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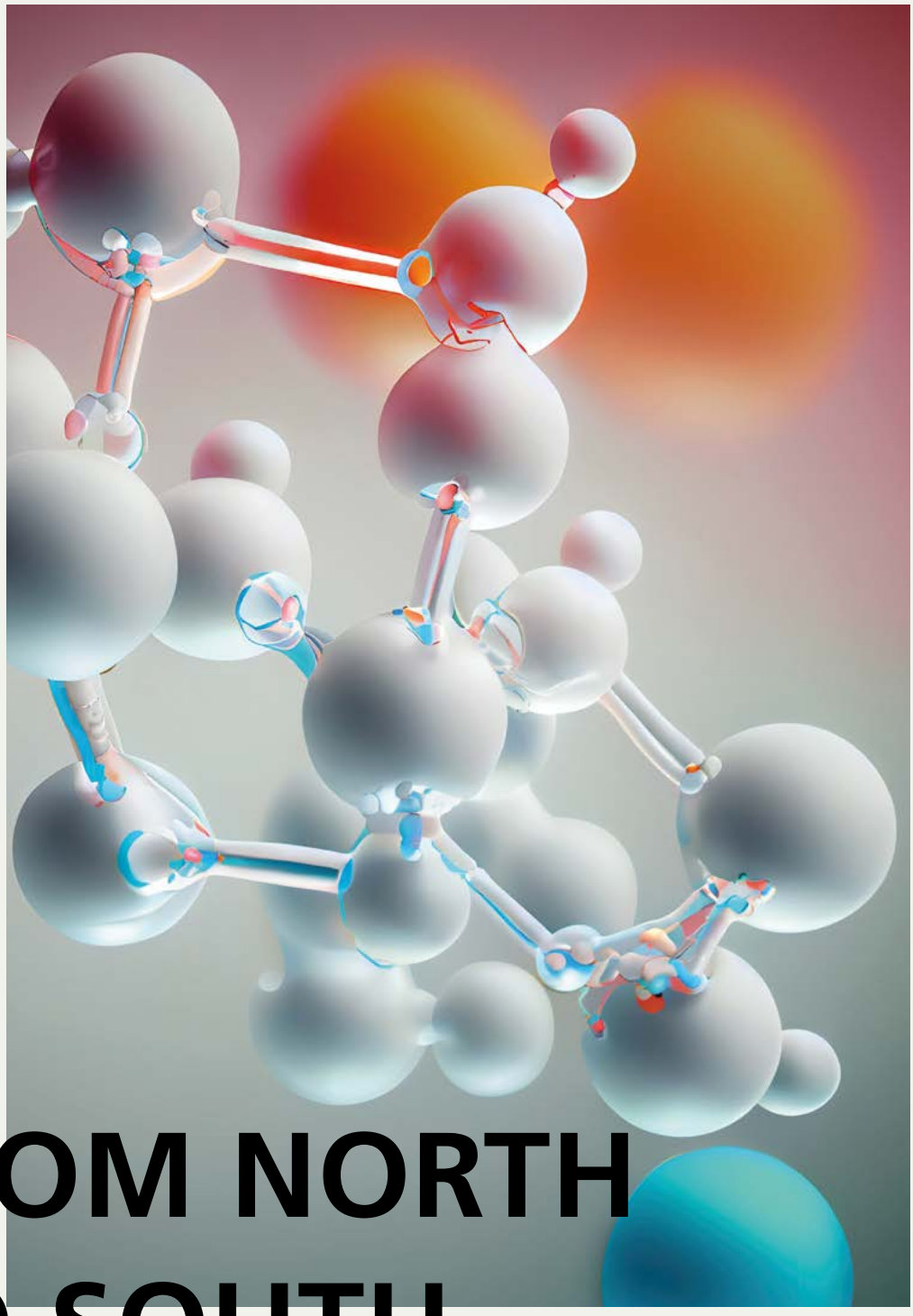


FROM NORTH TO SOUTH

Innovation: connecting vision, research and development

Fraunhofer ITMP annual report **2023**

DEAR READERS,

» The industrial healthcare sector is in a better position than any other industry to pave Germany's way out of the economic crisis. «

This sentence comes from a strategy paper published by the Federation of German Industries (BDI) back in 2021, but it remains just as true now as it was then. The advantages that the healthcare sector has are obvious: As compared to other key industries, it is not energy-intensive, does not need rare raw materials and does not require billions in subsidies to ensure value creation and security of supply in Germany and Europe. The industrial healthcare sector is also one of the most innovative of industries and therefore offers excellent growth opportunities for our knowledge-based economy. The BDI believes that the healthcare sector has the potential to become a leading industry of the 21st century, not least in light of demographic changes.

However, in order to maintain and further increase the prominence of the healthcare sector in Germany, government needs to create competitive conditions. The pharmaceutical strategy put forward by the German federal government and the Medical Research Act introduced by the Federal Ministry of Health are a good start. In particular, the healthcare system needs guarantees of continued financial viability to create further incentives for the healthcare sector to invest in research, development and production in Germany. In Germany currently, around 1.2 billion euros are spent on healthcare every day. The majority of this is spent on medical care, unsurprisingly, but around a quarter is spent just on the industrial healthcare sector.

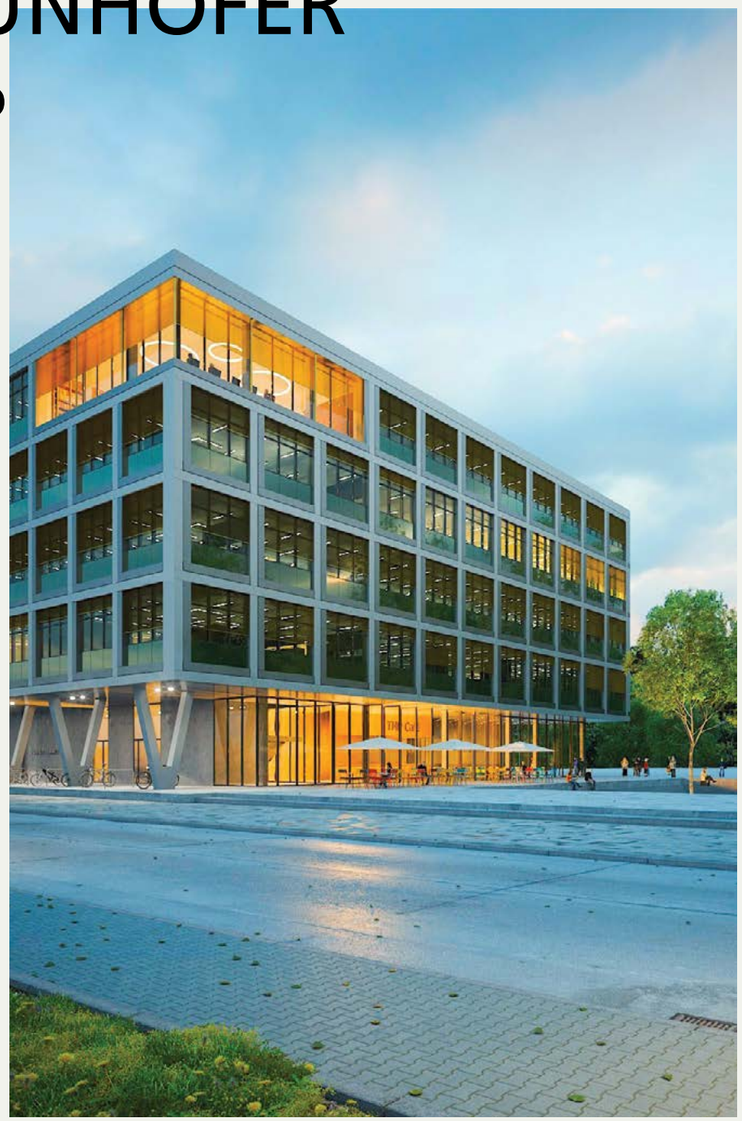
Prof. Dr. Dr. Gerd Geißlinger

Another important factor for Germany is to increase funding for applied research, particularly clinical research and innovation, in order to close the persistent translational gap between basic research results and medical practice. In recent years, Fraunhofer ITMP has developed in terms of both the issues that it addresses and its organization to allow it to position itself and its expertise, skills and technologies effectively at the interface between science and industry. We will continue to do our utmost to be the best partner to science and industry that we can be and to help society and politics in making healthcare more affordable. With this in mind, I would like to thank all the employees, project partners and supporters of Fraunhofer ITMP.

Prof. Gerd Geißlinger
Executive director of Fraunhofer ITMP

Pict. l.: Close up microscope, © Freepik
Pict. r. top down.: Equipment researchers; mesh gradient close up; © Freepik

PROFILE OF FRAUNHOFER ITMP



Fraunhofer ITMP new building at its Frankfurt site, planned completion end of 2024;
© Wörner Traxler Richter Planungsgesellschaft mbH

Prof. Dr. Dr. Gerd Geißlinger
Executive director
Fraunhofer ITMP

Prof. Dr. Frank Behrens
Deputy institute director
Fraunhofer ITMP

Dr. Lutz Zeitlmann
Deputy institute director
Fraunhofer ITMP

The Fraunhofer Institute for Translational Medicine and Pharmacology ITMP was founded from the Translational Medicine institute branch of Fraunhofer IME on January 1, 2021. The institute's focus is on the research and development of innovative methods for the early detection, diagnosis and therapy of diseases resulting from disturbed functions of the immune system.

The guiding principle of Fraunhofer ITMP is the realization of superior, innovative solutions for cost-intelligent diagnostics and therapy for the benefit of patients. Research topics range along the value chain from drug discovery, through highly specialized methods in preclinical research, to selected indication areas in clinical research. The effective transfer of innovative ideas from biomedical research to medical application and industry is at the core of its scientific objectives. Based on the 4D concept (linking drugs, devices, diagnostics and data), this idea and technology transfer is intended to enable, for example, novel diagnostic and therapy options as well as early detection and prevention options for immune-mediated and neurodegenerative inflammatory diseases.

Fraunhofer ITMP currently employs around 303 people at its sites in Hamburg, Berlin, Göttingen, Frankfurt am Main and Penzberg/Munich. The institute is divided into three cross-site research divisions: Drug Discovery, Preclinical Research and Clinical Research. Employees are organized in agile matrix teams across sites and divisions into what are known as innovation areas. This organizational structure allows rapid adaptation to current problems and issues.

The institute has close research links with many institutes and hospitals at the University Medical Center Hamburg-Eppendorf, Charité – Universitätsmedizin Berlin, Göttingen Medical School, the University Medical Center of Goethe University Frankfurt, Ludwig-Maximilians-Universität and the University Hospital of Munich. In addition, it enjoys lively scientific exchange with other national and international universities and research institutions. The aim of the collaboration is to identify trends and developments at an early stage and to develop and implement new research approaches and technologies. This being the case, Fraunhofer ITMP sees itself as a strong partner both for university medicine for the consistent translation of research findings into application and for the pharmaceutical and biotechnological industry.

RESEARCH DIVISIONS

Prof. Dr. Aimo Kannt
Drug Discovery, Preclinical Research
Fraunhofer ITMP Frankfurt am Main

Drug Discovery and Preclinical Research – Innovative therapeutics and biomarkers for precision medicine

This research area is concerned with elucidating disease mechanisms, validating drug targets and identifying and characterizing pharmacologically active molecules. The spectrum of therapeutic approaches ranges from small organic molecules to biopharmaceuticals, and research is also being done into novel drug entities such as proximity-inducing molecules. This work requires the development and use of innovative tools and technologies such as primary and stem cell models, high-resolution imaging, high-throughput screening and proteomics methods, methods for designing drugs and developing new substance libraries, innovative in vivo and ex vivo test systems and technologies for protein engineering and structure elucidation. An additional focus is analyzing large data sets, merging data from different sources, processing it and storing it according to FAIR (findable, accessible, interoperable, reusable) principles. This also includes using real-world data to develop new active ingredients.

In collaboration with the Clinical Research division at Fraunhofer ITMP, we use findings from clinical supply and molecular signatures obtained from patient samples to identify new target proteins, pharmacologically active substances and biomarkers for personalized medicine. The main indications are inflammatory diseases, neurodegenerative diseases, bacterial and viral infections and rare diseases.

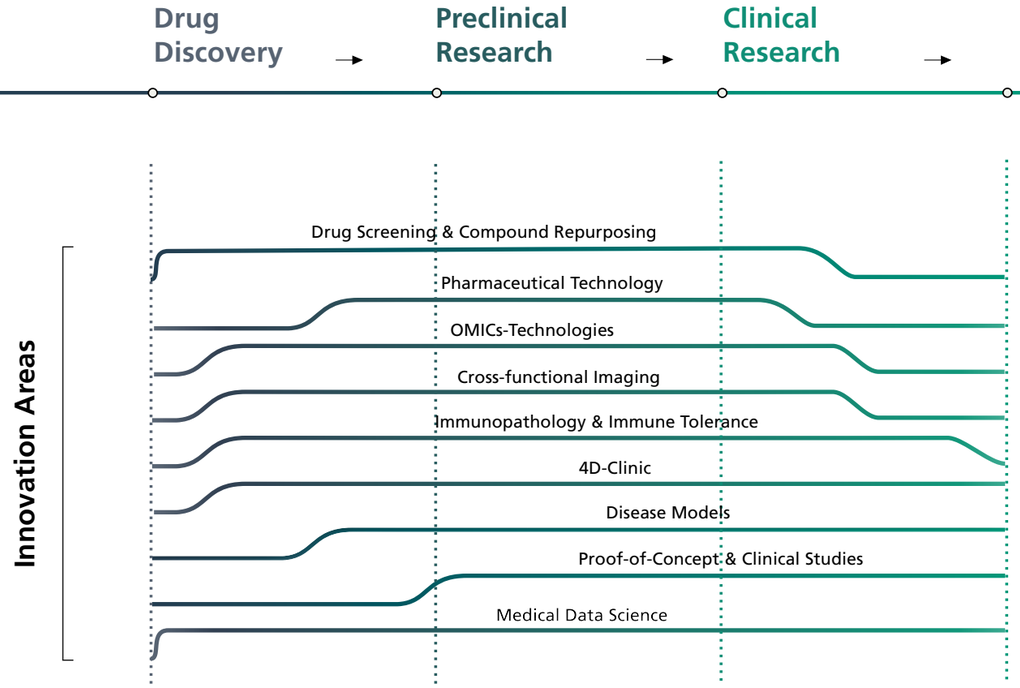


Fig.: Institute structure with cross-site and cross-divisional innovation areas.

Clinical Research
From idea to characterization of established products – successfully implementing innovative concepts through »Quality by Design«.

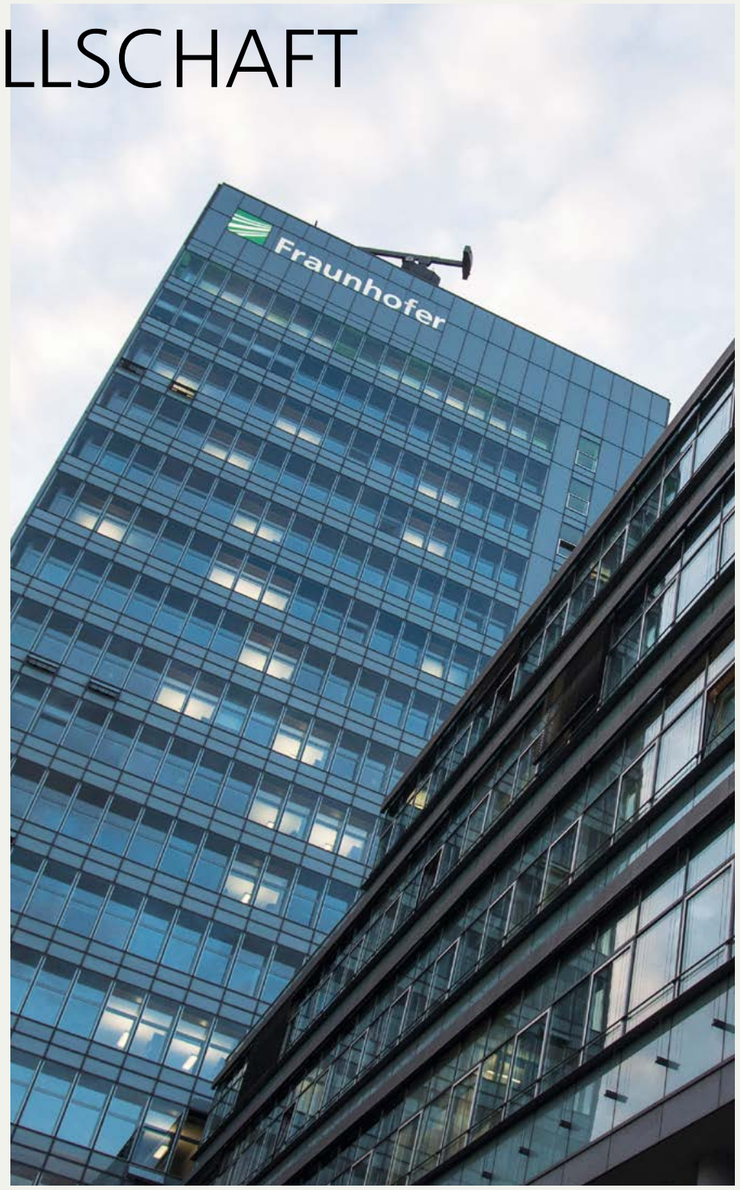
Prof. Dr. Frank Behrens
Clinical Research
Fraunhofer ITMP Frankfurt am Main

Our research focuses on planning, implementing and evaluating clinical projects for patients with immune-mediated inflammatory diseases of various organ systems and for pain as an indication area (projects falling under the German Medicinal Products Act, or AMG, as well as non-AMG projects).

In order to meet the medical challenges of immune diseases and related indications such as inflammation and pain in the field of translational research, we conduct innovative clinical projects on the early detection, diagnosis, prevention and treatment of those diseases. As well as developing our own drug candidates, we also conduct proof-of-concept studies and investigator-initiated clinical trials. We use modern study designs to make sustainable improvements to patient care and address patients' specific needs.

In our phase 1 research units at the sites in Frankfurt am Main and Göttingen, our direct connection to university hospitals means that drug candidates can be developed early, both for test subjects and for patients with the relevant indications.

FRAUNHOFER ITMP
WITHIN THE FRAUNHOFER-GESELLSCHAFT



Fraunhofer headquater in Munich; © Markus Jürgens

The Fraunhofer-Gesellschaft is at the global forefront of applied research. Founded in 1949, it now operates 76 institutes and research units in Germany. It has over 30,000 employees, most with a background in natural sciences or engineering, who generate a total annual research volume of 3.0 billion euros. Contract research accounts for €2.6 billion of this total.

https://www.itmp.fraunhofer.de/en.html

The Fraunhofer-Gesellschaft plays an important role in the innovation process through its focus on innovative key technologies and its implementation of research results in business and industry. As a trailblazer and driving force when it comes to forward-looking developments and scientific excellence, it also contributes significantly to the shaping of our society and our future.

The various Fraunhofer institutes operate autonomously, and so certain structures, programs and processes have been established within the Fraunhofer-Gesellschaft to pool their expertise together. The aim is to strengthen both field-specific and interdisciplinary networking between the individual Fraunhofer institutes and to expand their competitiveness by opening up new, joint business units. Within the Fraunhofer-Gesellschaft, Fraunhofer ITMP is involved in various structures and initiatives in the field of health research.

https://www.fraunhofer.de/en/research/fraunhofer-strategic-research-fields/digital-healthcare.html

Digital Healthcare FSF

The seven Fraunhofer Strategic Research Fields (FSFs) of the Fraunhofer-Gesellschaft form the focus of the research portfolio – especially with a view to the markets and needs of tomorrow. Within these fields, Fraunhofer's outstanding pre-competitive research specifically targets projects that have high potential for exploitation, thereby enhancing its impact on society and across multiple sectors. With the participation of Fraunhofer ITMP, the Digital Healthcare FSF focuses on building up the sovereignty of medicine and medical device supply in Germany and Europe, improving the usability of medical data, decoding the immune system and defining transdisciplinary translation cycles to accelerate the usability of innovative drugs and medical devices.

https://www.fraunhofer.de/en/for-customers-and-partners/healthcare-sector.html

Lead market: healthcare sector

In strategic customer segments (called lead markets or industries), innovative approaches to translating research results into industrial application are being developed along transdisciplinary lines using the Fraunhofer 4D model. Cross-institute

cooperation on handling complex research questions provides potential for medical innovations, which often arise at the interfaces between the various specialist fields. This technology-driven approach can produce innovations to give Germany a global competitive edge, secure Germany's and Europe's technological sovereignty and generate sustainable value creation for society. The healthcare sector is of considerable economic importance for Germany as a business location and is characterized by the development of innovative high-tech products in medical engineering and pharmaceuticals as well as new treatment and examination methods. Fraunhofer is involved in all four major areas of health research – drugs, diagnostics, devices and data (Fraunhofer 4D model). True to its interdisciplinary principles, the Fraunhofer-Gesellschaft brings together physicians, natural scientists, computer scientists and engineers to create the perfect conditions for innovation and the rapid commercialization of new ideas.

https://www.gesundheit.fraunhofer.de/en.html

Fraunhofer Group for Health

The Fraunhofer institutes are organized into nine groups, each with a dedicated research focus and tasked with coordinating this research within the Fraunhofer-Gesellschaft, pooling core areas of expertise and harmonizing the market presence of the respective group members. Fraunhofer ITMP falls organizationally within the Fraunhofer Group for Health, a medical, scientific and technological community of highly qualified experts from key areas of modern life sciences.

https://www.cimd.fraunhofer.de/en.html

Fraunhofer Cluster of Excellence Immune-Mediated Diseases CIMD

The Fraunhofer Cluster of Excellence Immune-Mediated Diseases CIMD pools Fraunhofer's specific strengths in the field of translational medicine, interdisciplinarity and transdisciplinarity. Its purpose is the use of scientific findings on the complex function, dysregulation and modulation of the immune system. This work makes research findings on early detection and diagnosis and new treatment options for immune-mediated diseases (IMDs) available for the benefit of patients. Fraunhofer CIMD conducts modern, forward-looking health research that is tailored to the indication area and has an interdisciplinary structure and organization. In the CIMD, established and new technologies are integrated in ways that are tailored to IMD applications. Data science and artificial intelligence, as well as medical technologies, are adopted into health research on IMDs in a targeted and medically moderated manner. The CIMD is developing into a central core for a national German network in the field of immune diseases, in cooperation with partners from universities, medical schools, non-university research institutions and industry.

https://websites.fraunhofer.de/med2icin-en/

MED²ICIN lighthouse project

With its lighthouse projects, the Fraunhofer-Gesellschaft sets strategic priorities in order to develop specific solutions for the benefit of Germany as a business location. The goal is to quickly turn original scientific ideas into marketable products. Fraunhofer ITMP has contributed its expertise in medical knowledge, cohort models, therapy guidelines and clinically based data models to the MED²ICIN lighthouse project. Over the course of the project, MED²ICIN has developed a digital patient model that forms a basis for personalized and cost-optimized treatment and provides faster treatment success with targeted decision-making support for physicians. The resulting MED²ICIN modules enable more effective prevention, diagnostics, therapy and care as well as more intelligent allocation of healthcare expenditure. Medical professionals and

software developers have also continuously and successfully evaluated and optimized the modules by conducting practical tests in parallel. At the symposium on July 17, 2023, live demonstrations of the MED²ICIN model made an excellent impression on patients, doctors, health insurers and politicians. There are plans to utilize and develop the MED²ICIN patient model in cooperation with industry, in medical practices, in the Fraunhofer ITMP's 4D Clinic and in other areas.

www.theranova.eu/

High-Performance Center Innovative Therapeutics TheraNova

Fraunhofer high-performance centers work together with university and non-university research partners to serve the needs of industry. Universities, higher education institutes, Fraunhofer institutes and other stakeholders work together at a single location on specific topics in order to rapidly implement the latest innovations. Together with the Goethe University Frankfurt am Main, the Max Planck Institute for Heart and Lung Research in Bad Nauheim and the Fraunhofer Institute for Computer Graphics Research IGD, as well as pharmaceutical and biotechnological companies in the Rhine-Main region, Fraunhofer ITMP has founded the High-Performance Center Innovative Therapeutics TheraNova. The focus of TheraNova is on the development of novel therapeutic approaches and drug classes for the treatment of diseases with a high unmet medical need. A key focus is the development and use of AI methods and quantum technologies for the design of complex biological agents and the analysis of multidimensional data sets (clinical data and findings, molecular and genetic profiles) for personalized therapy.

www.fraunhofer.de/de/forschung/fraunhofer-strategische-forschungsfelder/intelligente-medizin/proof-of-concept-initiative.html

Proof-of-Concept-Initiative

The Proof-of-Concept initiative (PoC initiative) was established by the Fraunhofer-Gesellschaft, Deutsche Hochschulmedizin and the Helmholtz Association as a joint project involving multiple organizations. Its aim is to accelerate processes for translating highly innovative approaches from basic research to application in medical practice. Fraunhofer ITMP is leading a project to develop an active ingredient for the treatment of neuropathic pain caused by chemotherapy.

TOTAL BUDGET 2023

Budget

The **operating budget** of Fraunhofer ITMP amounted to

23.7 Mio. €

in 2023 (incl. start-up financing).

In addition, around

8.51 Mio. €

were invested in **equipment.**

Expenditure relating to **construction activities** for the new institute building in Frankfurt am Main amounted to

10.8 Mio. €.

Income

69.3 %

of the operating budget for the contract research area of the parent institute was financed by **external income.**

The **industrial revenue** of

3.72 Mio. €

is at a good level.

Personal

At the end of 2023, a total of

303

people were employed at the Fraunhofer ITMP sites in Frankfurt am Main, Hamburg, Göttingen, Berlin and Penzberg/Munich.

The proportion of **women** (permanent staff incl. doctoral students) at Fraunhofer ITMP was

62 %.

Summary

The Fraunhofer ITMP with its sites in Frankfurt am Main, Hamburg, Göttingen, Berlin and Penzberg/Munich recoded considerable growth in 2023 and was thus able to strengthen and expand health research at the Fraunhofer-Gesellschaft in cooperation with excellent university locations.

ADVISORY BOARD 2023

The members of the advisory board advise the various bodies of the Fraunhofer-Gesellschaft as well as the institute management and promote the connection of Fraunhofer ITMP to partners from industry, science and the public sector.

The members of the Fraunhofer ITMP advisory board at the annual meeting at the Fraunhofer headquarters in Munich.
© Fraunhofer

The third annual meeting of the members of the Fraunhofer ITMP advisory board took place on June 5, 2023 at the Fraunhofer headquarters in Munich. The head (interim) of the Fraunhofer-Gesellschaft, Dr. Sandra Krey, together with members of the advisory board and representatives of the five Fraunhofer ITMP sites, welcomed Bavarian State Minister of Health and Care Klaus Holetschek and other guests.The current development and research activities of the institute and strategic issues relating to the 4D concept were discussed.

In his opening address to the event, Bavarian Health Minister Klaus Holetschek focused in particular on digitalization and the use of data in the healthcare sector. He also emphasized that »cooperation between Fraunhofer, universities and the pharmaceutical industry is an important part of the development of new medicines.« In her speech, Dr. Sandra Krey, executive vice president for Finances and Controlling and current head of the Fraunhofer-Gesellschaft (interim), also emphasized the importance of cooperation in the interdisciplinary field.

Prof. Gerd Geißlinger, executive director of the Fraunhofer ITMP and health research officer of the Fraunhofer-Gesellschaft, gave a positive assessment of the current situation for the institute, with its five sites in Frankfurt am Main, Hamburg, Göttingen, Berlin and Penzberg/Munich. »Fraunhofer ITMP achieved growth in all its sites last year in terms of both the number of employees and the operating budget. We also initiated numerous developments in our research areas.«

The focus at next year's meeting will be on matters including the building of networks between university and non-university institutes and pharmaceutical companies to improve clinical trials. The meeting will also discuss the use of artificial intelligence in the digitalization and processing of medical data.

Members of the advisory board in the 2023 reporting year

Prof. Dr. Iris Löw-Friedrich (Vorsitzende)
Executive Vice President, UCB Pharma GmbH, Monheim

Dr. h. c. Volker Bouffier
Minister-president of Hesse (ret.)

Prof. Dr. Klaus Cichutek
President of the Paul-Ehrlich-Institut, Langen

Dr. Carolin Daamen
Bristol Myers Squibb GmbH & Co. KGaA, Munich

Dr. Claudia Fleischer
Managing Director Roche Diagnostics GmbH, Mannheim/Penzberg

Dr. Rolf Greve
Science, Research, Equality and Districts Authority (BWFGB), Hamburg

Prof. Dr. Stefan Hell
Max Planck Institute for Multidisciplinary Sciences, Göttingen

Dr. Claudia Jentzsch
Berlin-Chemie Menarini, Berlin

Dr. Joachim Kreuzburg
Chief executive officer Sartorius AG, Göttingen

Prof. Dr. Heyo Kroemer
Chief executive officer Charité – Universitätsmedizin Berlin, Berlin

Dr. Volker Lodwig
Roche Diagnostics GmbH (ret.), Mannheim

Dr. Ulrike Mattig
Hessian Ministry of Science and the Arts (HMWK), Wiesbaden

Prof. Dr. Michael Popp
Bionorica SE, Neumarkt in der Oberpfalz

Prof. Dr. Enrico Schleiff
President of Goethe University, Frankfurt am Main

Prof. Dr. Blanche Schwappach-Pignataro
Dean of the University Medical Center Hamburg-Eppendorf (UKE, Hamburg

Prof. Dr. Angelika Vollmar
Ludwig-Maximilians-Universität München, Munich

Dr. Marion Zerlin
Managing Director Research and Development, Sanofi-Aventis Deutschland GmbH, Frankfurt am Main

FROM NORTH TO SOUTH

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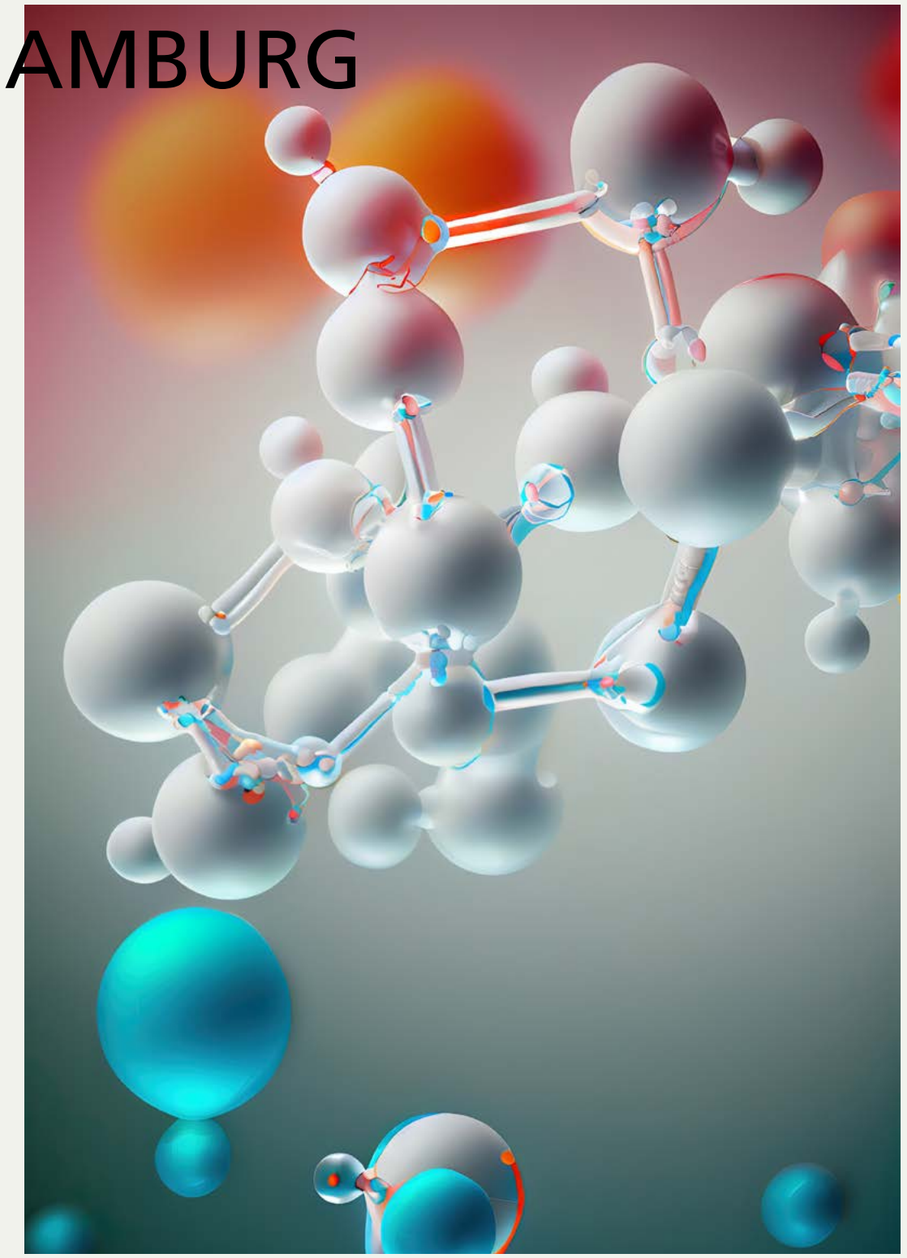
Fraunhofer ITMP locations

The Fraunhofer ITMP with its headquarters in Frankfurt am Main, currently has four additional institute locations in Hamburg, Berlin, Göttingen and Penzberg/Munich.

Pict. l.: Equipment researchers © Freepik
Pict. r.: Blue mesh © Dzina Belskaya; © CDC on Unsplash

FRAUNHOFER ITMP HAMBURG



Abstract molecular © Freepik

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Dr. Philip Gribbon
Head of Fraunhofer ITMP
Hamburg

Prof. Dr. Carsten Claussen
Head of Fraunhofer ITMP
Hamburg

Discovery Research ScreeningPort

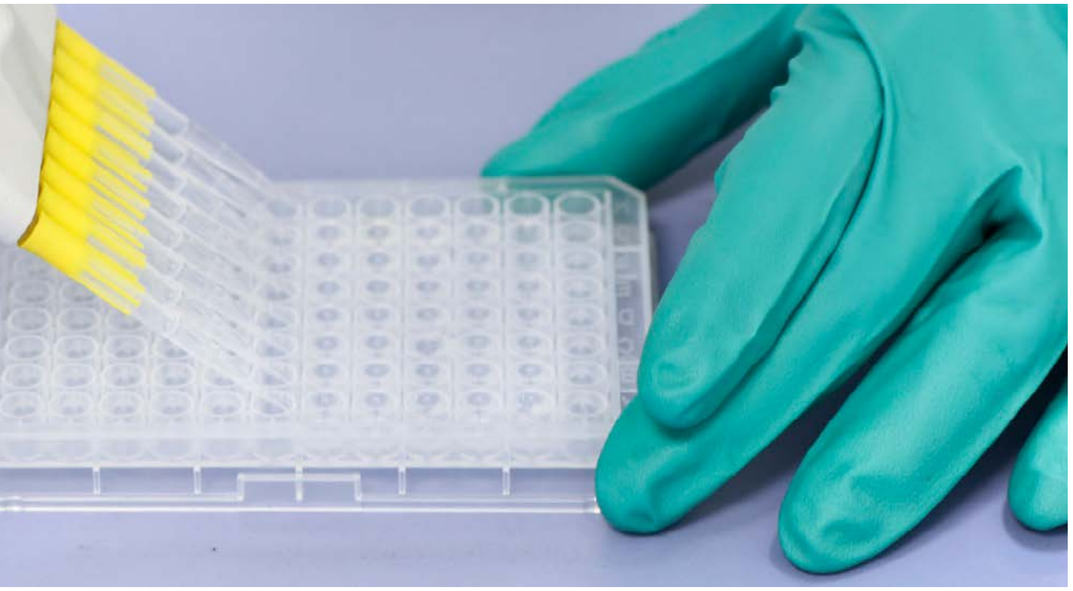
Our focus is on »small molecules,« which remain a dominant class of medicines. In our laboratories, the VolksparkLabs, we have access to high-throughput screening systems, various substance libraries and a broad portfolio of established assay formats. Our unique selling point is that our data scientists synergistically complement the experimental work done in the laboratory. We also have a powerful medical data science infrastructure thanks to the »Fraunhofer Edge Cloud« and a toolbox of algorithms and data sets.

Our research is aimed at generating and validating disease hypotheses in order to find diagnostic and therapeutic answers in chemical substances and transfer them to preclinical development. Results from high-throughput screening are supplemented by innovative, complex in vitro tests, such as tests of the blood-brain barrier, based on pluripotent stem cells or organoids derived from them. As an EU-OPENSCREEN (European Research Infrastructure Consortium ERIC) site, and thanks to the repurposing platform REMEDI4ALL, we are an important part of an established network of academic and clinical partners in the European research landscape.

Together with the University Medical Center Hamburg-Eppendorf (UKE), we operate translational laboratories in the field of kidney research and neuroimmunology. Together with the Bernhard Nocht Institute for Tropical Medicine we have also established a structural virology unit, Maria Rosenthal’s junior research group funded by the German Federal Ministry of Education and Research (BMBF), and have entered into a partnership with the Deutsches Elektronen-Synchrotron (DESY) for protein structure elucidation. We provide clients with decentralized data spaces, real and synthetic cohorts and tools and platforms to analyze complex data, for example using knowledge graphs.

We believe it is important to strengthen the joint expertise of the five Fraunhofer ITMP sites in the constantly growing field of medical data science so that we can gain more comprehensive knowledge from them.

FROM RESEARCH



PROXIDRUGS: A Regional Cluster with an International Impact

Proximity-inducing drugs have the potential to enable the targeted reduction of disease-relevant proteins, which could help treat diseases that could not previously be dealt with pharmaceutically. As one of nine partners in the PROXIDRUGS innovation network based in the Rhine-Main region, Fraunhofer ITMP is involved in developing such innovative therapies. This network is funded via the Clusters4Future initiative launched by the German Federal Ministry of Education and Research (BMBF), which aims to accelerate the transfer of knowledge from emerging fields into practice with a view to simulating new value creation.

Biological experiments are miniaturized for screening larger substance libraries – shown here is the process of manually pipetting into a 96-well microtiter plate (usually 384-well microtiter plates are used). © Fraunhofer ITMP, Martin Kunze

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Dr. Johanna Huchting
Project Manager Proxidrugs-ProxiDetect
Fraunhofer ITMP Hamburg
johanna.huchting@itmp.fraunhofer

Traditionally, low-molecular active substances are used, for example, to inhibit enzymatic activity or stabilize the (in)active conformation of a protein. By specifically binding to a protein, they modulate its direct, biochemically measurable function. Up to now, however, this approach has not been able to tackle a large number of disease-relevant proteins. This is partly due to the lack of a suitable binding site for small molecules in the traditional sense, and partly because proteins not only have direct functional properties, but also other characteristics such as scaffolding properties. This means that the mere presence of a protein as a binding partner for other macromolecules may be enough to promote pathology – and this is where traditional inhibitors reach their limits. Together with eight other partners from basic research and industry, Fraunhofer ITMP is developing a dynamic and sustainable innovation network under the PROXIDRUGS Clusters4Future initiative, aiming to put new findings from the field of proximity-inducing drugs into practice and thus get beyond the limits of traditional active substances.

Rethinking active substances

Using an innovative mechanism of action – reducing target proteins through »small molecule«-mediated protein-protein interaction – the »targeted protein degradation« research field focuses on active substances that bring their target protein into direct proximity with an effector protein from the cell’s own recycling machinery and thus initiate its degradation. This novel method not only makes it possible to remove disease-relevant proteins, but also enables active substances to be used very efficiently. The underlying catalytic mechanism of action provides a way to overcome the 1:1 stoichiometry of traditional inhibitors.

A young method comes of age

This innovative principle poses challenges for drug developers: Successful approaches to the rational development of conventional drugs need to be adapted or replaced with new strategies. The first rationally developed »degraders« are currently being investigated in advanced clinical trials, although their target structures have been known for some time. Consequently, we have not yet got as far as expanding the protein space suitable for pharmaceutical treatment. As part of PROXIDRUGS, Fraunhofer ITMP is setting up a molecular degrader discovery platform, which includes elements for data integration, prediction models, various customized biological assays and the design of chemical libraries. The project has also gained international visibility through the presentation of its initial results. Continuing the work of the PROXIDRUGS cluster, which brings together the pharmaceutical industry and basic and applied research, on a sustainable basis should help to bring proxidrugs directly to those who need them in the future.

PUBLICATION HIGHLIGHTS

Dr. Philip Gribbon
Head of Fraunhofer ITMP Hamburg
philip.gribbon@itmp.fraunhofer.de

»Be sustainable«: Recommendations for implementing FAIR principles in dealing with life science data

The European Strategy Forum on Research Infrastructures (ESFRI) plays a key role in policy-making for research infrastructures in Europe. The EOSC-Life project (2019–2023) brought the 13 »ESFRI life science research infrastructures« together into one science cluster. ESFRI Life was designed to be an open space for the application of digital biology while also establishing access to open, findable data, software and other digital research resources. With common practices, high-quality metadata and a shared vocabulary, these data can be made interoperable and reusable.

Life science research is a diverse field, with research communities in areas ranging from ecology to clinical trials. Instead of taking a standardized approach in a monolithic environment, EOSC-Life gets life science research communities involved in developing FAIR (findable, accessible, interoperable and reusable) data practices. These practices are founded on a common set of tools that is sustainable over the long term, and on the development of skills and capacities. Dr. Philip Gribbon was instrumental in the development of the EOSC-Life sustainability strategy, which was published in the European Molecular Biology Organization (EMBO) Journal. The publication outlines the resources and services and the associated training and exchange of knowledge that take place within the EOSC-Life project. Among other things, it identifies sustainability strategies that ensure long-term access to certain resources and services and the reuse of those resources and services. The research is increasingly being defined by open science guidelines, under which data and software are used jointly and available to all. The publication also illustrates how EOSC-Life can be integrated into a wider ecosystem. These considerations reflect the enormous diversity of the studies, which range from results at the atomic level in structural biology to epidemiological analyses of a global pandemic. They also reflect external factors. These may be regulatory requirements, e.g., for researchers working with personal health data or for sustainable agricultural and food systems affected by climate change. There are also organizational, technical, financial and legal/ethical challenges, which are the main obstacles to reusing life science data sustainably.

It is therefore necessary to promote awareness of various FAIR data components, including identifiers, metadata schemas, vocabulary and provenance, and to develop effective implementation strategies. These components are often applied inconsistently. This impairs data interoperability and the ability to reuse the data. There are also financial challenges that result from data and services being generated in increasingly complex ways. In addition, the necessary resources, such as curation, storage, computing and long-term access, are not scaled appropriately. Added to this are ethical and legal challenges, such as those resulting from GDPR provisions to ensure that citizens have the right to the secondary use of their personal data. Individuals continue to have these rights even beyond the (operational) duration of a project or infrastructure.

Publication
David et al.
»Be sustainable«: EOSC-Life recommendations for implementation of FAIR principles in life science data handling;
EMBO Journal
DOI: 10.15252/embj.2023115008

Recommendations to make your Research Sustainable

A particular merit of this publication is its broad spectrum of authors, as well as 12 concrete recommendations for practical action. This set of rules for researchers was developed within EOSC-Life:

Be recognized:

Focus on strong credibility and recognition for the research done:

- [R1] Build with the experts.
- [R2] Publish, communicate, disseminate.

Be practical:

Demonstrating, practising, and reproducing permit better and sustainable adoption of research outputs:

- [R3] Demonstrate, not only tell.
- [R4] Plan training for immediate and future needs.
- [R5] Metadata makes FAIR.

Be ready:

Sustainability requires agility and readiness to catch opportunities:

- [R6] Be prepared, agile and act timely.
- [R7] Curate now.

Be unifying:

Sustainability of products is based on clearly identified, recognised and motivated communities:

- [R8] Establish federated governance.
- [R9] Harmonise and integrate.
- [R10] Reward sustainability.

Be clear:

Inclusiveness and openness, as well as innovation, sustain communities:

- [R11] Be open and be inclusive.
- [R12] Treat innovation and sustainability independently.

IN FOCUS

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A breath of fresh air in project management – agile working at the Fraunhofer ITMP in Hamburg

Like many areas of work, applied research is characterized by ever-increasing complexity and constant time pressure. In order to remain successful despite these challenges, it can be beneficial for project management to let in some fresh air, with a particular focus on teamwork. Agile concepts, such as Scrum, are designed for teams in complex working environments and are centered on solution-oriented communication. Fraunhofer ITMP in Hamburg took note of this and took the bold experimental step of implementing Scrum. The experiment was a success – there are now four agile teams working there with support from certified Scrum master team members for their continued development.

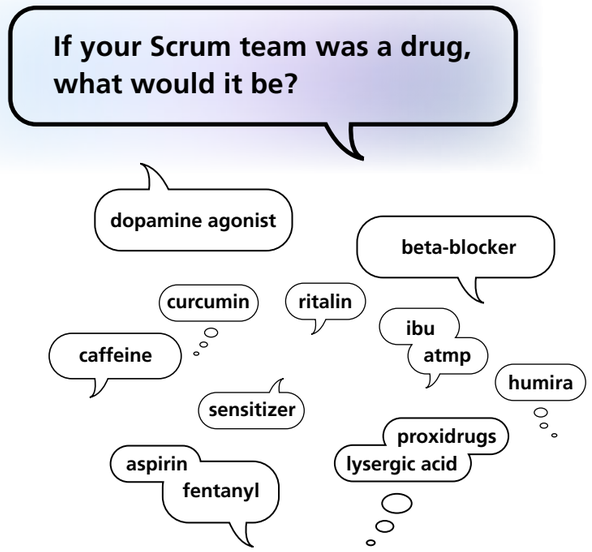
What is Scrum?

Scrum is one of a variety of agile concepts and was developed in the early 1990s by Ken Schwaber and Jeff Sutherland. With Scrum, the focus is on the team. That team consists of developers, the product owner and a Scrum master. Everyone involved tries to learn as quickly as possible in order to achieve continuous improvements, both in the product or project and in how they work within the team itself. Pending tasks are divided up and prioritized so that they can be completed within one sprint (a period lasting a maximum of four weeks). This iterative approach means that early results can be presented to the customer or project partner so that important feedback can be obtained.

The former president of the Fraunhofer-Gesellschaft, Hans-Jürgen Warnecke, pioneered this type of flexible organizational concept in corporate cultures with his »fractal factory« in the early 1990s. The adaptability and self-organization of independent units, initially in production companies , create an important foundation – including for Scrum in practical terms. So far, Scrum has mainly been used in software development. Increasingly, it is also being used in other complex working environments. LabScrum is one example of a development that has emerged from the original concept. The sprint is structured around fixed events: sprint planning, dailies, the sprint review and the sprint retrospective. Scrum focuses in particular on the values that guide the team: courage, focus, commitment, respect and openness. Trust and transparency also form the basis for successful collaboration within the team and with customers.

Practical experience – agile working at the Fraunhofer ITMP in Hamburg

The »agile working« experiment at the Fraunhofer ITMP in Hamburg began around two and a half years ago in the middle of the COVID-19 pandemic, a period that was full of social and professional challenges. The first Scrum team was set up in the Medical Data Science division with the support of the site heads, Carsten Claussen and Phil Gribbon, and certified Scrum master Gesa Witt. In line with the »learning by doing« principle, the Scrum events were set up and the first sprints were initiated. At the end of the sprints, the team was able to reflect on its working methods in a retrospective and had regular opportunities to delve deeper into the Scrum framework in order to implement improvements. With this pilot team, we were able to spend a year and a half gaining insights into how agile working can work in a real research context and also where headwinds can arise. In order to expand agile working potentially to the entire site in Hamburg, in 2022 all employees were offered training to learn the most important Scrum basics. Between late 2022 and early 2023, three more Scrum teams were set up in the fields of stem cells, microbiology and screening, supported by in-house Scrum masters, who were by then also certified. Over time, the dailies in particular have led to a significant increase in transparency within the team. The teams meet once or twice a week for 15 minutes to exchange news related to the project and discuss any obstacles. This allows us to recognize at a much earlier stage which projects might be delayed and take strategic steps to counteract those delays.



The retrospective has proven to be the greatest lever for internal change. It regularly provides the teams with a clear window of time to reflect on the way they work and take measures to improve it. All team members, research assistants and project managers alike, are invited to take part in the retrospective. As a rule, the Scrum master leads the event and begins with ice-breaker questions to get the team out of their daily routine, sometimes using humor, and then to direct their focus to the retrospective in question (fig.).

However, retrospectives at Fraunhofer ITMP in Hamburg are not just a tool for the team but are also used across different teams. Topics relevant to all employees in the team are addressed and all employees are heard. This has been used as an opportunity to draw up »Working Agreements« for the site summarizing how we interact with each other and how we want to behave in conflict situations. Despite the simplicity of the mechanic, formulating these agreements has an enormous team-building effect.

Remote vs. in person – a study of communication behavior

Introducing an agile way of working also means dealing with internal communication. In the course of the COVID-19 pandemic, working from home became well established and the use of tools such as MS Teams has now become routine. In view of this, many Scrum events at Fraunhofer ITMP in Hamburg are still held virtually. As part of his bachelor's thesis in business psychology, Markus Wolf investigated how communication is affected by being remote vs. in person by observing the data science team during its dailies and planning sessions in 2023. On the basis of the audio recordings, interviews and surveys, no significant difference was found between the two modalities. The agile teams at Fraunhofer ITMP in Hamburg continue to have the flexibility to choose between the two event formats.

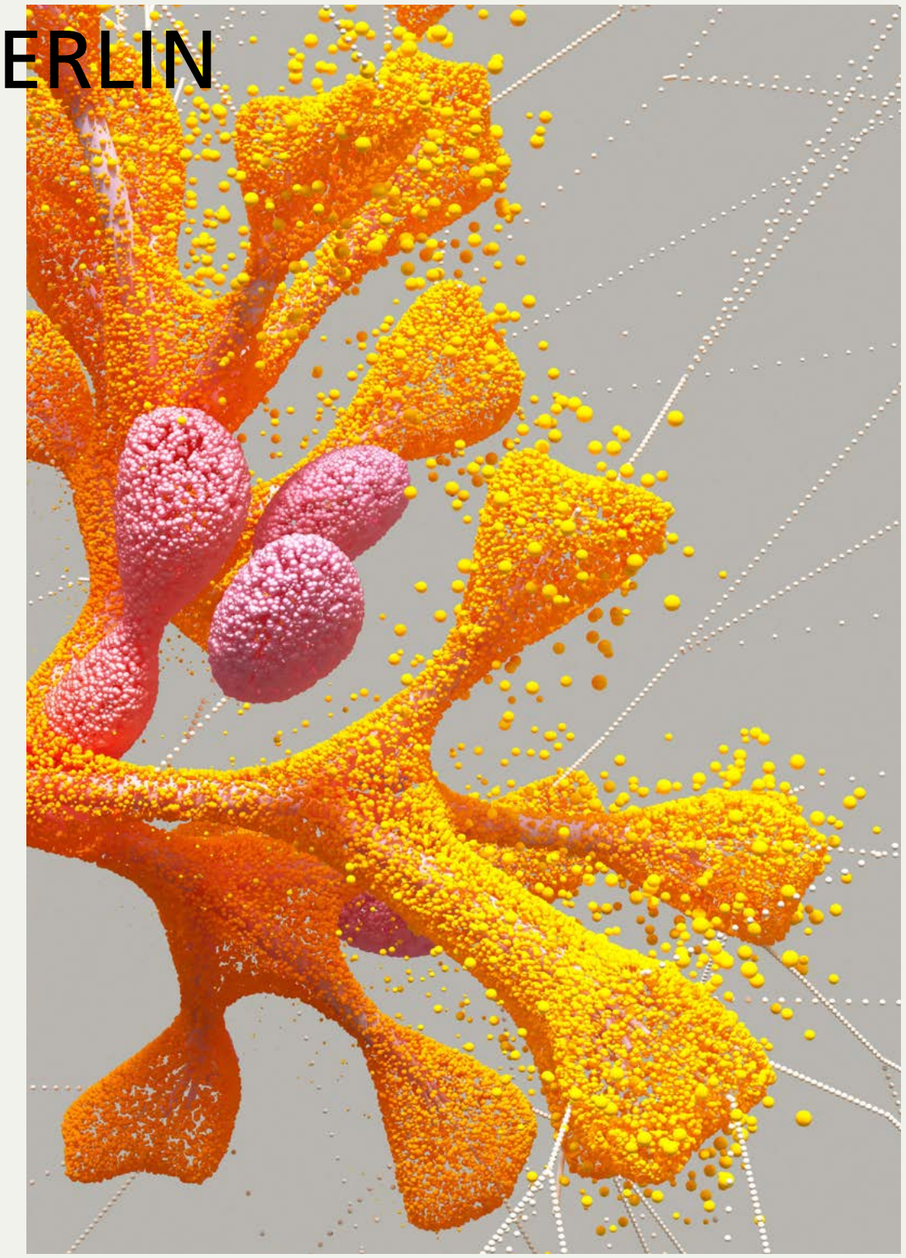
»Opportunities and challenges«

Over the two years of agile project work, the open and self-critical collaboration of the four teams has produced many benefits and continuous improvements. However, the need for time-consuming preparation, the changing of old habits and the lack of a hierarchy still present us with challenges. It is therefore only logical for us to offer our customers forms of agile project collaboration as well. We are therefore offering them a co-lab as a way to define and work on research topics together. This creates more flexibility in how projects are run. It enables the tasks to be refined or reformulated with the customer, new sprints to be jointly defined or objectives to be adapted within the scope of the research assignment. At the same time, there are also challenges to overcome: For example, the contractual structure of this type of co-lab and possible criteria and conditions for termination after sprints need to be harmonized with the specifications of the Fraunhofer-Gesellschaft.

Links
Scrum Guide **https://scrumguides.org/scrum-guide.html**
LabScrum **https://labscrum.org/**

Retrospektive Data Science Scrum Team; © Fraunhofer ITMP , Gesa Witt Scrum Team

FRAUNHOFER ITMP BERLIN



Organic structure © deepmind on unsplash

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Prof. Dr. Torsten Zuberbier
Executive head of Fraunhofer ITMP Berlin

Prof. Dr. Marcus Maurer
Head of Fraunhofer ITMP Berlin

Immunology and Allergology IA

Our field of research is the investigation, validation and testing of novel diagnostic and therapeutic approaches to allergic and immunological diseases, in particular mast cell-mediated skin diseases. We focus on identifying, characterizing and testing innovative therapeutic approaches that can stand up to preclinical testing and that we carry through to practical clinical implementation

We look particularly at the development of screening programs for new biomarkers and early diagnosis, research into previously unknown autoallergens and the creation of methods for detecting IgE autoantibodies. Our main goal is to continuously optimize treatment options and thus improve quality of life for patients.

The Berlin initiative is a flagship project, the only one of its kind in Germany, that brings together the new Fraunhofer ITMP site for Immunology and Allergology with the Charité’s Institute for Allergy Research under one roof. This close link creates the potential for optimal synergy between university research and care, and leads to the translation of research findings to clinical testing and application. Our newly established site has three departments: Drug Discovery, Preclinical Development and Clinical Research.

FROM RESEARCH

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Generating immunosuppressive T cells using bioactive substances: modulation of the body's own immune cells to suppress immune reactions.

The prevalence of chronic immune diseases, including allergies, has risen rapidly in recent decades and has now reached epidemic proportions. This rise is primarily caused by constantly changing climatic, environmental and living conditions, dietary habits and social circumstances.

Chronic immune diseases pose considerable economic challenges for the healthcare system. The available therapies largely suppress the activity of the entire immune system, which often causes undesirable side effects. Biopharmaceuticals, on the other hand, can specifically block one mechanism of action but are not suitable for all patients. They are also very costly. Even the current generation of available therapies, therefore, can only alleviate symptoms rather than addressing the causes of diseases.

UOur project is therefore pursuing an innovative approach: to convert pathogenic immune cells, in particular memory T lymphocytes, into immunosuppressive T lymphocytes using biologically active agents. To identify suitable active ingredients, we have developed a special biological assay that enables high-throughput screening.

We screened over 40,000 molecules and were able to identify 35 potential candidates, one of which was particularly active. In the presence of this molecule, it was possible to generate T lymphocytes that blocked the activity of pathogenic immune cells. We were also able to elucidate part of the molecule's intracellular mechanism of action, which

was previously unknown for the generation of suppressive cells.
These research results show that it is possible to convert pathogenic T lymphocytes into immunosuppressive ones using bioactive agents. This could support the restoration of immunological balance in chronic immune diseases. The aim of our research is to make a significant contribution to the development of targeted immunomodulatory therapies.

Measurement and analysis of the high-throughput screening assay to identify suitable active substances;
Pict. from top to bottom: Cell culture laboratory; © Freepik; no title; © Murat Idikut, Freepik;

PUBLICATION HIGHLIGHTS

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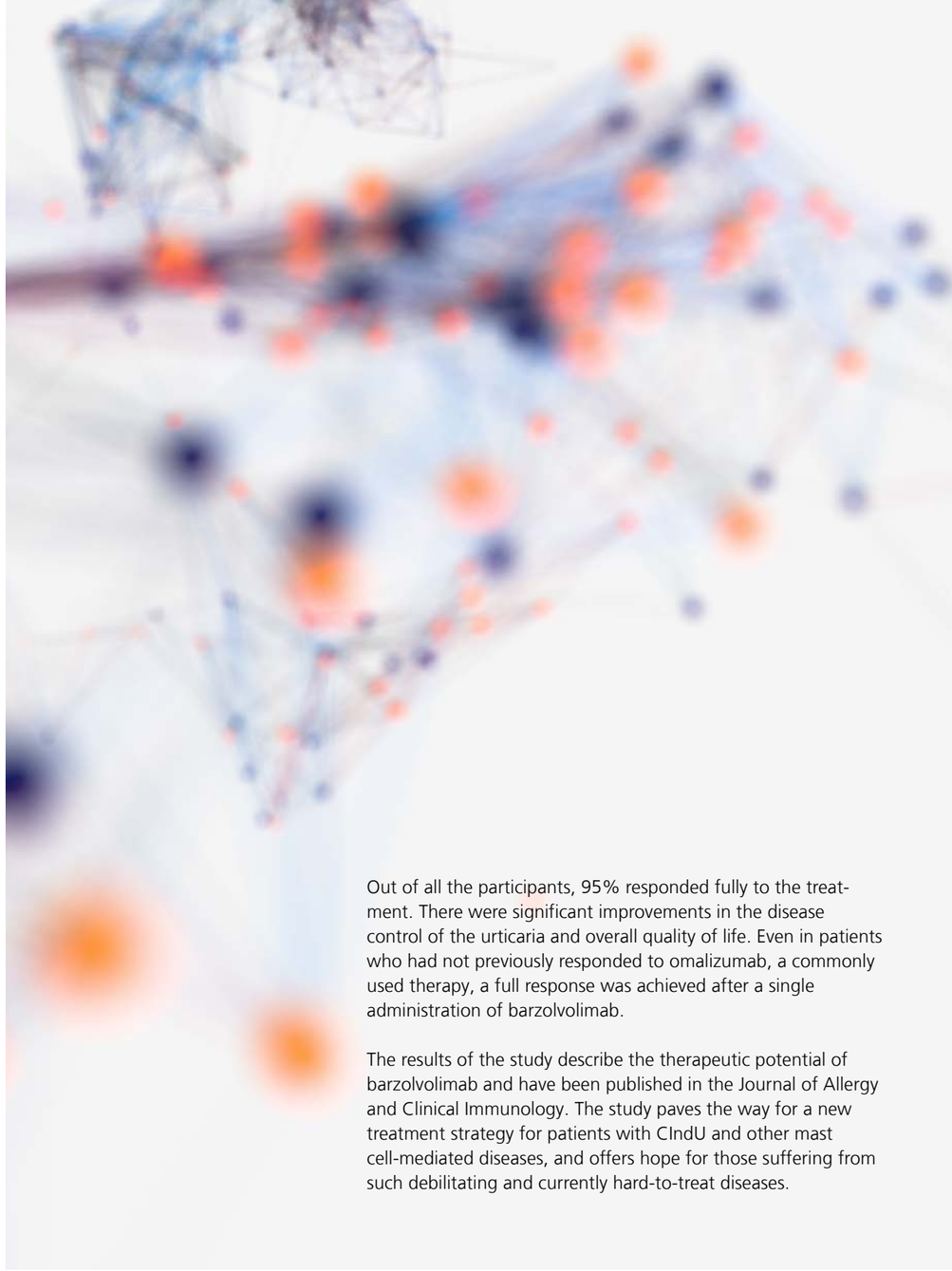
New drug is a promising therapeutic approach for patients with chronic inducible urticaria

A clinical study involving Fraunhofer ITMP in Berlin has demonstrated the efficacy of a single dose of the active ingredient barzolvolimab at significantly reducing disease activity in patients with chronic inducible urticaria. Chronic inducible urticaria (CIndU) is a subgroup of chronic urticaria characterized by urticarial symptoms that are triggered by certain stimuli. The most common forms of CIndU are cold urticaria (ColdU) and symptomatic dermographism (SD). They also cause significant impairments to the quality of life of those affected. Existing treatments, especially antihistamines, often provide inadequate relief, leaving patients and physicians with limited options.

This study investigated the efficacy of barzolvolimab as a new treatment for people with CIndU. Barzolvolimab is a monoclonal antibody that binds to and inhibits the KIT receptor on mast cells, which play a key role in the development of CIndU. A single dose of barzolvolimab was shown to cause a rapid reduction in mast cells in the skin, and thus to lead to a significant reduction in disease activity in both patients with SD and those with ColdU.

The study had 21 participants with an average age of 41 years suffering from ColdU or SD. The safety analysis showed that barzolvolimab was generally well tolerated, with only mild, reversible side effects such as changes in hair color and sense of taste. The pharmacokinetic analysis confirmed a slow degradation of the antibody, resulting in a prolonged reduction in mast cell concentrations. The inhibitory effect of barzolvolimab on mast cells correlated with improved responses to provocation tests and with reduced clinical activity.



Out of all the participants, 95% responded fully to the treatment. There were significant improvements in the disease control of the urticaria and overall quality of life. Even in patients who had not previously responded to omalizumab, a commonly used therapy, a full response was achieved after a single administration of barzolvolimab.

The results of the study describe the therapeutic potential of barzolvolimab and have been published in the Journal of Allergy and Clinical Immunology. The study paves the way for a new treatment strategy for patients with CIndU and other mast cell-mediated diseases, and offers hope for those suffering from such debilitating and currently hard-to-treat diseases.

Publikation
Terhorst-Molawi et al.
Anti-KIT antibody, barzolvolimab, reduces skin mast cells and disease activity in chronic inducible urticaria; Allergy
DOI: 10.1111/all.15585

Biological structure; © Freepik

IN FOCUS

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A new therapeutic approach to chronic spontaneous urticaria

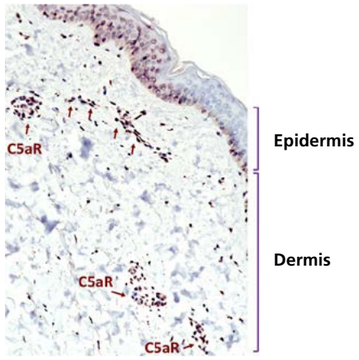
Chronic spontaneous urticaria – an increasingly common and harmful disease. Chronic spontaneous urticaria (CSU) is a chronic disease characterized by the recurrent appearance of wheals, swelling or a combination of both for at least six weeks. A key factor in the development of CSU is the activation of mast cells (MCs). MCs are an important part of the immune response. MCs are also of crucial significance in the development of chronic inflammatory skin diseases, allergies and anaphylaxis. More than a third of CSU patients do not respond adequately to the currently approved drug therapy options. As a result, there is no guarantee that symptoms can be satisfactorily controlled. Accordingly, there is significant need for new and additional treatment options.

Autoantibodies play an important role in chronic spontaneous urticaria

Although great progress has been made in understanding the pathogenesis of CSU, there are still many unanswered questions. CSU is a multifactorial disease. In some patients, two particular autoimmune mechanisms play a key part. Autoantibodies develop, lead to the activation and degranulation of skin mast cells (skin MCs) and then release histamine. This results in wheals and swelling. While the type I autoallergic endotype is caused by IgE autoantibodies, the type IIb autoimmune endotype is induced by IgG autoantibodies. The latter is characterized by a longer disease duration, higher disease activity, more frequent autoimmune comorbidities and lower therapeutic success compared to the type I autoallergic endotype.

As well as autoantibodies, other factors such as the complement system also play a decisive role in the pathogenesis of CSU. The complement system is a group of molecules that occur in an inactive form in the blood. When immune reactions occur, these molecules are activated by an enzyme cascade. The complement component C5a activates the MCs. The receptor for C5a, C5aR, is expressed on human skin MCs, and its activation leads to the degranulation of the MCs (fig. l.). The release of histamine from human skin MCs triggered by C5a happens rapidly and is completed within 15 seconds. In addition, C5a has been shown to contribute to the degranulation of skin MCs in cases of CSU. This appears to be particularly important in type IIb autoimmune CSU. Previous studies showed that the activation of human MCs by type IIb autoimmune CSU autoantibodies is enhanced by the complement system, and C5a acts as a mediator (fig. r.).

Consequently, it was hypothesized that a therapeutic approach could be achieved by inhibiting the complement system. This would block the activation of the skin MCs and induce a reduction in disease activity.



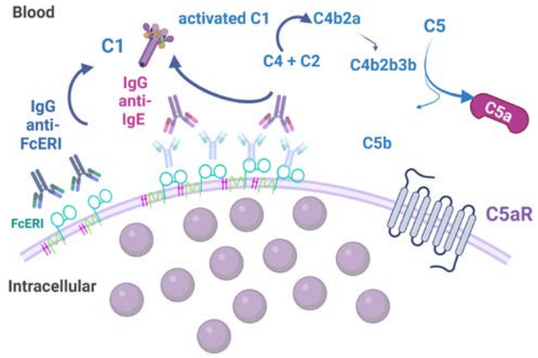


Fig. r.: Schematic representation of the activation of mast cells by the IgG anti-IgE receptor antibody. When the Fc regions of two IgG antibodies are in close proximity, the first component of the complement system (C1) is activated by the formation of an immune complex. This is followed by the activation of C4, C2, C3 and C5 with the release of C5a and the resulting increase in the release of histamine after binding to the C5a receptor (created with BioRender); © Fraunhofer ITMP, Melba Muñoz
Fig. l.: Immunohistochemical staining of human skin from patients with CSU, showing C5aR-expressing cells in both the epidermis and the dermis; © Fraunhofer ITMP | Melba Muñoz

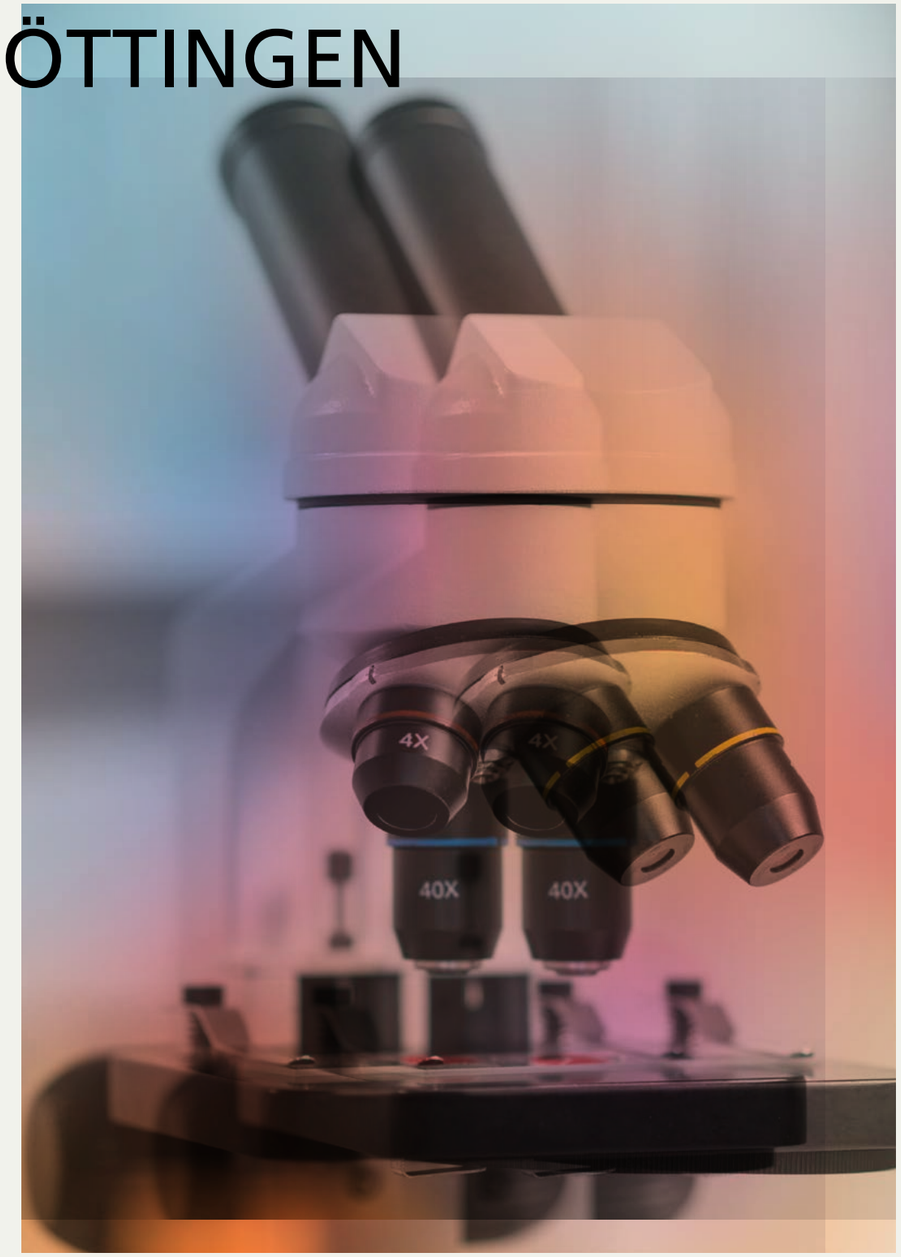
DANICSU: study to evaluate the efficacy and safety of danicopan in patients with chronic spontaneous urticaria

Factor D (FD) is a serine protease that induces the cleavage and activation of complement factors. By binding FD with the small-molecule inhibitor danicopan, complement activity can be strongly inhibited under both in vitro and in vivo conditions. In the DANICSU clinical trial, FD was defined as a therapeutic target, as inhibiting it simultaneously inhibits the terminal complement cascade. This results in reduced C5a formation.

The effect of oral danicopan was investigated in a total of 24 CSU patients, 12 with a type I endotype and 12 with a type IIb endotype, after 16 weeks of treatment. In reducing disease activity by blocking complement activation, danicopan could provide a promising new treatment for CSU.

This study will also examine the expression of complement components in the skin and identify certain biomarkers in the blood of patients. In addition to evaluating the efficacy of danicopan, the study will also investigate other mechanisms and the importance of complement activation in urticaria.

FRAUNHOFER ITMP GÖTTINGEN



Laboratory close-up; © Freepik

Prof. Dr. Stefan Jakobs
Executive head of Fraunhofer ITMP Göttingen

Prof. Dr. Martin Weber
Head of Fraunhofer ITMP Göttingen

Translational Neuroinflammation and Automated Microscopy TNM

The Translational Neuroinflammation and Automated Microscopy site in Göttingen focuses on research into neurodegenerative diseases. A core technology in this area is high-resolution light microscopy, which we can use to visualize subcellular structures at the nanoscale. A modern phase 1 unit provides us with support in translating our research into new drug candidates from basic research to clinical application.

Deciphering the molecular mechanisms of neuro-degenerative diseases

In order to identify new drug candidates and thus new therapeutic options, the Göttingen site combines innovative approaches and state-of-the-art technologies: The site brings together extensive expertise in the research and treatment of neuro-degenerative diseases and in drug research using high-resolution light microscopy. This allows us to decipher the molecular mechanisms that lead to diseases such as Alzheimer's, Parkinson's and, in particular, multiple sclerosis.

We use various animal and cell culture systems to image neurodegenerative diseases in the laboratory. For example, we generate patient-specific induced pluripotent stem cells (iPS cells), precision-engineered with CRISPR/Cas, for use in disease modeling. These cell lines also form the basis for our innovative drug screenings based on automated STED microscopy and AI-assisted analysis.

The close integration of basic research and clinical application at the Göttingen site enables the direct transfer of research results to new therapeutic approaches. The establishment of an early clinical trial unit (ECTU) in collaboration with the Göttingen Medical School means that newly identified and promising drug candidates can be tested on humans in phase 1 clinical trials. Our aim is to accelerate the development of new therapies through this translational approach.

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FROM RESEARCH

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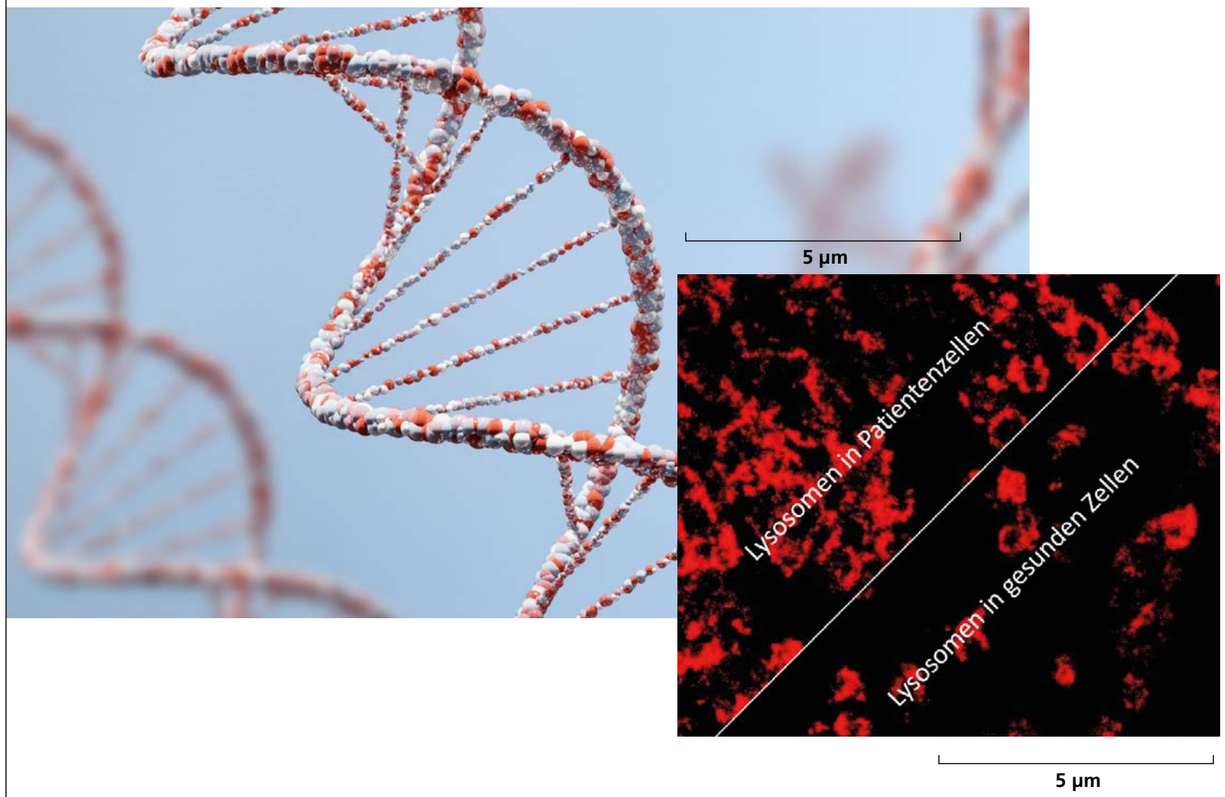
Deep Phenotyping of Lysosomal Storage Diseases

Lysosomal diseases (LDs) are a group of more than 70 genetic disorders caused by a dysfunction of lysosomal or lysosome-related proteins. Taken individually, these disorders range from rare to very rare and – with a prevalence of one per 5,000 live births – they are the most common cause of neurodegeneration in childhood. In addition, impaired lysosomal function has recently been linked to neuro-degenerative diseases in adulthood. There are already therapeutic approaches available for a small number of LDs, but most of them are still untreatable.

LDs are mono-genetically inherited diseases. Although the affected genes have different functions at the cellular level in lysosomes or lysosome-related cellular processes, loss of function leads to comparable phenotypic changes in patients and at the cellular level. One of the hallmarks of the cellular pathology of lysosomal diseases is the accumulation of undigested macromolecules, leading to lysosomal hypertrophy and reduced degradative capacity. In addition, secondary and tertiary storage effects, such as the accumulation of lipids and cholesterol,

further contribute to the cellular phenotype.
Despite a steady stream of new findings, there are still some gaps standing in the way of a comprehensive characterization of cellular lysosomal pathology and the phenotypic changes of different LDs. We hypothesized that there are similarities that provide the basis for a holistic approach to developing therapies.



Initial results

An analysis of fibroblasts taken from patients with different LDs, such as multiple sulfatase deficiency (MSD), metachromatic leukodystrophy (MLD) and Krabbe disease, revealed increased expression of lysosomal-associated membrane protein 1 (LAMP1). Using immunofluorescence (IF) staining and Western blot (WB) analysis, this was detected in disease cells, indicating lysosomal hypertrophy and an accumulation of storage material. Altered positioning of the lysosomes and accumulation around the nucleus could be seen in the LD fibroblasts. However, the phenotypic differences in primary cells from different patients with the same LD are due to genetic background, age and gender.

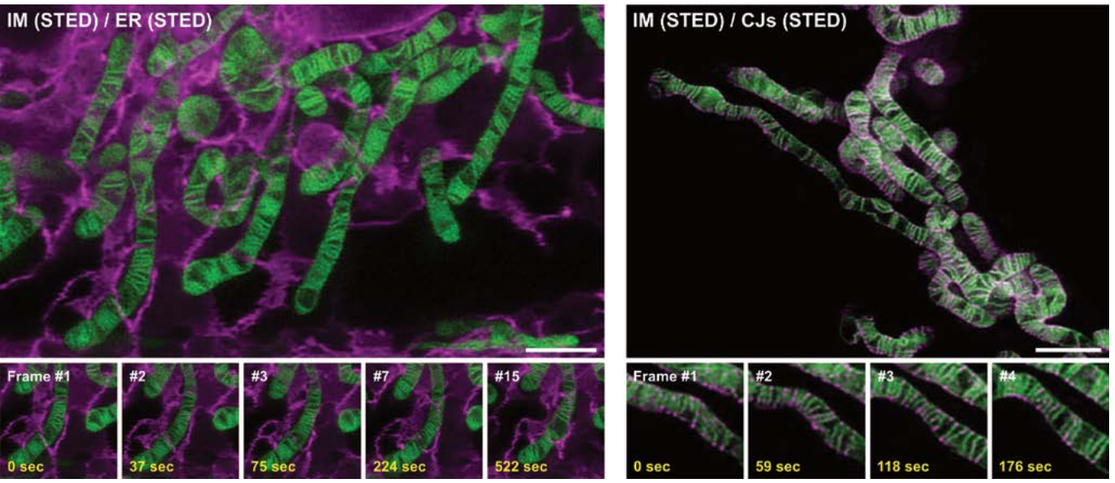
Due to other disadvantages of primary fibroblasts, suitable model cell lines with isogenic controls have been developed to carry out a comprehensive analysis and characterization of different LDs. Using CRISPR/Cas, KO model cell lines for seven LDs were created from a standard human cell line. The LD cell lines were then characterized and phenotypically compared. Immunofluorescence and STED microscopy revealed disruptions in the mitochondrial network and defective lysosome clustering. Disease models showed differences in metabolism, signal transduction and cell content with similarities and unique features. Future analyses will be carried out with the aim of identifying molecular similarities and differences between different LDs.

Outlook

The project results are expected to help identify suitable target molecules for high-throughput screening approaches with a view to providing therapies for lysosomal dysfunction in LDs and beyond.

Pirct. from top to bottom: DNA representation; © freepik
Characterizing the lysosomal phenotype in childhood neurodegenerative diseases using high-resolution microscopy;
© Fraunhofer ITMP, Lina Schmidt

PUBLICATION HIGHLIGHTS



»Vivid and Bright: Getting a Better Look at Mitochondria Thanks to New Dye PK Mito Orange«

Visually mapping dynamic cellular processes is a major challenge for super-resolution light microscopy (nanoscopy). The high light intensities required for STED nanoscopy lead to rapid bleaching of the dyes used and increased phototoxicity. As a result, there is often a very short window available for observing cell dynamics. The new fluorescent dye PK Mito Orange (PKMO), however, enables multi-color, three-dimensional images of mitochondria in living cells to be captured over a longer time frame.

The dye PKMO allows STED multicolor nanoscopy of living mitochondria together with other cellular structures in time-lapse; Pict. l.: Mitochondrial cristae (green) in combination with the endoplasmic reticulum (magenta); Pict. r.: Mitochondrial cristae (green) together with Mic60 (magenta), a protein of the inner mitochondrial membrane; Size bars in both figures: 2µm, figures modified after Liu et al. 2022;

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In recent years, the development of fluorescence microscopy, and in particular STED nanoscopy, has revolutionized the study of submitochondrial structures in living cells. Mitochondria have a complex structure due to their smooth outer membrane and heavily folded inner membrane. High-resolution imaging techniques are required to gain an understanding of their dynamics and function. In the past, electron microscopy was the only tool available for visualizing the fine structure of mitochondrial membranes. However, this can only be used on dead, fixed samples. STED nanoscopy, on the other hand, makes it possible to produce images of living cells with a resolution of up to 30 to 40 nm.

Nanoscopy of living mitochondria is challenging. One particular difficulty is that the folds of the inner membrane, known as cristae, are highly mobile and very sensitive. The phototoxicity and bleaching behavior of existing dyes limit the imaging time available. Moreover, the different properties of these dyes mean that it is rarely possible to combine them. This makes simultaneous labeling of several mitochondrial target structures impossible. The next generation of mitochondrial markers therefore needs to offer the following qualities: easy and robust labeling of the mitochondrial inner membrane, a high level of brightness and photostability and thus reduced phototoxicity, and compatibility with common STED laser wavelengths and other dyes.

Together with the working group led by Prof. Zhixing Chen from Peking University, we have developed the dye PK Mito Orange (PKMO), which has all these characteristics. With PKMO, we have been able to capture STED time-lapse images of the dynamics of the inner membrane over several minutes. We have also managed to produce 3D STED images of living mitochondria. Furthermore, PKMO can be combined with other dyes. This means, for example, that the movement of the mitochondrial inner membrane can be studied in the context of other structures (see figure).

Nanoscopy of mitochondrial function and dynamics makes it possible to unravel molecular mechanisms associated with diseases such as Alzheimer's, Parkinson's and cancer. The development and improvement of new mitochondrial markers and nanoscopic imaging techniques will further advance mitochondrial research in the coming years. This research offers considerable potential, as mitochondria play a key role in cellular metabolism and therefore in health too.

Publication
Liu et al.
Multi-color live-cell STED nanoscopy of mitochondria with a gentle inner membrane stain; PNAS
DOI: 10.1073/pnas.2215799119

FRAUNHOFER ITMP FRANKFURT

Test tube close-up; © Freepik

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Prof. Dr. Dr. Gerd Geißlinger
Executive director
Fraunhofer ITMP Frankfurt am Main

Prof Dr. Frank Behrens
Deputy institute director
Fraunhofer ITMP Frankfurt am Main

Fraunhofer Institute for Translational Medicine and Pharmacology ITMP Frankfurt am Main

The Fraunhofer Institute for Translational Medicine and Pharmacology (ITMP), which has its main site in Frankfurt am Main, was founded from the Translational Medicine institute branch of Fraunhofer IME in January 2021. Since then, Fraunhofer ITMP has become the Fraunhofer-Gesellschaft's leading institute for health research, thanks to its focus on researching and developing innovative ways to detect, diagnose and treat immune diseases at an early stage.

Our expertise lies in researching therapeutic and diagnostic innovations for diseases that are currently untreatable or that cannot be adequately treated. For this purpose, we use state-of-the-art technologies and multiomics methods for biomarker discovery. We develop predictive disease models for the in vitro, ex vivo and in vivo characterization of drugs as well as innovative, optimized dosage forms.

Our expertise in pharmaceutical chemistry and technology enables us to optimize new drugs and dosage forms for those drugs. In the field of clinical research, our core expertise lies in the planning (study design) and quality-assured execution of clinical trials, as well as in the early clinical development of drug candidates in our in-house phase I station. Our own biomaterial bank enables basic scientific analysis for further characterization of diseases in our indication focus areas of immune-mediated diseases and pain.

FROM RESEARCH

Treating Chemotherapy-Induced Neuropathic Pain with a Test Substance

Neuropathy and neuropathic pain are severe and unfortunately common side effects of chemotherapy for which there is currently no effective treatment. A consortium made up of Fraunhofer ITMP, the German Consortium for Translational Cancer Research (DKTK) Helmholtz Health Hub and Goethe University Frankfurt conducted a clinical phase IIa study led by Fraunhofer ITMP as part of a proof-of-concept initiative. The study was carried out exclusively on female test subjects and involved testing a novel approach to chemotherapy-induced neuropathic pain on patients undergoing chemotherapy.

Pict. l.: Neural synaptic pathway; © Freepik
Pict. r.: medical research lab; © Freepik

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Paclitaxel-induced neuropathic pain in tumor patients

Paclitaxel is an effective first-line therapeutic agent used in standard treatment for ovarian and breast cancer. However, patients being treated with paclitaxel for tumors are at a high risk of developing paclitaxel-induced peripheral neuropathic pain (PIPNP). PIPNP is a serious side effect that increases dose and treatment constraints and thus reduces the chances of continued therapy and survival. It can persist for life, significantly impair quality of life and give rise to increased healthcare costs. As things currently stand, there are no sufficiently effective or approved pharmacological treatments available.

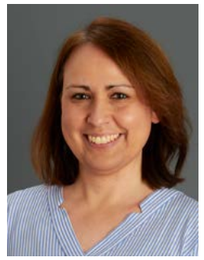
The test substance used in the study was identified preclinically in two models as a potential candidate for preventing PIPNP. According to the identified mechanism, the test substance can significantly reduce the synthesis and thus the plasma concentrations of a specific pain-promoting signaling substance. Mechanical and thermal hypersensitivity were substantially reduced in the mouse model of paclitaxel-induced neuropathy.

Clinical phase IIa study involving patients treated with paclitaxel

In order to clinically validate these observations and develop the test substance as a potent drug candidate for PIPNP prevention, Fraunhofer ITMP – together with the German Consortium for Translational Cancer Research (DKTK) and Goethe University Frankfurt – conducted a clinical phase IIa study involving patients who need paclitaxel chemotherapy. As part of this study, the efficacy of the test substance for treating PIPNP was investigated. Working closely with the Institute of Clinical Pharmacology at Goethe University Frankfurt, the researchers focused particularly on identifying biomarkers that could be useful for a precision medicine approach.

The initial results following treatment with the test substance look promising. With regard to the reduction of pain-promoting signaling substances in the patients' plasma, they also developed significantly less neuropathic pain after paclitaxel therapy. Contrary to the expectations of the literature data regarding the study results, the test substance is to be further developed in the future.

PUBLICATION HIGHLIGHTS



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Proof of concept for the prevention of fetal and neonatal alloimmune thrombocytopenia (FNAIT)

Fetal and neonatal alloimmune thrombocytopenia (FNAIT) is a rare, potentially life-threatening blood clotting disorder in fetuses and newborns. Early therapy with the immunoglobulin RLYB211 could be used to prevent FNAIT in the future. A long-standing collaboration with the biopharmaceutical company Rallybio has now resulted in the successful completion of a phase 1/2 proof-of-concept study of the drug candidate.

In the randomized, single-blind, placebo-controlled, monocentric phase 1/2 proof-of-concept study, the safety and efficacy of a single dose of i.v. RLYB211 for eliminating HPA-1a-positive platelets was investigated at Fraunhofer ITMP in Frankfurt am Main. The dose was previously administered to HPA-1a-negative and HLA-A2-negative healthy male participants.

The safety and efficacy data presented in the article below are promising as a proof of concept. They are based on a data cut-off in January 2022. On the basis of these data, it can be confirmed that administering 1000 IU of anti-HPA-1a to HPA-1a-negative individuals results in the rapid and complete elimination of HPA-1ab thrombocytes. This therapeutic effect lasted for at least 7 days after the infusion of anti-HPA-1a. After the administration of RLYB211, rapid and complete elimination of thrombocytes was achieved in all participants.

These results regarding the prophylactic administration of RLYB211 for rapid elimination of HPA-1a-mismatched platelets give hope for the future prevention of HPA-1a alloimmunization and the occurrence of FNAIT. Therefore, it is important to identify women who are at high risk for HPA-1a immunization early during pregnancy.

Close up scientist looking glas slide; vivid blurred colorful background; © Freepik

The aim is to determine whether alloimmunization is prevented in the target population with the same RLYB211 dose as in the study. To this end, a future study is planned to investigate the prevention of alloimmunization as a primary endpoint in pregnant women who are at high risk.

The necessary tests are already available today; prenatal screening for the development of HPA-1a-related FNAIT could be done as part of prenatal healthcare. For translation to standard healthcare, it is absolutely necessary for screening and prophylaxis to be developed in a safe and cost-effective manner. Screening would have the potential to significantly reduce the incidence of FNAIT, similar to the way prenatal screening and anti-RhD therapies reduce the incidence of HDFN.

Publication

Geisen et al.
An HPA-1a-positive platelet-depleting agent for prevention of fetal and neonatal alloimmune thrombocytopenia: a randomized, single-blind, placebo-controlled, single-center, phase 1/2 proof-of-concept study; Journal of Thrombosis and Haemostasis
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Imaging Mass Spectrometry: Molecular Tissue Mapping for Research into Immune-Mediated Diseases

Imaging mass spectrometry is a highly promising research field for high spatial resolution analysis and localization of metabolites, lipids and drugs in tissue samples. Using the latest mass spectrometric methods and computer-aided analysis, it makes it possible to carry out detailed molecular tissue mapping and provides valuable findings for preclinical and clinical research. For research into immune-mediated diseases in particular, it offers great potential for improving our understanding of complex biological processes and the development and progression of diseases, as well as enabling advances in diagnosis, treatment and personalized medicine.

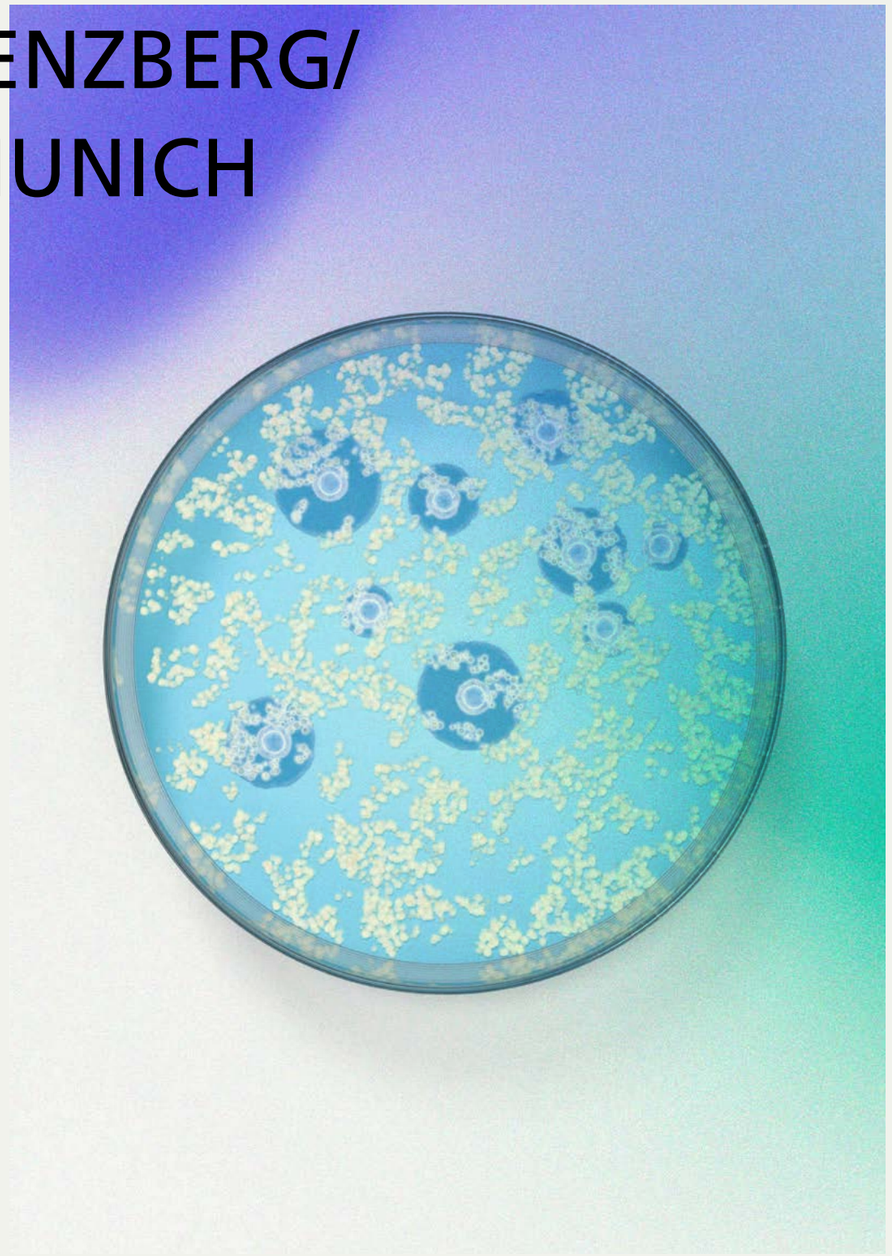
The Biomedical Analytics working group at the Clinical Research department at Fraunhofer ITMP, based in Frankfurt am Main, specializes in the use of mass spectrometric methods for analyzing endogenous and exogenous analytes. It focuses particularly on analyzing lipids and lipid mediators in preclinical and clinical research projects. Various mass spectrometers coupled to liquid or gas chromatography are available for this purpose, and these can be used to specifically analyze low-concentration lipid mediators and carry out comprehensive lipid screenings. Until now, the focus in clinical research projects has primarily been on analyzing blood and urine samples to detect changes that affect the entire organism and identify potential biomarkers. It is possible to analyze tissue samples too, but this requires mechanically disrupting the tissue to make it accessible for sample preparation and the actual mass spectrometric analysis. During this step, however, all information about the spatial distribution of lipids in the tissue is lost. Yet this information can be crucial for gaining a better understanding of disease-relevant processes in the body.

Thanks to technical advances in the field of mass spectrometry and bioinformatic data analysis, we have seen remarkable progress in the practical applications of imaging mass spectrometry in both preclinical and clinical research. For example, rare and small biopsies – such as skin, intestinal or synovial tissue biopsies from patients with immune-mediated diseases – can be analyzed using high spatial resolution right down to the low micrometer range and relevant lipids can be identified. This method makes it possible to obtain detailed molecular insights and plays a valuable role in generating a more comprehensive understanding of tissue- and cell-specific functions. This kind of imaging can also support research into more complex biological processes. For example, some lipids are thought to be released locally to trigger biological processes in neighboring cells and tissue structures. However, this paracrine function has rarely been specifically investigated and confirmed. Imaging mass spectrometry also provides deeper insights into the tissue- and cell-specific functions of lipids. These findings are crucial for the evaluation and potential application of lipids as biomarkers.

Combining this with immunohistochemistry imaging technologies such as multi-epitope-ligand cartography (MELC) enables the complex interplay between immune cells and lipids to be investigated. Among other things, this makes it possible to break down the spatial distribution of inflammatory processes. This is still a largely unexplored area and, in addition to facilitating a better understanding, it could also lead to new treatment options for inflammatory diseases such as psoriatic arthritis.

Pict.: Imaging mass spectrometry of a tissue section: A very fine charged spray is applied to individual sample pixels. The charged molecules released from the sample in this way are fed into the mass spectrometer and analyzed (Desorptions-Elektrospray-Ionisation, DESI). © Fraunhofer ITMP

FRAUNHOFER ITMP PENZBERG/ MUNICH



Germs petri dish rendering; © Freepik

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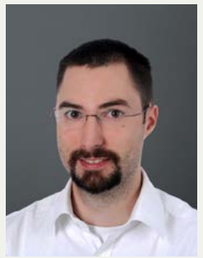

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Immunology, Infection and Pandemic Research IIP

The Immunology, Infection and Pandemic Research IIP branch lab of Fraunhofer ITMP in Penzberg/Munich researches the interactions between infectious agents and the immune system with the aim of improving the prevention, screening and early detection of future pandemics and optimizing the treatment of infectious diseases. In cooperation with the Faculty of Medicine at Ludwig-Maximilians-Universität München, the LMU University Hospital Munich and Roche Diagnostics GmbH a unique nationwide flagship project has been created that covers all fields of applied infection and immunology research.

The Fraunhofer ITMP site IIP in Penzberg/Munich monitors the international incidence of infection through epidemiological surveillance to prepare for future pandemics. After selecting potential pandemic-causing pathogens, it develops model systems that can be presumed to be close to future outbreak pathogens, as we are unlikely to know the exact species/variant of a pathogen that will trigger the next pandemic. A modular system can be used to create sequencing data, antigens and antibodies for these prototype strains, and suitable rapid test systems can be developed and also produced on a limited scale. Through close cooperation with major manufacturers they can then be produced on a large commercial scale.

Multi-parameter diagnostic platforms are being established to diagnose infectious diseases. Through these platforms multiple viral and bacterial pathogens can be detected simultaneously and the status of the immune system or organ functions can be determined. Two different aspects play an important role in the treatment of infectious diseases: the combating of the pathogen itself and the body's immune response to the pathogen. In the case of many diseases, an excessive immune response causes more damage than the pathogen itself. A precise understanding of the mechanisms and dysregulations of the immune system can help to identify at an early stage when to support or slow down the immune system. Companion and complementary diagnostics approaches can be used to identify cellular or molecular markers to detect infections at an early stage and identify dysregulations of the immune system. This enables the optimization of therapy prognoses and the improvement of therapy success in combination with optimally suitable drugs for infectious and immune-mediated diseases.

Research is also being conducted into pathogen-independent parameters that target common pathways of inflammation in infections, which can be used to predict the course or severity of infectious diseases. Combining the complementary expertise of the various partners can optimize the early detection, monitoring and follow-up of infectious diseases and accelerate the development and, in some cases, the production of suitable diagnostics, vaccines and therapeutics to combat the pathogen.

FROM RESEARCH

»Beyond sputum« – New Biomarkers for Diagnosing TB

Tuberculosis (TB) is one of the most common infectious diseases in the world. It can be fatal if it goes untreated or is not treated in time. Scientists at the Fraunhofer ITMP site in Penzberg/Munich have evaluated a test procedure that can be used to quickly and easily detect tuberculosis in children using a blood sample taken from the fingertip.

Tubes prepared lab; © Freepik

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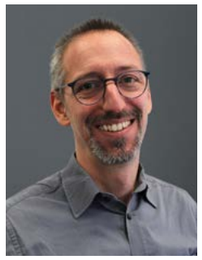

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Accounting for around 240,000 deaths worldwide each year, TB is one of the ten most common causes of death in children under the age of five. This is mainly due to the difficulty of diagnosing this disease in children, which is not done correctly or in time in around two thirds of cases: In standard tuberculosis tests microbiological evidence of the pathogen Mycobacterium tuberculosis complex is found in sputum, the secretion from the lower airways. However, these sputum samples are difficult to obtain from children and immunocompromised persons. The final evaluation of the bacterial cultures from the sputum test can take up to eight weeks and requires a complex infrastructure that is not available in all countries where children are currently or will be tested for TB. Unspecific physical symptoms and a low bacterial load also make diagnosing tuberculosis in children more difficult.

As part of an international research consortium linked to the RaPaed-TB tuberculosis study led by the LMU University Hospital Munich, a new diagnostic tool was tested in five countries that can significantly improve the diagnosis of tuberculosis in children using a blood sample from the fingertip. The results of this large-scale study were published in the scientific journal The Lancet Infectious Diseases 2023 by Dr. Laura Olbrich and Dr. Norbert Heinrich, who also work at the Fraunhofer ITMP site IIP in Penzberg/Munich.

The innovative, semi-automated test method can be used to analyze the activity of three specific genes in capillary blood and create a transcriptional signature of these genes, which provides a means for diagnosing TB quickly and easily. Instead of sputum samples, a blood sample from a fingertip is all that is needed to carry out the test, and the test result is available after just over an hour. The use of this procedure was tested in cooperation with the LMU University Hospital Munich’s partners in South Africa, Malawi, Tanzania, Mozambique and India, involving 975 children under the age of 15 who were suspected of having tuberculosis. Sputum tests were also carried out on these children for reference purposes. Compared to the sputum tests, the new test procedure was able to detect TB in almost 60 percent of the children involved in the study, with a 90 percent specificity. This means that the new tool achieves comparable or better results than other tests based on biomarkers.

These promising results in terms of diagnosing tuberculosis in children raise hopes that the process of diagnosing this dise se in adults can also be improved using biomarker tests. The strategic cooperation between Roche Diagnostics GmbH, LMU University Hospital Munich and the Fraunhofer ITMP site in Penzberg/Munich was expanded to include a new collaboration project for this purpose at the end of 2023: As part of the DisTB (Discovery of novel biomarkers for the diagnosis of TB disease) study research is being carried out into new, specific biomarkers in blood, urine or saliva samples that can be used to detect tuberculosis in adults. In addition, there are plans to set up a sample database which can be used to develop and verify further diagnostic markers.

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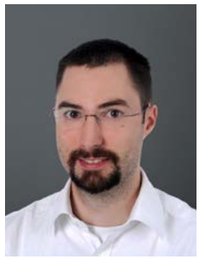

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PaPräKa Specialist Conference – Removing Roadblocks in Drug Development

We can say for certain that further pandemics will strike in the future. The Pandemic Prevention Campaigns (PandemiePräventionsKampagnen – PaPräKa) specialist conference identified the weaknesses in the fight against the SARS-CoV-2 pandemic and, based on this, the potential for improvement at organizational and scientific level.

On September 14, 2023 the Pandemic Prevention Campaigns conference (PaPräKa) took place in Göttingen, focusing on the theme of Removing roadblocks in drug development: accelerating processes from the preclinical stage to IP transfer. The event was spearheaded by Metropolregion Hannover Braunschweig Göttingen Wolfsburg GmbH, TU Braunschweig and Innovationszentrum Niedersachsen.

Around 50 experts – including Prof. Michael Hoelscher, Head of Fraunhofer ITMP site Immunology, Infection and Pandemic Research in Penzberg/Munich - exchanged views on the challenges in researching and developing drugs for combating new pathogens in the SARS-CoV-2 pandemic and discussed which improvements need to be made in non-pandemic times to accelerate drug development during future pandemics. To this end, the Response Against Pandemic Infectious Diseases (RAPID) action plan for Lower Saxony produced by Innovationszentrum Niedersachsen was presented at the PaPräKa conference. In addition to highlighting some of the non-scientific factors that

slowed down drug development during the SARS-CoV-2 pandemic, this plan also outlines possible solutions for speeding up the process of developing drugs to combat new pathogens in future pandemics:

- The approval of research funds could be accelerated through emergency funding programs agreed in advance and better structured approval procedures, especially for applications involving ethics committees or for animal testing applications.

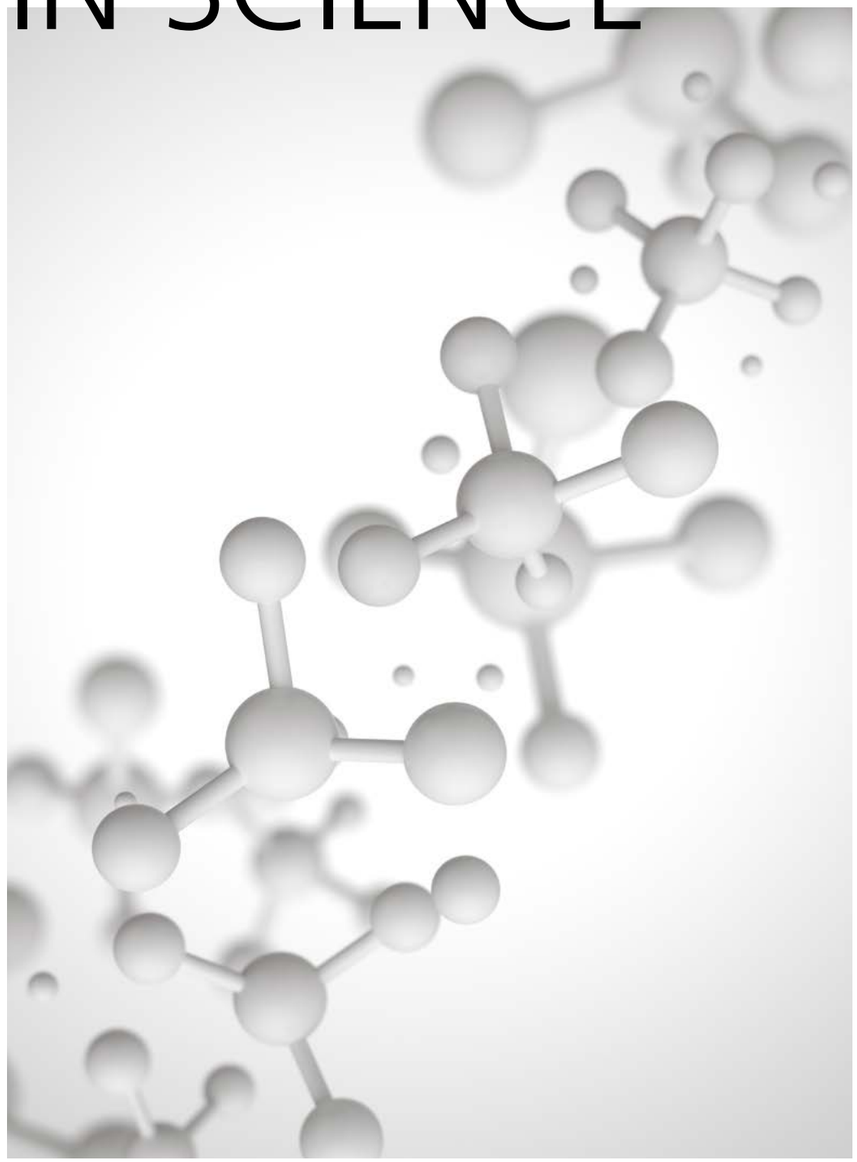
- Developing a new drug is a complex process involving various stakeholders from completely different institutions. By establishing a preparatory coordination structure, the aim is to ensure smooth and legally compliant cooperation between stakeholders from science, research and industry. This can help avoid any duplication of work and make the most effective use of the stakeholders' expert knowledge. This coordinated approach is designed to be put into practice in the period between pandemics.

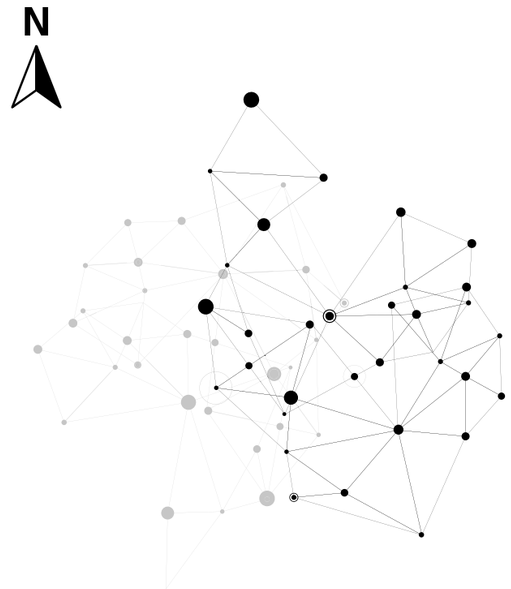
Future pandemic pathogens are very likely to be of zoonotic origin, so maintaining a close dialog between human and veterinary scientists and research institutions is particularly important.

Researchers at the Fraunhofer ITMP site Immunology, Infection and Pandemic Research in Penzberg/Munich are currently working on setting up technology platforms that can be used to develop diagnostic and therapeutic approaches for combating future pandemic pathogens.

Petri dish; © Freepik

WOMEN IN SCIENCE





The »Women in Science« interview series is aimed at women involved in research at Fraunhofer ITMP. In these sessions, we pose five questions to each of five female interviewees from five locations, report on projects in various areas of health research from different perspectives and discuss what motivates these women.

Pict. l.: Molecule atom structure, © Freepik
Pict. r. from top to bottom: Women working chemical project, petri dish; © Freepik

Dr. Johanna Huchting
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Dr. Johanna Huchting works at Fraunhofer ITMP's Discovery Research ScreeningPort site in Hamburg. Together with her colleagues, she is developing an integrative »molecular degrader discovery« platform as part of the PROXIDRUGS future cluster. Dr. Huchting has a doctorate in organic synthesis chemistry. Prior to joining Fraunhofer ITMP, she led research projects at the University of Hamburg and KU Leuven relating to drugs for combating RNA viral infections.

Who or what made you want to work in health research?

I have always been fascinated by how the smallest processes in the body work. My first introduction to the »world of molecules« was in science lessons at school. This gave me an initial basic understanding of the fact that these processes are determined by the (inter)action of molecules. The idea of using tiny molecules to intervene in these processes as a means of fighting pathogens or alleviating symptoms made a strong impression on me and was really spurred me on start studying chemistry. Even ten years after completing my doctorate, I am still just as fascinated by this. It is an important part of what keeps me motivated on a daily basis.

To what extent do you think the dynamics and relevance of health research have changed in recent years? And how has the role of women changed?

In health research in Germany, training and non-industrial applied research are in a state of flux. Academic health research was previously seen as purely knowledge-oriented and clearly separate from translation into practice. These days, it is venturing further toward the application side. Within the context of public-private partnerships and open innovation, it has a direct impact on industrial research and development, so we are seeing a break away from existing innovation structures. This offers health research at Fraunhofer ITMP a wide range of opportunities to grow, expand its sphere of activity and help steer both medical and technological progress in the long term. At the same time, health research brings together a variety of disciplines, some of which are still new, and structural changes are taking place, for example in the way degree programs are organized.
I think that these aspects are helping to generate a wealth of ideas. This is because all kinds of different people come together in health research, which encourages an interdisciplinary approach and mutual exchange. Women have the opportunity here to form networks, to help shape the change in team structures and to be and become role models in leadership positions.

What exactly are you currently working on at Fraunhofer ITMP?

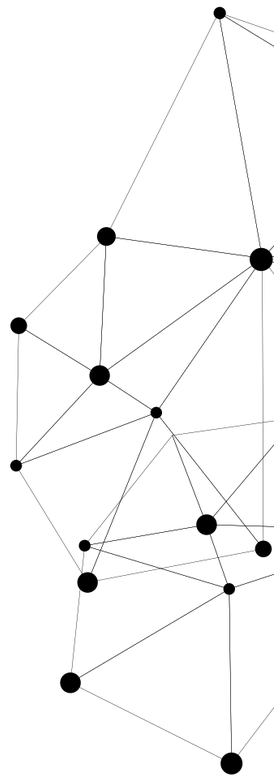
At the Discovery Research ScreeningPort at Fraunhofer ITMP in Hamburg, biologists, chemists, chemo- and bioinformaticians and data scientists work closely together. Our research focuses on early preclinical drug discovery. For example, we develop biological test systems that we can use to determine the efficacy of a large number of chemical molecules in relation to a specific disease factor. This enables us to identify starting points for developing new drugs.
My work on projects in the PROXIDRUGS future cluster is currently aimed at establishing a molecular degrader discovery platform. This draws on the various areas of expertise available to us in Hamburg by combining elements of biological assay development and high-throughput screening with computer models and prediction tools.

What other goals are on your research agenda and to what extent does your work interact with your private life, with your family and friends?

Proximity-inducing drugs (proxidrugs), which include molecular degraders, are a class of novel drugs. They are novel because they have a completely different mechanism of action than conventional inhibitors. In addition to proxidrugs, there are other approaches in the research world aimed at achieving novel mechanisms of action with small molecules. The purpose of this is to find (better) ways to treat diseases for which there have so far been no active substances available, or no adequate ones.
Integrating proxidrugs into our research is enabling me to gain valuable experience that I would like to use in the future to incorporate other novel classes of active substances into our portfolio.
I also find it exciting to share ideas with friends from my student days who are now looking at completely different aspects of health research, such as the regulatory perspective or the viewpoint of patent attorneys.

What advice would you like to give to women who want to start a career in health research?

Pursue your interests. Find people who recognize your potential and are not afraid to think outside the box. Above all, ask questions and join in discussions.



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Melba Muñoz took part in the Allergy and Clinical Immunology Fellowship Program at Johns Hopkins University in the USA from 2003 to 2005. She completed a Master of Science degree in cell biology and molecular genetics at the University of Maryland (2005–2007). She then completed her doctorate at the Max Planck Institute for Infection Biology in 2011. Before starting her current job at Fraunhofer ITMP in Berlin, she was a postdoc at the German Rheumatism Research Center in Berlin until 2016.

Who or what made you want to work in health research?

I was lucky enough to meet Dr. Luis Caraballo from the University of Cartagena in Colombia when I started my medical studies. With his enthusiasm for science, he inspired me to start my first projects on genetic susceptibility to asthma among people in the Caribbean. During my studies at the Institute for Immunological Research at the University of Cartagena, I discovered my passion for immunology. Back in Colombia, I never imagined that a scientific career would be an option for me. Alongside my medical studies, I was able to broaden my horizons through additional immunological research studies in the laboratory. This enabled me to continue my research at the Johns Hopkins University Asthma & Allergy Center in Baltimore in the USA. I then completed my specialist training in dermatology and allergology.

To what extent do you think the dynamics and relevance of health research have changed in recent years? And how has the role of women changed?

In immunological research, we are currently seeing a revolution in the implementation of years of basic research. Many diseases are being cured and the quality of life of those affected is being significantly improved. Some of these milestones in health research have extended the lives of seriously ill cancer patients by more than five years. It is now possible to alter the progression of some chronic inflammatory diseases and even achieve complete remission in some cases.

I am also inspired by the fact that more and more women have been awarded the Nobel Prize in scientific fields over the last three years. Although there are many factors that still prevent women from being recognized professionally as equals, a lot of changes are currently happening. Thanks to gender equality concepts, initiatives and measures to support the advancement of women, we can make better progress in ensuring equality for women.

What exactly are you currently working on at Fraunhofer ITMP?

I am currently looking into pathogenetic mechanisms in order to understand the extent to which they cause chronic urticaria. Chronic spontaneous urticaria (CSU) is one of the most common skin diseases. Those affected by it suffer from itchy wheals, swelling or even both on an almost a daily basis, which severely impairs their quality of life.
Mast cells play a key role in triggering CSU symptoms. We are currently investigating certain factors that cause the activation of mast cells in CSU and contribute to the development of symptoms. We are examining the extent to which blocking the complement system reduces disease activity. At the moment we are working on an upcoming clinical trial to investigate the efficacy of a complement inhibitor in CSU patients.

What other goals are on your research agenda and to what extent does your work interact with your private life, with your family and friends?

Another important part of my research is aimed at understanding the development of symptomatic dermographism (SD), which most commonly starts with urticaria. SD is the recurrent appearance of itchy and streaky wheals that develop after exposure to shear forces on the skin such as stroking, scratching or rubbing. I am trying to better characterize patients who suffer from this disease in terms of epidemiology, laboratory tests, therapy and prognosis. This includes developing better tools to assess disease activity, quality of life and disease control.
The support of my family, my husband and my friends is crucial to me. Their support and good organizational skills have enabled me to achieve my professional goals.

What advice would you like to give to women who want to start a career in health research?

I would like to encourage women to take advantage of career opportunities in health research. It takes courage and effort to be curious, to discover, to understand and to look for solutions. As researchers, we make an important contribution to improving health in society. Even if hypotheses can't always be conclusively proven or experiments fail, it is challenges like these that bring you so much joy when you finally find a successful solution. There are many women who are not afraid to work hard in order to pursue what inspires them. That's why I would like to see more women like this in research.

Pict.: © Fraunhofer ITMP; Melba Muñoz

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Sarah Schweighofer studied molecular biology at the University of Vienna and completed her master's thesis at Yale, where she discovered the fascinating world of high-resolution microscopy. In her subsequent doctoral studies at the Max Planck Institute for Multidisciplinary Sciences, she investigated pro-apoptotic proteins and looked into how their interactions orchestrate the complex process of cell death. She also further expanded her knowledge of high-resolution microscopy in the process.

Who or what made you want to work in health research?

My biology teacher was no longer able to answer my probing questions about genetics and molecular biology and gave up trying, telling me: »If it interests you that much, you'll just have to study it yourself.« Attending a summer school called »Kommissar DNA« further strengthened my resolve to find out more about molecular biology and then enroll on a study program.

To what extent do you think the dynamics and relevance of health research have changed in recent years? And how has the role of women changed?

Science is currently undergoing a transformation. We are moving away from descriptive research and further toward a scientific approach that uses very large data sets to find answers to questions that were considered unsolvable not so long ago. Processing large volumes of data is no longer possible without the help of computers and specialized methods such as machine learning and artificial intelligence. This is why computer science is playing an increasingly important role in biology and health research.
Now I would like to see more women getting enthusiastic about the technology used in health research. While the proportion of female researchers in life sciences is growing, positions in bioinformatics or biophysics are still predominantly held by men. However, the use of computers and software programs is an integral part of life sciences now, although it is something that is often overlooked in study programs. For young female researchers in particular, who tend to have less contact with technology and programs in their private lives, a greater emphasis on these topics while they are still at the studying stage would make them less reluctant to engage with them in future.

What exactly are you currently working on at Fraunhofer ITMP?

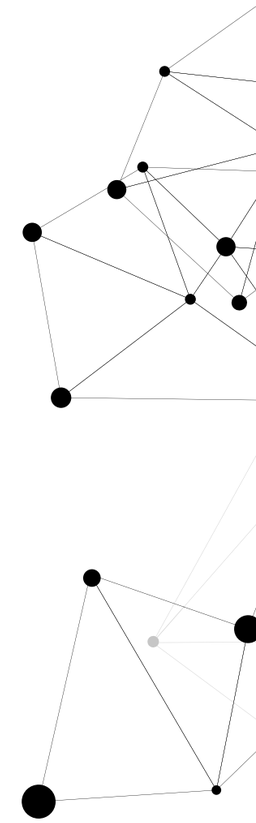
At Fraunhofer ITMP's Translational Neuroinflammation and Automated Microscopy TNM site in Göttingen, we are working on establishing high-resolution STED microscopy as an advanced screening method for carrying out detailed characterizations of new pharmacologically active substances. This allows us to visualize the effects of active compounds on patient cells at the subcellular level. It enables us to detect changes that are almost impossible to spot with other methods. I work at the interface between the biology laboratory and image data analysis. Automated algorithms are used to extract information that is invisible to the human eye.

What other goals are on your research agenda and to what extent does your work interact with your private life, with your family and friends?

I would like my work to help generate a more precise understanding of cellular mechanisms and thus improve human health. My fascination and curiosity naturally play a big part in my everyday life too. I never stop being curious. Many of my friends work in science like me. I find it fascinating to gain an insight into their research topics and hear their thoughts during our evenings out together.
In the professional research environment, we often have to be creative in finding solutions to problems. This creativity is also reflected in my private life – in my love of Lindy Hop dancing.

What advice would you like to give to women who want to start a career in health research?

Get out of your comfort zone and be brave! Have the courage to put forward your unique perspective and offer different approaches and solutions in a largely male-dominated environment. Stay curious, and embrace technology, programs and machines with enthusiasm. Also, as researchers, we sometimes approach problems too rationally and tend to »think them to death.« Sometimes you need to trust your instincts too.



Pict.: © MPI-NAT; Irene Boettcher-Gajewski

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Maria Vehreschild is a specialist in internal medicine, hematology, oncology and infectiology and conducts research into utilizing microorganisms for treating infections and other immune-mediated diseases.

Who or what made you want to work in health research?

It has always been important to me to do something charitable with my work. When I was choosing my career, it took me a long time to decide whether I should get involved in politics, in an NGO or in the healthcare sector. In the end, I realized I was more interested in helping people directly, so I decided to study medicine. Research was important to me right from the start. The longer I work with patients, the more I feel justified in my decision to take on the dual role of clinician and researcher. This role allows me to initiate and implement research that is very precisely tailored to patients' needs.

To what extent do you think the dynamics and relevance of health research have changed in recent years? And how has the role of women changed?

The coronavirus pandemic clearly highlighted the important role that health research, and infection research in particular, plays in our society. Yet funding for this area of science is becoming increasingly scarce due to crises such as wars and climate change. This presents a dilemma.
Today, women are increasingly represented in scientific professions overall. In Germany, however, they remain the exception to the rule in leadership positions. As a country, we have not yet managed to create the conditions that would enable women to take up management roles on a regular basis. The current shortage of skilled workers is particularly unfavorable factor in this respect. How are women supposed to develop freely academically if there are not enough childcare places for their children and when they are still doing most of the work in terms of looking after and bringing up children in this country? Fortunately, unlike ten years ago, there are already a number of programs in place that support women in situations like these.
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What exactly are you currently working on at Fraunhofer ITMP?

I am currently setting up a working group that deals with the utilization of microorganisms, especially bacteria and phages, in diagnostic and therapeutic applications. The microbes that colonize us, our microbiota, play an important role in regulating our organ functions. If these microbiota become imbalanced, this can lead to health problems. We want to start by restoring the balance.

What other goals are on your research agenda and to what extent does your work interact with your private life, with your family and friends?

In addition to developing microbiota-based therapies, I am very committed to supporting young scientists and implementing modern management and work concepts. We need a complete rethink in this respect if we want to continue to attract and retain top talent in the future. Of course, my work also plays an important role in my private life, especially since my husband is also a physician and a scientist. It's not always easy to keep work and my private life separate and it requires excellent cooperation to spread the childcare load fairly and still be flexible enough to meet the needs of everyone involved.

What advice would you like to give to women who want to start a career in health research?

Working in health research is great because, unlike in many other fields, your work directly benefits other people. It gives you a real sense of fulfilment when you get it right. If you're worried that you won't be able to combine having children with a career, go and talk to women in management positions. This will help you gain a better understanding of what you can and cannot expect in terms of support. Women in management positions are generally very open to answering such questions. It is often younger women who are afraid to ask them. It's important to know in advance what you can expect and how you can prepare for it. Only then can you make a conscious decision for or against a particular career without going into it unawares.

Pict.: © Universitätsklinikum Frankfurt; M. Vehreschild

Dr. Sabine Suppmann
Group Leader Protein Production
Fraunhofer ITMP Penzberg/Munich
sabine.suppmann@itmp.fraunhofer.de

Dr. Sabine Suppmann has been working at Fraunhofer ITMP site Immunology, Infection and Pandemic Research IIP in Penzberg/Munich since April 2023. As leader of the Protein Production group, she and her colleagues have been involved in further developing the Penzberg laboratory ever since then. Her responsibilities include taking charge of the Pandemic Preparedness project as part of a constantly growing team currently numbering 12 employees and doctoral students. Her research focuses on the production of pathogen-specific antigens and proteins and how to detect them using scientific and technical processes.

Who or what made you want to work in health research?

Like many of my colleagues, the SARS-CoV-2 pandemic was the trigger for me. I was working at the Max Planck Institute of Biochemistry (MPIB) at the time, supporting basic research by producing recombinant proteins. When the MPIB went into lockdown in March 2020, I received inquiries from the Technical University of Munich and LMU University Hospital Munich asking whether my team could produce SARS-CoV-2 proteins for diagnostic tests. At that time, there were still no reliable commercial tests on the market. We produced the proteins under intense pressure, working in shifts at the completely deserted institute to avoid contact. It was a completely new experience for me to work on something applied and, above all, something urgently needed and relevant. As a result, I decided to continue my work at the newly founded Fraunhofer ITMP site IIP.

To what extent do you think the dynamics and relevance of health research have changed in recent years? And how has the role of women changed?

As I only switched to health research in 2023, I am unfortunately not in a position to comment on recent developments. However, I strongly suspect that women are still underrepresented here, as in all areas, especially in management positions. I am particularly aware of this in my private life.

What exactly are you currently working on at Fraunhofer ITMP?

The aim of the Penzberg working group is to establish technology platforms. The purpose of this is to provide diagnoses or therapies that are specifically adapted to the pathogen as quickly as possible in current and future infection situations. In other words, the aim is to ensure pandemic preparedness. We are currently working on viral pathogens such as yellow fever and bacterial pathogens such as tuberculosis. Our strategic partnership with the Division of Infectious Diseases and Tropical Medicine at LMU University Hospital Munich and the pharmaceutical company Roche was expanded at the end of 2023 to include a further cooperation project involving tuberculosis research. The DisTB study (Discovery of novel biomarkers for the diagnosis of TB disease) is aimed at identifying new, highly sensitive and specific biomarkers for diagnosing tuberculosis.

What other goals are on your research agenda and to what extent does your work interact with your private life, with your family and friends?

At the moment, with the increasing influence of Artificial Intelligence, we have reached a significant point in science. We want to make the best possible use of the rapidly growing potential associated with this technology for our applications. The prediction of protein structures using the AlphaFold2 AI algorithm has revolutionized protein research. In the future, predicting suitable targets on pathogens will significantly speed up the development of diagnostic tests and therapeutics. A lot of what we currently have to determine through lengthy series of experiments will hopefully soon be predicted, based on as much data as possible that has been collected to date.
Outside of my laboratory work in protein production and the research projects at the institute, I make a conscious effort to keep work separate from my private life. However, it does come up from time to time, especially when I'm with friends who work in science too.

What advice would you like to give to women who want to start a career in health research?

Based on my own experience, many conversations with female colleagues and some media, I have picked out a few key points for me personally to bear in mind over the years:

1) Have confidence in your abilities. Take your career development into your own hands and don't hide your knowledge and skills.

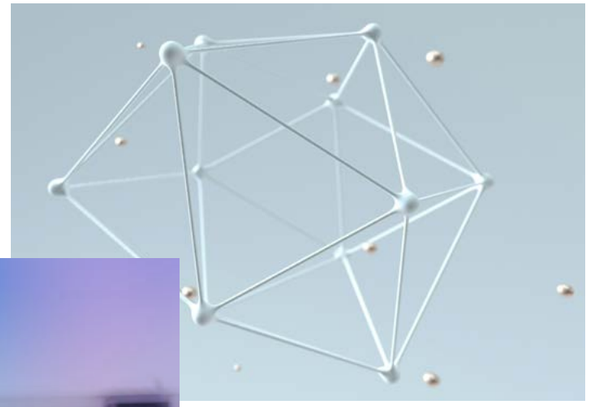
2) Don't expect too much of yourself. Try to appreciate more often that you can't always do everything, instead of trying to shoulder too much. Constant stress or overload will only have a detrimental impact on those around you.

3) Resolve conflicts objectively and try to take professional criticism constructively and not make it personal.

Link
Press release January 23, 2024; Tuberculosis: Closing the diagnostic gap
www.itmp.fraunhofer.de/de/presse/TBC_Diagnostics.html

Pict.: © MPIB; Susanne Vondenbusch-Teetz

PEOPLE AND **EVENTS**



Pict. l. from top to bottom: D koi, © unsplash; audience scientifik conference, © freepik; Fraunhofer ITMP Neubau Frankfurt am Main, © Wörner Traxler Richter Planungsgesellschaft mbH; Pict. r. from top to bottom: Simon Lee, © unsplash; laboratory microscope, agar plate microorganism, researcher lab, © freepik;

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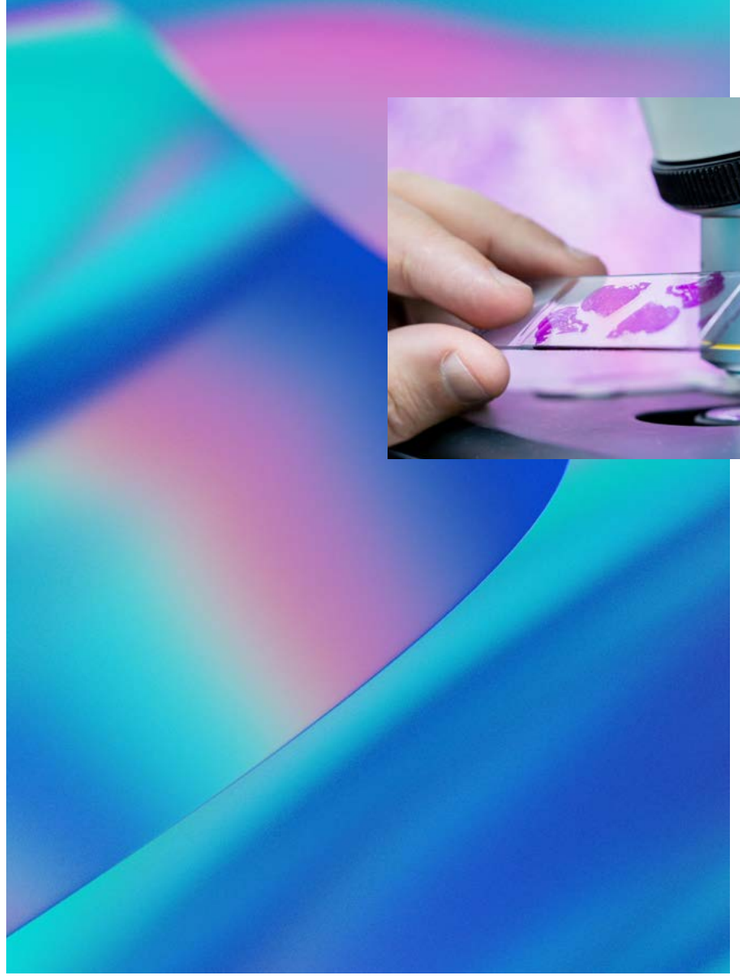
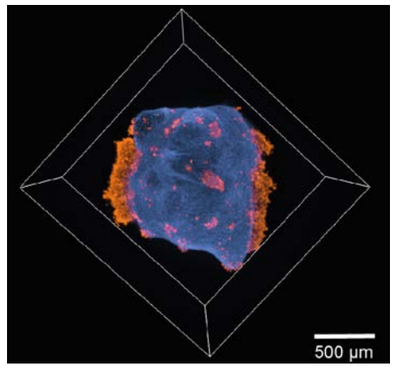


Organoid technology for drug research at the GSCN annual conference

Around 400 attendees from the field of basic and applied stem cell research came together for the German Stem Cell Network (GSCN) conference, which was held in Ulm from September 13 to 15, 2023. Fraunhofer ITMP in Hamburg, represented by Kim Krieg, Annika Wittich and Dr. Ole Pless, had the opportunity to present its research focusing on the application of human induced pluripotent stem cell models in pharmaceutical drug research. The stem cells can be used to obtain, among other things, three-dimensional microtissues with a highly organized structure and functionality that enable complex in vitro modeling of human organs and their diseases. At the TRR305 collaborative research center funded by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation), cerebral organoids are being produced using cancer metastasis as an example in order to model brain metastases that are currently difficult to treat. The process of metastasis involves tumor cells spreading to other parts of the body, the most common cause of death in cancer patients. The in vitro cultures are used to investigate new therapeutic strategies that minimize the growth of metastatic cancer cells, especially in the brain, with few undesirable effects on the sensitive nerve tissue. This research approach won Kim Krieg the HSCN Poster Award. In July 2024, the annual conference of the International Society for Stem Cell Research (ISSCR) is being held in Hamburg, with around 5,000 participants, as an opportunity for global scientific exchange and networking.



Growth of tumor cells (orange) on the brain organoid (blue)

Science senator and second mayor of the Free and Hanseatic City of Hamburg, Katharina Fegebank

Trilateral research into combating antibiotic resistance

Antibiotic-resistant bacterial infections are on the rise worldwide and pose growing problems for doctors, while the number of new antibiotics being developed is small. As a result, the treatment options for these infections are continuously dwindling. Today, more than a million people die from antibiotic-resistant bacterial infections every year. Gram-negative pathogens such as »E. coli,« »Pseudomonas aeruginosa« or »Klebsiella baumannii« are particularly problematic, as they exhibit numerous mechanisms that render antibiotics ineffective. To develop new therapies, innovative approaches are therefore needed. That is why Fraunhofer ITMP, Universiyt Hamburg and the Université d'Aix-Marseille are pooling their expertise in this area. With the second mayor and science senator of the city of Hamburg, Katharina Fegebank, in attendance, the three institutions signed a Memorandum of Understanding (MoU) in Marseille in May. This Franco-German cooperation was created for the purpose of long-term collaboration to apply innovative methods in the search for new active substances to combat antibiotic-resistant bacteria. Prof. Björn Windshügel, head of infection biology at Fraunhofer ITMP in Hamburg, is enthusiastic about the collaboration: »Together with our colleagues from University Hamburg and Université d'Aix-Marseille, we will be developing novel drugs that switch off a key resistance mechanism in Gram-negative bacteria. This could restore the effectiveness of many antibiotics.«
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Pict. f.l.t.r.: © Fraunhofer ITMP, Kim Krieg; © Fraunhofer ITMP, Björn Windshügel; © Freepik;

First Sustainability Report Published by a Fraunhofer-Gesellschaft Health Institute

Sustainability reporting is an essential element of valid sustainability management and an important tool for stakeholder communication. Generally speaking, the first step in preparing a sustainability report is to record the impact of a company's or organization's business activities on all three aspects of sustainability (environmental, economic and social). Then targets and measures for improving performance are defined.
The sustainability report compiled at the Fraunhofer ITMP site in Hamburg was prepared in line with a Global Reporting Initiative (GRI) standard that allows validated and recognized reporting on general and industry-specific topics. In addition, the »Guideline to Sustainability Management in Non-University Research Organizations« (LeNa) was taken into account, which covers the research-specific sustainability aspects of non-university research institutions.
Based on these standards, the impact of business activities for the 2019/2020 financial years (at the former Fraunhofer IME site) was chronicled and described. Resource consumption and environmental impacts were recorded and reported in detail. The report also sheds light on the handling of human samples, personal data, the patentability of results and the financing of research projects with regard to social, ethical and economic aspects.
This is the first sustainability report to be published by a Fraunhofer-Gesellschaft health institute, and it has laid the foundations for applying a sustainable approach to our activities at the Fraunhofer ITMP site in Hamburg. Specific measures will be taken to make the Fraunhofer-Gesellschaft in general and Fraunhofer ITMP in particular more sustainable in future.

Sorting medical waste.

Active Cooperation Through Exchange: Visiting Scientists and Research Stays

The visiting scientist program at the Fraunhofer ITMP ScreeningPort in Hamburg has become established as an important platform for intellectual exchange in health research. As part of this scheme, we were delighted to welcome colleagues from Fraunhofer ITMP in Frankfurt am Main. The program was built around the following topics and events:

• Building on the experiences from the coronavirus pandemic and in preparation for future challenges, the »High Throughput Screen« for identifying new inhibitors of the RNA virus macrodomain (Volkswagen Foundation MACROVIR) was introduced in collaboration with Dr. Jan Heering. Through this partnership, two further projects were launched to develop new approaches to investigating antiviral substances (DEMAR and FLIP-COVID).

• The ERASMUS program has been supporting six young researchers in their career in the fields of bioinformatics, drug repurposing, antibiotics research and other research applications.

• Together with the University of Cagliari (Italy), a close partnership was established with the then EU project E4C. Dr. Philip Gribbon gave a series of lectures on drug repositioning and FAIR data on site.

• The collaboration established under the Clusters4Future initiative of the German Federal Ministry of Education and Research (BMBF) to research a new substance class of PROTACs gave rise to an international partnership with the US Moffitt Cancer Center in Tampa, Florida. During her three-month stay, Maria Kuzikov learned about the use of chemoproteomics in clinical research.

• At the end of the exchange, the parties agreed to support the REMEDi4ALL conference on drug repurposing in Barcelona in 2024.

In addition to sharing individual expertise, the joint dialog also promotes cooperation between the individual institutions involved and represents an important alliance for the scientific community.

First meeting of the ENIGMA consortium in Brussels in September 2023. Members of the consortium. From left to right: Pavel Kolkhir, Inge Kortekaas, Melba Muñoz, Emek Kocatürk, Fariza Mishaal S Badloe, Shauni De Vriese, Yikui Xiang, Lauren Reber, Marcus Maurer, Jan Gutermuth, Jörg Scheffel, Nicolas Charles, Sandy Lenie, Carolin Steinert, Sabine Altrichter, Lisa Huygen, Hafsa Belasri. © Fraunhofer ITMP | Marcus Maurer

Foundation and first meeting of the ENIGMA consortium

Autoimmunity is defined as a disruption of tolerance to self antigens that results in the immune system turning against the body's own tissues. Some chronic inflammatory diseases (CIDs), including autoimmune diseases, are characterized by the presence of pathogenic autoreactive antibodies, including IgE antibodies. In 2023, the ENIGMA initiative was launched to find answers to open questions about IgE-mediated autoimmunity. Studies are investigating early developments of IgE autoantibodies to identify relevant autoantigens and correlate IgE autoimmunity with disease characteristics and response to treatment. The first ENIGMA conference took place in Brussels in September 2023, bringing together 17 experts in IgE autoimmunity. They discussed the role of IgE autoantibodies in urticaria, atopic dermatitis and lupus erythematosus. A joint manuscript on IgE autoimmunity is planned for the future, as is the development of diagnostic instruments. Membership of the ENIGMA team is expected to grow as a result of a call made through scientific journals.

New Methodology Developed for Incorporating »Real-World Evidence« into Guidelines

Prof. Dr. med. Dr. h.c. Torsten Zuberbier

Traditional medical evidence is based on scientific papers and publications, usually in medical databases. Established tools such as questionnaires are used for studies, although not all aspects of patient behavior are always recorded, particularly with regard to self-treatment with over-the-counter medication. The use of artificial intelligence and deep data mining to analyze online inquiries, such as search queries and forum posts, opens up new possibilities in terms of examining evidence. This approach enables the needs and behavior of patients to be captured unfiltered, providing »real-world evidence« that offers a more comprehensive insight into treatment concerns, self-treatment suggestions and potential side effects. The »CIMD project« is a collaboration between Fraunhofer ITMP in Berlin and the Fraunhofer Institute for Algorithms and Scientific Computing SCAI in Sankt Augustin. Its aim is to develop a methodology for systematically searching for and evaluating »real-world evidence« from sources beyond just medical databases. The intention is to use the results of this project to support the process of developing guidelines and make sure that they are evidence-based. This means that all the factors that influence such guidelines will be taken into account, including those outside of large clinical trials. These are generally not available, especially for older drugs. The results have shown that the »real-world expectations« of patients differ significantly from published results. This is taken into account in the new ARIA guidelines on improved patient care, for example.

Pict. f.l.t.r.: © Fraunhofer ITMP, Marcus Maurer; © Fraunhofer ITMP, Sarah Hah; Hands skin, © Freepik;

Symposium on Recent Developments in Rheumatology and Immunology

The »Rheumatologie & Immunologie: Aktuelle Entwicklungen und Therapieansätze« (»Rheumatology & Immunology: Recent Developments and Therapeutic Approaches«) symposium brought a group of experts on stage in front of a specialist audience on November 17, 2023 to present the latest approaches in diagnosing and treating immune-mediated rheumatic diseases. The event began with welcoming speeches by Prof. Hubert Serve (Director of Medical Clinic 2, Frankfurt University Hospital Frankfurt, Goethe University Frankfurt), Prof. Gerd Geißlinger (Director of the Institute of Clinical Pharmacology, Frankfurt University Hospital, Goethe University Frankfurt, and Director of Fraunhofer ITMP in Frankfurt am Main) and the opening address by Prof. Frank Behrens (Head of Translational Rheumatology, Immunology – Inflammation Medicine, Frankfurt University Hospital, Goethe University Frankfurt, and Deputy Director of Fraunhofer ITMP in Frankfurt am Main) and Prof. Veit Krenn (Deputy Medical Director/Managing Director of Pathology Trier). These were followed by contributions from Prof. Hendrik Schulze-Koops (Head of the Rheumatology and Clinical Immunology Section, Medical Clinic and Polyclinic IV, LMU University Hospital Munich), Prof. Martin Aringer (Head of Rheumatology, Medical Clinic III and University Center for Autoimmune and Rheumatic Diseases, University Hospital Dresden and Faculty of Medicine Carl Gustav Carus, TU Dresden), Prof. Reinhard Voll (Medical Director of the Department of Rheumatology and Clinical Immunology, Medical University Hospital – Faculty of Medicine, University of Freiburg) and Prof. Ulrike Hüffmeier (Senior Physician, Human Genetics Institute, University Hospital Erlangen, FAU Erlangen-Nuremberg).
In addition to the content discussed, a common thread running through the evening was the sense of scientific and personal solidarity between the speakers and Professor Harald Burkhardt, who retired as Head of Rheumatology at Frankfurt University Hospital in the fall of 2023. With this in mind, all presentations were accompanied by a personal tribute to his work. Prof. Burkhardt himself ended the symposium with his lecture on »Loss of immunological self-tolerance in rheumatoid arthritis and evidence for antigen-specific vaccination as a new therapeutic option« and gave the closing remarks.
Following his retirement from Frankfurt University Hospital, Harald Burkhardt will continue to contribute his scientific expertise to Fraunhofer ITMP.

4D Inflammation Clinic Webinar Marks World Psoriasis Day 2023

To mark World Psoriasis Day 2023, Frankfurt University Hospital and Fraunhofer ITMP in Frankfurt am Main co-hosted an information event followed by a panel discussion on October 30, 2023. The webinar was hosted by Dr. Laura Schnieder, with Professor Frank Behrens (Deputy Director of Fraunhofer ITMP in Frankfurt am Main, Professor of Translational Rheumatology, Immunology – Inflammation Medicine, Frankfurt University Hospital and Faculty of Medicine at Goethe University Frankfurt), Dr. Michaela Köhm (Head of Innovation at the 4D Clinic at Fraunhofer ITMP in Frankfurt am Main, Senior Clinician Scientist in Translational Rheumatology, Immunology – Inflammation Medicine), Dr. Irina Blumenstein (Senior Physician, Medical Clinic 1, Frankfurt University Hospital) and Dr. Andreas Pinter (Senior Physician, Department of Dermatology, Venereology and Allergology, Frankfurt University Hospital) providing insights on diagnosing and treating psoriasis and the early diagnosis of psoriatic arthritis. The event was broadcast live on YouTube to enable as many interested parties as possible to attend and access the information provided.
In the ensuing discussion, the need for a transdisciplinary view of immune-mediated diseases like psoriasis was emphasized. This approach is already being put into practice today for patients at the pioneering 4D Inflammation Clinic, which is largely built on the pool of scientific and medical expertise available at Fraunhofer ITMP. The webinar audience, whether attending in person and remotely, therefore showed a keen interest in the innovative development of this facility.
World Psoriasis Day is designed as an opportunity to raise awareness of the disease and provide information about the latest relevant research findings. At the 4D Inflammation

Clinic, our aim is to continue focusing on event formats at the Frankfurt am Main site that take the perspective of those affected by diseases into account when presenting research approaches.

Second Summer School at TheraNova High-Performance Center

The summer school at the Innovation Center Innovative Therapeutics (TheraNova) took place in Darmstadt on September 11 and 12, 2023. At this high-performance center, researchers from the two participating Fraunhofer institutes – Fraunhofer IGD and Fraunhofer ITMP – collaborate with working groups from Goethe University Frankfurt and the Max Planck Institute for Heart and Lung Research. Their focus is on transferring new findings from basic biomedical research into innovative active ingredients and medical applications. During the two-day summer school event, doctoral students and research physicians from the high-performance center presented the progress of their projects and had the chance to find out about the latest research findings in the field of cell and gene therapy. Dr. Jessica Hartmann (Paul-Ehrlich-Institut), Prof. Halvard Bönig (Institute for Transfusion Medicine and Immunohematology at Goethe University Frankfurt) and Prof. Winfried Wels (Georg-Speyer-Haus) offered important insights into the regulatory requirements for approving these kinds of therapeutics. In an open discussion session, Prof. Manuel Kaulich (Vivlion GmbH), Prof. Andreas Weigert (Phialogics GmbH) and Dr. Meike Saul (Curnova GmbH) reported on their start-up experiences, giving the doctoral students present some crucial tips and inspiration on entrepreneurship. The event also included a workshop on intellectual property, where the doctoral students had the opportunity to draw up an exploitation plan for their own project.

Official Opening of New Building and Topping-Out Ceremony for the Fraunhofer Institute for Translational Medicine and Pharmacology ITMP in Frankfurt am Main

From left to right: Dr. h. c. Volker Bouffier (Member of the Fraunhofer ITMP Advisory Board and former Minister-President of Hesse), Ayse Asar (State Secretary of Hessian Ministry of Higher Education, Research, Science and the Arts), Boris Rhein (Minister-President of Hesse), Prof. Gerd Geißlinger (Director of Fraunhofer ITMP), Dr. Sandra Krey (Executive Vice President for Finances and Controlling at the Fraunhofer-Gesellschaft), Prof. Frank Behrens (Deputy Director of Fraunhofer ITMP).

The topping-out ceremony for the Fraunhofer Institute for Translational Medicine and Pharmacology ITMP , which was held on Goethe University Frankfurt's Niederrad Campus on September 1, 2023, marked a significant milestone for the research scene in Hesse. More than 100 representatives from politics, industry and science were present, including Minister-President Boris Rhein, emphasizing the importance of Fraunhofer ITMP for this center of science and pharmaceutical research. The exemplary cooperation between teaching, research, industry and politics at Fraunhofer ITMP was highlighted several times. The Fraunhofer-Gesellschaft, Goethe University Frankfurt, the German federal government and the State of Hesse have joined forces to implement a pioneering project in medical research. The Fraunhofer ITMP facility was formed out of the LOEWE Center for Translational Medicine and Pharmacology (LOEWE-TMP), which is funded by the State of Hesse. Along with its five locations in Hamburg, Berlin, Göttingen, Frankfurt am Main and Penzberg/Munich, Fraunhofer ITMP's activities in the planned new building will focus on the transfer of medical findings into innovative therapies and medicines. Dr. Sandra Krey from the Fraunhofer-Gesellschaft is keen to stress the importance of this within the healthcare sector, always with the aim of contributing to affordable healthcare for society as a whole. The 4D strategy combines the areas of drugs, devices, diagnostics and data to develop cost-effective system solutions. Prof. Gerd Geißlinger, Director of Fraunhofer ITMP, emphasizes the importance of translational research too. Innovations created through transdisciplinary health research will bring swift benefits to patients and help establish cost-effective healthcare. The researchers are due to move into the new building in the fourth quarter of 2024.

Fraunhofer CIMD Summer School 2023 in Leipzig

Participants at the Summer School 2023 at Fraunhofer IZI in Leipzig.

The Fraunhofer CIMD Summer School 2023 was held in September at Fraunhofer IZI in Leipzig and focused on the four main topics of Fraunhofer health research: diagnostics, data, drugs and devices, or »4D.« The participants, consisting of PhD students and young postdocs from research institutions, clinics, universities, federal authorities and industry, attended a variety of excellent presentations by experts from both inside and outside of Fraunhofer over the four-day event.
The first day got off to an interactive start, with a round of introductions in which participants asked each other about aspects of their private lives and day-to-day work and exchanged ideas using a bingo questionnaire. On day two and day three, there were sessions giving participants the chance to present their own projects. This not only allowed participants to learn more about the work that others were doing but also led to a lively exchange of ideas and the identification of potential collaborations. On the last day, there was another interactive block of topics during which participants worked in interdisciplinary groups on various issues and discussed and worked on specific project challenges, problems and ideas.
All in all, the Summer School proved to be a successful initiative to support the next generation of scientists and to promote networking and cooperation across individual projects and subject areas. Further information is available on the Fraunhofer CIMD website.

Meeting of the Fraunhofer ITMP advisory board – interdisciplinary collaboration for the healthcare of the future

The thirdmeeting of the advisory board of the Fraunhofer Institute for Translational Medicine and Pharmacology ITMP in Munich on June 5 focused on new strategies for future healthcare. The head (interim) of the Fraunhofer-Gesellschaft, Dr. Sandra Krey, welcomed members of the advisory board, representatives of the Fraunhofer ITMP sites and the Bavarian State Minister of Health and Care, Klaus Holetschek. In his welcoming address, Holetschek stressed the importance of digitalization in the healthcare sector and highlighted the collaboration between Fraunhofer institutes, universities and the pharmaceutical industry on drug development. Dr. Sandra Krey, in her speech, highlighted interdisciplinary collaboration as the key to innovative solutions in the healthcare system. She emphasized the role of Fraunhofer ITMP in the development of cost-effective system solutions for the healthcare industry. Prof. Gerd Geißlinger, executive director of the institute, gave a positive summary of the growth of the

Pict. f.l.t.r.: © Fotograf Jürgen Lecher, Fraunhofer ITMP; © Fraunhofer CIMD, Christian Schneider-Broecker;

ITMP and the progress made in the various research areas. Fraunhofer ITMP works closely with the Fraunhofer Group for Health to promote research results in the fields of medicine, pharmacy, medical engineering and biotechnology. The Fraunhofer-Gesellschaft's 4D strategy, based on the topics of »drugs,« »diagnostics,« »devices« and »data,« is having a positive effect on the development of the ITMP. The specialist presentations from the various sites dealt with specific topics from combating tuberculosis to the use of artificial intelligence in medical data processing. The next meeting is set focus on areas such as networking and the use of artificial intelligence in clinical trials.

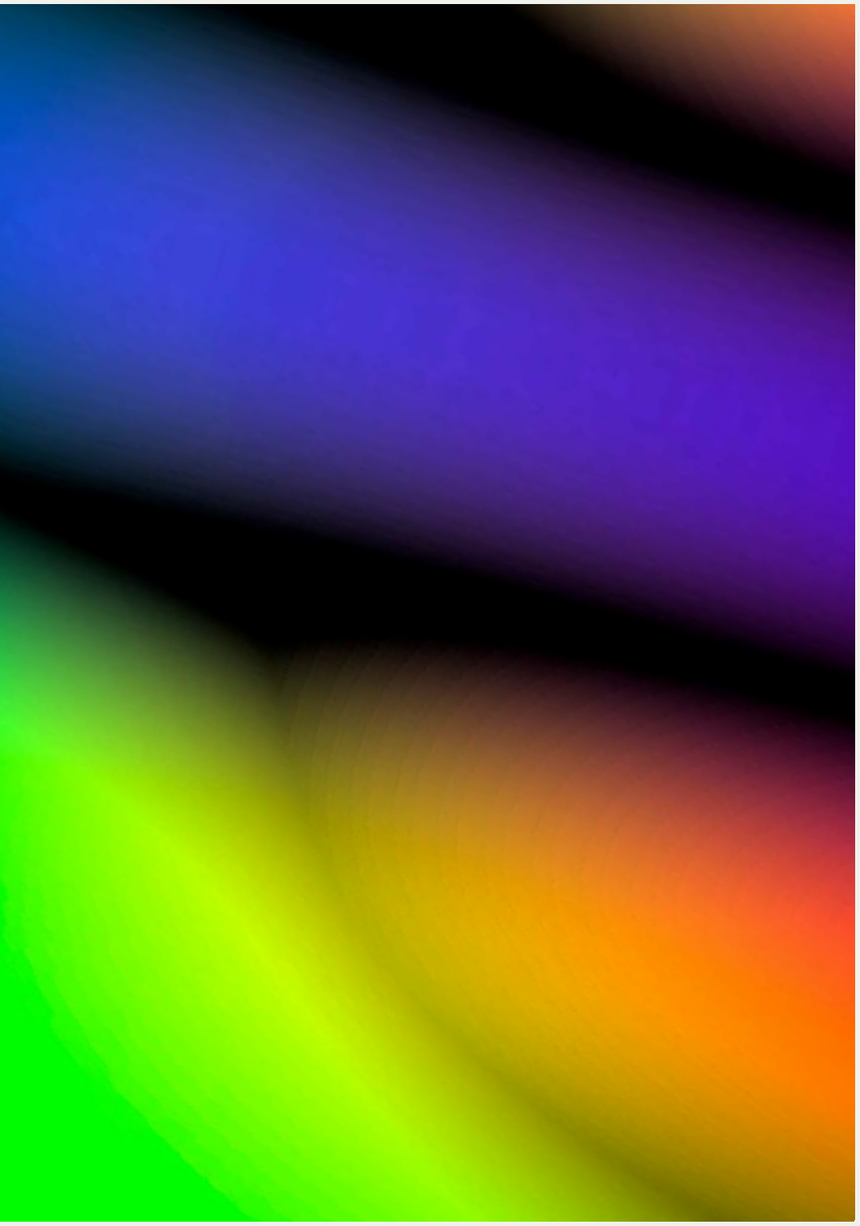
The members of the Fraunhofer ITMP advisory board at the annual meeting at the Fraunhofer headquarters in Munich. © Fraunhofer

Modulation of endolysosomal ion channels as a potential therapeutic option

Endolysosomal ion channels, such as the TRPML or two-pore Ca2+ channels, play an important part in the intracellular trafficking of a variety of bacteria, bacterial toxins and viruses. These include Ebola virus, coronavirus, Mycobacterium tuberculosis, cholera toxin and anthrax toxin. For example, TPC knockout mice are better protected against Ebola infections than wild-type mice. For these and other reasons, TRPML and TPC ion channels are interesting target structures for drug research. A cooperation project with the pharmaceutical industry is therefore being launched to investigate new modulators of these cation channels in various disease models. The aim is to assess and validate the efficacy of these substances and their suitability for use in various indications. This will be done by Prof. Dr. Dr. Christian Grimm and Dr. Yvonne Klingl using various assays in cell systems as well as the Opera Phenix® Plus High-Content Imaging Machine at the Fraunhofer ITMP site for Immunology, Infection and Pandemic Research in Penzberg/Munich.

Pict. © Fraunhofer;

ABOUT PERSON



Pict. l.: Blurred abstract; © Freepik
Pict. r.: Dr. Lutz Zeitlmann; © Fraunhofer, Markus Jürgens

Dr. Lutz Zeitlmann
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New Addition to Fraunhofer ITMP Management Team – Focus on Strategic Development

Since the beginning of 2023, the management team at Fraunhofer ITMP has been boosted by the arrival of Dr. Lutz Zeitlmann as deputy director. Together with Prof. Frank Behrens, he advises, supports and represents the institute director Prof. Gerd Geißlinger on all overarching strategic and operational issues affecting Fraunhofer ITMP as a whole. Prior to his move, Lutz Zeitlmann was a head of department at the Fraunhofer-Gesellschaft headquarters in Munich, where his responsibilities included further developing the research portfolio in the healthcare sector.

Shaping strategic development and transfer together

Lutz Zeitlmann had already worked closely with Fraunhofer ITMP in his capacity as a head of department at the Fraunhofer-Gesellschaft headquarters in Munich, particularly in the context of joint initiatives aimed at strengthening health research and the establishment and expansion of the Fraunhofer ITMP sites in Hamburg, Berlin, Göttingen, Frankfurt am Main and Penzberg/Munich. Supporting site development and facilitating successful integration into the Fraunhofer ITMP research portfolio are an important part of his duties in his new role too. Among other things, he acts as a point of contact with the Fraunhofer headquarters and grant authorities to ensure the successful transfer of the new locations to the Fraunhofer funding model following the start-up phase.
Lutz Zeitlmann also has experience in Fraunhofer's unique industry standpoint from his time before joining the organization, as he held various positions at biotech companies and pharmaceutical SMEs for more than ten years. At these companies, he worked on therapy and diagnostics for oncological and immunological diseases, including in collaboration with Fraunhofer institutes. For this reason, he recently took on the role of transfer promoter at Fraunhofer ITMP to advise on research needs in industry and the commercialization prospects of research projects.
At the same time, he also supports Prof. Geißlinger as his deputy in his capacity as spokesperson for the Fraunhofer-Gesellschaft's Health section, including within the strategic research field of digital healthcare. This research field serves to link all Fraunhofer institutes operating in the f ield of health and promotes joint initiatives, such as the cooperation with Helmholtz, the proof-of-concept initiative and the 4D strategy for affordable healthcare.

Outlook – new paths for innovation

For Lutz Zeitlmann, working at Fraunhofer ITMP brings a change of perspective compared to his previous work for other companies and at the Fraunhofer headquarters. However, he still believes in the importance of encouraging cooperation between all stakeholders in order to pool their strengths in working toward common goals. Stepping up our cooperation with partners within and outside the Fraunhofer-Gesellschaft will create considerable potential for further developing both Fraunhofer ITMP and the Fraunhofer-Gesellschaft as a whole. Together, we can make an even greater contribution to innovation and value creation in Germany and Europe.

PATENTS 2023

Hans Reniers, © Unsplash

Patent registrations

Gribbon, Philip; Keminer, Oliver; Carotenuto, Lidia; Taglialatela, Maurizio; Miceli, Francesco; Weckhuysen, Sarah; Leo, Antonio; Citraro, Rita; De Sarro, Giovanbattista;
Modification of human voltage-gated potassium channel;
Kv7 by JNJ-37822681

Hernández Olmos, Víctor; Heering, Jan; Proschak, Eugen; Steinhilber, Dieter; Weigert, Andreas;
Novel orally available BLT2 agonists for treatment of skin disorders;

Heering, Jan; Steinhilber, Dieter; Zhu Wenxin, Felix; Flauaus, Cathrin; Lu, Ruirui; Schmidtko, Achim; Proschak, Eugen; Balzulat, Annika; Hernández Olmos, Víctor;
Aktivatoren des Kalium-Kanals Slack (Kcnt1, Slo2.2) zur Behandlung von chronischem Juckreiz und neuropathischen Schmerzen;

Patents granted

Do, Nhu Nguyen; Vilma Urbonaviciute; Weiße, Sylvia; Holmdahl, Rikard; Burkhardt, Harald;
HLA-DR /C II peptide complexes with chondroitin-binding peptide (His-tag) for treating arthritis;
EP 4010006: WE / PL / TR / GB / NO / IE / GR / ES / CH / EU

Weiße, Sylvia; Schneider, Nadine; Bingze, Xu; Holmdahl, Rikard; Burkhardt, Harald;
Production of galactosylated MHC II / CII peptide complexes;
EP 4010007: NO / PL / ES / EU / GB / IE / GR / WE / CH / TR

Kern, Kai-Uwe;
Bromhexine for the Treatment of Pain;
WE 3 638 223 / US 2020-0197330 A1 / JP 2020-523395

Von Knethen, Andreas; Parnham, Michael; Sha, Lisa;
B7-H1 fusion polypeptides for treating and preventing organ failure; WO CA 2,995,987

Geisslinger, Gerd; Sisignano, Marco; Brenneis, Christian; Scholich, Klaus; Zinn, Sebastian; Parnham, Michael;
CYP2J2 Antagonists in the Treatment of Pain;
WO CA 2,952,016

Von Knethen, Andreas; Parnham, Michael; Sha, Lisa;
Rekombinantes B7-H1-Fusionsprotein als Therapiekonzept des multiplen Organversagens bei Sepsis;
US 2020/0215159 A1

Baumann, Isabell; Jakobsson, Per-Johan; Saul, Meike; Steinhilber, Dieter; Süß, Beatrix;
MiRNA-574-5p as a biomarker for stratification of prostaglandin E-dependent tumors;
WO CA 3,067,069

BACHELOR'S, MASTER'S, AND DOCTORAL THESES 2023

Theses 2023 overview

Overview of the number of theses whose experimental part was supervised by Fraunhofer ITMP staff.

25 Doctoral theses
34 Master's theses
19 State examinations
15 Bachelor theses

Laboratory chemicals research; © Freepik

Doctoral Theses

Anders, Björn; **Symptome und Folgen chronischer Schmerzen in Patienten mit Rheumatoider Arthritis;** Johann Wolfgang Goethe-Universität Frankfurt a. M.

Anders, Malte; **Nociception and pain in the electroencephalogram;** Johann Wolfgang Goethe-Universität Frankfurt a. M.

Bhattacharya, Anshu; **Adaptations of autophagy and lysosomal systems upon membrane damage and pathogenic invasion;** Johann Wolfgang Goethe-Universität Frankfurt a. M.

Chachulski, Laura; **Development and Application of Compound Class-Specific Benchmark Data Sets for Differentiated Assessment of Docking and Scoring Algorithm Performance;** Constructor University, Bremen

El-Hindi, Khadija; **Sphingolipide in der Entzündlichen Kanzerogenese;** Johann Wolfgang Goethe-Universität Frankfurt a. M.

Hammermann, Leonard; **Characterization of myelin-specific autoantibodies in an EAE mouse model;** Georg-August Universität Göttinigen

Hartel, Jennifer Christina; **Sphingolipide in T-Zellen;** Johann Wolfgang Goethe-Universität Frankfurt a. M.

Holländer, Christian; **M&A Function and M&A Performance: A Capability-based Analysis;** Johann Wolfgang Goethe-Universität Frankfurt a. M.

Kuzikov, Maria; **The role of drug repurposing in containment of emerging diseases - Case study SARS-CoV-2;** Constructor University, Bremen

Luo, Yanyan; **The establishment of a mast cell model for mastocytosis;** Charité – Universitätsmedizin Berlin

Mojtahed Poor, Sorwe; **Methodenvalidierung zur mehrstufigen Ustekinumab- multizentrischen, Placebo-kontrollierten Phase III Studie zur Bestimmung der Auswirkung einer Komedikation mit Methotrexat in Patienten mit aktiver Psoriasisarthritis;** Johann Wolfgang Goethe-Universität Frankfurt a. M.

Mutayoba, Beatrice; **Evaluation of the magnitude of anti Tuberculosis Drug Resistance in Tanzania;** Ludwig-Maximilians-Universität München

Özdemir, Metin; **Investigation of TOMM20 Interactome in Relation to Protein Quality Control and Translocation;** Georg-August-Universität Göttingen

Pronto, Julius; **Atrial mitochondrial calcium handling in patients with atrial fibrillation;** Georg-August-Universität Göttingen

Rotter, Marco; **Synthese und biochemische Charakterisierung von Substraten und Inhibitoren der Metallo-beta-Lactamasen;** Johann Wolfgang Goethe-Universität Frankfurt a. M.

Schöndorf, Thomas; **Investigating the regulation of mitochondrial translation;** Georg-August-Universität Göttingen

Schweighofer, Sarah; **BAX and BAK – the deadly rings. A comprehensive study of the mitochondrial apoptic pore in situ with super-resolution microscopy;** Georg-August-Universität Göttingen

Shin, Anna; **Characterization of tick-borne encephalitis virus in Kazakhstan by serological, molecular techniques and virus isolation;** Ludwig-Maximilians-Universität München

Sillah, Abdu; **Impact of Adult Tuberculosis on Household Child Contacts in the Greater Banjul area of The Gambia;** Ludwig-Maximilians-Universität München

Sofi, Senan; **Entwicklung und Validierung eines krankheitsspezifischen Fragebogens zur Messung der Krankheitskontrolle für Patiente mit Mastozytose und MCAS (M2CT);** Charité – Universitätsmedizin Berlin

Valpadashi, Anusha; **Characterization of TIM22 complex in inner mitochondrial membrane;** Georg-August-Universität Göttingen

Wang, Jean; **Empirical Examination of Communication Practices During Chinese Cross-border Mergers & Acquisitions Integration;** Johann Wolfgang Goethe-Universität Frankfurt a. M.

Wedel, Saskia; **Investigation of SAFit2 as a novel treatment option for nerve-injury and chemotherapy induced neuropathic pain;** Technische Universität Darmstadt

Witte, Steffen; **Molecular Basis of Mitochondrial Deseases exemplified by mutation of the translation Factor Cox14;** Georg-August-Universität Göttingen

Wolters, Miriam; **Exercise-Induced Changes in Bioactive Lipids Might Serve as Potential Predictors of Post-Exercise Hypotension. A Pilot Study in Healthy Volunteers;** Johann Wolfgang Goethe-Universität Frankfurt a. M.

NETWORKS
IN SCIENCE AND INDUSTRY

Connect science; © Freepik;

International activities and cooperation's with Industry

Das Fraunhofer ITMP arbeitet mit vielen internationalen Fraunhofer ITMP cooperates with many international research partners and remains in close contact with universities and other research organizations. The aim is to recognize trends and developments as they emerge, and to develop and implement novel research strategies and technologies. In 2023, Fraunhofer ITMP cooperated with around 40 national and international industrial clients and carried out confidential projects for several international industrial associations.

Cooperation with universities

Fraunhofer ITMP has close cooperations with a large number of institutes and clinics of the University Hospital of the Goethe University Frankfurt am Main, the University Medical Center Hamburg-Eppendorf, the University Medical Center Göttingen, the Charité - Universitätsmedizin Berlin, the Ludwig-Maximilians-Universität München LMU and the LMU Medical Center. There is also close cooperation with national universities such as the Philipps-Universität Marburg, the Justus Liebig University Giessen, the Jacobs University Bremen, the Hannover Medical School, the Senckenberg Biodiversity and Climate Research Center, the Dr. Margarete Fischer-Bosch-Institute of Clinical Pharmacology IKP Stuttgart and the BNITM in Hamburg. In addition, there are cooperations with several international universities such as the University of Florida, the University of Maryland, the University of Cork, the University of Southern Denmark, the National and Kapodistrian University of Athens and the National University of Ireland, Galway.

Teaching activities

Prof. Dr. Frank Behrens is Head of the Division translational Rheumatology, Immunology – Inflammation medicine at the University Hospital Frankfurt am Main and Professor and lecturer for Internal Medicine/Rheumatology and holds courses, seminars and lectures in Internal Medicine, Rheumatology and Clinical Pharmacology at the University Hospital of Goethe-University Frankfurt am Main and at Goethe-Business school.

Prof. Dr. Harald Burkhardt is Head of the Division of Rheumatology at Goethe University Hospital Frankfurt am Main and Professor of Internal Medicine/Rheumatology at Goethe University Frankfurt am Main. He holds lectures in Internal Medicine at the University Hospital Frankfurt am Main.

Prof. Dr. Bernhard Brüne is Professor and Director of the Institute for Biochemistry I at the Faculty of Medicine at Goethe University Frankfurt am Main. He lectures within the framework of GRK AVE (»Resolution of Inflammation«), in biochemistry for medical students, as well as in the master program in Molecular Medicine.

Demetrios Christou holds seminars and lectures for students in the New Revised Medical Curriculum at the Charité – Universitätsmedizin Berlin.

Prof. Dr. Sandra Ciesek is Director of the Institute of Medical Virology at the University Hospital Frankfurt am Main and lectures for stu**dents of human and dental medicine.**

Prof. Dr. Carsten Claussen is Honorary Professor for Information Systems at the Heinz-Nixdorf-Institute of the University of Paderborn and holds lectures, seminars and internships at the Faculty of Medicine of the University Hamburg (UKE).

Prof. Dr. Jennifer Dressman retired from her position as Professor of Pharmaceutical Technology in the Department of Biochemistry, Chemistry and Pharmacy at the Goethe University Frankfurt am Main in March, 2021.

Dr. Bernhard Ellinger holds seminars and internships in the model course in Medicine the model course in dentistry at the University Medical Center Hamburg-Eppendorf.

Prof. Dr. Prof. Alexander Flügel is Director of the Institute for Neuroimmunology und Multiple Sclerosis Research at the University Medical Center Göttingen (UMG). He gives lectures in Neuroimmunology for the educational programs Development, Neuronal & Behavioral Biology, Molecular Medicine and Neuroscience at the University of Göttingen.

Prof. Dr. Jutta Gärtner is University Professor and Director of the Clinic for Pediatrics and Adolescent Medicine at the University Hospital Göttingen. She holds seminars and courses at the Medical Faculty of the Georg-August University Göttingen.

Prof. Dr. Dr. Gerd Geißlinger is Professor and Director of the Institute for Clinical Pharmacology of the University Medical Center Frankfurt am Main. He lectures in clinical pharmacology and therapy for medical students.

Dr. Philip Gribbon has been appointed as a visiting professor at the University of Cagliari. He has lectured at the: EU-OPENSCREEN 2022 Autumn school, on the topic of FAIR data; FEBS Practical/Lecture Course 2022 Biomolecules in Action III, on the topic of compound screening and probe development.

Prof. Dr. Dr. Christian Grimm is a university Professor at the Walther Straub Institute for Pharmacology and Toxicology at the University Medical Centre of the LMU Munich. He gives lectures in pharmacology and toxicology for medical and natural science students.

Prof. Dr. Sabine Grösch is extraordinary Professor at the Institute for Clinical Pharmacology at the Goethe-University Frankfurt am Main. She holds lectures in clinical pharmacology and molecular medicine.

Dr. Sheraz Gul is Adjunct Lecturer at the NUI Galway, College of Medicine, Nursing & Health Sciences, Ireland and was an invited instructor at MSc (Toxicology) – Screening Molecular Libraries Module.

Dr. Robert Gurke supervises practical courses in the Department of Medicine and Pharmacy and gives lectures/seminares in the master program Molecular Medicine at Goethe University Frankfurt am Main.

Dr. Jan Heering supervises internships and gives lectures in assay development (part of lecture series on drug design) in the Faculty of Biochemistry, Chemistry and Pharmacy at Goethe University Frankfurt am Main.

Prof. Dr. Michael Hoelscher is Director of the Department of Infectious Diseases & Tropical Medicine at the University Medical Center of LMU. He is holding lectures in Infectious and Tropical Diseases and International Health. He is the chair of the PHD Program of LMU.

Prof. Dr. Stefan Jakobs is Professor of High-Resolution Microscopy of the Cell at the Department of Neurology, University Medical Center Göttingen and research group leader at the MPI for Multidisciplinary Sciences. He holds seminars and practical courses on cell biology and high-resolution microscopy.

Porf. Dr. Aimo Kannt is a lecturer at Goethe University and Heidelberg University Medical Schools. In addition, he gives seminars for the International Master Programs in Translational Medicine at the Universities of Heidelberg and Groningen. At Goethe Business School, he is responsible for the R&D module of the Pharma MBA program.

Dr. Michaela Köhm is Adjunct Lecturer of the Division of Rheumatology, Medical Clinic 2 at University Hospital Frankfurt am Main and holds seminars and courses in Internal Medicine and Rheumatology as well as for General Practitioner and Pathophyisiology.

Dr. Edmund Kostewicz holds lectures at the Goethe Business School, Frankfurt University, at the Master of Pharma Business Administration Program.

Prof. Dr. Ellen Niederberger is an APL professor at the Institute of Clinical Pharmacology of the Goethe University Frankfurt am Main. She is involved in lectures and courses of the study program human medicine, the master program Molecular Medicine and the master program Neuroscience.

Dr. Ole Pless holds lectures, seminars and practical courses at the Faculty of Medicine of the University Hamburg (UKE) as well as seminars at Goethe University Frankfurt am Main.

Prof. Dr. Eugen Proschak is Professor of Drug Design in the Department of Biochemistry, Chemistry and Pharmacy at Goethe University Frankfurt am Main.

Prof. Dr. Peter Rehling is University Professor and Director of the Institute of Cell Biochemistry at the University Medical Center Göttingen. He gives lectures, seminars and practical courses in biochemistry and molecular biology for students of human and dental medicine, molecular medicine and cardiovascular science.

Dr. Maria Rosenthal holds lectures, seminars and exercises in biochemistry and virology at the faculty of mathematics, informatics and natural sciences of the University Hamburg as well as the German Academy for public health on the topic of viral hemorrhagic fevers.

Dr. Otto Quintus Russe is Managing Director of the House of Pharma & Healthcare at Goethe University Frankfurt am Main. He is also Academic Director of the Master of Pharma Business Administration (MBA) and the Data Science in Health Program at Goethe Business School.

Dr. Stephan Schäfer is Adjunct lecturer at the medical faculty at the University Hospital in Frankfurt, where he holds seminars in Clinical Pharmacology.

PD Dr. Susanne Schiffmann holds seminars and lectures for medical, molecular medicine and medical technology students at Goethe University Frankfurt am Main.

Prof. Dr. Klaus Scholich holds seminars, practical courses and lectures at the University Hospital Frankfurt am Main.

Prof. Dr. Lars Schweizer is Professor of Business Administration, in particular Strategic Management, in the Department of Economics at Goethe University Frankfurt am Main. He is also Academic Director for the Master of Pharma Business Administration at Goethe Business School.

PD Dr. Frank Siebenhaar holds seminars and courses in allergology and is a lecturer in the teaching format »Problem-based Learning«(POL) for students in the New Revised Medical Curriculum at the Charité – Universitätsmedizin Berlin.

PD Dr. Marco Sisignano holds lectures in Clinical Pharmacology for medical students and seminars for students in the master program Molecular Medicine at the University Hospital Frankfurt am Main.

Prof. Dr. Dieter Steinhilber is Professor for Pharmaceutical Chemistry at the Faculty of Biochemistry, Chemistry and Pharmacy at Goethe University Frankfurt am Main.

Dr. Dominique Thomas supervises practical courses for pharmacy students and molecular medicine students and holds seminars in Clinical Pharmacology at Goethe University Frankfurt am Main.

Prof. Dr. Maria Vehreschild holds lectures in Internal Medicine at Goethe University Frankfurt am Main and leads a series of in-service training courses of physicians with recognition by the LÄK (Landesärztekammer).

Dr. Carmen Walter holds seminars and lectures at the University Hospital Frankfurt am Main.

Prof. Dr. Martin Weber is associate Professor for Translational Neuroinflammation at the University Medical Center Göttingen. He holds lectures seminars and courses on the field of Neurology for medical students. He leads the PhD program VorSPrUNG.

PD Dr. Andreas Wieser is a private lecturer at LMU and gives lectures, seminars and practical courses for medical and pharmaceutical students, as well as lecturing nurses at the clinic. Additionally, he is teaching at the Centre for International Health (CIH) of the LMU. In a joint program with the CIH he is also lecturing on vector biology and control at the University of Cape Coast in Ghana.

Prof. Dr. Björn Windshügel is Honorary Professor for Computational Drug Discovery at Constructor University Bremen and gives lectures drug discovery and molecular modeling in the MCCB program.

Prof. Dr. Wolfram-Hubertus Zimmermann is University Professor and Director at the Institute of Pharmacology and Toxicology at the University Medical Center Göttingen. He lectures in pharmacology and toxicology for medical students and students of molecular medicine.

Prof. Dr. Torsten Zuberbier is University Professor and Director at the Institute of Allergology at the Charité – Universitätsmedizin Berlin. He holds seminars and lectures for students in the Standard Medical Curriculum at the Charité – Universitätsmedizin Berlin.

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International Lipidomics Society; Dr. Robert Gurke

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Ksilink; Direktorium: Prof. Dr. Wolfram-Hubertus Zimmermann

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Merck; Mitglied des Beirats »Cladribine« und »Evobrutinib«;
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Prof. Dr. Bernhard Brüne

Senatskommission für Third Mission;
Prof. Dr. Bernhard Brüne

Society for Laboratory Automation and Screening;
Gewähltes Mitglied des Exekutivausschusses. Seine Amtszeit beträgt drei Jahre, wobei er zunächst die Rolle des Sekretärs und anschließend die des Präsidenten der Gesellschaft übernimmt.: Dr. Philip Gribbon; Mitglied des Rates für strategische Beziehungen: Dr. Sheraz Gul

Stiftung für Unternehmensrecht an der Heinrich-Heine-Universität Düsseldorf;
Kuratoriumsmitglied: Prof. Dr. Carsten Claussen

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Mitglied des wissenschaftlichen Beirats: Dr. Sheraz Gul

Tierethikkommission Regierungspräsidium Darmstadt;
Dr. Martine Hofmann

Urticaria Centers of Reference and Excellence (UCARE) - GA²LEN Network; Mitglied des Steuerungskomitees:
Prof. Dr. Marcus Maurer, Prof. Dr. Torsten Zuberbier

urticaria network e.V.;
Schatzmeister: PD Dr. Frank Siebenhaar

VIB Screening Core, Belgium;
Mitglied des Beirats: Dr. Sheraz Gul

Von-Behring-Röntgen-Stiftung; Mitglied sowie Wissenschaftlicher Beirat: Prof. Dr. Jutta Gärtner

Zentrale Ethik-Kommission für Stammzellforschung (ZES); Prof. Dr. Wolfram-Hubertus Zimmermann

Organization of Scientific Meetings and Courses

»Strategic Entrepreneurship and Innovation Research Seminar« – Goethe Universität Frankfurt a. M. & TU Darmstadt
Januar und Juni 2023, Initiator und Mitglied des Organisationskommitees: Prof. Dr. Lars Schweizer

»Journal Club« des Fraunhofer ITMP – Immunerkrankungen, Datananalyse, Datenmodellierung, optische Bildgebungsverfahren und mehr; Hybrid, 6 Termine in 2023, organisiert durch Yixin Wang

Regionalwettbewerb Jugend forscht Hamburg Volkspark
Hamburg, 16. und 17. Februar 2023, Patenbeauftragte: Dr. Mira Grättinger

TheraNova Winter School
Frankfurt a. M., 27. März 2023, organisiert durch das Leistungszentrum Innovative Therapeutika (TheraNova)

Screening Molecular Libraries – NUI Galway, MSC toxicology; Galway, 28. bis 31. März 2023, Co-organisator: Dr. Sheraz Gul

Workshop zu FAIR Data Management in Antibiotic Drug Discovery; Basel, 7. und 8. April 2023, durchgeführt während der 6th AMR Conference Organisator: Dr. Philip Gribbon

Exzellenzkurs Spondyloarthritiden; Lufthansa Trainingszentrum Seeheim, 20. bis 22. April 2023; Leitung: Prof. Frank Behrens, Dr. Michaela Köhm

Fraunhofer CIMD Workshop »Erfolgreiche interdisziplinäre Zusammenarbeit«; Frankfurt a. M., 20. Juni 2023, organisiert durch das Fraunhofer Cluster of Excellence Immune-Mediated Diseases (CIMD)

TheraNova Summer School; Darmstadt, 11. bis 12. September 2023, organisiert durch das Leistungszentrum Innovative Therapeutika (TheraNova)

Fraunhofer CIMD Summer School; Leipzig, 12.bis 15. September 2023, organisiert durch das Fraunhofer Cluster of Excellence Immune-Mediated Diseases (CIMD)

Jahrestagung der Wissenschaftlichen Kommission Technologie, Innovation und Entrepreneurship (TIE) des VHB e.V. ; Goethe-Universität-Frankfurt am Main, 21. bis 22. September 2023, Mitglied des Organisationskommitees: Prof. Dr. Lars Schweizer

AMR »Drug Discovery Bootcamp«; Dublin, 4. bis 7. Oktober 2023, durchgeführt während der annual ESCMID/ASM Conference on Drug Development to meet the Challenge of Antimicrobial Resistance, Co-Organisator: Dr. Philip Gribbon

Expertensession/Podiumsdiskussion anlässlich des Welt-Psoriasis-Tag 2023; Universitätsklinikum Frankfurt, 30. Oktober 2023, (virtuell); Leitung: Prof. Frank Behrens, Dr. Michaela Köhm, Organisation: Yixin Wang, Dr. Laura Schnieder

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