

A hub for collaboration

PROFESSOR DR BRIGITTE VON RECHENBERG

Professor Dr Brigitte von Rechenberg of the University of Zurich heads a research centre focusing on collaborative applied biotechnology and molecular medicine research. Here, she explains how their unique approach has fostered a translational network of researchers working across a broad spectrum of science and technology

To begin with, could you please provide a brief overview of the Competence Centre for Applied Biotechnology and Molecular Medicine's (CABMM's) main aims and objectives?

Applied Biotechnology and Molecular Medicine is an integrated approach of different disciplines and technologies on living organisms, parts of organisms or their products, with the goal to develop medical applications (diagnostics or therapy). The vision of the CABMM is to reach this goal through research on an international, interdisciplinary and translational level, and through implementation in clinics.

The CABMM is an official Competence Centre at the University of Zurich, and includes the Medical and Vetsuisse Faculty and partners from the Swiss Federal Institute of Technology (ETH Zurich). Combining the various disciplines is increasing their competence and additionally optimising the use of infrastructure and equipment. Bridging basic and clinical research to answer complex clinical questions is the main asset of this Competence Centre.

What is it that most excites you about being part of the CABMM?

The fascinating part for me is the translational aspect of the CABMM. Unlike other networks that normally focus on a research topic, our network spans various fields, but the common ground is expertise on a technological platform. For example, tissue engineering can be used for tissue regeneration of various organs, such as heart valves or vessel grafts in cardiovascular surgery, but also for filling defects in cartilage, tendon and bone, or even to regenerate nerves. Although various differentiation techniques are used, the original cells (similar to mesenchymal stem cells) can be the same and are useful to researchers in many different disciplines.

How does the CABMM ensure that it creates a successful environment for collaborative research to take place?

In the rules and regulations, collaboration with partners is one of the basic

requirements to become and stay a member of the CABMM. In addition, the Steering Committee and the Managing Director actively support networks by bringing the partners together and seeking new partners to join the group.

Members meet at our biannual symposiums, and also research retreats bring members together. Furthermore, our website introduces the different partners along with their research field and expertise to our members. Last but not least, we also offer central services such as histology, and support members with their animal experiments through veterinary expertise.

On a more personal note, you are part of the Centre's Musculoskeletal Research Unit. What have been some of your biggest achievements regarding musculoskeletal diseases and cartilage repair thus far?

The CABMM was funded substantially through a private foundation to conduct musculoskeletal research on a high level. This allows us to fund start-up research grants in the musculoskeletal field for members and/or their young researchers.

On top of this, we have guaranteed quality research through our Scientific Advisory Board, which contains high-profile international researchers. Over the last three years, we have been able to fund research related to osteoporosis, mechanisms of bone resorption, and tendon and disk degeneration. In addition, several groups have longstanding collaborations, and have published research together in the musculoskeletal field.

Would you care to draw attention to a moment of success for the CABMM that you are particularly proud of?

We think that the network itself is excellent and comprises many enthusiastic and dedicated researchers, all with excellent standing in their field. I always try to avoid being 'proud' of something – pride is always the beginning of the end, and thus decline.



One of the outstanding features of this network is that no 'egos' act as a hindrance for getting together and networking. The main goal is still to find solutions for human and animal patients.

And finally, with an eye towards the future, where are you hoping the Centre will be in five years?

The CABMM should become an excellent research platform that is not only a leading centre in Applied Biotechnology and Molecular Medicine, but also in regulatory affairs. Within the CABMM, we can offer three regulatory levels to bring products on the market: good manufacturing practice (GMP), good laboratory practice (GLP) and good clinical practice (GCP). To our knowledge, this makes the University of Zurich one of the few places in Europe where all three regulatory affairs are under one roof. This will be an attractive aspect for developing products with industrial partners and international networks. We will also increase our active platform by attracting more groups and expanding our laboratories.

Competent collaborations

Researchers are aware of the potential benefits of interdisciplinary crosstalk in the **Competence Centre for Applied Biotechnology and Molecular Medicine** based in Switzerland. A prerequisite of any programme at the Centre is that collaboration with partners is central to the research

COLLABORATION BETWEEN SCIENTISTS spanning various disciplines has long been known as an important and effective research tool. This is of particular relevance when looking at the field of translational medicine. Known colloquially as 'bench-to-bedside' research, studies of this nature have played an important role in the recent string of successes within the medical world.

In recognition of this fact, in 2008 a group of highly motivated and successful scientists founded the Competence Centre for Applied Biotechnology and Molecular Medicine (CABMM). "The CABMM was the result of longstanding and successful collaborations between the original founders, Professor Simon-Philipp Hoerstrup, Professor Michael Hottiger and myself," Professor Dr Brigitte von Rechenberg explains.

CABMM

Interdisciplinary collaboration is an integral element of the CABMM, with the rules and regulations stipulating that collaboration with partners is the most basic requirement. Based at the University of Zurich, the aim of the Competence Centre was, and still is, more specifically to promote collaboration between the various stages of translational research, from basic ideas and theories to clinical applications such as viable treatments and/or drugs.

Now, four years on, the CABMM has proved its worth with a series of outstanding collaborative research papers in the fields of healthcare and medicine. In the highly stimulating environment of the CABMM, in which interdisciplinary crosstalk and scientific exchange are actively encouraged, researchers now hope to continue this trend and promote the setup that has proved to be so successful for all involved.

The collaborative and interdisciplinary ethos of the CABMM, which is central to the Centre's success, is reflected in its current structure and consists of four 'application fields':

Experimental Medicine and Surgery; Molecular Medicine; Regenerative Medicine; and Applied Biotechnology. With over 50 highly qualified researchers within these fields (collectively known as the plenum), it is easy to appreciate the benefits of interdisciplinary collaborations.

DIPLOMATIC SCIENCE

Members of the plenum also attend an annual plenary meeting that is recognised as the highest decision-making assembly of the CABMM. Decisions include those regarding the rules and regulations, election of the Steering Committee and the acceptance of new partners.

Alongside the plenum, the CABMM's Steering Committee plays a central role in the strategic planning and coordination of the Centre's activities, as well as controlling economic matters. Half of the Steering Committee is made up of the three co-founders: Hoerstrup, Hottiger and von Rechenberg. The Centre also contains a well-established and distinguished Scientific Advisory Board, whose role is an essential one, as explained by von Rechenberg: "To guarantee excellent quality, this Board contains several high-profile international researchers, who review the CABMM network activities and especially grants".

The CABMM's structure, which combines networks of collaborative scientists and a platform on which collaboration and progress can be achieved, also aims a substantial component of their efforts at the promotion of young (postgraduate) academics within the field. Through the setup and promotion of joint training programmes, the CABMM team hope that this new generation of scientists will seed and blossom in the Centre's established networks in the years to come, an essential component for future expansion.

VON RECHENBERG'S SUCCESSES

With the foundations for new and exciting collaborative translational research now firmly in place, one must turn to the outputs as a true measure

INTELLIGENCE

COMPETENCE CENTRE FOR APPLIED BIOTECHNOLOGY AND MOLECULAR MEDICINE (CABMM)

OBJECTIVES

To implement and support applications in biotechnology and molecular medicine by conducting R&D focusing on current issues in clinically relevant questions and problems. Existing research groups are integrated in a large network to provide a working platform for collaborative research. Another objective is to train and mentor junior scientists and newly founded groups.

KEY COLLABORATORS

For a full list of collaborators, please visit www.cabmm.uzh.ch/aboutusP/Members.html.

FUNDING

The platform was generously funded by a Synthes-Professorship over the last five years and also in the coming year, and a private foundation very generously supported the running of the platform of the CABMM, research grants, and four postdoc positions and two technicians for a total of 10 years. Most studies are funded through soft money generated by competitive grants (Swiss National Fund (SNF), EU grants, KTI, EUREKA) or by collaborating with other research groups and companies.

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was trained as a small animal surgeon (ECVS) and after 12 years in clinics decided to make musculoskeletal research her main interest. As a dedicated veterinarian, she also saw that research performed by human medical doctors would profit a lot from her expertise with animals, which laid the ground for the CABMM.

of success. Experimental Medicine and Surgery is the most substantial of the four CABMM application fields, containing almost half of the plenum.

Within this group, an important team of researchers investigates musculoskeletal diseases. As a member of this team, von Rechenberg has collaborated with several orthopaedic companies to investigate mechanisms of cartilage repair: "Our research with photo-oxidised cartilage plugs led us to some really interesting insights about cartilage repair," she highlights. "With these experiments we could demonstrate that cartilage remodelling from the subchondral bone also occurs in healthy cartilage."

In a more interdisciplinary project, von Rechenberg and her colleagues collaborated with Dr Peter J Richards, who belongs to the CABMM's Regenerative Medicine application field. In this 2010 study, the investigators explored fracture healing in an experimental mouse model of senile osteoporosis, focusing primarily on the role of bone marrow stromal cells (BMSCs) in bone repair. They hypothesised that the BMSCs within osteoporotic bone were defective in terms of their ability to produce new mineralised tissue (termed osteogenesis), and, as a consequence, fracture healing would be severely impaired in this model. Despite showing clear deficiencies in the osteogenic potential of BMSCs from osteoporotic mice, the researchers found that fracture healing proceeded normally and did not appear to be compromised by the osteoporotic nature of the bone. Whilst this was not in complete agreement with their hypothesis, it provided an important insight into the mechanisms of fracture repair in osteoporosis and an example of the importance and success of the interdisciplinary collaborations found at the CABMM.

FURTHER ACHIEVEMENTS

Another exemplar study in Experimental Medicine and Surgery came from a team led by Professor Norbert Boos and Karin Würtz, PhD, investigating age-related changes in human intervertebral discs. In this novel investigation, the researchers delved into the degenerative changes at varying spinal levels in humans with intervertebral disc (IVD) degeneration. Using cadaver specimens, the study discovered a strong intra-individual correlation of degenerative

An especially attractive prospect to any potential partners lies in the Competence Centre for Applied Biotechnology and Molecular Medicine's unique ability to bring products on the market without having to outsource

changes at all spinal levels (cervical, thoracic and lumbar) – a result supporting the notion that this process has links with individual, predisposing factors.

From the Molecular Medicine application field, founding member Hottiger has also achieved great success. In 2012, a team from his laboratory investigated the effect of ARTD1 (formerly PARP1, a chromatin-associated enzyme involved in regulating metabolic homeostasis) in hepatic lipid accumulation. Using a mouse model, Hottiger's team found that ARTD1 knockouts fed a high-fat diet show an impaired adipocyte function and consequently exacerbated amounts of triglycerides and other fat cells within the cells of their liver. These findings have strong implications for non-alcoholic fatty liver disease, a condition that is on the rise with the ever-growing obesity epidemic.

LOOKING TO THE FUTURE

These examples are just a snapshot of the groundbreaking results that have been made possible by the CABMM's groundbreaking and innovative platform. Within the field of translational medicine, there is a need to connect its stages in order to ensure the production of effective knowledge; something that holds true in the very foundations of the Centre. With that said, von Rechenberg and her colleagues do not want to rest on their laurels, and plans for expansion are ever-present.

An especially attractive prospect to any potential partners lies in the CABMM's unique ability to bring products on the market without having to outsource: "I hope this will also increase our active platform by attracting more groups and expanding our laboratories," notes von Rechenberg.

