A much higher resolution can be obtained using electron microscopy. The **electron microscopy platform** offers the possibility to carry out microstructure analysis of cells and tissues with the help of transmission electron microscopy (TEM) and scanning electron microscopy (SEM). TEM allows for the examination of ultra-thin tissue sections or thin particle layers. SEM on the other hand is able to scan object surfaces allowing for the creation of a detailed image of the cell surface. Experts help with planning the experiment, preparing the samples, operating the devices and interpreting the results.

Fluorescence microscope.

Another service is **cell sorting and cell analysis**, such as for the isolation of stem cells. The multi-color, fluorescence-based measurement of cells in a solution allows characterizing and simultaneous sorting of up to four subpopulations from one sample. To do this, the platform offers various high-tech devices.

The CRTD also features a central platform to produce and to clean proteins in bacteria or cell cultures recombinantly. The isolated proteins are, for example, stained to be used as staining reagents in biochemical tests or to be utilized in the **production of specific antibodies**. The obtained antibodies can also be cleaned and be utilized to specifically prove the existence of respective proteins in various tissues and development stages of the examined organism.

Beyond that, the CRTD has a central **laboratory for clinical cell and tissue technologies**. In this clean room laboratory, cells are being isolated and reproduced under defined conditions in order to be used in clinical studies and therapies or to be stored deep-frozen in nitrogen.



Electron microscopy: TEM image of cells.

Core groups at the CRTD

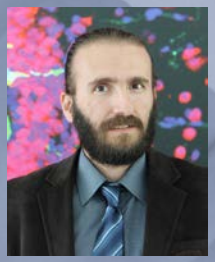
Marius Ader
Cell replacement in mammalian retina

Christopher Antos
Appendage and organ regeneration in zebrafish

Christian Bökel
Stem cell niches in drosophila

Mike O. Karl
Retinal development and regeneration

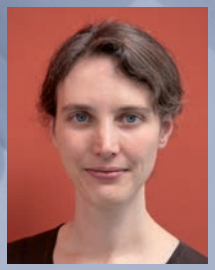
Gerd Kempermann
Genomics of brain regeneration



Caghan Kizil
Mechanisms of induced plasticity in the brain

Stephan Speier
Islet cell regeneration

Elly Tanaka
Animal models of regeneration



Claudia Waskow
Regeneration in hematopoiesis

Ezio Bonifacio
Preclinical approaches to stem cell therapy/diabetes

Michael Brand
Patterning and regeneration of the vertebrate brain

Federico Calegari
Neural stem cells in the mammalian brainr

Karsten Kretschmer
Molecular and cellular immunology/ immune regulation

Nikolay Ninov
Beta cell biology and regeneration

Sophie Pautot
Three-dimensional cell culture systems

International partners of the CRTD

1	Australia
2	Finland
3	France
4	Ireland
5	Israel
6	Italy
7	Japan
8	Canada
9	Netherlands
10	Austria
11	Poland
12	Sweden
13	Switzerland
14	Singapore
15	Spain
16	Czech Republic
17	Turkey
18	United States
19	United Kingdom

Educating a new generation of excellent scientists

In the last decade, the focus of basic biology and medicine have progressively merged together. In particular, the significance of stem cell research for medicine has strongly increased. Aside from research, the CRTD is committed to the education of junior scientists.

The closely knit network of leading scientists and multiple, interdisciplinary cooperation make the CRTD into an excellent study location for a hitherto unique "International Master's Program in Regenerative Biology and Medicine" in Germany which links basic research with clinical implementation.

This master's program showcases the expertise of the CRTD network: The combination of a wide array of disciplines, such as molecular biology, regenerative therapies, bioengineering, medicine and biomaterials; the distinct international character of the research environment; a strong component of hands on research from the very first semester and the close dialogue between all facilities and faculties are parts of this innovative educational concept.

Aside from the master's program, the scientists of the DFG-Research Center also take part in the organization and implementation of the bachelor's program "Molecular Biotechnology" at the TU Dresden as well as the Dresden International Graduate School for Biomedicine and Bioengineering (DIGS-BB), one of the largest PhD programs in Germany.

Communication opens up new paths

Science is constantly changing and thrives from the interaction between scientists. The CRTD sees itself as a think tank and catalyzer for thinking outside the box.

This requires an active and open communication culture among master's students, doctoral students, and professors. The CRTD is facilitating this atmosphere by organizing numerous activities, such as cross-campus seminars, retreats, or conferences, such as the yearly CRTD summer conference for regenerative medicine or the international stem cell conference that takes place every two years. With this in mind, the CRTD intends to live up to its own standard of being one of the top research institutions in the area of regenerative therapies worldwide. This claim requires hard work and critical reflection and can be fulfilled given the excellent conditions and scientific competence in Dresden.

Communication space

Because internal as well as external communication is a crucial element of the CRTD, the specifically designed communication areas are an essential component of the CRTD's new building that was opened in 2011. Aside from the auditorium and seminar rooms, areas for communication and exhibits are designated to facilitate the daily dialogue between scientists and also offer space to present the CRTD from a popular science angle.

Science for all

Science does not always take place behind closed doors. Having a dialogue with the general public and regular invitations into the institute are part of the CRTD's self understanding.

Aside from the basic research and the education of young scientists, open dialogue with the general public is one of the core duties of the institute. The CRTD is committed to actively communicating with scientists, journalists, politicians, business people and the general public about research und education, future perspectives and societal issues.

School project "Science goes to school!"

The press office of the CRTD is regularly issuing press releases and information through online media on scientific results and news from the research institute.

The CRTD is promoting the direct exchange between science and society with various offers. Every year, over 1,000 people come to the DFG-Research Center during the **Long Night of Sciences** to have discussions with international scientists, visit laboratories and to listen to presentations.

In 2012, for the first time ever, the CRTD hosted an art exhibition. The world famous **photo series "A Child Is Born"** by the Swedish photographer Lennart Nilsson was loaned from the Fotografiska Museet in Stockholm. 2,500 people saw the photographs depicting the development of a child in the mother's womb as well as the accompanying program.

In order to inspire talented youth at an early stage to become scientists, the CRTD is taking part in a number of events, such as **Child University Dresden, Girls' Day, Junior Doctor**, and the **Summer University** of the TU Dresden that serves as an orientation forum for high school graduates from all over Germany. The CRTD has signed a **cooperation agreement** with the **Martin-Andersen-Nexö-Gymna-**

sium Dresden (MANOS) in order to support this high school which promotes math and science talents as well as interested students in Dresden. The CRTD also consults the school about current research in the area of modern life sciences.

In addition, the CRTD supports the school project **"Science goes to school!"** which received the "Saxon Integration Award 2011" and was awarded by the "Stifterverband für die Deutsche Wissenschaft". International doctoral students of the Dresden International PhD Program (DIPP) visit schools in Dresden and offer workshops where they promote science and tolerance.

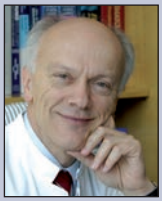
The program of the **Dresdner Seniorenakademie** is targeted to elderly people. Every semester, the CRTD contributes lectures to this series, for instance on brain cells, stem cells of mice, the amount of data handled by bioinformatics, and other subjects.

On a yearly basis since 2009, the CRTD, together with the Max Planck Institute for Molecular Cell Biology and Genetics, the Dresden University Hospital Carl Gustav Carus, and the self-help association PRO RETINA Germany e.V. organize the **information day** about retina research in Dresden, "**AugenBlick mal… Retina Research in Dresden."** Visitors receive information on all aspects of retina diseases, such as retinitis pigmentosa, macular degeneration, or glaucoma, from basic research and clinical aspects to therapies and self-help.

The CRTD not only informs the people of Dresden about its research, but also travels. A CRTD exhibit informed roughly 72,000 people about the regeneration capability of the Axolotl on the **MS Science**, the floating Science Center of "Science in Dialogue" in 2011. This CRTD exhibit was also available to 320,000 visitors at the **Thyssen-Krupp Ideas Park** in Essen in 2012.

The CRTD exhibit on the regeneration capability of the Axolotl on the MS Science.

The CRTD – a unique center of interdisciplinary research



Prof. Dr. Gerhard Ehninger
University Hospital
Carl Gustav Carus Dresden

„The close network of basic research and scientists at the hospital offers the advantage that one can find cooperation partners more quickly and more efficiently and that it is easy to simply enter into an exchange with each other. For the future of the CRTD, I hope that the network will grow further and remain lively. Together, we will be able to develop regenerative therapies of the future."

Prof. Dr. Martin Bornhäuser
University Hospital
Carl Gustav Carus Dresden

„What I like about the CRTD is that it is possible to look at the big picture and to discuss problems from the hospital with scientists from other disciplines. Ideas from basic research are often stimulating to help finding new approaches that may be applicable to our patients. I hope that the CRTD will remain the nucleus for a deepened research focus and that the use of the network be improved further."

Prof. Dr. Dr.-Ing. habil.
Hans Müller-Steinhagen
Rector of the TU Dresden

„With the help of the CRTD, the TU Dresden was able to secure the first Cluster of Excellence in the framework of the Excellence Initiative by the German federal and länder governments. With its 200 international top-scientists, the CRTD serves as the TU Dresden's lighthouse in its effort to be successful in the framework of the Excellence Initiative. Scientists from all over the world work together at the CRTD to develop regenerative therapies for the medicine of tomorrow."

Prof. Dr. Jochen Guck
Biotechnology Center of the TU Dresden

„The CRTD is the logical continuation of Dresden's successful recipe to use cutting-edge science at the intersection of physics, engineering, biology, and medicine in order to translate the understanding gained from basic research into medical application. It is the combination of various points of view and backgrounds that allows scientists at the CRTD to find novel solutions to hitherto difficult-to-treat or even incurable diseases. This approach makes the CRTD one of the internationally leading institutes of its kind."

Dirk Hilbert
First Mayor and Representative
for the Economy of the City of Dresden

„Having the CRTD, a DFG biotechnology institute, in Dresden, is both an award and a motivation. It "honors" the relentless dedication of the professors und scientists of Dresden's biotechnology research community who, thanks to numerous international awards, have also put Dresden on the map as a business location. It motivates us in government and administration and to continue to implement the best conditions for further growth, be it for the expansion of companies, new businesses, education, or the influx of international scientists from Germany and abroad. We wish all the best to the CRTD!"

Prof. Dr. Stefan Diez
B CUBE –
Center for Molecular Bioengineering

„The CRTD offers great possibilities for us to further develop our approaches in the area of molecular bioengineering with regard to medical applications. It thus complements the research and development chain from the examinations within the single molecule level to human biology. Furthermore, unique scale-independent synergies have been achieved in the establishment and use of common technology platforms. One example is the clean room laboratory for micro and nanostructuring."

Prof. Dr. Kai Simons
Max Planck Institute for Molecular
and Cell Biology Dresden

„Stem cell research is expanding globally and competition is increasing. What sets the CRTD apart is the synergistic mix of different disciplines from cell and development biology, to molecular bioengineering, to tangible results in the hospital. This symbiosis is exceptionally strong and promises to be successful in the future."

Day-care center BioPolis.

Family-friendly environment

The CRTD stands up for compatibility of family and science.

By offering a family-friendly work environment, the CRTD supports the many young families of the people working here. In order to ensure child care during work time, the CRTD has – together with the City of Dresden and neighboring institutes – co-organized and co-financed a kindergarten close to the institute. The CRTD is supporting parents by offering flexible working hours, seminars that take place predominantly in the morning, and external access to the intranet to facilitate working from home. A room specifically set aside for families offers optimal conditions for short term child care at the work place.

In addition, the CRTD supports dual career opportunities in order to help partners of the CRTD team finding a work place in Dresden.

Events, such as the summer party, which is linked to the annual summer conference, or the Christmas party, specifically aim at including families and foster social contacts and integration. For all these efforts, the CRTD was awarded the "Most family friendly institution of the TU Dresden" in 2008.

Baby feeding and changing room.

CONTACT

TU Dresden
DFG-Research Center for Regenerative Therapies Dresden – Cluster of Excellence
Fetscherstraße 105
01307 Dresden
Germany

E-Mail: info@crt-dresden.de
Phone: +49 (0)351 458 82051
Fax: +49 (0)351 458 82059
Website: **www.crt-dresden.de**
Twitter: www.twitter.com/CRTDpress
Facebook: facebook.com/CRTDnews

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Center for Regenerative Therapies TU Dresden

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