University of Basel

BIOZENTRUM
The Center for Molecular Life Sciences

2022

Biozentrum Highlights

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Prof. Alex Schier,
Director of the Biozentrum,
University of Basel.

Dear readers

On October 6, 2022, I had the opportunity to welcome Artem Rybchenko, the Ukrainian ambassador to Switzerland, at the Biozentrum. Despite the ongoing war, the ambassador was beginning to make plans for rebuilding his country and toured our new building. He was impressed with the Biozentrum as a blueprint for combining spaces for research, teaching, infrastructure, and community. When I told him that the Mango, Jenal, Pieters and Becskei groups had welcomed Ukrainian refugees to their labs, he was visibly moved and thanked us for our support of Ukraine.

My interactions with the ambassador and the struggle of the Ukrainian people are powerful reminders of the privileges we enjoy here at the Biozentrum, in Basel, and in Switzerland – the freedom of speech, the freedom of education, the freedom of assembly, the freedom of movement, and, as scientists, the freedom to pursue and disseminate fundamental research. Academic freedom is often considered an exalted status given to professors in ivory towers, but history has shown that one of the very first acts of tyrants is to oppress the creation and communication of ideas and knowledge. Thus, the academic freedom at our institute is not a luxury but one of the pillars of a free and peaceful society.

Freedom and peace have also been the foundations for the highlights you will read on the following pages. In June, we held our first Biozentrum Retreat, helping strengthen the connections that were weakened during the Covid pandemic and catalyzing open discussions about our research and community. In September, we shared our enthusiasm for blue-sky research with more than 4,000 visitors at the Biozentrum Open House Day. In January, we launched a new course to help our graduate students become creative, rigorous and fulfilled scientists. And throughout the year, we published important research studies. As you browse through these publications, you will recognize the wonderful diversity of research topics at the Biozentrum – a diversity that highlights the freedom of our scientists to pursue their most interesting and creative ideas.

The contrast between the peace in Switzerland and the war in Ukraine reminds us that we cannot take our freedoms for granted. But the bravery of the Ukrainians and the determination of the Ukrainian ambassador also show us that tyranny can be fought. Or as Thomas Paine wrote in 1776: *"Tyranny, like hell, is not easily conquered, yet we have this consolation with us, that the harder the conflict, the more glorious the triumph. What we obtain too cheap, we esteem too lightly: it is dearness only that gives every thing its value."*

Prof. Dr. Alex Schier
Director of the Biozentrum, University of Basel

2022 at a glance.

First Biozentrum Retreat

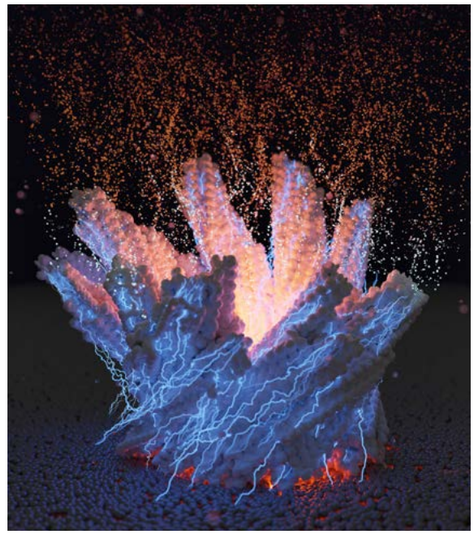
This year, the Biozentrum organized its very first three-day retreat. About 300 researchers, from master's students to professors, came together to share ideas about their scientific work and new technologies. In addition to brief insights into the work of the 32 research groups and all Core Facilities, the newly appointed Prof. Benjamin Engel gave an introductory talk covering the spectrum from the molecular architecture of chloroplasts to climate change. Prof. Anissa Kempf, another Biozentrum newcomer, held a keynote lecture on how neurons in the brain control sleep behavior. The highlights of the retreat included the plenary lecture presented by Prof. Jay Shendure from the Department of Genome Sciences, University of Washington, and the discussion round with Martine Clozel – co-founder of the biotech companies Actelion and Idorsia. The retreat was intended to strengthen the community and promote collaboration in everyday research.

Prof. Markus Rüegg was awarded the 2021 Lelio Orci Award, one of the most prestigious prizes in the life sciences in Switzerland, for his contributions to the molecular principles essential for the development and maintenance of the neuromuscular system.

Tackling the Achilles' heel of pneumonia-causing bacteria

Babies and infants are particularly at risk of developing severe pneumonia or meningitis caused by pneumococcus. A weak point of the bacteria is the transport protein LicB, which is embedded in the bacterial membrane and imports vital choline molecules from the environment. Using nanobodies, the team of Prof. Camilo Perez was able to solve the molecular structure and the mode of action of LicB, revealing how to inhibit the protein and thus the uptake of choline. The nanobodies selected by the researchers to elucidate the LicB structure also remain of interest. Many of them could be repurposed as a new class of LicB inhibitors or applied to identify crucial sites which can be targeted by novel antibiotics to treat pneumococcal infections.

Bärland et al.,*Science Advances*



High-speed storage of CO_2 discovered in bacteria

The steadily worsening climate crisis caused by the accumulation of carbon dioxide (CO_2) in the atmosphere makes the search for ideas to store CO_2 increasingly important. The enzyme HDCR produces formic acid from gaseous hydrogen (H_2) and carbon dioxide (CO_2), thus removing CO_2 from the environment and storing it in the cell. Prof. Benjamin Engel's team, together with colleagues from the Universities of Frankfurt and Marburg, has now shed light on the structure of this enzyme revealing a new way of storing CO_2. HDCR forms a thread-like structure which acts like an electron-conducting 'nanowire' and is responsible for the extremely efficient conversion rates of the two gases. The researchers found this enzyme to be faster than any previously known chemical catalyst performing this reaction. The HDCR structure shows a new way to efficiently store CO_2 by using hydrogen as an energy source. This could turn out to be very useful for future biotechnology applications.

Dietrich et al., *Nature*

Genetic engineering in research: same same, but different

In order to better understand the recycling of receptors in the cell, Prof. Martin Spiess' team switched off individual proteins of the cell's sorting and recycling machinery using three different methods. Although these methods theoretically have the same effect, the researchers obtained different results. In their study, they reveal that the so-called knocksideways technique draws a more realistic picture of a protein's function in the cell than CRISPR/Cas9 or RNA interference. With this method, target proteins can be completely and rapidly removed from the system with the least impact on cell physiology. Therefore, knocksideways is best suited for studying the function of cells.

Buser et al., *Life Science Alliance*

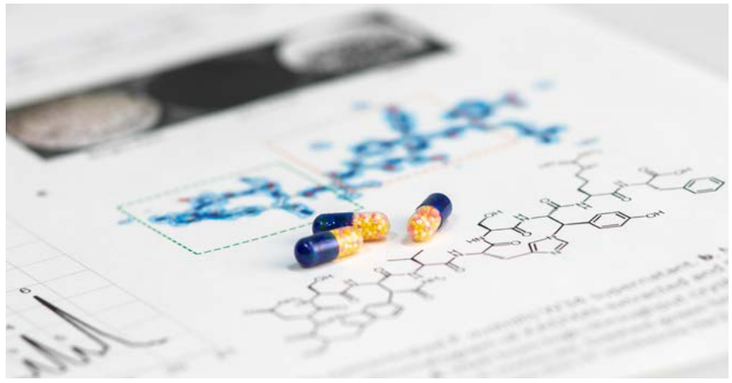
The Lundbeck Foundation awarded the renowned Brain Prize to Prof. Silvia Arber for her pioneering research into the neuronal circuits that control movement.

Alex Schier, Professor of Cellular and Developmental Biology, was elected a Fellow of the American Association for the Advancement of Science (AAAS), the world's largest general scientific society. With his election, the AAAS recognized his work on embryonic development, in particular, for establishing and applying genetic and genomic methods to define the logic governing cell fate diversification during embryogenesis.

Discovery of a new antibiotic against resistant pathogens

For a long time, antibiotics were considered a silver bullet against bacterial infections. Over time, many pathogens have adapted to resist antibiotics, so the search for new drugs is becoming increasingly important. An international team of researchers including Prof. Sebastian Hiller discovered a new antibiotic by computational screening. This compound kills Gram-negative bacteria, which include many dangerous and resistant pathogens. Using different methods, the scientists were also able to resolve the structure of the new peptide antibiotic Dynobactin and decipher its mode of action. They revealed that the peptide blocks the bacterial membrane protein BamA, which plays an important role in the formation and maintenance of the outer-protective bacterial envelope. Furthermore, the research team could demonstrate that Dynobactin is extremely effective. Mice with life-threatening sepsis caused by resistant bacteria survived the severe infection by drug administration. The computer-based screening will give a new boost to the identification of urgently needed antibiotics. This study was part of the National Centre of Competence in Research (NCCR) "AntiResist" headed by the Biozentrum.

Miller et al., *Nature*

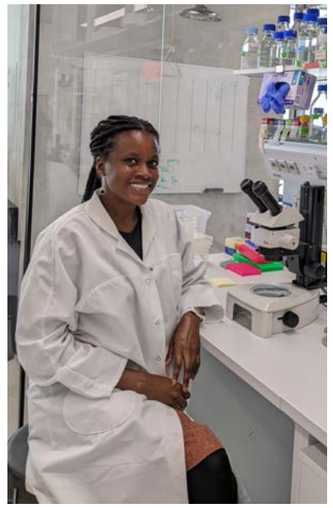


Kick-off and funding of Biozentrum start-ups

Congenital muscular dystrophy is a rare hereditary disease. The more than thirty known forms of this neuromuscular disease differ in the type of genetic defect and in the severity of disease progression. To date, there is no treatment for this life-threatening genetic disease. Together with Dr. Thomas Meier, former CEO of Santhera Pharmaceuticals, Prof. Markus Rüegg and Dr. Judith Reinhard founded the start-up SEAL Therapeutics AG with the goal of further developing their novel gene therapy approach for the treatment of LAMA2-deficient congenital muscular dystrophy and bringing their research findings from the laboratory to the patient. The founding of the start-up is an important step to getting partners from the pharmaceutical industry on board and to test the efficacy of the novel gene therapy in clinical trials. The Biozentrum spin-off Aukera Therapeutics, founded in 2021, was selected for the start-up accelerator program BaseLaunch. With its qualification for this program, the biotech venture received funding of up to 500,000 Swiss francs as well as business development support. This also includes strategic and individual advice also on legal aspects and access to the BaseLaunch program infrastructure and network. The Aukera founders Dr. Stefan Imseng and Dr. Dritan Liko develop selective drugs for the treatment of diseases related to the growth regulator mTORC1, such as cancer or neurodegenerative diseases. In autumn this year the young entrepreneurs could add another success, their company is being supported by the Venture Kick funding initiative. The Biozentrum spin-off NXI Therapeutics also received financial support from Venture Kick for the preclinical development of a new generation of immunosuppressive drugs for autoimmune diseases and organ transplantation. Venture Kick was initiated to support Swiss start-ups with enough funding to kick-start their entrepreneurial success.

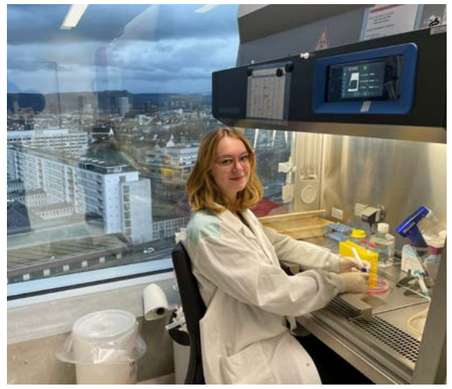
Women in Science Day 2022

February 11th is celebrated globally as the International Day of Women and Girls in Science. This day was declared by the UN in 2015 in order to achieve full and equal access to and participation in science for women and girls. At the Biozentrum a lot of talented and curiosity-driven women are doing impactful research. In 2022, we highlighted some of our passionate female researchers with interviews on their work and gender equality in science.



"It is important that we celebrate this Women in Science Day as it highlights a group of people that have been an integral part of research without getting their due recognition."

Jadiel Wasson, Postdoc

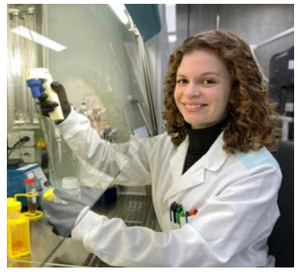


"We need to create an environment where all scientists are treated equally by putting an end to gender biases, stereotypes, discrimination based on gender and structural barriers."

Laura de Smalen, PhD student

"My wish for the future is that we as a society get to the point where we will stop asking women questions that men usually don't get."

Fabienne Estermann, PhD student



"In my lab, I want the best people, and so I don't care about their gender, nationality, sexual preference, race or religion. Excellent scientists come in many flavors."

Prof. Susan Mango, Research Group Leader

"It is important to encourage students at an early age to explore subjects that are considered typically oriented for the opposite gender."

Lucia Du, Postdoc

Nanomachine keeps cellular power plants healthy

Mitochondria are the cell's power stations that supply energy for the whole body. Their malfunction leads to illnesses such as diabetes, cancer or Parkinson's disease. Using high resolution cryo-electron microscopy, the researchers led by Prof. Jan Pieter Abrahams from the Biozentrum and the Paul Scherrer Institute gained new insights into the functioning of the nanomachine LonP1, which keeps these cellular power plants intact and healthy by rapidly removing defective proteins. LonP1 consists of ring-shaped components, which recognize and unfold the unwanted proteins and then guide them into a large cavity where they are cut into fragments. Having elucidated its structure and mode of action, the scientists now better understand how LonP1 can fulfill such a broad spectrum of tasks and why it plays such a vital role in mitochondrial maintenance and health.

Mohammed et al., *Structure*

Junior PIs working at Basel's life sciences institutions organized the 2nd J-BLISS symposium to strengthen their network.

Inauguration of the Swiss High-field NMR Facility

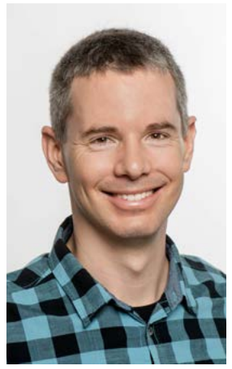
On October 11th, 2022, the Swiss High-field NMR Facility was inaugurated with a scientific symposium at the Biozentrum. The new technology platform is operated jointly by the Universities of Basel and Zurich and the ETH Zurich and offers researchers around Switzerland access to cutting-edge technology in the field of nuclear magnetic resonance (NMR) spectroscopy. Five high-performance NMR instruments with a field strength of 600 to 900 MHz are available at the Biozentrum. In Zurich, researchers will have access to the state-of-the-art 1.2 GHz NMR spectrometer starting from 2024. The opening event was attended by high-ranking representatives of the three participating universities, invited guests from academia and industry along with scientists working in the fields of structural biology and NMR spectroscopy.

New PhD student course

This year, the Biozentrum launched a new course, which addresses first year PhD students. In the "How to be a scientist" course, the starting students get a glimpse behind the scenes of academic research. This new course is not a classical teaching class. So, the students are not trained in technical aspects or lab work but are rather exposed to scientific approaches, from an idea to the paper. They also get the opportunity to connect with their peers and to squeeze information out of various researchers about their career, experiences and obstacles they had to face. Furthermore, people from the university were invited to discuss subjects, such as personal integrity, mental health, how to reconcile family and academic career and gender issues. 23 students participated in the first round of the "How to be a scientist" course.

Prestigious grants for Biozentrum researchers

Prof. Benjamin Engel received a Consolidator Grant from the European Research Council (ERC). In his project "cryoOcean", the cell biologist will use cryo-electron tomography to study the molecular architecture of chloroplasts in marine algae. In addition, Prof. Anissa Kempf received a five-year ERC Starting Grant which enables her to investigate the molecular basis of sleep and to gain further insight into the mechanisms controlling sleep-wake rhythms. The Swiss National Science Foundation (SNSF) awarded Prof. Peter Scheiffele a highly endowed SNSF Advanced Grant for his research project on the formation of complex neuronal circuits in the brain. Due to Switzerland's exclusion from the EU research program "Horizon Europe", the SNSF implemented transitional measures including the SNSF Advanced Grants.



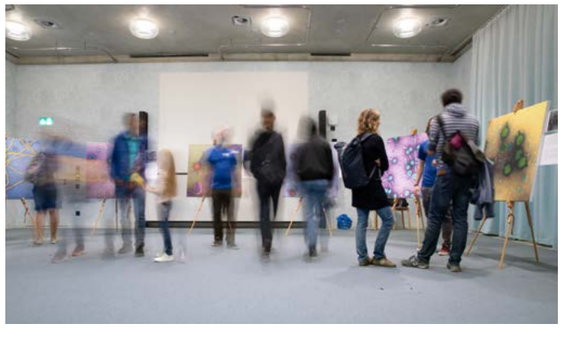
After the break due to the pandemic, we have successfully restarted our public lecture series "Einblicke Biozentrum".

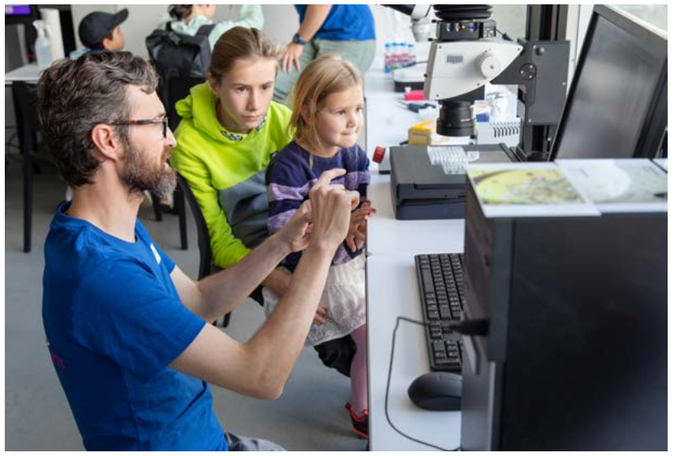
Basel Summer Science Academy

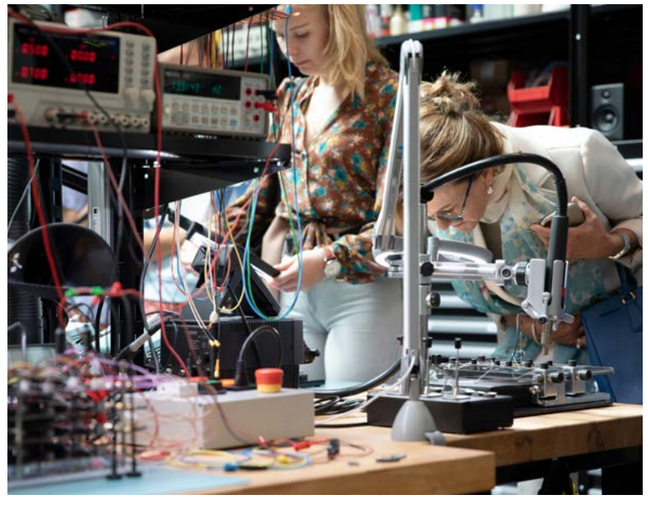
Launched four years ago, the Basel Summer Science Academy has become a successful internship program for high school students from various gymnasiums in the Basel region. This time, twenty students took the opportunity to get a taste of research life and to immerse themselves into invisible worlds. In the summer school organized by the Biozentrum, they gained hands-on experience in lab work, discovered the diversity of microbial life and learned how bacteria and viruses interact with each other. The students collected water samples from the Rhine river, isolated their own bacteriophages and characterized them. Besides the lab work, they were offered a diverse side program ranging from an excursion to the Pharmacy Museum Basel and the Novartis campus to Rhine swimming and a barbecue in the park. And their work did not just end up in the drawer, the most beautiful images of bactariophages could be admired at the phage art exhibition. The most famous guest was certainly Nobel laureate Prof. em. Werner Arber, who also studied and worked with bacteriophages in his time as an active researcher.

Biozentrum Open House Day 2022

On September 17th, 2022, the time had finally come – one year after moving into our new home, we opened the doors of the Biozentrum to the public. And the turnout exceeded our expectations. More than 4000 people did not miss the opportunity to get an insight into our research and our state-of-the-art building. At more than twenty booths on the research market, the Biozentrum scientists enthusiastically took the guests on a tour into their fascinating research. Many offers were interactive allowing the visitors to get an idea of the daily work of a scientist. They could isolate their own DNA, discover the fascinating world of light microscopy, see what happens in our brain when we move and get a glimpse into the laboratories on the 14th floor, as well as the view over the rooftops of Basel. We were thrilled to share the Biozentrum with the general public and overwhelmed by the interest of the many visitors. It was wonderful to see that all of them were excited and appreciated getting a behind-the-scenes look. There was a real sense of community of young and old folk coming together to learn, explore, and have fun. So, it was a great open house day and a pleasure to host such a successful event – the pictures speak for themselves.







Biozentrum meets D-BSSE

The ETH-Department of Biosystems Science and Engineering (D-BSSE) is completing the construction of its new building located next to the Biozentrum. This move to the Life Sciences Campus presents an opportunity for increased collaboration between the two institutions. In October, the Biozentrum invited D-BSSE scientists to share knowledge and ideas, and to promote collaboration and community building.

Neutralizing antibodies control bacterial infection

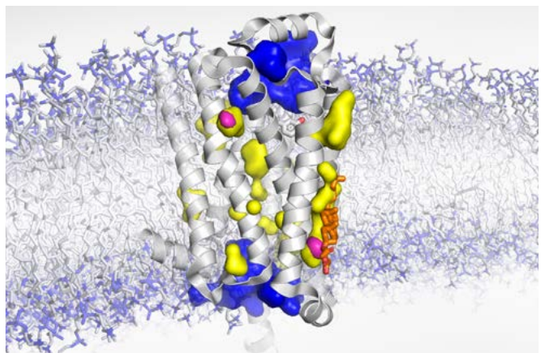
Bartonella bacteria are transmitted from blood-sucking insects to mammals, including humans, where they enter the red blood cells and cause various symptoms. An example of such a human infection with a worldwide distribution is the louse-borne five-day fever or trench fever. Prof. Christoph Dehio's team, together with researchers led by Prof. Daniel Pinschewer at the Department of Biomedicine, investigated the response of the immune system to a *Bartonella* infection in a mouse model. In their study, they discovered neutralizing antibodies that control the infection process by binding to the bacteria and without the aid of phagocytes or other immune factors. These antibodies prevent the pathogens from attaching to and invading the erythrocytes – so stopping the infection. The blood-sucking insects no longer ingest any pathogens with their blood meal and thus cannot transmit them to a new host. Prophylactic administration completely prevented an infection, while therapeutic administration eliminated present bacteria. This work was supported by the NCCR "AntiResist".

Siewert et al., *PNAS*

Cell receptors: of voids and void fillers

Nearly all vital functions in the human body are regulated by so-called G protein-coupled receptors (GPCRs) on the cell surface. These receptors therefore serve as attractive drug targets to treat various diseases. Using cutting edge-technology including NMR spectroscopy, the research team of Prof. Stephan Grzesiek discovered that GPCRs contain completely empty cavities which are important for their activation and thus for relaying messages to the inner cell. Their experimental approach to locate these voids may help to direct and speed up the search for new and more specific drug candidates with fewer side effects.

Abiko et al., *Nature Chemistry*



"Experimental Molecular Biology" course

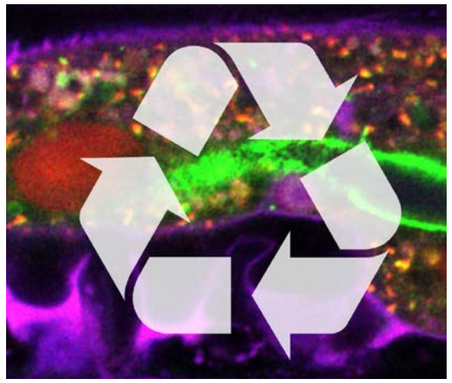
In the second trial run of the newly launched course "Experimental Molecular Biology" (EMB), 15 Bachelor students had the chance to get involved in a real research project, from learning the technical skills and tools for lab work to how to think in a scientific way. So, they did not simply follow a "recipe" with a known result for their experiments but rather were given the opportunity to work independently and discover new, yet unknown things. Several Biozentrum Core Facilities, including Research IT, the Imaging Core Facility, Proteomics as well as the Biophysics Core Facility support the EMB course. The annual course will start officially in Fall Semester 2023 and will then be mandatory for all students choosing the BSc in Molecular Biology.

On the Swiss National Future Day many school children had the opportunity to visit our labs, carry out exciting experiments and get a glimpse behind the scenes at the Biozentrum

Cell's recycling surprisingly efficient

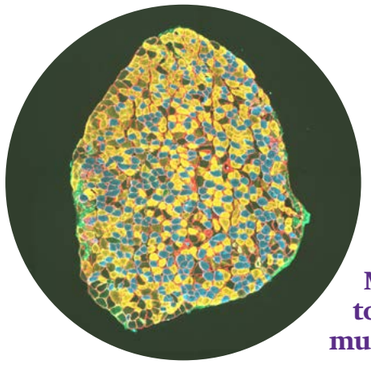
Cells live and survive by taking up proteins, recycling and reusing or degrading them. About 80 percent of the receptor proteins located on the cell surface are recycled by the cell and returned to the surface. Prof. Anne Spang's team was able to show that this recycling system is extremely sophisticated and efficient. Shortly after the uptake of molecules at the cell surface, the cell decides whether to recycle or transport them into the cell. Cells thus start their recycling process much earlier than previously assumed.

Solinger et al., *Nature Communications*



Biozentrum PhD Fellowships

The Biozentrum is an institute that has always attracted good researchers. By providing the Biozentrum PhD Fellowships program, it also has a unique tool to actively recruit outstanding, international junior scientists. Twice a year, talented and highly motivated young researchers from all over the world are encouraged to apply for the prestigious fellowships. The fellowships are awarded on a competitive basis to a maximum of ten candidates per call. Recipients are offered a unique rotation-based selection of a research group of choice and a number of other incentives that foster the scientific excellence and the career prospects of these PhD candidates. Since its inception in 2006, 81 PhD students from over thirty different countries – about half of them women – have completed their doctorate. There are currently 43 PhD fellows conducting research at the Biozentrum.



Multiple treatments to slow age-related muscle wasting

Everyone wants to stay fit and healthy as they grow old. But as we age, our body degrades, our muscles shrink and strength declines. Some older people suffer from excessive muscle loss, a condition known as sarcopenia. Researchers led by Prof. Markus Rüegg demonstrated in mice that both calorie restriction and the drug rapamycin have a positive effect on aging skeletal muscle. The combination of the two treatments provides additive benefits and could delay the onset of sarcopenia. Compared to their peers, treated mice are more active and physically capable because their muscles remain healthy.

Ham et al., *Nature Communications*

Bacterial nano-speargun as a precision weapon

Many bacteria are equipped with a nano-sized speargun, the so-called Type VI secretion system (T6SS). With this speargun they inject a deadly cocktail of toxins into their competitors and eliminate them. Prof. Marek Basler's team discovered that certain bacteria do not fire their weapon randomly. Instead, they assemble their weapon after cell-cell-contact with the rival and aim the shot in its direction. In this contact-dependent T6SS assembly, a newly described periplasmic protein as well as the outer membrane protein OmpA play a key role. Precise localization and accurate timing increase the probability of striking the enemy and improve the cost-benefit ratio. This preserves resources and improves the chances of success. Targeted attacks are a much more efficient strategy to get rid of competitors and conquer new ecological niches. This is certainly an advantage in the competitive struggle with other bacteria.

Lin et al., *EMBO Journal*

Our community is the key ingredient to the Biozentrum's success. In 2018, the Biozentrum Discovery Seminar series was launched to promote scientific exchange and catalyze new personal interactions that inspire new ideas and collaborations. Also this year, many internationally renowned scientists as wells as young in-house researchers provided insights into their most diverse research topics.

Liver cancer: How liver cells go astray

The causes of liver cancer are manifold. In addition to metabolic disorders, the main causes in the western world are infections with hepatitis C virus and high alcohol consumption. In their study, the team led by Prof. Michael N. Hall uncovered how a healthy liver cell turns into a tumor cell. Reduced levels of the central metabolic molecule acetyl-CoA trigger comprehensive metabolic changes and promote the dedifferentiation of liver cells. In other words, they are reprogrammed to an early, immature stage of development. The cells lose their characteristic function and begin to proliferate rapidly, thus tumors develop. The researchers observed this mechanism in liver tumors from both mice and patients. Furthermore, the metabolic changes in tumor cells exhibit a "signature" which can also be found in other types of cancer such as prostate and pancreatic cancer

Park et al., *Molecular Cell*

Research Summer for Bachelor students

Early involvement of students in real-life research has always been a priority at the Biozentrum. With its Research Summer internship program, Bachelor students from across Europe get the unique opportunity to work on cutting-edge research projects for several weeks and discover at an early stage in their career what lab work is all about. During the "Research Summer 2022", ten students selected from 114 applicants had the chance to gain hands-on research experience in one of the Biozentrum labs, learn new lab techniques and how to document and present their results. The inspiring scientific and social side program further encouraged the participants to exchange ideas and welded the group together.

Prof. Richard Neher and his team received the Remarkable Outputs 2021 Award of the SIB Swiss Institute of Bioinformatics for the open source web tool Nextclade. Also in 2022, his expertise and opinions on the coronavirus pandemic was highly valued by the media.
After the discontinuation of the Swiss National COVID-19 Task Force, he is now member of the newly established scientific advisory committee providing the government with the latest information on the pandemic.

Heat stress reduces lifetime of mRNA molecules

The coronavirus pandemic and the development of the novel vaccines has brought mRNA into the public eye. A great hurdle in the development of mRNA-based therapies, however, is the generally very low stability of the molecules. To be effective, they should not be degraded too quickly nor too slowly within the cell. Using a newly developed method, Prof. Attila Becskei's team succeeded in precisely determining the lifespan of mRNAs under stressful conditions. They discovered that with increasing temperature mRNAs are degraded faster. To a certain extent the cell is able to compensate this effect. However, mRNAs which are important for the production of key membrane components and the ribosomes remain stable even at higher temperatures. This mechanism can maintain a constant mRNA turnover at changing temperatures to a certain extent and protects the cell from the negative consequences of heat stress. Knowing how mRNAs behave and how to influence their stability may help to optimize mRNA-based vaccines.

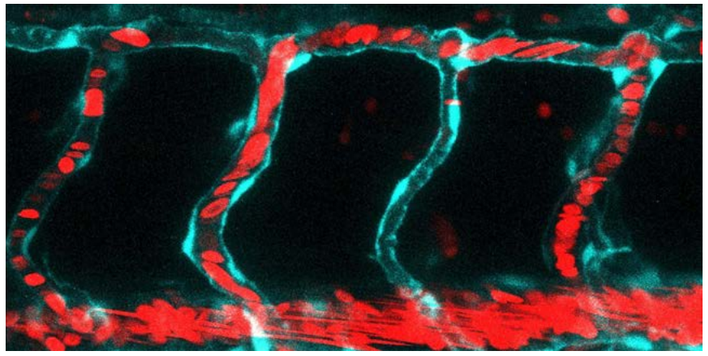
Jaquet et al., *Nucleic Acid Research*

Cell population sizes: When is enough enough?

T lymphocytes, T cells for short, are essential for a proper functioning of our immune system. While enough T cells need to be present at any time, the body must also ensure that they do not exceed a certain density. The team of Prof. Jean Pieters uncovered a cell-intrinsic mechanism that controls the appropriate number of T cells in the organism and thus ensures proper functioning of the immune system. This mechanism requires the protein coronin 1, which plays an important role in T cell survival. The research results also showed that the regulation of the cell population by coronin is also found in amoebas (slime molds) that go through both single and multicellular stages, suggesting that this regulation of cell density is evolutionarily conserved.

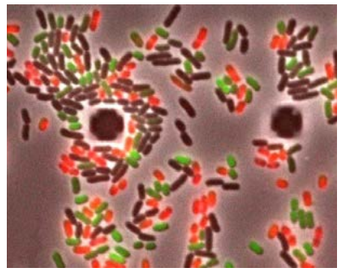
Fabrice et al., *Science Signaling*

How the vascular cells respond to blood pressure



The dense network of blood vessels is estimated to be about 150,000 kilometers in length. Already very early in embryo development the heart starts to beat and the first blood vessels begin to form. The crux is that the vessels form while blood is flowing through them and their integrity needs to be maintained to prevent blood leakage. Together with researchers at Amsterdam UMC, the scientists working with Prof. Markus Affolter discoverd in zebrafish that during blood vessel formation vascular cells, when exposed to great forces, are able to reinforce their cell junctions by employing a specific protein called Vinculin. This protein accumulates at the cell junctions exposed to great tension from the blood pressure. It fortifies and stabilizes the junction by causing invagination of the cell membrane forming typical finger-like structures. Once the lumen is completely open and the blood flow is established, the tension on the specific vascular junctions is relieved and the fingers regress over time. Vinculin is the driving force for junction reinforcement and thus protects the cell junctions from tearing, particularly in the early stages of vessel formation.

Kotini et al., *Cell Reports*



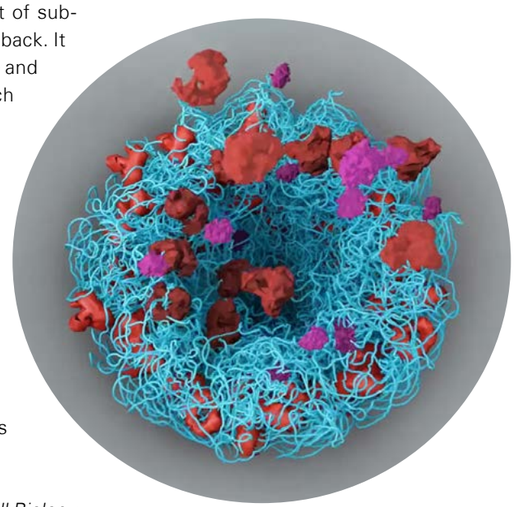
Virulence could be the Achilles heel of pathogens

The antibiotic resistance crisis is forcing us to rethink how to deal with bacterial pathogens. Recently, Prof. Médéric Diard's team demonstrated that the diarrhea-causing pathogen *Salmonella* is more sensitive to stress when producing virulence factors. This trade-off between virulence and stress resistance favors the evolution of stress resistant but harmless variants. Moreover, the researchers revealed that in mice the virulence-associated stress sensitivity is a burden for *Salmonella* during infection, leading to an instability in the virulence. This means that stress triggered by harsh conditions such as inflammation could contribute to select for non-virulent variants in the gut. Driving the evolution towards such non-virulent variants might be an alternative approach to fight bacterial pathogens. This evolution-proof concept expands the toolbox of antibacterial treatments and could help prevent life-threatening infections.

Sobota et al., *PLoS Biology*

Safeguarding the cell nucleus

The cell nucleus is guarded by a highly secure door, the so-called nuclear pore, that controls the transport of substances from the cytoplasm to the cell nucleus and back. It works like a molecular sieve that controls the entry and exit of cargo-carrying shuttle proteins. The research group led by Roderick Lim, Professor at the Biozentrum and the Swiss Nanoscience Institute (SNI), examined three prominent shuttle proteins in human cells and uncovered that their crowding at nuclear pores is important for preventing unwanted leakage into and out of the nucleus. The number of shuttle proteins that occupy the pore depends on their concentrations within the cell. However, when one shuttle protein is reduced, another shuttle protein can take its place to reinforce the pore. This escape-proof, failsafe compensation mechanism is important for fortifying the pore.

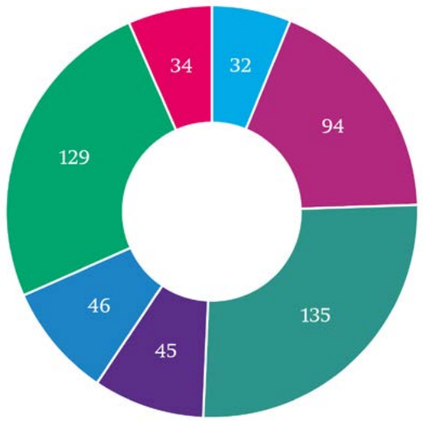


Kalita et al., *Journal of Cell Biology*

Key Facts.

Members of staff

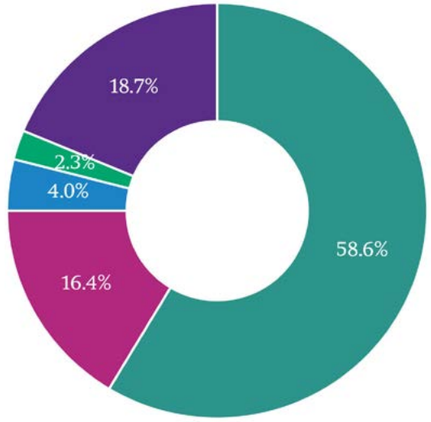
Total members of staff: 515
Scientists from more than 40 countries



- Professors
- PhD students
- Master students
- Administration
- Postdoctoral researchers
- Scientific staff
- Lab staff/ Technicians

Annual financial statement

Sources of funding of the budget of 71.4 million Swiss francs:



- University of Basel
- Swiss National Science Foundation
- EU/ERC grants
- Swiss Institute of Bioinformatics
- Misc. third party grants

Research groups 2022

Prof. Jan Pieter Abrahams
Prof. Markus Affolter
Prof. Silvia Arber
Prof. Marek Basler
Prof. Attila Becskei
Prof. Dirk Bumann
Prof. Christoph Dehio
Prof. Médéric Diard
Prof. Fiona Doetsch
Prof. Flavio Donato
Prof. Knut Drescher
Prof. Benjamin Engel
Prof. Stephan Grzesiek
Prof. Michael N. Hall
Prof. Christoph Handschin
Prof. Sebastian Hiller
Prof. Maria Hondele
Prof. Urs Jenal
Prof. Anissa Kempf
Prof. Roderick Lim
Prof. Timm Maier
Prof. Susan Mango
Prof. Richard Neher
Prof. Camilo Perez
Prof. Jean Pieters
Prof. Markus Rüegg
Prof. Peter Scheiffele
Prof. Alex Schier
Prof. Torsten Schwede
Prof. Anne Spang
Prof. Erik van Nimwegen
Prof. Mihaela Zavolan

Awards, Grants & Fellowships for PhD students and Postdocs 2022

Ines Böhm, FreeNovation, Novartis Research Foundation

Carolina Borges-Merjane, Research Fund 2022 for the Promotion of Excellent Young Researchers

Zayna Chaker, Research Fund for the Promotion of Excellent Young Researchers

Christy Cheung, PhD Fellowship, Boehringer Ingelheim Fonds

Ana Delgado, Bruno Speck Award for Basic Research

Antonio Falasconi, PhD Fellowship, Boehringer Ingelheim Fonds

Jessica Faria da Eira, EMBO Long-Term Fellowship

Manuel Ferreira Pinto, J.C.W. Shepherd PhD Student Prize for Scientific Excellence, Biozentrum

Pavel Filipcik, SNSF Postdoctoral Fellowship

Elisabetta Furlanis, Gottfried Schatz PhD Student Prize for the Best Thesis

Regula Furrer, James Mitchell Award for Excellence in Collaborative Science (ETH Zurich) and Research Fund for the Promotion of Excellent Young Researchers

Özgür Genç, Innosuisse Grant and Propelling Grant, University of Basel

Alexander Harms, SNSF Starting Grant

Meng Ge, SNSF Postdoctoral Fellowship

Polina Isaikina, J.C.W. Shepherd PhD Student Prize for Scientific Excellence, Biozentrum

Gytis Jankevicius, Propelling Grant, University of Basel

Thomas Julou, SNSF project grant

Bor Kavčič, Postdoctoral Fellowship, Peter and Traudl Engelhorn Foundation

Myrto Panopoulou, EMBO Postdoctoral Fellowship

Annemarie Perez Boerema, SNSF Postdoctoral Fellowship

Anja Schwartzlose, PhD Fellowship, Boehringer Ingelheim Fonds

Florent Waltz, SNSF Postdoctoral Fellowship

Yinan Wan, Marie Skłodowska-Curie Individual Fellowship

Jadiel Wasson, Research Fund 2022 for the Promotion of Excellent Young Researchers

Haohao Wu, EMBO Postdoctoral Fellowship

Matthias Zeug, PhD Fellowship, Boehringer Ingelheim Fonds