

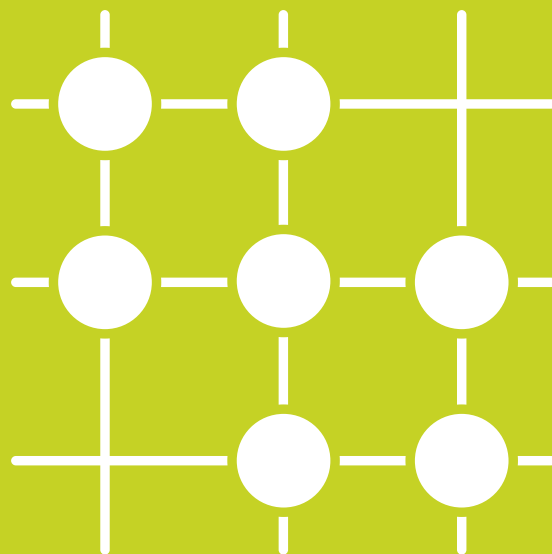


Universität  
Basel



# Research Report 2021/2022

**University Children's Hospital Basel**





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# Editorial



**Prof. Sven Schulzke, MD, MSc, FRACP**  
**Head of Research**

I am very pleased to present the UKBB research report 2021–2022 to interested researchers, collaborators, colleagues from clinical and management fields, institutional partners, and the wider public. While the current report covers a period still affected by the SARS-CoV-2 pandemic, collaborative research meetings and scientific conferences were re-initiated in 2022, allowing the research community to bounce back from reduced opportunities of personal discussion and networking. This was a major relief for many of us and a fantastic opportunity to celebrate the freedom of social gatherings with active, on-site presentations and plenty of discussion on exciting scientific topics. Not surprisingly, the UKBB Research Day in November 2022 had a very strong attendance with more than 120 participants who enthusiastically engaged in lively discussions after very instructive talks and poster presentations. Despite the pandemic, publication output of UKBB research groups remained on a very high level in this period, nearly identical to the previous top years 2019–2020.

## **UKBB Research Strategy 2025**

In a focussed team effort over the past several years, the new UKBB Research Strategy 2025 entitled «Paediatric research in a digital world» was developed. The new research strategy integrates with the University of Basel's strategy and is embedded in the overarching strategy of the owners of UKBB, the cantons of Basel-Stadt and Basel-Landschaft. The latter explicitly emphasize UKBB's role in actively engaging in paediatric research and education and UKBB's responsibility towards improving networking of researchers affiliated with the University of Basel with other institutions (such as ETH Zurich, the University of Applied Sciences and Arts Northwestern Switzerland, other research institutions on a national and international level, and industry partners). Administrative requirements for research on children based on the Human Research Act along with general data protection and safety concerns have steadily increased. Accordingly, significant improvements in the IT-infrastructure at UKBB have been made and specific personnel is now available inhouse to help UKBB scientists with the design, conduct, analysis, and reporting of their research in the era of digitalisation under current regulatory conditions.

## THOMI-HOPF Special Program Paediatric Research

Due to the generous support from the THOMI-HOPF-FOUNDATION, UKBB is in the position to offer renewed early academic career support to young doctors and scientists over the next 5 years, allowing for protected research time and close mentoring of awardees. Both factors are crucial prerequisites for the successful start of a research career. Other early support programs such as the «Club Paediatrics» for medical students have continued and meanwhile, more than one third of paediatric residents at UKBB are former participants of the «Club Paediatrics», showing that both students and UKBB benefit from this program. Support of mid-level faculty in basic and clinical sciences is ongoing and the current report will again provide space for mid-level faculty to present their scientific achievements in the «rising stars» section. These researchers represent a major driving force of scientific development at UKBB and are essential to the functioning of our research environment, as they often simultaneously support both young researchers and established research group leaders.

## Further developments

The **Botnar Research Centre for Child Health (BRCCH)** has achieved an important milestone by launching yet another major research program entitled «**Principal Investigator Initiative (PII)**», addressing critical challenges in global paediatric health and medicine. BRCCH's PII projects bring together researchers from its four partner institutions and international partners who will deliver step-changing innovations and intervention strategies across paediatric health diagnosis, disease treatment and prevention with global reach. Each project is supported with up to 1 million CHF for a duration of four years. It was a great pleasure to see that UKBB researchers successfully acquired two of these highly competitive PII grants: One PII grant went to a consortium led by **PD Dr Delgado-Eckert** («Alex: Design, Development and Evaluation of a Digital

Health Assistant for Paediatric Asthma») and one to a group led by Prof. Szinnai and Pfister («OptiThyDose: Intelligent Digital Decision Support Tool to Personalise Dosing for Children with Thyroid Diseases»).

With regards to the **Swiss Personalized Health Network (SPHN)**, the second funding period (2021–2024) has started. «National Data Stream», «Driver» and «Demonstrator» projects have been launched. Each National Data Stream project comprises a Swiss-wide multidisciplinary consortium that invests in the development of a sustainable data infrastructure for high-end data-driven and personalized health research. Driver projects are based in a concrete research field (e.g., oncology, immunology) and aim to push the development of clinical data management systems in all university hospitals by testing data interoperability and data sharing principles within the whole network while Demonstrator projects aim to demonstrate the added value of SPHN data resources and infrastructure elements for data-driven personalized health research, clinical and public health research, and clinical use. UKBB researchers have helped to acquire several of these grants and have leading roles both in paediatric data stream (PD Dr Bielicki) and demonstrator projects (Prof. Jan Bonhoeffer, Dr Morgan Sangeux). Thus, UKBB continues to be an integral part of the Basel Hub strategy, together with the University of Basel and USB. Considerable efforts are being made by the Basel Hub to address the scientific and infrastructural challenges of building and maintaining clinical data warehouses and biobanks.

# UKBB Research at a Glance

## Vision

Research groups at UKBB operate on an international level, demonstrate outstanding research excellence, and have a clear focus leading to beneficial effects of research on health in infants, children, and adolescents.

## Research Goals

The main goal of our research is to gain scientific knowledge across basic, translational, and clinical research fields to improve diagnosis, treatment, and prevention of diseases in the entire paediatric age range. We aim to collaborate with associated institutions of SwissPedNet, other partner institutions within and beyond Switzerland, and industry partners in clinical trials. We promote truly translational research from bench to bedside, supporting young scientists in the development of their career through fostering their creativity, scientific thinking and problem-solving abilities, and helping them acquiring methodological skills to obtain scientific independence. This results in successful competitive research grant proposals and growth of research groups.

## Key Areas of Research

The key areas of research at UKBB are largely defined by structural professorships at the University of Basel and also include very successful research groups with excellent scientific output independent of structural endowment. The key focus areas of research at UKBB are as follows:

- Developmental paediatrics and pulmonology
- Haematology and oncology
- Immunology, infectious diseases, vaccinology
- Paediatric orthopaedics

## Organisation and Governance

Research at UKBB is carried out based on the current research strategy 2025, under the governance of the University of Basel, and embedded in the departmental structure of the medical faculty. Researchers at UKBB are affiliated with one or more of the departments of biomedicine (DBM), biomedical engineering (DBE), clinical research (DKF), or public health (DPH). The head of research and the UKBB research board are responsible for allocation of resources and reporting of research to the executive board and the board of directors.

## Quality Control

Standard operating procedures and quality control measures from the department of clinical research (DKF) and its clinical trial unit (CTU) are used for clinical studies in the paediatric clinical trial unit at UKBB. In general, clinical research is embedded in

the DKF and proposals are handled according to the Swiss Human Research Act (HRA) and assessed by the Ethics Commission of Northwestern and Central Switzerland (EKNZ).

### Members of the Research Board 2021 – 2022

**Chair: Prof. Sven Schulzke**, Neonatology, Head of Research

**Lut Berben, PhD, RN** Nursing Science and Development

**PD Dr. Julia Bielicki**, Infectious Diseases, Medical Lead Paediatric Research Centre

**Prof. Daniela Finke**, Developmental Immunology

**Prof. Dirk Fischer**, Neuromuscular Research

**Prof. Urs Frey**, Paediatric Pulmonology, Medical Director

**Prof. Stephanie Gros**, Molecular Therapeutic Strategies in Paediatric Surgery

**Prof. Ulrich Heininger**, Infectious Diseases and Vaccinology

**Prof. Georg Holländer**, Paediatric Immunology

**Prof. Marc Pfister**, Paediatric Pharmacology and Pharmacometrics

**Prof. Gabor Szinnai**, Paediatric Endocrinology

**Prof. Elke Viehweger**, Neuroorthopaedics

### Activities of the Research Board

Strategic research planning

Budget and infrastructure organisation

Allocation of resources to research groups

Career development of young investigators

Organisation of the annual research day

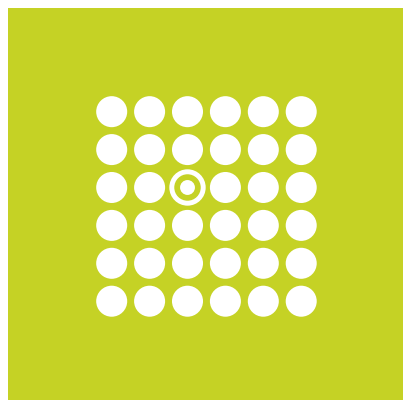
Reporting to the executive board and board of directors



Future Development of  
Research Infrastructure



# Future Development of Research Infrastructure



## The Basel University Centre for Rare and Undiagnosed Diseases



**Andreas Wörner, MD**

– Coordinator Rare Diseases  
UKBB

Rare diseases (RD) encompass about 8'000 different conditions with a prevalence of less than 1 in 2'000 inhabitants. In total, about 7% of the Swiss population have at least one rare disease. RD frequently show chronic clinical courses, often diagnosed in childhood. Because of their rarity, there is a risk of delayed diagnosis within different levels of the healthcare system. Accessibility to specialized interdisciplinary care is essential for affected persons in respect to diagnosis, coordinated care and treatment. By initiative of the National Council, a Coordination Board for RD, kosek (Nationale Koordination Seltene Krankheiten), was created to establish structures for RD coordinated care.

In 2020, the University Hospital Basel USB and the University Children's Hospital Basel UKBB were together approved as the **Centre for Rare Diseases (CRD) Basel**. Since then, children and adults with complex, yet-undiagnosed diseases have been treated in the consultation for patients without a diagnosis, a unique multidisciplinary offer to improve time to diagnosis and state-of-the-art treatment for RD. On a national level, coordinator groups have been formed in order to harmonize RD care approaches. Patient representatives take active part within these groups. The Swiss Rare Disease Registry SRDR aims to set up a nationwide disease-specific RD database, providing structure and support for future nested studies and epidemiological research.

In November 2021, kosek was given the first approvals for disease-specific reference centers. The CRD Basel was appointed Reference Center for Rare Neuromuscular Diseases (Heads: Prof. Andrea Klein, UKBB, and Prof. Michael Sinnreich, USB) and Associated Center for Rare Metabolic Diseases (Heads: Prof. Gabor Sinnai, UKBB, and Prof. Emanuel Christ, USB). In 2022, calls for further reference centers were opened – a decision is scheduled for 2023. Further goals of the CRD Basel include networking with international centers for RD, improvement of visibility and accessibility for affected patients, transition policies for RD patients, coordinated life-long care concepts and improved longitudinal research for chronic RD patients across the borders of paediatric and adult care.

# Future Development of Research Infrastructure



**PD Julia Bielicki, MD, MPH,  
PhD**

## Paediatric Research Centre at UKBB: Driving impactful high-quality research at UKBB through teamwork

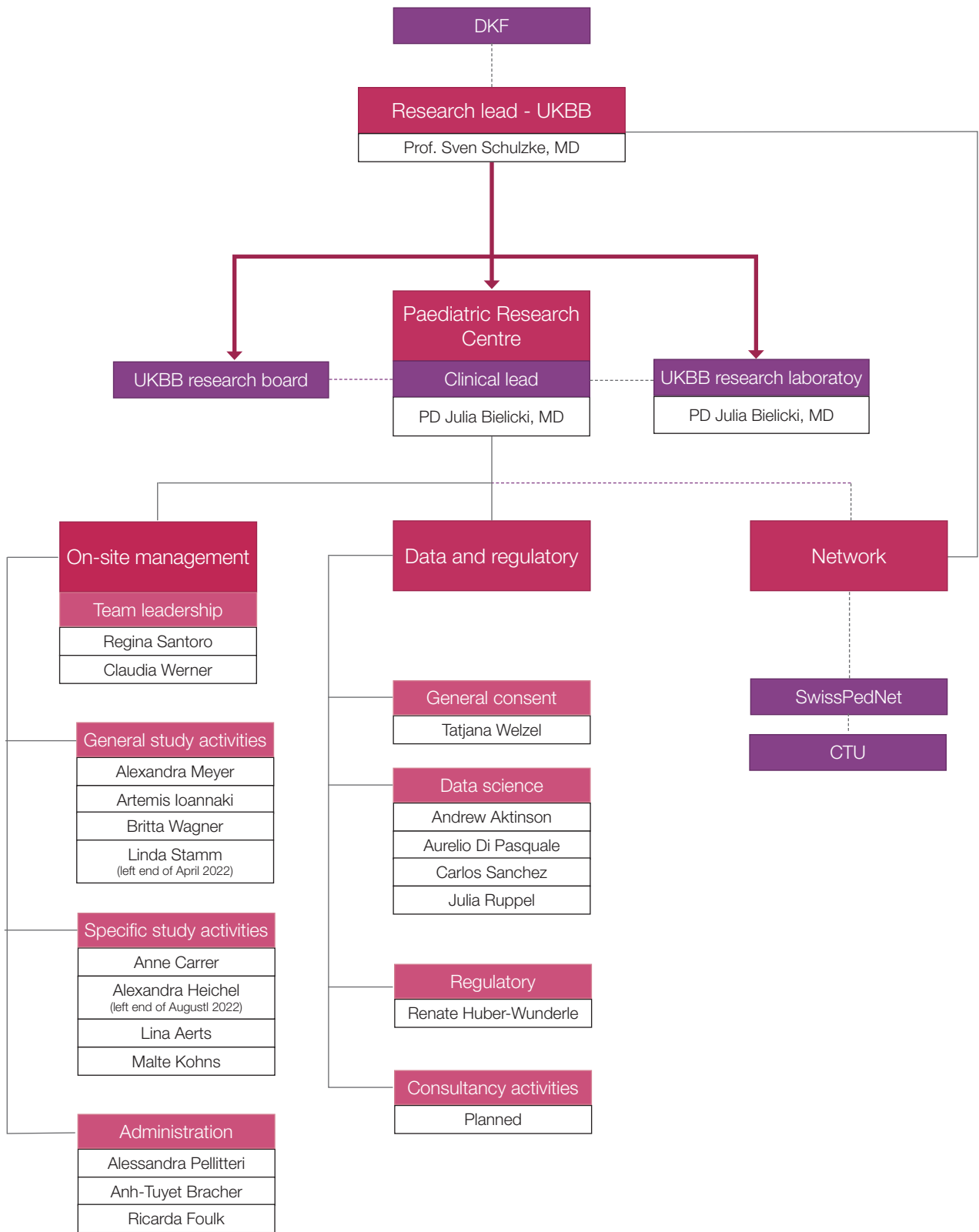
In 2021–2022, the team at the Paediatric Research Centre (PRC) supported 26 studies, including six investigator-initiated randomised controlled trials of which four were led or co-led by UKBB PIs working closely with the PRC.



The following activities to maintain and improve the PRC infrastructure for clinical research at UKBB took place:

- Revision and updating of Standard Operating Procedures through the orca platform of the Department for Clinical Research to ensure GCP-adherent training and implementation of clinical research involving the PRC team. The orca system is also fully adherent to Swiss-medic and FDA requirements and allows SOPs and relevant quality management processes to be managed through their whole life cycle.
- Submission and subsequent approval of a PRC biobanking regulation by the competent authority to enable integration of samples from PRC-supported studies into a biobank. The PRC biobank underwent accreditation by the Swiss Biobanking Platform and received the Vita Label.
- Revision and widening of the remit of General Consent now covering all inpatient areas, day care, radiology as well as selected outpatient clinics, for example the gait laboratory. Preparations for implementation of the General Consent in further outpatient clinics are currently underway.
- A research IT post actively contributed to optimization of use of IT resources, ranging from data visualization through data extraction from the new Electronic Health Record System KISIM, establishment of a searchable GC database to facilitate reuse of routine data and close collaboration with the Research IT of USB to advance data warehousing.

In 2023, we are looking forward to finalising the integration of UKBB in the Clinical Data Warehouse hosted by the University Hospital Basel.



# Future Development of Research Infrastructure



**Prof. Stephanie Gros, MD**

## Biobanking – Current Step and Future Concepts

Embedded within the Swiss Biobanking Platform (SBP) and the Basel Personalized Health Initiative the UKBB Biobanking team has taken major steps towards establishing the UKBB biobanking. The overall aim is to secure a reliable biobank to ensure high biosample quality, to make cooperative sharing of biological resources more accessible and to strengthen research opportunities of the UKBB.

The Swiss Biobanking Platform is orchestrating the development of a network of biobanks that conform to national and international legal requirements and comply with all ethical and quality standards. The goal is to make sample and data sharing possible throughout Switzerland. A biobank contains samples of human and non-human origin, for example liquids, tissue samples, cells, bacteria or others. Samples are intended for diagnostic, therapeutic or research purposes. The sampling is regulated and fully documented. An appropriate governance is required.

To ensure high-impact research on children's diseases, sampling of growing numbers of bio-specimens is becoming increasingly important. While the UKBB is faced with an expanding number of bio-samples, the need for clearly structured, regulated and documented approaches is becoming essential. Having successfully established a biobanking software at the UKBB to ensure correct documentation and harmonization of all biobanking processes including sample collection, transport, treatment, preparation, storing, distribution (which will ensure comparable quality standards in all Swiss biobanks) one of the major logistical challenges was solved. Finally, the location for the fully automated ultra-freezing unit of the Personalized Health Initiative Basel could be determined, the call was put out and the ordering process started.

Together with our partners from the University Hospital of Basel we are currently working towards establishing the standardized biosampling processes, the legally and scientifically correct handling of samples and data, and the setting up of IT processes to answer to scientific needs in unison with the Personalized Health Initiative of Basel. Establishing governance for the biobank will be one of the next steps to ensure effective use of these samples for relevant research questions. Qualified personnel are essential to professionalize these processes.



Rising Stars

# Rising Stars



**Morgan Sangeux, PhD, HDR**

## Group members

Prof. Heide Elke Viehweger, MD,  
PhD, MHA

Benjamin Kraler, MD

Marco Odorizzi, MD

Michelle Widmer, MD

Stefanie Albrecht, MSc

Matilde Bertoli, PhD

Katrin Bracht-Schweizer, PhD

Jacqueline Romkes, PhD

Bastian Widmer, MSc

## When machine learning and biomechanics meet to improve clinical decision making for children with cerebral palsy.

Cerebral palsy is the first cause of disability with a prevalence of about 2.5 in 1000 children born in developed countries. The cause of cerebral palsy is a brain lesion occurring shortly before or after birth which leads to secondary problems such as muscle and bone deformities. A variety of interventions may be performed to improve the children capacity to walk independently. Which is best, and for which child?

We tackle these questions following two approaches: biomechanical and statistical modelling. Instrumented gait analysis is utilised routinely at UKBB to inform the clinical decision-making process, plan the details of surgical interventions when these are deemed necessary, and evaluate the outcome of these interventions. Instrumented gait analysis provides quantitative and objective measures of the walking function. With the addition of musculoskeletal modelling, we estimate joint loading and determine personalised muscle function. This helps us predict the mechanical effect of the treatments. We are exploring how the technology developed for children with cerebral palsy may help decision making in other conditions, such as scoliosis, knee pain, or the early diagnosis of less common movement disorders.

Despite our biomechanical understanding, the principles of evidence-based medicine are difficult to apply by clinicians when choosing the most appropriate treatment for a given child, or when discussing their rationale with the families. We face low level of evidence to support interventions because of the ethical and practical difficulties to organise randomised controlled trials within the field of surgery. In addition, children with cerebral palsy vary markedly in clinical presentation and response to interventions. We have recently been awarded a Swiss Personalised Health Network project, EVIGAITCP, that will determine, from observational cohort data, the causal effect of some of the most common orthopaedic treatments to improve walking in children with cerebral palsy. The project starts with the two hospitals, but we are aiming to expand our approach nationally and internationally.

We are also exploring how our concept of biomechanics informed machine learning may apply to a range of other conditions, beyond cerebral palsy.

## Risk of cardiac disease after treatment for childhood cancer

Childhood cancer patients are at-risk of developing cardiac dysfunction after treatment with anthracycline-containing chemotherapy or chest radiation. Modifiable cardiovascular risk factors such as being overweight, hypertension, diabetes, and physical inactivity may potentiate this risk. So far, the prevalence of cardiac dysfunction in Swiss childhood cancer survivors is unknown. Studies from North America, where cardiovascular risk factors are different, suggest cardiac dysfunction in up to one third of adult childhood cancer survivors. Early detection and prompt medical management of cardiac dysfunction are crucial to prevent progression to heart failure.

Therefore, we established a multicenter, prospective, longitudinal cohort study to investigate the prevalence of and risk factors for cardiac dysfunction in adult childhood cancer survivors. We identify childhood cancer patients formerly treated in the Children's Hospitals of Basel, Bern, St. Gallen, Lucerne, and Geneva through the Swiss Childhood Cancer Registry and invite interested participants for a comprehensive cardiac assessment including conventional and speckle tracking echocardiography, and cardiopulmonary exercise testing. We also collect information on cancer diagnosis, treatment exposure, lifestyle, cardiovascular risk factors, fatigue, and quality of life. This study is ongoing and so far, we have completed baseline cardiac assessments in 380 patients.

The study is funded by: Krebsforschung Schweiz, Stiftung für krebskranke Kinder Regio basiliensis, and Nachwuchsförderung of the University of Basel.

Website: [www.cardiosurvivor.ch](http://www.cardiosurvivor.ch)



**Christina Schindera, MD, PhD**  
Transitional Care Research

### Group members

- Prof. Nicolas von der Weid, MD
- Tomas Slama, MD
- Andrea Ziörjen

# Rising Stars



**Malte Kohns Vasconcelos,  
MD, MSc**

Infectious Disease Epidemiology

## Group members

- PD Julia A. Bielicki, MD, MPH, PhD
- John van den Anker, MD, PhD
- Verena Gotta, PhD, PharmD
- Regina Santoro, Senior Trial Manager
- Claudia Werner, Senior Trial Manager
- Emanuela Früh, master's student
- Rameesa Khan, MSc Student
- Chloé Schlaeppli, MD, PhD candidate

## Management of acute respiratory infections

Acute respiratory infections (ARI) are the most common reason for unscheduled healthcare visits. With the roll-out of conjugate vaccines and increasing availability of detection methods for viruses, a major shift has occurred in the observed aetiology of severe ARI in young children: globally, most episodes are caused by viruses instead of bacteria. In this context, management strategies that reduce unnecessary use of antibiotics are becoming increasingly important. In the ADEQUATE trial, we randomise children with ARI in emergency departments in six European countries to either regular management or regular management plus an assay detecting 23 different respiratory pathogens at the point of care and follow them up to assess if early availability of pathogen detection results can avert antibiotic treatments or hospitalisations. In a sub-study, we investigate the effect of antibiotic treatment on the composition of bacterial colonisation in the throat and markers for antibiotic resistance.

In the KIDS-STEP Trial, which takes place in Switzerland and Germany, we randomise children admitted to hospital with community-acquired pneumonia (CAP) to receiving either a steroid or placebo to assess the effectiveness of early steroid treatment for accelerating clinical stabilisation. Antibiotic use is a secondary endpoint in this trial, and we believe that a shorter duration of vital sign alterations in the context of CAP may help to support decisions to withhold antibiotics or stop treatment earlier. Continuous collection of incidence data for all CAP admissions in the trial network, and pathogen detection data for more than two thirds of trial participants, allow us to monitor and describe changing patterns over the COVID-19 pandemic.

Other projects we work on include the modelling of minimum antibiotic dosing regimens that will result in adult-equivalent blood levels of antibiotics, and thereby secure the safe application of diagnostic standards in microbiology to children. Following on from previous work in the European Pregnancy and Paediatric HIV Cohort Collaboration, I am a board member of the Swiss Mother and Child HIV Cohort Study (MoCHiV) that contributes to several observational studies on management of children and young people living with HIV every year.



## Impact of cancer therapy on lung development in children

Advances in childhood cancer treatment and hematopoietic stem cell transplantation (HSCT) have resulted in continuously increasing survival rates over the last decades. These high survival rates have their drawbacks since the applied treatment can lead to various toxic side effects, including pulmonary toxicity. Treatment-related pulmonary dysfunction is often under-diagnosed, because conventional lung function tests including e.g., spirometry are not sensitive enough to detect small airway damage. In contrast, the novel nitrogen multiple-breath washout test (N2MBW) has been shown to be more sensitive in detecting early pulmonary dysfunction compared to conventional lung function tests.

The overarching aim is to comprehensively assess the early stages of pulmonary dysfunction in children treated for cancer or undergoing HSCT. Therefore, we will perform conventional and novel lung function tests prospectively over two years after cancer diagnosis or HSCT. In addition, magnetic resonance imaging (MRI) without contrast will be done to assess structural changes as well as ventilation and perfusion deficits. To address our research questions, we have set-up a multicenter cohort study in five paediatric oncology centers (Basel, Bern, Geneva, Lausanne and Zurich).

This study is the first study that comprehensively assesses pulmonary dysfunction during and after cancer treatment or HSCT in a standardized and prospective way. This knowledge will help to better understand pathophysiologic mechanisms of pulmonary toxicity, and tailor pulmonary surveillance, which may ultimately contribute to possible preventive interventions in the future.

This is a collaborative project between the oncology, radiology and pulmonary departments from different centers in Switzerland and ongoing projects in Australia (Prof. Paul Robinson, Sydney).



**PD Jakob Usemann, MD, PhD**  
Paediatric Pulmonology

### **Group members**

- Christine Schneider, PhD candidate
- Gabriele Raffle, PhD candidate



# Research Groups\*

\*in alphabetical order by Research Group Leader's name

# Translational Cellular Immunotherapy

- **Natural Killer (NK) Cells**
- **Acute Leukemia**
- **Children**
- **Graft-versus-Leukemia Effect**
- **Innate Immunity**
- **Memory NK Cells**



**PD Maya Caroline André, MD, PhD**

Research Group Leader

## **Group Members at the UKBB**

- Ronja Schirrmann, PhD
- Malika Sutter, PhD candidate
- Anila Knierim, PhD candidate
- N.N., PhD candidate
- Daniel Stowitschek, MD candidate
- Aylin Kuru, MD candidate
- Stela Halacheva, MD candidate

(all employed by the University of Tübingen, Germany)

The DNA methyltransferase inhibitors (DNMTi) 5-AzaCytidine (5-AzaC) and 5-Azadesoxycytidine (5-AzaD) are widely used in the treatment of myelodysplastic syndromes and acute myeloid leukemia to reverse the «epigenetic silencing» of tumour suppression genes. It has been noted that nanomolar doses of DNMTi may exert sustained changes in critical signalling pathways involved in AML tumorigenesis without inducing direct cytotoxic effects. We had previously observed in NOD SCID IL2R $\gamma$ <sup>-/-</sup> NSG mice that transplantation of healthy donor stem cells (SCs) resulted in sustained graft-versus-leukemia (GvL) effects mediated by immature NK cells when particularly low-doses of 5-AzaC were administered during SC differentiation. Following this observation, we subsequently provided evidence that 5-AzaC does not regulate NK cell differentiation itself but rather triggers the emergence of an inflammatory myeloid cell population, which is capable of triggering via so-far-unknown mechanisms the NK cell functionality. However, our own detailed RNAseq analysis revealed that the gene expression pattern seen in our inflammatory macrophages is fundamentally different from the gene expression pattern described in AML SCs that have been exposed to equally low doses of DNMTi. Since we propose a crucial role for the macrophage-mediated sterile inflammation in the host's innate immune response to leukemia, we currently ask the question if the epigenetic control of inflammation is comparable in myeloid cells derived from healthy SC donors and patients with MDS/AML. To this aim, we make use of stored bone marrow and peripheral blood samples of a large cohort of AML patients that has been treated with DNMTi and that will allow in-depth analysis of inflammatory macrophages «before» and «after» the initiation of therapy. A better understanding of how inflammatory myeloid differentiation is maintained in MSD/AML patients will be a pivotal step in further establishing an «epigenetic niche therapy» as an adjunctive form of immune stimulation.

Third party funding 2022 for our research group amounts to CHF 458'000 (various organizations)

# Transition to Adult Care in Paediatric Rheumatology Research Group

- **Transitional Care**
- **Transfer**
- **Adolescents and Young Adults**
- **Paediatric Rheumatic Diseases**



**Lut Berben, PhD, RN**  
Research Group Leader

## Group Members at the UKBB

- Andreas Wörner, MD
- Thomas Daikeler, MD
- Mary-Louise Daly, RN
- Johanna Dreier, RN

For up to 50% of children suffering from a rheumatic disease, medical care does not end when they reach adulthood and they will need ongoing medical care throughout their adult lives. Our research group assessed current transitional care practice in all 10 paediatric Swiss rheumatology clinics and their adult counterparts, and showed that the clinics had implemented the standards for good transitional care only partly. All study sites agreed to participate in a study designed to develop a transitional care program based on stakeholder input and the standards of good transitional care.

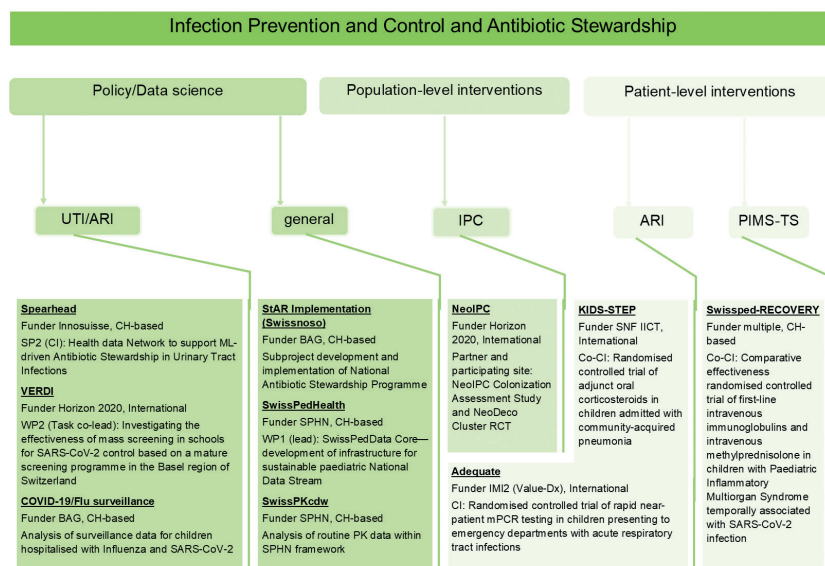
The overall aim of the HEROES study is to develop, implement and evaluate a transitional care program for adolescents and young adults with a rheumatic disease moving from paediatric to adult settings in Switzerland. To ensure a successful and sustainable transitional care program, this study is based on principles of implementation science. Overall, a hybrid-effectiveness implementation type 2 design and a mixed method, participatory partnership approach is used.

The development of the transitional care program is based on a thorough contextual analysis for all centers, review of literature and continuous stakeholder involvement. The following implementation outcomes will be assessed by interviews and questionnaires: acceptability, feasibility, appropriateness of the intervention, adoption, fidelity and penetration, and sustainability. Effectiveness outcomes will be assessed at the adolescents and young adults, parent, healthcare professionals, and healthcare setting/system levels and include quality of life, medication/ appointment adherence, trust in the healthcare team, satisfaction with transitional care, and work satisfaction. Economic outcomes will be measured at the adolescents and young adults, parent, and healthcare setting/system level and will include unplanned healthcare provider visits and absences from work.

In 2022 we received a research grant of CHF 520'000 from the Nursing Science Foundation Switzerland. Currently, we are preparing to conduct the baseline stakeholder interviews followed by the contextual analysis which will help to inform the development of the transitional care program.

# Infection Prevention and Control and Antibiotic Stewardship

The main activities of the group during 2021 and 2022 are displayed in Figure 1.



- Antibiotic Stewardship
- Antimicrobial Resistance
- Randomized controlled Trials
- Severe Bacterial Infections
- Infection Prevention and Control



**PD Julia Anna Bielicki, MD, MPH, PhD**  
Research Group Leader

## Group Members at the UKBB

- Malte Kohns, MD
- Tatjana Welzel, MD
- Lina Aerts, PhD
- Andrew Atkinson, PhD
- Chloé Schläppi, MD, PhD candidate NeolPC
- Julia Ruppel
- Carlos Sanchez
- Regina Santoro
- Anne Carrer
- Montserrat Fässli, MD candidate
- Rahel Erlacher, MD candidate
- Elena Robinson, master's student (Medicine)
- Emanuela Früh, master's student (Medicine)
- Ricarda Foulk

Specific highlights include:

- Extension of the KIDS-STEP trial investigating the effect of adjunct oral corticosteroid treatment in children hospitalised with pneumonia on the co-primary endpoints of clinical stability and disease relapse (SNF, grant 173532) to include four German centres in Bochum, Düsseldorf, Freiburg i.B. and Tübingen.
- Set-up and completion of the Swissped-RECOVERY trial (multiple funders) jointly led between UKBB and Kinderspital Zürich investigating the comparative effectiveness of intravenous immunoglobulins and intravenous corticosteroids as first treatment of Paediatric Inflammatory Multiorgan Syndrome temporally associated with SARS-CoV-2 infection. The results of this trial were published in the Lancet Child and Adolescent Health in early 2023.
- Participation in the international multicentre studies Adequate (IMI2, Value-Dx grant 820755) and NeolPC (Horizon 2020, grant 965328). PD Dr Bielicki is the Chief Investigator for both studies. Adequate is an RCT investigating the effectiveness of near-patient multiplex respiratory PCR testing in children presenting to emergency departments with acute lower respiratory tract infections. NeolPC is a programme of work developing infection prevention and control in neonatal intensive care, and the NeolPC colonisation assessment phase was implemented at the UKBB and 27 other neonatal units globally.
- Successful funding of the SwissPedHealth National Data Stream through the Swiss Personalised Health Network. PD Dr Bielicki leads Work Package 1 focusing on establishing the relevant infrastructure to sustain a key resource for on-going paediatric research in Switzerland, and as part of this is hosting the SwissPedHealth National Data Manager.

# Paediatric Epilepsy and Sleep

- Paediatric Epileptology
- Cerebral Plasticity
- Nocturnal Regeneration
- Sleep Structure and Development



## PD Alexandre N. Datta, MD

Research Group Leader

### Group Members at the UKBB

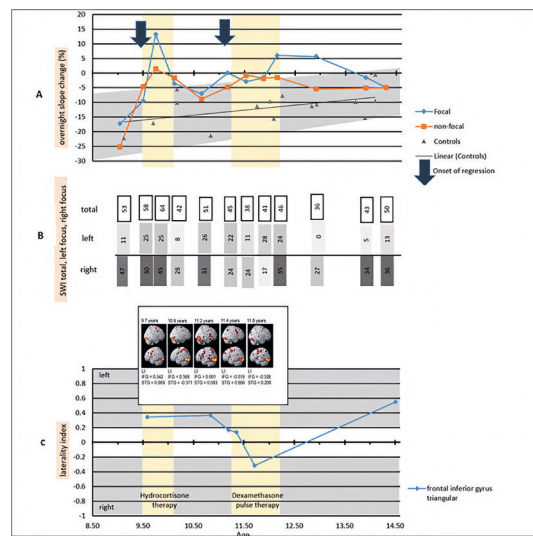
- Patricia Dill, MD
- Nina Bechtel, PhD
- Martina Studer, PhD
- Annette Nageleisen-Weiss, PhD candidate
- Alexandra Puchwein-Schwepke, MD
- Julia Früh, MD
- Dimitra Lekaditi, MD, MSc
- Chris Napirowsky, MD
- Diana Reppucci, MD
- Tobias di Marco, PhD candidate
- Sangeeta Jethwa, MD

The main activity of our research group consists of visualizing and understanding the impact of epileptic activity and the underlying genetic variants on functional networks of the brain and their adaptation capacities, in particular for language, memory and attention networks. Most of these processes happen during sleep. Our focus is in understanding sleep, its development, micro- and macrostructure and its capacities for regeneration and reorganization at different age groups, to explore the essence of brain plasticity. Cutting edge imaging and EEG techniques, new biomarkers including metabolome and microbiota are explored, developed, applied and correlated to clinical and neuropsychological parameters for visualizing the impact of epilepsy on cognition.

A main current project focuses on the gut–brain axis with application of exogenous ketone bodies as antiseizure treatment for children with pharmaco-resistant epilepsies.

Collaboration with many other local research teams of the UKBB, the Department of Clinical Research as well as national and international collaborations allow us to continuously develop and optimize our research goal.

Collaborations: Prof. Pablo Sinues, DBE and UKBB, Prof. Marc Pfister, Pharmacology UKBB; Prof. Sven Schulzke, UKBB, Prof. Dirk Fischer, UKBB, Prof. Anne-Katrin Pröbstel, USB, Dr. Bigna Bölsterli St. Gallen, Prof. Reto Huber, ZH, Prof. Claudio Bassetti, Berne, Prof. Maja Steinlin, Berne, Prof. Margitta Seeck and Prof. Christian Korff, Geneva, Prof. Sarah Lippé, Montréal, Prof. Ronit Pressler and Prof. Deb Pal, UK, Prof. Lino Nobili, Italy.



Graphic: 6-year course of sleep homeostasis in a case with epilepsy-aphasia spectrum disorder: Impact of epileptic activity on sleep and cognition looking at longitudinal focal and non-focal slope of slow waves in sleep, focal spike wave activities during night and language laterality by functional MRI. Oser et al., 2021

# Computational Physiology and Biostatistics

In 2021, we concluded a collaboration with the Karolinska Institutet, Stockholm, Sweden, in which we applied the method of fluctuation-based clustering to a cohort of adults with mild-to-moderate asthma, severe asthma, or chronic obstructive pulmonary disease (COPD). This method, previously developed in our group, uses machine learning techniques and aims to characterize patients based on their lung function fluctuation patterns.

Using this approach, we identified four lung disease phenotypes in which a progressive functional alteration can be observed, corresponding to gradually worsening clinical severity and increasing airway remodeling and cellular senescence. Remarkably, these phenotypes are independent of an asthma or COPD diagnosis, highlighting the overlap between these two diseases. Furthermore, eosinophilic (type 2) inflammation does not appear to be a determining factor for these newly found phenotypes.

These insights may translate into novel treatable traits such as specific components of remodeling pathways, and it may suggest monitoring strategies tailored to those whose airway function is least stable and who may be at increased risk of complications induced by respiratory viral infections. Our findings can be found in Delgado-Eckert, Edgar, et al. «Lung function fluctuation patterns unveil asthma and COPD phenotypes unrelated to type 2 inflammation.» *Journal of Allergy and Clinical Immunology* 148.2 (2021): 407–419.

<https://doi.org/10.1016/j.jaci.2020.12.652>

At the beginning of 2022, a new paediatric asthma research project was approved for funding by the Botnar Research Centre for Child Health (BRCCH). The project was conceived within our group and is in partnership with the Center for Digital Health Interventions at ETH Zurich and the Swiss Tropical and Public Health Institute. Consequently, we spent a significant amount of time during 2022 preparing the start of this 4-year project, which will be carried out in collaboration with eight tertiary care centers in Romania, a country with a high incidence of asthma in the targeted population. The goal of the project is to improve asthma control in children and adolescents using a smartphone-based gamified digital health assistant designed for regular and sustained remote disease monitoring and patient coaching.

- **Analysis of (Patho-)physiological Time Series**
- **Machine Learning based Disease Phenotyping in Asthma**
- **Mathematical Modeling of Host-Pathogen Interactions**
- **Development of Digital Health Assistants for Asthmatic Children and Adolescents**



**PD Edgar Delgado-Eckert, PhD**  
Research Group Leader

#### **Group Members at the UKBB**

- Carlos Sanchez, MSc
- Maximilian Köhler, MSc
- Ronid Picard Pérez-Gil, BSc

# Clinical Research in Paediatric Cardiology

- **Cardiac Function by Advanced Echocardiography and Spiroergometry**
- **Cardiac Repolarisation and Pharmacotherapy**
- **Heart Rate Variability**
- **Early Detection of Nocturnal Hypoglycemia**



**Prof. Birgit C. Donner, MD**  
Research Group Leader

## Group Members at the UKBB

- Elysanne Ramin-Wright, cand. med., master's student at University Basel
- Arianna Lauro, cand. med., master's student at University Basel (completed 2021)

We focus on clinical studies identifying patients at risk of cardiac sequelae.

## Nocturnal hypoglycemia in diabetic children: influence on cardiac repolarization and autonomic heart rate regulation.

In collaboration with **Dr. S. Bachmann**, Paediatric Endocrinology, the influence of nocturnal hypoglycemia on cardiac repolarization/autonomic heart rate regulation in children with type 1 diabetes mellitus is investigated. Using continuous nocturnal glucose measurements and ECG analysis, changes in the duration of repolarization and parameters of heart rate variability (HRV) related to hypoglycemia were studied.

A QTc lengthening and alterations in HRV occurred even before detection of nocturnal hypoglycemia (Bachmann et al. 2021).

A recent pharmacometric analysis by **Dr. V. Gotta, research group Prof. M. Pfister**, Paediatric Pharmacology and Pharmacometrics, confirmed QTc prolongation during nocturnal hypoglycemia with longest QTc intervals during the night time with highest risk for hypoglycemia (Gotta et al., submitted). The possible potential for hypoglycemia prediction is currently analyzed in cooperation with **Dr. X. Binbin**, University Lyon.

## Personalized medicine in patients with long QT syndrome and pregnancy

Pregnant women with inherited long QT syndrome are at an increased risk for preterm delivery, intrauterine growth retardation (IUGR) and arrhythmia. In cooperation with **Dr. T. Welzel and Prof. Dr. J. van den Anker**, Paediatric Pharmacology and Pharmacometrics, a review was performed to support clinicians in their selection of  $\beta$ -receptor blocker treatment for pregnant women considering the risk of IUGR, maternal comorbidities, fetal factors and the LQTS genotype (Welzel T. et al. 2021).

## Long-term cardiopulmonary function in preterm-born children

Three-dimensional real-time echocardiography in combination with cardiopulmonary exercise testing are applied for functional analysis of a cohort of formerly preterm children at school-age (followed by **Prof. S. Lemola**, Faculty of Psychology Basel).

In cooperation with **Prof. Dr. D. Trachsel**, paediatric pneumology, this cohort was compared with an age-matched control in respect of cardiopulmonary function and hemodynamics. Maximal oxygen uptake is significantly diminished, but individual factors like activity and a healthy lifestyle are strong confounders. These results might contribute to the detection of patients at-risk for pulmonary hypertension/ventricular dysfunction and help to establish preventive measurements.



# Paediatric Anesthesia

Mechanical ventilation is widely used in paediatric patients during general anesthesia and postoperative treatment, as well as therapy for respiratory failure of various etiology. The overall goals of mechanical ventilation are to optimize gas exchange and to reduce the patient's work of breathing, while minimizing ventilator-induced lung injury. Respiratory complications remain the leading cause of morbidity in children under anesthesia while the incidence of adverse events and complications is higher, the longer the mechanical ventilation.

Our research in the indicated period is focused on more precise monitoring of respiratory mechanical parameters and more efficient control of mechanical ventilation. More accurate measurement of airway pressure is a long-standing requirement in the field of mechanical ventilation due to possible iatrogenic lung damage associated with inadequate pressure application. Therefore, control of applied pressures in the airways and lungs is of utmost importance to guide ventilation modalities. This is of particular relevance during the potential use of less sophisticated ventilators, such as «pandemic or low-cost open-source ventilators» developed during the coronavirus pandemic.

Our COVent project initiated in 2020 is conducted in collaboration with the ETH product development group, and the financial support of the Botnar Research Center for Child Health, Basel. An add-on system has been developed that enables placement of a pressure sensor on the tip of the endotracheal tube. Using this system, extensive in vitro testing of respiratory mechanics has been executed with high-end and low-cost ventilators. After accomplishing a bench study, we continue tests on experimental animals with the aim of in vivo confirmation of previously obtained results.

At the same time, we are testing the safety of the developed intratracheal add-on system and low-cost ventilators as well as the possibility of effective and more precise tracheal-pressure-controlled mechanical ventilation. Tracheal pressure monitoring needs to be explored in order to evaluate its potential for a possibly decisive component for harmless mechanical ventilation strategies and, especially, improved adjustment in low-cost, open-source mechanical ventilators.

- Airway
- Mechanical Ventilation
- Respiratory Monitoring
- Safety



**Prof. Thomas O. Erb MD, MHS**  
Research Group Leader

#### **Group Members at the UKBB**

- Nikola Stankovic, MD, PhD

# Developmental Immunology

- Innate Lymphoid Cells
- Mucosa
- Inflammation
- Immune Response



**Prof. Daniela Finke, MD**  
Research Group Leader

## Group Members at the UKBB

- Gleb Turchinovich, PhD
- Frank Lehmann, PhD
- Yagmur Farsakoglu, PhD
- Gueric Samson, PhD
- Aurelie Lenaerts, PhD
- Franziska Bosch, PhD candidate
- Rüveyda Bal, student assistant
- Annick Peter
- Edit Horvath
- Martha Gaio

New subsets of functionally distinct innate lymphoid cells (ILCs) have been identified in recent years, which have important roles in determining the outcome of infections and inflammation. The research goal of our lab is to understand the molecular pathways controlling development, differentiation and function of ILCs with a primary focus on group 3 ILCs (ILC3s). To study ILC biology in mice, we use state-of-the-art technologies such as gene targeting of ILC3s with Cre/loxP, gene targeting of hematopoietic stem cells (HSCs) using Crisp/Cas9, multicolour flow cytometry and immunofluorescence staining of tissue sections and single cell RNA sequencing in combination with state-of-the-art bioinformatics. In particular, we focus on the commitment of ILCs from HSCs, the role for tissue-specific transcriptional regulation of ILC compartments and the key pathways that regulate ILC immune functions under steady-state and proinflammatory conditions.

## Characterizing the mutual interactions of ILC3s and T cells and their impact for adaptive immunity

Although research on ILC3s has provided evidence for their capacity to modulate T cell responses via multiple soluble factors, the molecular mechanisms underlying cell-contact dependent T cell regulation by ILC3s are less well-understood. Our recent data suggest that tissue-specific environmental factors regulate the capacity of ILC3s to induce antigen-specific CD4<sup>+</sup> T cell responses. We have now analyzed MHCII+ILC3 during primary and recall responses in lymphoid, mucosal and peripheral tissues. In addition, we have established new models which allow us to monitor ILC-T cell interactions *in vivo*.

## Defining the molecular signature of ILC3s

We have established a robust in-vitro differentiation system allowing the generation of ILC progenitors from HSCs. Our results show a developmental relationship between ILCs and dendritic cell progenitors. By using a combination of bioinformatic approaches we also identified a number of novel candidate genes that can play a role in ILC lineage commitment. Our studies will help to further understand molecular mechanisms underpinning ILC lineage specification and potentially provide additional targets for therapeutic intervention.

# Neuromuscular Research Group

Our main scientific activity is clinical studies aimed to delay disease progression in neuromuscular diseases. In the recent years, we investigated whether Tamoxifen has a positive impact on the course of the disease progression in ambulant DMD patients.

We coordinated a multicenter, 48-week, double-blind, placebo-controlled randomized clinical parallel trial (RCT) using a 1:1 design with a total number of 80 ambulant (6.5–12 year old) DMD patients. This trial was funded by ERA-NET 2016, the Swiss National Science Foundation, and various patient organisations of Switzerland, the UK, NL, Spain and Monaco (FSRMM, Duchenne UK, Duchenne Parent Project NL and Spain, and Association Monégasque Contre les Myopathies). 78 young (age 6.5–12 years) patients with DMD were included and evaluated over a period of 48 weeks.

The primary efficacy outcome, defined as the change of motor function in the MFM subscore D1, did not differ statistically between the Tamoxifen treatment group and the placebo control group. The change in the D1 subscore was 2.9 percentage points smaller in the Tamoxifen treatment group as compared to the placebo control group after one year of treatment (95% CI, 3.02 to 8.82,  $p=0.331$ ). The degree of disease progression was also less, although not statistically significant, in the Tamoxifen group than in the placebo group against all secondary endpoints. Overall, Tamoxifen was safe and well-tolerated.

In conclusion, this trial did not meet its pre-specified primary endpoint. Although there was a trend towards slower disease, and the degree of disease progression was less in the Tamoxifen group than in the placebo group against all endpoints, the differences were not found to be either clinically or statistically significant. Therefore, these results currently advise against the pursuit of Tamoxifen as a treatment option for DMD.

- Investigator initiated Clinical Trials
- Duchenne Muscular Dystrophy
- Tamoxifen
- Ketobodies
- Migraine Prevention



**Prof. Dirk Fischer, MD**  
Research Group Leader

## Group Members at the UKBB

- PD Andrea Klein, MD
- Patricia Hafner, MD
- Bettina Henzi, MD
- Carlos Spagnuolo, MD
- Niveditha Putananickal
- Daniela Rubino-Nacht
- Karin Wild

# Pulmonary Research Group

- Asthma
- Developmental Lung Physiology
- Air Pollution
- Genetics
- Respiratory Disease



**Prof. Urs Frey, MD, PhD**  
Research Group Leader

## Group Members at the UKBB

- Uri Nahum, PhD
- Edgar Delgado-Eckert, PhD
- Carlos Sanchez, MSc
- Olga Gorlanova, MD, PhD candidate
- Amanda Gisler, PhD candidate
- Annika Nissen-Kratzert, MD candidate
- Ben Hitzler, MD candidate
- Heide Oller, MD candidate
- Pract. med. Noëmi Kuenstle, study doctor, PhD candidate
- Céline Rüttimann, MD candidate
- Jakob Usemann, MD, PhD
- Andrea Marten, Dipl. Ing. FH
- Isabel Gonzalez Novoa
- Kathrin Gerber-Windisch
- Sandra Marti-Pasqual
- Mana Okada
- Fiona Beck

Titled «Air Pollution and Effects on Lung Functional Development and Respiratory Morbidity in At-Risk Infants», our project period spans 4 years (10.2021–09.2025) and is funded by the SNF (project 320030-204717/1). We previously demonstrated that even low-level air pollution exposure during pregnancy and early childhood is associated with impaired lung functional growth in infancy and early childhood. Although the mechanisms are still unclear, they could be related to lung functional growth deficits or remodeling of the lung due to changes in the intrauterine environment. Air pollution is known to induce oxidative stress response and related autophagy and cellular senescence mechanisms, potentially playing a role in pollution-related lung pathology and in remodeling. We recently found that, in the cord blood of human infants, autophagy-related biomarkers are correlated with remodeling biomarkers. We also found that air pollution exposure during pregnancy is associated with biomarkers of autophagy and remodeling in the cord blood of healthy term infants. We hypothesize that the interaction of oxidative stress response, autophagy and remodeling could be a key mechanism involved in the complex host–environment interaction determining lung functional growth and related respiratory morbidity. Moreover, this response could be different in infants at risk for chronic respiratory symptoms, such preterm infants, infants born from asthmatic mothers or infants exposed to high levels of air pollution during pregnancy.

We collaborate with several national and international research centers, including the Swiss TPH, Inselspital, Bern, The University of Newcastle, Australia, and institutes in Germany.

# Paediatric Gastroenterology & Nutrition

We have published clinical and epidemiological studies to better understand the etiology and course of chronic inflammatory bowel diseases, as well as studies on gastrointestinal motility and functional disorders. We have studied different therapeutic strategies in patients with functional abdominal pain in randomized, prospective and placebo-controlled clinical studies.

We have implemented different nutritional programs, (parenteral nutrition included) respective to the golden standards for hospitalized and ambulatory patients. We were very active in the development of guidelines, position papers and multicenter-studies of ESPGHAN/NASPGHAN. Several studies drew high attention to our Paediatric Endoscopy Quality Improvement Network (PEnQuIN). The scientific results were recently published as a supplement in the Journal for Paediatric Gastroenterology and Nutrition (JPGN). The PEnQuIN process has led to international agreement on clinically meaningful metrics that can be used to assess safety and quality of endoscopic care for children.

We have further started a research project, in cooperation with ETH Zürich. Since there are no specific instruments being developed for an easy and quick endoscopic retrieval of foreign bodies and there are still major challenges to the current lack of paediatric gastroenterology instruments, the overall objectives of this new research project are to develop and provide practical solutions for the detection and removal of metallic foreign bodies from the esophagus of children.

- Endoscopy
- Inflammatory Bowel Disease
- Functional Gastrointestinal Disorders
- Celiac Disease
- Quality



**PD Raoul I. Furlano, MD**  
Research Group Leader

#### **Group Members at the UKBB**

- Corinne Légeret, MD
- Marc A. Sidler, MD

# Molecular strategies in paediatric surgery

- Neuroblastoma – Mechanisms of Proliferation and Migration
- Novel Therapeutic Strategies
- Preclinical and Orthotopic Models
- Molecular Imaging
- Influence of Hypoxia on Tumor Progression



**Prof. Stephanie Gros, MD**  
Research Group Leader

## Group Members at the UKBB

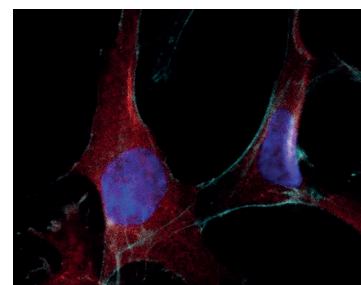
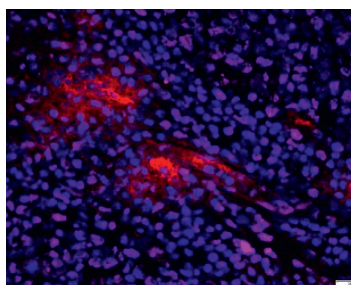
- Zihe Huo, PhD
- Urs Kym, MSc
- Nicola Pini MD candidate
- Stefanie Volkart, MD candidate
- Antonia Leutert, MD candidate
- Remo Bilang, MD candidate
- Natasha Whitehead, MSc
- Piotr Jasko, PhD candidate
- Rebecca Angresius, MD
- Byurhan Rashid, MD candidate
- Julius R uth, master's student



Neuroblastoma accounts for 15% of paediatric cancer deaths. Not much is known about its metastatic spread, which together with recurrence is the limiting factor for survival. Only a few new treatment strategies have been implemented in the past decade and none to specifically target tumor cell migration.

In our research we are targeting tumor hypoxia-induced proliferation and metastases by using several potent preclinical tumor cell inhibitors, some of which have already reached Phase I clinical trials. Our specific targets are the enzyme carbonic anhydrase IX (CAIX), which furthers tumor cell proliferation by helping to remove H<sup>+</sup> leaving tumor cells together with lactate and the water channel aquaporin 1 (AQP1) that primarily facilitates tumor cell migration, as we could show for neuroblastoma and thus may increase metastases (Huo et al., *Front Cell Dev Biol.* 2021; Pini et al., *Children* 2021). With a growing number of cooperation partners (University of Basel, DBSSE-ETH, and abroad) we were able to implement isothermal microcalorimetry for rapid drug response assessment in a preclinical setting as well as establish perfused 3D models for the preclinical evaluation of novel therapeutics and the tumor's micro-environment (Gros et al., *Int J Mol Sci.* 2019; Huo et al., *Int J Mol Sci* 2022). We also exploited some biophysical activities of tumor cells such as water membrane transport, adhesiveness and thermogenesis (Pini et al., *Children* 2021). For matching primary and metastatic esophageal carcinoma cell lines, we were able to show a correlation of increased thermogenesis and decreased adhesiveness with metastatic spread (Huo et al., *Cells* 2021).

We are currently working towards refining preclinical tumor and metastases models that allow us to analyze the metastatic process and to test novel therapeutics directed at defined stages of this process.



# Computational Spine Biomechanics

The «in SEA2 SpineBot» project aims to acquire in-vivo biomechanical data of functional spine units. The project was reinitialized following the work of a collaboration between the Institute for Surgical Technology and Biomechanics (ISTB) of the University of Bern and the University Children's Hospital Basel (UKBB) in 2006. The new project outline resulted in an additional collaboration with Prof. Georg Rauter from the BIROMED Lab at the Department of Biomedical Engineering (DBE) and received initial funding from the Christian Toggenburger Prize that was rewarded to PD Daniel Studer, MD in 2021. Consecutively, the project was reinitialized in the same year by recruiting Felix Erb as PhD candidate.

The aim of Felix Erb's PhD project is the construction of an updated spinal measuring device for safe and reliable data acquisition with the implementation of serial elasticity in its robotic construction. The design overhaul of the project hopes to overcome the technical and functional vulnerabilities of the original SpineBot. In addition, a pre-interventional planning tool is under development to process low-dose CT data to patient-specific robot motion, which further allows for reliable patient-specific measurement and facilitates the integration of the biomechanical data in finite element simulations.

A prototype is being constructed following an extensive requirement analysis and conceptualization of the device. The team members expect a validation and feasibility study by the year 2025.

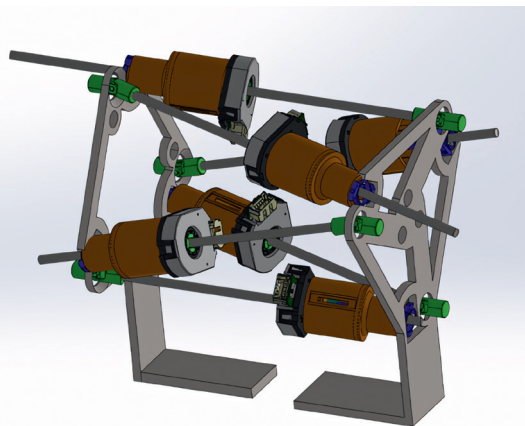


Figure 1: Concept of the «in SEA2 SpineBot», a programmable motorized parallel kinematic robot with serial elastic actuation for reliable force-controlled in-vivo measurement of the spine.

- Segmental Spinal Stiffness
- SpineBot
- Scoliosis



**Prof. Carol Claudius Hasler, MD**  
Research Group Leader

#### Group Members at the UKBB

- PD Daniel Studer, MD
- Christoph Heidt, MD
- Thomas Angst, master's student
- Anna Frei, master's student

# Paediatric Infectious Diseases and Vaccinology

- **Pertussis**
- **Vaccines**
- **Vaccine Hesitancy**
- **Varicella**
- **COVID-19**



**Prof. Ulrich Heininger, MD**  
Research Group Leader

## Group Members at the UKBB

- Prof. Jan Bonhoeffer, MD
- Chloé Schläppi, MD
- Nina Vaezipour, MD
- Rahel Erlacher, MD
- Michael Büttcher, MD

The main area of our research is in the field of **pertussis**, specifically its epidemiology, burden of disease, and prevention by vaccines. This research is performed in collaboration with national (Swiss Public Health Office and Swiss Paediatric Surveillance Unit, Zumstein et al., 2021a, Zumstein et al., 2021b) and international collaborators (Feng et al., 2021, Jog et al., 2022, Abu-Ray et al., 2022, Chitkara et al., 2022).

Our second main area of research deals with the epidemiology, burden of disease and vaccine prevention of **varicella** (Heininger et al., 2021, Pawaskar et al., 2021, Lienert et al., 2021).

**Acceptance of recommended vaccines** or its opposite: vaccine hesitancy (recently included in the top 10 threats for global health by WHO) has been a long-standing area of research by our group. Most recently, collateral effects of mandatory immunization were studied by the research group leader during a short-term sabbatical in Melbourne, Australia (Yap et al., 2022).

More recently, the **COVID-19** pandemic led to collaborative research on its epidemiology and clinical presentations (Sousa Filipe et al., 2021, Thiabaud et al., 2021, Brunigk et al., 2022, ) as well as collateral effects on other infectious diseases such as respiratory tract pathogens (Meyer Sauter et al., Kohns et al., 2021, Schmid et al., 2021) and invasive group A streptococcal infections (Erlacher et al., in preparation).

Further ongoing activities of this research group include management and epidemiology of **sepsis** (Fan et al., 2022), **measles** (Brühl et al., 2022), **soft tissue infections** (master theses S. Weber, ongoing) and a number of other areas in the field of paediatric infectious diseases (see publications in PubMed).

Finally, as the current president of the Paediatric Infectious Disease Group Switzerland (PIGS), UH initiated a strategy meeting that was held in Gerzensee, November 2022. There, amongst other items, further collaborative research amongst PID specialists in Switzerland has been discussed and promoted. Collaborative research has been successful in the past and will further materialize in the short and intermediate future with several projects already ongoing, some of which are led by members of our research group.



Figure 1: PIGS members at the strategic meeting in Gerzensee, November 3 and 4, 2022



# Congenital intestinal malformations

We enrolled 44 HSCR patients in a prospective multicenter study and grouped them according to their degree of colonic mucosal acetylcholinesterase-positive innervation into low-fiber and high-fiber patient groups. The fiber phenotype was correlated with the tissue cytokine profile as well as immune cell frequencies using Luminex analysis and fluorescence-activated cell sorting analysis of colonic tissue and immune cells. Using confocal immunofluorescence microscopy, macrophages were identified in close proximity to nerve fibers and characterized by RNA-seq analysis. Microbial dysbiosis was analyzed in colonic tissue using 16S-rDNA gene sequencing. Finally, the fiber phenotype was correlated with postoperative enterocolitis manifestation.

We published 3 peer-reviewed papers during this period.

- **Cholinergic Nerve Fibers**
- **Enterocolitis**
- **Hirschsprung's Disease**
- **Neuroimmunology**
- **Microbiome**



**Prof. Stefan Holland-Cunz, MD**  
Research Group Leader

#### **Group Members at the UKBB**

- Simone Ross-Keck, MD
- Virginie Galati-Fournier

# Paediatric Immunology

- Thymus Development
- Thymic Epithelial Cell
- T Cell
- Genetics & Epigenetics
- Lineage Fate



**Prof. Georg Holländer, MD**  
Research Group Leader

## Group Members at the UKBB

- Thomas Barthlott, PhD
- Julian Behr, PhD candidate
- Irene Calvo-Asensio, PhD
- Martha Gaio, administrative assistant
- Veysel Kaya, PhD candidate
- Anja Kusch, PhD candidate
- Lucas Musette, PhD candidate
- Saulius Zuklys, PhD

The thymus provides, throughout life, the physiological site for the development of T lymphocytes. Hence, its function is critical for the establishment and maintenance of the immune system's capacity to distinguish between vital «self» and injurious «non-self». Thymic epithelial cells (TEC) are instrumental in this process as they commit blood precursors to a T cell fate and select a repertoire of antigen specificities by expressing collectively almost every protein coding gene in the body. This creates a library of self-antigens that delete autoreactive T cells to establish immunological tolerance.

Our research uses gain or loss of function models to detail the genetic, epigenetic and metabolic control of TEC biology. We combine cytometry and histology with transcriptomic, proteomic and metabolic assays. Our work focuses on:

- The transcription factor FOXP1, a TEC master regulator. We determined the factor's structure and interactome and identified a novel primary immunodeficiency mediated by a FOXP1 mutant.
- The complexity of TEC development and regeneration. Lineage tracing and single cell transcriptomics revealed novel TEC subtypes and their developmental trajectories in response to growth factor stimulation enabling thymus regeneration.
- The epigenetic control of TEC biology. Interference with histone modifications, miRNA generation or RNA binding proteins profoundly impairs TEC development and function. Some changes are only apparent in adult mice thus allowing the dissection of age-related pathways depending on these epigenetic factors.
- The relevance of metabolism. Homeostasis of adenine nucleotides influences TEC mitochondria and superoxide production. Furthermore, distinct TEC subsets differentially depend on oxidative phosphorylation and glycolysis for ATP production.

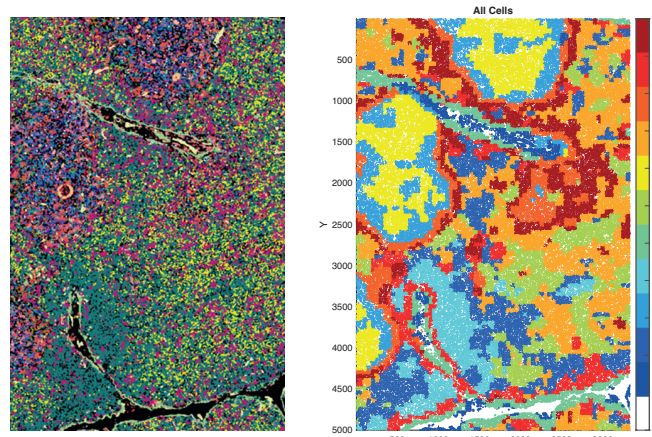


Figure 1: Thymus tissue analysis: Representation of 35 individual cell types (identified by pseudocolors, left panel) which form 12 distinct regions composed of separate cell types (right panel).

# Bone Tumour and Limb Reconstruction Group

## Research finished during 2021–2022

1. Personalized 3D-printed guide for resection of malignant bone tumors and following reconstruction. Goals: demonstrate the potential of treatment outcomes in the field of orthopedic oncology by using a 3D-printed guide. Results: Surg Oncol. 2022 Jun; 42:101733

2. Allograft bypass and reconstruction technique combined with long-term bracing in the treatment of congenital pseudarthrosis of the tibia. Retrospective study on CPT patients who accepted allograft bypass or reconstruction 2009–2018. Li Chengxi and Chao Dong have submitted for review.

3. Pelvis/hip research finalized projects:

- Acetabular coverage after triple pelvic osteotomy in patients with severe Legg-Calvé-Perthes disease related to ontogeny. Doctoral thesis by Mr. Adam Kratky, completed 04.2021.
- The «true» acetabular anteversion angle (AV angle): 2D CT versus 3D model. Kira Barlow and Z. Krol published in the International Journal of Computer Assisted Radiology and Surgery (2022).

## Research that is still ongoing:

1. Isothermal microcalorimetry (IMC) in bone and soft tissue sarcoma. Aim: evaluate the possible application of isothermal microcalorimetry in the prognosis of bone and soft tissue sarcoma. We tested the different drug resistance capability by IMC in cells and human tissues. At the cellular level, we induced drug-resistant U2OS cell lines using low concentration doxorubicin (Dox). We also tested different sarcoma cells of soft tissue and bone sarcoma under different medications in cooperation with the study group of Prof. S. Gros, MD.
2. In the area of reconstruction/deformities
  - In cooperation with the Functional Biomechanics Laboratory/USB (Nüesch C, Ismailidis P) we examined the development of muscle strength after femoral leg lengthening after a minimal follow-up of 10 years. The results were presented by Dr. Speth at the EPOS in Copenhagen and a publication is in preparation.
  - The same patient group was also analyzed regarding clinical and radiological-long term impact for the knee regarding a retrograde femoral approach after femoral intramedullary lengthening in cooperation with the radiology department (Harder D., Donners R.) at the USB. The manuscript was submitted at the end of 2022 after successful presentation at different conferences.

- Reconstructions and Tumours
- Deformities
- Hip
- Infections



**Prof. Andreas H. Krieg, MD**  
Research Group Leader

## Group Members at the UKBB

- Manuel Kraus, MD
- Zdzislaw Krol, PhD
- Chao Dong, MD
- Bernhard Speth, MD
- Chengxiang Li, MD candidate
- Sabina Gorski, MD candidate
- Adam Kratky, MD candidate
- Isabel Beglinger, master's student
- Claire Ettlin, master's student

# Immune Thrombocytopenia Research

- Platelets
- Thrombocytopenia
- Bleeding Disorder
- Autoimmunity
- Immune Hematology



**Prof. Thomas Kühne, MD**  
Research Group Leader

## Group Members at the UKBB

- Alexandra Schifferli, MD
- Monika Imbach
- Caroline Martin Asal
- Verena Stahel

The main focus of the group ([www.itpbasel.ch](http://www.itpbasel.ch)) is to understand the pathophysiology and clinical aspects of Immune thrombocytopenia (ITP), which is an autoimmune bleeding disorder mediated by autoantibodies, but also by autoreactive T-cells, the complement system, the monocytic phagocytic system and others. Thrombocytopenia is not only the result of premature platelet destruction, but also of an insufficient platelet production based on a decreased performance of the megakaryopoiesis.

A particular interest is to test the hypothesis whether platelets may have an effect on the immune system, based on the observation that a subgroup of patients with ITP who were treated with thrombopoietin-receptor agonists (TPO-RAs) may have sustained platelet responses. For this purpose, a prospective clinical study was performed and completed, and a second randomized clinical trial is currently recruiting patients. In these two trials patients were exposed to TPO-RAs and the immune system was measured at the cellular, cytokine and mRNA level. Sustained responses after termination of the TPO-RAs were observed (<https://doi.org/10.1182/blood-2021-146648>).

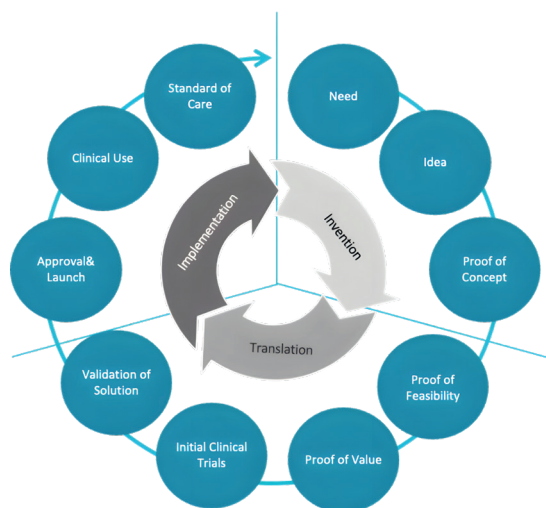
In our international ITP Registry there are data from almost 5000 children and adults with ITP. Because ITP is a diagnosis of exclusion, secondary ITP or non-immune thrombocytopenia may be diagnosed in the course of the disease. In an analysis of almost 4000 children, we found 113 patients with secondary ITP and non-immune thrombocytopenia in whom the diagnosis during an observation period of 2 years was changed to secondary ITP with infectious and autoimmune diseases as main causes (Schifferli et al., Blood Advances 2021).

Another clinical focus is in the clinical aspects of adolescents and young adults (AYAs). We were able to demonstrate, based on registry data in a Swiss-French collaboration, that there are unique aspects in this patient group and that this group is inadequately represented in clinical trials and current practice guidelines (<https://ashpublications.org/blood/article/140/Supplement%201/5551/487843>).

In 2022 we organized our triannual 7th ITP expert meeting in Lenzerheide with 30 distinguished experts from Europe and the USA, and discussed therapy-refractory ITP. A meeting supplementum with contributions of all participants will occur in a high-ranking journal soon.

# Paediatric Pharmacology and Pharmacometrics Research Center

The Paediatric Pharmacology and Pharmacometrics Research Center (PedPharm) is inventing, translating, and implementing intelligent digital health solutions and child-friendly formulations to improve and save the lives of paediatric patients (see below Figure).



- Paediatric Pharmacology
- Pharmacometrics (PMX)
- Systems Pharmacology
- Artificial Intelligence (AI)
- Paediatric Clinical Trials



**Prof. Johannes van den Anker, MD, PhD**

**(Paediatric Pharmacology);**

**Prof. Marc Pfister, MD**  
**(Pharmacometrics and Systems Pharmacology)**

Research Group Leaders

## Group Members at the UKBB

- Verena Gotta, PhD, PharmD
- Gilbert Koch, PhD
- Uri Nahum, PhD
- Cornelis Smit, PhD
- Tatjana Welzel, MD
- Michael Buettcher, MD
- Britta Steffens, PharmD
- Marion Anliker-Ort, PhD candidate
- Freya Bachmann, PhD candidate
- Dominic Braem, PhD candidate
- Tamara van Donge, PhD candidate
- Britta Steffens, PhD candidate-
- Marije Otto, master's student
- Swapnoleena Sen, master's student
- Anita Stebler, master's student
- Ricarda Foulk

**UKBB level** – The Paediatric Clinical Pharmacy group was formed (Dr. Verena Gotta) to provide paediatric pharmacology consultations in collaboration with PedPharm. As a result of a strong partnership with paediatric endocrinology (Prof. Gabor Szinnai) the digital health project OptiThyDose was granted ~1.0M by BRCCH.

**University of Basel level** – While mentoring three master students and six PhD students we have published more than 100 peer-reviewed papers in 2 years. We have strengthened our partnerships with Department of Pharmaceutical Sciences (Prof. Joerg Huwyler) and Swiss TPH (Prof. Jennifer Keiser). The latest joint project with Swiss TPH was granted ~0.8M by the Bill & Melina Gates Foundation.

**National level** – We lead SwissPedPha, serve in the SwissPedNet board and contribute to expert teams of SwissPedDose and PEdDeDose. We partner with several Swiss research centers such as the SwissPedNet hub Lucerne (Dr. Michael Buettcher).

**International level** – A joint project with the University of Oxford/MORU Tropical Health Network was launched to evaluate CHILD-IVITAB in children <15 kg (EPIC-15). EPIC-15 was granted ~0.5M by the Thrasher Research Fund.

**Start-up companies** – NeoPrediX AG was established to facilitate implementation of Pharmacometrics-AI based digital health solutions in perinatal medicine ([www.neopredix.com](http://www.neopredix.com)). Galvita AG was founded to bring child-friendly formulations such as CHILD-IVITAB to paediatric patients not just in Switzerland but worldwide, including low- and middle-income countries ([www.galvita.com](http://www.galvita.com)).

# Mycobacterial and Migrant Health Research

- Tuberculosis
- Biomarkers
- Immune diagnostics
- Refugee
- Asylum-seekers



**Prof. Nicole Ritz, MD, PhD**  
Research Group Leader

## Group Members at the UKBB

- Nora Fritschi, MD, PhD candidate
- Nina Vaeziopour, MD, MSc candidate
- Iryina Yurkina, MD
- Manuela Hauser, MD candidate
- Dimitri Rast, MD candidate
- Daniela Neudecker, MD candidate
- Mirjam Kissling, master's student
- Andrea Marten, laboratory technician
- Off-site:
- Julie Tomasini, study nurse, University of Fribourg
- Anita Uka, research physician and MD candidate, University of Fribourg

## Improving the diagnosis of tuberculosis (TB) in children

Improving the diagnosis of tuberculosis (TB) in children is done through several strategic approaches: child-friendly, easily accessible samples, and robust diagnostic biomarkers in the clinical settings. Notable achievements were made:

- In an EU-funded research and innovation project we found that a novel skin-based immunodiagnostic test (Diaskintest) has improved sensitivity. Diaskintest results were also associated with contagiousness of the TB index case.
- In our prospective multicentre Childhood Tuberculosis in Switzerland (CITRUS) study (ongoing since 2017) we have identified novel biomarkers using machine learning. These complement currently available immunodiagnostic tests for TB infection. In addition, we found that routine data (ratios from full blood counts) can be used as easy-to-obtain biomarkers in the diagnosis for TB.
- In a national surveillance study on TB in children we showed that subclinical TB (i.e., without symptoms) was present in one third of the cases, with higher frequency in children less than 5 years of age. Dr. med. Nora Fritschi, the first author of this study, received the 2022 Swiss TB award for this work.

In 2021 and 2022, a significant research area was **the impact of COVID-19 on children**. A key national study was co-ordinated by our research team in collaboration with the Swiss Paediatric Surveillance Unit. We determined the clinical spectrum and risk of hospital admission. In addition, we investigated the clinical spectrum of SARS-CoV-2 infection in neonates, which is often mild but may resemble neonatal bacterial infection. The novel Paediatric Inflammatory Multisystem Syndrome temporally associated with SARS-CoV-2 (PIMS-TS), was evaluated with emphasis on short- and long-term cardiology follow-up.

The third research priority focused on the **health of refugee children**. In collaboration with the Division of Infectious Diseases at Johns Hopkins University, we investigated the malaria risk of refugees in Africa. The study found that Congolese refugees in northern Zambia have a higher in-hospital mortality from malaria, despite the availability of local refugee centers. In Switzerland, we are currently leading a study to investigate the health of Ukrainian refugee children and the implementation of national screening recommendations.

# Neonatal Respiratory and Clinical Epidemiology Research Group

Our aims are to better understand and support the growing respiratory system of neonates along with systematically summarising the evidence in the field to provide up-to-date knowledge to care givers.

- **Preterm Birth**
- **Respiration**
- **Autonomic Dysregulation**
- **Neonatal Lung Disease**

## **Prognostic value of heart rate variability in preterm infants**

We are in the process of finalising a prospective cohort study assessing the predictive value of sample entropy on hypoxaemic events in preterm infants immunised in the hospital. We examine whether sample entropy, a measure of complexity in a time series of heart beats, helps clinicians to pre-emptively assess the risk of hypoxaemic events after immunisation. More than 280 preterm and term infants have been recruited due to excellent efforts of the study team. Within this SNSF-funded project, we also investigate associations of heart rate variability and hypoxaemic events following cessation of caffeine citrate therapy or stopping of respiratory support, both representing important milestones of maturation in the life of a preterm infant.



**Prof. Sven Schulzke, MD, MSc, FRACP**

Research Group Leader

## **End-expiratory pressure in neonates on invasive and non-invasive respiratory support**

The level of end-expiratory pressure or, in case of non-invasive ventilation, the level of continuous positive airway pressure that minimizes trauma to the lungs while enabling effective gas exchange is unknown in neonates. In order to overcome this critical knowledge gap, we launched a clinical study in our NICU to determine optimal end-expiratory pressure using modern infant lung function techniques. Recruitment is ongoing and we do hope that sophisticated forced oscillation and respiratory impedance measurements along with clinical indices of ventilation intensity will help us to determine the best possible compromise between effectiveness and safety of positive pressure support in neonates.

## **Randomised clinical trial: RoProp study**

The RoProp trial is an international, multi-centre, randomised clinical trial in preterm infants with threshold retinopathy of prematurity. Participants receive propranolol or placebo in order to prevent retinopathy requiring laser therapy. Recruitment for this trial starts in 2023 and we are looking forward to seeing the first results within the next 3 years.

## **Group Members at the UKBB**

- Christina Albicker, master's student
- Lara Canova, MD candidate
- Roland Gerull, MD
- Isabel Gonzalez, study nurse
- Sirée Kämpfen, MD, PhD candidate
- PD Roland Neumann, MD
- Leandra Ramin-Wright, MD candidate
- Christina Renner, master's student
- Pascal Scherer, master's student
- Carlos Sanchez Roldan, MSc
- Sabine Seiler, MD candidate
- Benjamin Stöcklin, MD, PhD

# Childhood leukemia

- Acute Myeloid Leukemia
- Molecular Mechanisms
- *in vivo* Models



**Prof. Jürg Schwaller, MD**  
Research Group Leader

## Group Members at the UKBB

- Amandine Bovay, PhD (Swiss National Science Foundation, SNF, until 08/2021)
- Zijovin Jevtic, PhD (Swiss Cancer League)
- Samantha Tauchmann, PhD candidate
- Hugues-Etienne Châtel-Soulet, PhD candidate
- Federica Valigi, PhD candidate
- Sabine Ehret, Laboratory Technician (80%)
- Jonathan Seguin, Bioinformatician (80%)

Our group explores the molecular mechanisms of paediatric acute myeloid leukemia (AML). Based on its rarity and genetic heterogeneity, we perform most of our studies in cell and mouse models. In 2020/21, we worked on two major subjects.

A) We studied the impact of the cellular origin and transforming potential of AML-associated fusion oncogenes in inducible transgenic mice. Using our inducible iMLL-AF9 AML mouse model, we found (in a collaborative study with Simon Mendez-Ferrer, Cambridge UK) functional interaction between tumor cells with bone marrow mesenchymal stem cells that help to escape from chemotherapy (Forte et al., 2020). We also studied malignant transformation by the NUP98-NSD1 fusion gene associated with aggressive paediatric AML (Jevtic et al., 2022, collaboration with Angela Bachi, Milan, Italy).

B) We studied the molecular mechanism of a rare AML form called acute erythroleukemia (Fagnan et al., 2021). We found that the nuclear interacting SET domain protein 1 (NSD1) histone methyltransferase controls erythroid differentiation and that its inactivation results in acute erythroleukemia (Leonards et al., 2020). In collaboration with Thomas Mercher (Paris, France) we also characterized primary tumor cells and defined and generated models of different molecular subgroups of this disease (Fagnan et al., 2020).

Finally, we functionally characterized the *in vitro* and *in vivo* transforming activity of a NFIA-ETO2 fusion gene associated with a very rare form of paediatric acute erythroleukemia (Piqué et al., accepted for publication).

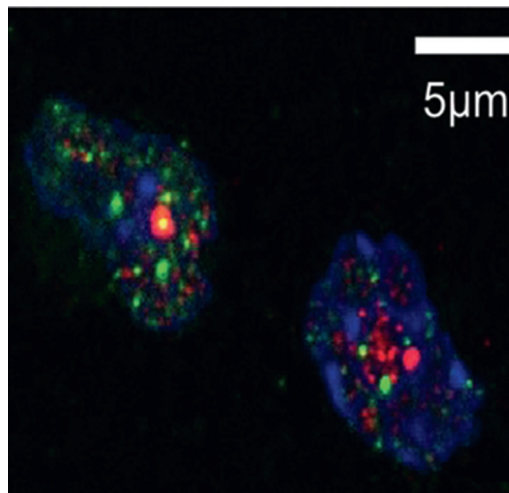


Figure 1: Immunofluorescence staining showing the NUP98-NSD1 fusion oncogene (red) and an interacting protein SMARCA5 (green) in hematopoietic cells (from Jevtic et al., 2022).

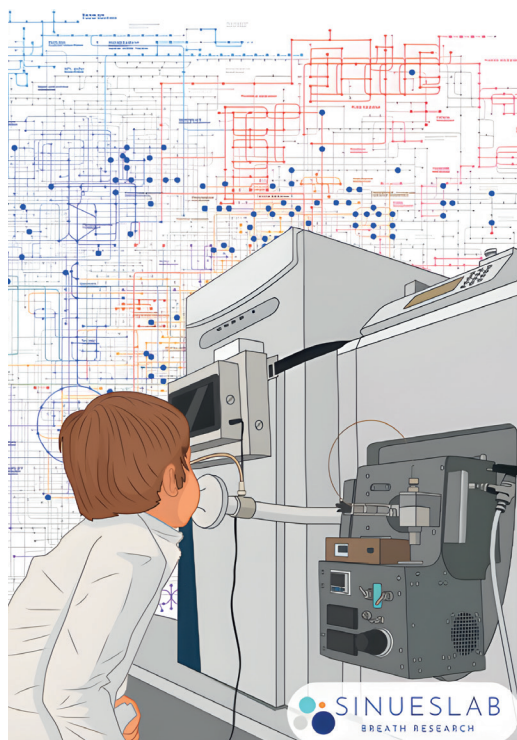


# Sinueslab: Translational Medicine Breath Analysis

The medical certification of the DBI-EPIbreath® Test, developed by Prof. Pablo Sinues' Deep Breath Intelligence Spin-Off, represents a significant achievement in the Translational Medicine Breath Research group's efforts to utilize breath diagnostics for rapid and non-invasive health assessments. The test enables faster and better decision-making for epilepsy medication, with results available in real-time and no sample preparation required.

In addition, a recent study published in iScience titled «Rapid detection of Staphylococcus aureus and Streptococcus pneumoniae by real-time analysis of volatile metabolites» demonstrates the ability of SESI-HRMS to quickly identify pathogenic bacteria, potentially reducing the time required for diagnosis and improving patient treatment. The study reveals that VOCs produced by S. aureus and S. pneumoniae cultures can be distinguished within hours, and patient samples can be classified into those with and without bacterial growth in just minutes.

Lastly, the iScience article «An Interoperability Framework for Multicentric Breath Metabolomic Studies» proposes an interoperability framework to standardize multicentric data collection and processing for breath analysis. The authors discovered a technical variability of approximately 20% and established a core metabolic breath signature of roughly 850 mass spectral features. The proposed framework and findings have the potential to facilitate large-scale multicenter studies in personalized medicine.



- **Breath Research**
- **Metabolomics**
- **Translational Medicine**
- **Personalized Medicine**



**Prof. Pablo Sinues, PhD**  
Research Group Leader

#### **Group Members at the UKBB**

- Amanda Gisler, PhD
- Jakob Usemann, MD, PhD
- Kapil Dev Singh, PhD
- Mohamad Awchi, PhD candidate
- Kim Fabienne Arnold, PhD
- Jiafa Zeng, PhD candidate
- Noemi Künstle, PhD candidate
- Fabienne Decrue, MD, PhD
- Zhihong Yin, PhD candidate
- Isabel Gonzalez
- Mélina Richard
- Nadine Oser, PhD
- Alexandra Christen
- Rosa Alba Sola Martinez, PhD
- Mana Okada

# Clinical Research in Paediatric Neurosurgery

- **Epilepsy Surgery**
- **Brain and Spinal Cord Tumor Surgery**
- **Craniosynostosis Repair**
- **Neuroendoscopy and Hydrocephalus**
- **PROMs**



## **PD Jehuda Soleman, MD**

Research Group Leader

### **Group Members at the UKBB**

- Prof. Raphael Guzman, MD  
Chief Paediatric Neurosurgery
- Maria Licci, MD
- Ladina Greuter
- Nicole Frank, MD
- Florian Ebel, MD
- Tim Hallenberger, MD,  
PhD candidate
- Serife Maide Pinar, MD candidate
- Several master's students
- Birsal Klein-Reesink, Study Coordinator  
Clinical Neurosurgical Research Center (CNRN) Basel

Aside from continuous research on paediatric brain tumors (Greuter 2021, Soleman 2021, Wyss 2022, and Greuter 2022), incidentalomas (Kozyrev 2021) and transitional care of patients with paediatric brain tumors (Ebel 2022), we focus on the minimal invasive treatment and surgical outcome of dysraphism, tethered cord, and spinal cord tumors (Stricker 2022, Lalgudi 2021, Greuter 2022). We were able to set up and introduce the Swiss Paediatric Brain and Spinal Cord Tumor Database, a national surgical database for paediatric brain and spinal cord tumors with the main goal of broadening our knowledge on the behavior of these tumors and improving their surgical treatment in children.

We further focus on advancing the area of minimally invasive neuroendoscopic treatment of intraventricular paediatric tumors (Ebel 2022) and paediatric arachnoid cysts (Soleman 2022), as well as the surgical treatment of childhood/neonate hydrocephalus (Serafimova 2021).

Early epilepsy surgery in children (Frank 2022), epilepsy surgery in children suffering from epilepsy due to syndromes such as Sturge-Weber syndrome (Frank 2022), and improved cognitive outcome after epileptic surgery (Knorr 2021) is an additional focus of our research group, underlining the importance of surgery as an integral part in the treatment of childhood epilepsy.

The improvement of surgical techniques for the correction of craniosynostosis by using pre-surgical CAM/CAD planning techniques and post-surgery 3D photography is an additional research focus of our group (Frank 2021).

We investigate the surgical management and outcome of patients with Chiari Type I malformations with and without syringomyelia, where several papers have been published in the past and many projects are still ongoing.

Lastly, PROMs, especially in the area of craniosynostosis repair, but also after selective dorsal rhizotomy for spasticity in cerebral palsy patients, in patients undergoing epilepsy surgery and neuroendoscopy is a major focus of our group.

Due to national and international collaborations our research group is and will further be able to design and execute some large volume and prospective studies analysing and potentially improving the treatment and outcome of these rare neurosurgical pathologies occurring in children.

# Paediatric Endocrinology and Diabetology

Over the last two years projects have been realized with local, national and international collaborators in Endocrinology and Diabetology. Further, as a result of strong partnership with Paediatric Pharmacology UKBB (Prof. Pfister) the digital health project OptiThyDose was granted by BRCCH in 2022 (<https://brc.ch/research/optithydose/>).

## Diabetology

First, the DiaHEART study, in teamwork with Prof. Donner, Paediatric Cardiology UKBB, is described in detail in Autonomic cardiac regulation during nocturnal hypoglycemia in diabetic children (Pediatr Diabetes 2021).

Second, a comprehensive quality of life study describes the psychosocial burden and fear of hypoglycemia in parents and their children with type 1 diabetes (Front Endocrinol 2022).

Finally, the DiaCAMP and DiaMONITOR studies combining continuous parallel measurement of physical activity and heart rate with routine glucose sensor data over 7 days have been realized.

The aim of these studies is to develop personalized recommendations to predict and avoid hypoglycemia in children with type 1 diabetes. These data are currently being analyzed in collaboration with Paediatric Pharmacology UKBB (Prof. Pfister), Computer Science and Machine Learning ETH Zürich (Prof. Vogt), and Computational Systems Biology ETH Zürich (Dr. Kaltenbach).

## Endocrinology

Based on retrospective longitudinal clinical data from four paediatric centers (Basel, Zürich, St.Gallen, Bern) we developed with the teams of Paediatric Pharmacology UKBB (Prof. Pfister) and Department of Mathematics, University of Konstanz (Prof. Schropp), algorithms for optimal personalized dosing for neonates with congenital hypothyroidism and children with hyperthyroidism (JPKPD 2021, J Optim Theory Appl 2021).

As a next step, clinical validation of these algorithms is planned in the context of the BRCCH-granted OptiThyDose study together with Prof. Pfister's and Prof. Schropp's teams. The OptiThyDose study is designed as a large multicenter prospective randomized controlled trial. Participating clinical partners are Hôpital Necker, Paris (Prof. Polak), Ospedale Bambino Gesù, Rome (Prof. Cappa) and Arabkir Medical Center in Yerevan, Armenia (Prof. Navasardyan). The ultimate aim is to provide simple personalized dosing to children with thyroid diseases.

- Diabetes
- Thyroid Diseases
- New Technologies
- Pharmacometrics Modeling
- Quality of Life



**Prof. Gabor Szinnai, MD, PhD**  
Research Group Leader

### Group Members at the UKBB

- Sara Bachmann, MD
- Marie-Anne Burckhardt, MD, PhD
- Melanie Hess, MD
- Fabien Claude, MD
- Ricarda Foulk, administrative study coordinator

# Clinical Biomechanics: Paediatric Orthopaedics and Musculoskeletal Modeling

- **Motion Analysis**
- **Biomechanics**
- **Machine Learning**
- **Patient-reported Outcome**



**Prof. Heide Elke Viehweger,  
MD, PhD, MHA**

Research Group Leader

## **Group Members at the UKBB**

- Morgan Sangeux PhD, HDR (co-lead research group)
- Jacqueline Romkes, PhD
- Katrin Bracht-Schweizer, PhD
- Enrico De Pieri, PhD
- Matilde Bertoli, PhD
- Michele Widmer-Klaeusler, MD
- Prof. Reinald Brunner, MD
- Marco Odorizzi, MD
- Benjamin Kraller, MD
- Beat Göpfert, Bs eng
- Stephanie Albrecht, MSc
- Bastian Widmer, MSc
- Christoph Heidt, MD, PhD
- Gherardo Pagliazzi, MD

The group focuses on clinical biomechanics in paediatric orthopaedics and neuroorthopaedics using motion analysis, neuromusculoskeletal modeling and virtual reality (VR). Predictive neuromusculoskeletal models and interdisciplinary outcome evaluation methods are developed. The group creates systems for therapeutic/surgical decision-making support, in-silico models, medical imaging for clinical biomechanics and advanced rehabilitation. The research pathway comports the association of technical, functional and patient-reported outcome measures (PROMs). An SNF Project #200903 (2021, PI Viehweger) at the University of Basel has the purpose of exploring the interplay among nervous, musculoskeletal, and psychological systems and their impact on toe-walking behavior, and vice versa.

A developed musculoskeletal modelling platform informs clinical decisions to address knowledge gaps identified by clinicians in orthopaedics and neuroorthopaedics.

In a collaborative project with the Institute of Sports Science, University of Basel (Study ID EKNZ 2020-02827), the research group is the only group in Switzerland with experience in biomechanical exploration of functional training in CP patients based on a motion capture system.

The group co-founded the research focus group CADENCE—Clinical Biomechanics and Ergonomics Engineering of the DBE (Prof. Mündermann, Prof. Rauter, Dr. Netzer). With SNF Requip funds, a new research laboratory is under equipment to complete the technical possibilities, combining VR environment, innovative ways to capture movement (wearable sensors, markerless systems) and real-time feedback during dynamic activities, employing more complex tasks using the fall safety feature of «The FLOAT», a Robotic Body Weight Unloading System for 3D Overground Training.

Digital health solutions are developed and health-specific data collected. Recently a collaboration with the Department of Mathematics and Computer Science was established to develop Clinical Decision Support and Information Management, to establish interconnective digital platforms and introduce machine learning (ML), artificial intelligence (AI) and Internet of Things (IoT) in the research workflow. The recent SPHN demonstrator funds (M. Sangeux) serve as an accelerator for the digital health projects.

# Outcomes Research in Paediatric Oncology

## 2021:

Many publications from the SURfit study (effects of a 1-year partially supervised exercise program in childhood cancer survivors – the 1st worldwide randomized intervention study) show positive effects of exercise in reducing cardio-vascular risk factors, ameliorating bone structure and strength, as well as the general fitness.

Start of the multicenter CardioOnco study (PI Christina Schindera, Tomas Slama PhD student) aiming at the early diagnosis of cardiac dysfunction in childhood cancer survivors (CCS) using a new echocardiographic technology (speckle tracking); publication of the results of the monocentric study she realized in Berne.

Collaboration with the Pulmonology Research Group at UKBB (PI Jakob Usemann) for early detection of pulmonary damage in CCS using multiple-breath washout technology with a first publication showing enhanced sensitivity of the new technique compared to spirometry.

Collaboration with the Research Group at ISPM of the University of Berne (Prof. Claudia Kühni), a.o. in the field of hearing loss in CCS, looking at its prevalence but also at whether CCS would use low-threshold approaches (like realizing the hearing test in the city, collaboration with Amplifon).

Research project with the Pharmacology Dpt at UKBB (Prof. Marc Pfister) studying late renal toxicity in CCS, by looking at new biological markers in blood and urine, as well as urine cytology (collaboration with Cytology/Pathology at USB, Prof. Lukas Bubendorf).

## 2022:

Start of a new intervention study with standardized training to prevent peripheral polyneuropathy (PNP) in children with cancer treated with neurotoxic medications (collaboration with Dr. Fiona Streckmann).

Start of different research projects in the field of fertility preservation in children and adolescents with cancer (PI Tamara Diesch, collaboration with Dr. Astrid Ahler) but also with non-malignant hematologic conditions like hemoglobinopathies (Sickle Cell Disease and Thalassemia).

- Childhood Cancer
- Survivor
- Cardiovascular Outcomes
- Intervention Studies



**Prof. Nicolas-Xavier von der Weid, MD**

Research Group Leader

### Group Members at the UKBB

- Christina Schindera, MD, PhD
- Tamara Diesch, MD
- Alexandra Schifferli, MD
- Tomas Slama, PhD candidate/  
Project manager (2021–2022)

# Paediatric Rheumatology Research Group

- Inflammatory Diseases
- Personalized medicine
- Transition
- Disease activity
- Implementation research



**Andreas Wörner, MD**  
Research Group Leader

## Group Members at the UKBB

- Tatjana Welzel, MD
- Florence Aeschlimann, MD
- Thomas Daikeler, MD,  
Rheumatology USB
- Lut Berben PhD, Rheumatology  
Transition
- Christiane Marquis, Nurse
- Mary Daly, Transition Clinic  
Nurse

The Paediatric Rheumatology Research Group (PRRG) focuses on clinical studies addressing efficacy, safety and individualized dosing of anti-inflammatory medication and investigates vaccination aspects in children with paediatric inflammatory rheumatic diseases (PiRD) under immunosuppression.

In 2021/2022, the PRRG completed a pilot study assessing pharmacokinetics (PK) of adalimumab, a monoclonal antibody directed against tumor necrosis factor-alpha. Up to now, adalimumab is dosed in fixed-weight-based bands, irrespective of co-medication/potential factors influencing adalimumab PK. The study aims to characterize PK and adalimumab target values correlated to the disease activity in PiRD.

Children with PiRD have an increased infection risk. In a multicenter observational cohort study, the PRRG assessed the vaccination completeness in Swiss PiRD patients stratified by immunosuppressive treatment. This study showed that maintaining a complete vaccination status was only reached in a minority of PiRD patients (Welzel, Wörner et al., *Front Ped* 2022).

With the emergence of SARS-CoV-2 in 2020, effective anti-inflammatory treatment for children affected by paediatric inflammatory multisystem syndrome temporally associated with SARS-CoV-2 (PIMS-TS) was urgently needed. PRRG members were involved in a recent open-label multicenter two-arm RCT investigating the effectiveness of intravenous methylprednisolone compared with intravenous immunoglobulins in children with PIMS-TS (Welzel et al., *Front Ped* 2022; Welzel et al., *Lancet Child Adolesc Health* 2023). Myocardial involvement in PIMS-TS was studied in the multicenter international CARDOVID study using cardiovascular MRI (Aeschlimann et al., *Cardiovasc Magn Reson* 2021).

About half of all patients with PiRD diagnosed in childhood need continuous specialized medical care during adolescence and adulthood. A careful transition from a paediatric to an adult rheumatology team is key for high-quality care in early adulthood. In a Swiss multicenter study, the PRRG assessed the practice of transitional care in respect of current international guidelines (Berben, Wörner et al., *Swiss Med Wkly* 2021). Further research will focus on implementation of standard-of-care transitional programs for adolescents with PiRD in Switzerland.



Publications 2021/2022

# Publications 2021/2022

in alphabetical order by Research Group Leader's name

## PD Maya Caroline André, MD, PhD

### Peer reviewed article

Welzel T, Schöbi N, André MC, Bailey DGN, Blanchard-Rohner G, Buettcher M, Grazioli S, Koehler H, Perez MH, Trück J, Vanoni F, Zimmermann P, Atkinson A, Sanchez C, Whittaker E, Faust SN, Bielicki JA, Schlapbach LJ; Swissped Recovery Trial. Multicenter Randomized Trial of Methylprednisolone vs. Intravenous Immunoglobulins to Treat the Pediatric Inflammatory Multisystem Syndrome-Temporally Associated With SARS-CoV-2 (PIMS-TS): Protocol of the Swissped RECOVERY Trial. *Front Pediatr.* 2022 May 20;10:905046. doi: 10.3389/fped.2022.905046. PMID: 35669398; PMCID: PMC9163685

### Review

Schlapbach LJ, Andre MC, Grazioli S, Schöbi N, Ritz N, Aebi C, Agyeman R, Albisetti M, Bailey DGN, Berger C, Blanchard-Rohner G, Bressieux-Deguedre S, Hofer M, L'Huillier AG, Marston M, Meyer Sauter PM, Pachlopnik Schmid J, Perez, MH, Rogdo PM, Trück J, Woerner A, Wütz D, Zimmermann P, Levin M, Whittaker E, Rimensberger PC. Best Practice Recommendations for the Diagnosis and Management of Children with Pediatric Inflammatory Multisystem Syndrome Temporally Associated With SARS-CoV-2 (PIMS-TS; Multisystem Inflammatory Syndrome in Children, MIS-C) in Switzerland, *Front Pediatr* 2021; May 26th. <https://doi.org/10.3389/fped.2021.667507>

## Lut Berben, PhD, RN

### Peer reviewed article

Berben L, Sigg N, Daly ML, Bachmann S, Baer W, Berthet G, Bolt I, Dan D, Enderlin Steiger S, Fröhlich J, Hasler P, Hofer M, Huemer C, Kaiser D, Marcoli N, Palmer Sarott S, Rottländer Y, Schmid G, Soennichsen C, Strahm Furler L, Vanoni F, Wildi L, Daikeler T, Woerner A. Current practice of transitional care for adolescents and young adults in Swiss paediatric and adult rheumatology centres. *Swiss Med Wkly.* 2021 Nov 12;151:w30046. doi: 10.4414/smw.2021.w30046. PMID: 34797619.

Cajita MI, Denhaerynck K, Berben L, Dobbels F, Van Cleemput J, Crespo-Leiro M, Van Keer J, Poncelet AJ, Russell C, De Geest S. Is degree of chronic illness management in heart transplant centers associated with better patient survival? Findings from the intercontinental BRIGHT study. *Chronic Illn.* 2022 Dec;18(4):806-817. doi: 10.1177/17423953211039773. Epub 2021 Sep 22. PMID: 34549630; PMCID: PMC9643815

## PD Julia Anna Bielicki, MD, MPH, PhD

### Peer reviewed article

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## Prof. Birgit C. Donner, MD

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## Prof. Thomas O. Erb, MD, MHS

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## Prof. Daniela Finke, MD

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## Prof. Dirk Fischer, MD

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## Prof. Urs Frey, MD, PhD

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## Prof. Stefan Holland-Cunz, MD

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## Prof. Andreas H. Krieg, MD

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## Prof. Thomas Kühne, MD

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# Publications 2021/2022

**Prof. Marc Pfister, MD  
(Pharmacometrics and Systems Pharmacology)**

**Prof. Johannes van den Anker, MD, PhD  
(Paediatric Pharmacology)**

## Peer reviewed article

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## Prof. Nicole Ritz, MD, PhD

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## Prof. Sven Schulzke, MD, Msc, FRACP

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## Prof. Jürg Schwaller, MD

### Peer reviewed article

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## Prof. Pablo Sinues, PhD

### Peer reviewed article

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## Prof. Heide Elke Viehweger, MD, PhD, MHA

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## Prof. Nicolas-Xavier von der Weid, MD

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## Andreas Wörner, MD

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# Promotions and Honours

# Habilitations/Dissertations/Master Thesis

## Full Professorship

Name	First name	Research Group
Sinues	Pablo	Translational Medicine Breath Analysis

## Titular Professorship

Name	First name	Research Group
Krieg	Andreas	Bone Tumor and Limb Reconstruction
Szinnai	Gabor	Paediatric Endocrinology and Diabetology
Viehweger	Heide Elke	Clinical Biomechanics: Paediatric Orthopaedics and Musculoskeletal Modeling

## Habilitations

Name	First name	Research Group
Bielicki	Julia Anna	Infection Prevention and Control and Antibiotic Stewardship
Delgado- Eckert	Edgar	Computational Physiology and Biostatistics
Neumann	Roland	Neonatal Respiratory and Clinical Epidemiology Research
Subotic	Ulrike	Congenital intestinal malformations
Studer	Daniel	Computational Spine Biomechanics
Usemann	Jakob	Pulmonary Research Group
Vuille-dit-Bille	Raphael N.	Congenital intestinal malformations

## Dissertations

Name	First name	PhD/MD	Title	Supervisor	Research Group
Bilang	Remo	MD	Perfusion-Based Bioreactor Culture and Isothermal Microcalorimetry for Preclinical Drug Testing with the Carbonic Anhydrase Inhibitor SLC-0111 in Patient-Derived Neuroblastoma	Stephanie J. Gros	Molecular Strategies in Paediatric Surgery
Burckhardt	Marie-Anne	PhD	Improving patient care in young people with Type 1 Diabetes using advances in technology	Timothy W. Jones, Children's Diabetes Centre, Children's Hospital Perth, Australia	Paediatric Endocrinology and Diabetology
Châtel-Soulet	Hugues-Etienne	PhD	Understanding the cellular and molecular mechanisms of EVI1-expressing KM-T2A-rearranged acute myeloid leukemia	Jürg Schwaller	Childhood Leukemia
Decrue	Fabienne	PhD	Impact of environmental factors on preterm and term-born infants and children	Urs Frey/ Pablo Sinues	Pulmonary Research Group/Translational Medicine Breath Analysis
Evers	Katrina	PhD	Novel biomarkers in perinatology and infancy	Sven Wellmann/Mirjam Christ-Crain	Fetal and Neonatal Stress Research
Frank	Nicole	MD	Focal Lesionectomy as surgical treatment of epilepsy in patients with Sturge-Weber syndrome: a case-based systematic review and meta-analysis	Jehuda Soleman	Clinical Research in Paediatric Neurosurgery
Freisleder	Florian	MD	Pain During Cast Wedging of Forearm Shaft and Distal Forearm Fractures in Children Aged 3 to 12 Years — A Prospective, Observational Study	Johannes Mayr	Congenital intestinal malformations
Gisler	Amanda	PhD	Main and Interaction Effects of Gaseous and Particulate Pollutants on Respiratory Health in Children	Urs Frey/ Pablo Sinues	Pulmonary Research Group/Translational Medicine Breath Analysis

# Habilitations/Dissertations/Master Thesis

## Dissertations

Name	First name	PhD/MD	Title	Supervisor	Research Group
Gorski	Sabina	MD	Vascularized Bone Graft Reconstruction Following Bone Tumor Resection at a Multidisciplinary Sarcoma Center: Outcome Analysis	Andreas H. Krieg	Bone Tumor and Limb Reconstruction
Hauck	Annalisa Giada Virginia	MD	Early life serum neurofilament dynamics predict neurodevelopmental outcome of preterm infants	Sven Wellmann	Neonatal Respiratory and Clinical Epidemiology Research
Hauser	Manuela	MD	Malaria in Refugee Children Resettled to a Holoendemic Area of Sub-Saharan Africa	Nicole Ritz	Mycobacterial and Migrant Health Research
Heiri	Andrea	MD	Young adults with immune thrombocytopenia: an observational study of the PARC-ITP Registry On behalf of the Intercontinental Cooperative ITP Study Group (ICIS)	Thomas Kühne	Immune Thrombocytopenia Research
Herrmann	Katharina	MD	Mismatch response in preterm and asphyxiated neonates: a functional electrophysiological investigation of attention and habituation	Peter Weber	Paediatric Neurology and Developmental Medicine
Huber	Rehana	MD	Is there a relationship between socioeconomic factors and prevalence, adherence and outcome in childhood epilepsy? A systematic, scoping review	Peter Weber	Paediatric Neurology and Developmental Medicine
Huo	Zihe	PhD	Innovative hypoxia-related factors in neuroblastoma metastasis and therapeutic methods	Stephanie J. Gros	Molecular Strategies in Paediatric Surgery
Jethwa	Sangeeta	MD	Sleep architecture in neonatal and infantile onset epilepsies in the first six months of life	Alexandre Datta	Paediatric epilepsy and sleep
Knorr	Corine	MD	Subgroup analysis of seizure and cognitive outcome after vagal nerve stimulator implantation in children	Jehuda Soleman	Clinical Research in Paediatric Neurosurgery
Krátký	Adam	MD	Acetabuläre Überdachung nach Triple-Beckenosteotomie bei Patienten mit schwerer Legg-Calvé-Perthes Krankheit bezogen auf die Ontogenese	Andreas H. Krieg	Bone Tumor and Limb Reconstruction



Name	First name	PhD/MD	Title	Supervisor	Research Group
Lenherr	Julia	MD	Sleep quality and architecture in idiopathic generalized epilepsy: A systematic review and meta-analysis	Alexandre Datta	Paediatric epilepsy and sleep
Leutert	Antonia	MD	The effect of AQP1 inhibitors on neuroblastoma cell proliferation and migration in vitro	Stephanie J. Gros	Molecular Strategies in Paediatric Surgery
Mandanis	Xénia Maria	MD	Unterscheidungsmerkmale von Heranwachsenden mit über- und unterdurchschnittlichen stationären Massnahmenverläufen	Alain Di Gallo	Child and Adolescent Psychology
Martig	Andrea	MD	Hematopoietic stem cell transplantation for children with sickle cell disease: opportunities and barriers from a patient's point of view	Nicolas von der Weid	Research in Childhood Cancer
Moesch	Michèle	MD	Associations of Mucosal Nerve Fiber Innervation Density with Hirschsprung – Associated Enterocolitis – A retrospective three center cohort study.	Stefan G. Holland-Cunz	Congenital intestinal malformations
Müller	Isabelle	MD	Cholinergic Signaling Attenuates Pro-Inflammatory Interleukin-8 Responses in Colonic Epithelial Cells	Stefan G. Holland-Cunz	Congenital intestinal malformations
Napirowski	Chris	MD	Impact of epileptic activity on sleep and cognition in self limited epilepsy with centro-temporal spikes	Alexandre Datta	Paediatric epilepsy and sleep
Orsós	Natalie	MSc	Method development of NANO-RAST for Bacteremia and Sepsis relevant antibiotics and Gram-negative bacteria	Alexander Sturm/ Julia A. Bielicki	Infection Prevention and Control and Antibiotic Stewardship
Pfammatter	Michèle Stephanie	MD	Primary Transverse Closure Compared to Open Wound Treatment for Primary Pilonidal Sinus Disease in Children	Johannes Mayr	Congenital intestinal malformations
Pini	Nicola	MD	AQP1-Driven Migration Is Independent of Other Known Adverse Factors but Requires a Hypoxic Undifferentiated Cell Profile in Neuroblastoma	Stephanie J. Gros	Molecular Strategies in Paediatric Surgery

# Habilitations/Dissertations/Master Thesis

## Dissertations

Name	First name	PhD/MD	Title	Supervisor	Research Group
Rast	Dimitri	MD	Aerococcus urinae – significance of detection in the paediatric urinary tract: a case series.	Nicole Ritz	Mycobacterial and Migrant Health Research
Reppucci	Diana	MD	FIRES – Pathophysiology, therapeutical approach and outcome	Alexandre Datta	Paediatric epilepsy and sleep
Schürch	Barbara	MD	Diagnostic accuracy of an interdisciplinary tertiary center evaluation in children referred for suspected congenital anomalies of the kidney and urinary tract on fetal ultrasound – a retrospective outcome analysis	Christoph Rudin	Paediatrics and paediatric Nephrology
Sieber	Lea	MD	Personalized Prediction of Bilirubin Levels in Neonates	Sven Wellmann	Neonatal Respiratory and Clinical Epidemiology Research
Simmen	Patrizia	MD	Multichannel Esophageal Heart Rate Monitoring of Preterm Infants	Sven Schulzke	Neonatal Respiratory and Clinical Epidemiology Research
Stöcklin	Benjamin	PhD	Understanding the respiratory consequences of preterm birth	Sven Schulzke	Neonatal Respiratory and Clinical Epidemiology Research
Tauchmann	Samantha	PhD	Dissecting the mechanisms of blood differentiation in erythroleukemia	Jürg Schwaller	Childhood Leukemia
Tischhauser	Eveline Ramona	MD	Discordant use of short-acting beta agonist in children and adults with severe, uncontrolled asthma from the U-BIOPRED cohort	Urs Frey	Pulmonary Research Group
Troxler	David	MD	Non-inferiority of point-of-care ultrasound compared to radiography to diagnose upper extremity fractures in children	Johannes Mayr	Emergency Department

Name	First name	PhD/MD	Title	Supervisor	Research Group
Uka	Anita	MD	Factors associated with hospital and intensive care admission in paediatric SARS-CoV-2 infection: a prospective nationwide observational cohort study.	Nicole Ritz	Mycobacterial and Migrant Health Research
Van Donge	Tamara	PhD	Pharmacometric approaches to guide neonatal and Paediatric pharmacotherapy	Marc Pfister	Paediatric Pharmacology and Pharmacometrics
Visscher	Rosa	PhD	Assisting Clinical Decision-Making for Paediatric Movement Disorder	William Taylor, ETH Zurich	Clinical Biomechanics: Paediatric Orthopaedics and Musculoskeletal Modeling

## Master Thesis

Name	First name	Title	Supervisor	Research Group
Angst	Thomas	Traditional T1-S1 Measurement of the Spinal Length on X-ray Images does not correlate with the true Length of the Spine.	Carol C. Hasler	Computational Spine Biomechanics
Beck	Kei	Fear of falling in toe-walking children – a validation study	William Taylor, ETH Zurich/Rosa Visscher/M. Gwerder	Clinical Biomechanics: Paediatric Orthopaedics and Musculoskeletal Modeling
Beyeler	Marina	Usability and overall perception of a health bot for nutrition related questions for bariatric patients	Corinne Légéret/Raoul Furlano	Paediatric Gastroenterology & Nutrition
Bleuler	Tanja	Stop tiptoeing around toe-walking – a feasibility study	William Taylor, ETH Zurich/Rosa Visscher	Clinical Biomechanics: Paediatric Orthopaedics and Musculoskeletal Modeling

# Habilitations/Dissertations/Master Thesis

## Master Thesis

Name	First name	Title	Supervisor	Research Group
Düllberg	Jill	Desire to have a child in chronic hematological diseases	Nicolas von der Weid	Outcomes Research in Paediatric Oncology
Früh	Emanuela	Pharmacological target attainment for antibiotics in children compared to adults	Malte Kohns/Julia A. Biellicki	Infection Prevention and Control and Antibiotic Stewardship
Heusser	Olivia	Motion analysis in the context of toe walking: are there criteria to differentiate idiopathic toe walkers	Michèle Kläusler/Elke Viehweger	Clinical Biomechanics: Paediatric Orthopaedics and Musculoskeletal Modeling
Kissling	Mirjam	Monocyte, Lymphocyte and Neutrophil Ratios - Easy-to-Use Biomarkers for the Diagnosis of Paediatric Tuberculosis.	Nicole Ritz	Mycobacterial and Migrant Health Research
Kloeckner	Julie	Predict foot kinetics during walking in children with cerebral palsy	William Taylor, ETH Zurich/Rosa Visscher/Enrico de Pieri	Clinical Biomechanics: Paediatric Orthopaedics and Musculoskeletal Modeling
Köhler	Maximilian	Implementation in an R-package of the lung function fluctuations based clustering algorithm	Edgar Delgado	Computational Physiology and Biostatistics
Lauro	Arianna	Long-term cardiopulmonary function in preterm born children	Birgit Donner	Clinical Research in Paediatric Cardiology
Lohmann	Clarisse	Use of health promoting food and supplements in Swiss children	Corinne Légéret/Raoul Furlano	Paediatric Gastroenterology & Nutrition
Martel	Petra	Guidelines bezüglich Kuhmilcheiweissproteinallergie	Corinne Légéret/Raoul Furlano	Paediatric Gastroenterology & Nutrition
Nissen-Kratzert	Annika	Comparison of nasal microbiome between full-term and preterm infants at mean post-menstrual age of 45 weeks	Urs Frey	Pulmonary Research Group

Name	First name	Title	Supervisor	Research Group
Otto	Marije	Characterization of copeptin, aldosterone and proatrial natriuretic peptide kinetics in response to rehydration treatment for diabetic ketoacidosis in children with type 1 diabetes	Verena Gotta	Paediatric Pharmacology and Pharmacometrics Research Center
Pedrini	Laura	Kindliches Essverhalten im Wandel – eine Datenerhebung aus der Nordwestschweiz	Corinne Légéret/ Raoul Furlano	Paediatric Gastroenterology & Nutrition
Robinson	Elena	Description of a Klebsiella oxytoca outbreak in a neonatal unit	Julia A. Bielicki	Infection Prevention and Control and Antibiotic Stewardship
Sarbach	Laurin	Kindliches Essverhalten im Wandel – eine Datenerhebung aus der Nordwestschweiz	Corinne Légéret/ Raoul Furlano	Paediatric Gastroenterology & Nutrition
Sen	Swapnoleena	Pharmacometric approach to characterize PK/PD of amoxicillin in hospitalized patients with various co-morbidities: focus on age, critical illness and impaired kidney function	Cornelis Smit/ Marc Pfister	Paediatric Pharmacology and Pharmacometrics Research Center
Sivalingam	Rathick	Characterization of GATA1 regulators in acute erythroleukemia	Jürg Schwaller	Childhood Leukemia
Stanganello	Monica	Long-term Follow-up after Tibialis anterior tendon shortening in Combination with Achilles tendon lengthening using Gait analysis.	Michèle Kläusler/ Elke Viehweger	Clinical Biomechanics: Paediatric Orthopaedics and Musculoskeletal Modeling
Stebler	Anita	Befragung (online-survey) Management von Skabies Erkrankung bei Kindern und Jugendlichen in der Schweiz	Michael Büttcher/ Marc Pfister	Paediatric Pharmacology and Pharmacometrics Research Center
Stern	Sarah	Trying to model acute myeloid leukemia (AML) by transplantation of naïve iMLL-AF9 total bone marrow in to non-conditioned recipient mice	Jürg Schwaller	Childhood Leukemia

# Habilitations/Dissertations/Master Thesis

## Master Thesis

Name	First name	Title	Supervisor	Research Group
Topyürek	Bedran	Quality of life in children suffering from coeliac disease	Corinne Légéret/ Raoul Furlano	Paediatric Gastro- enterology & Nutrition
Varghese Thiruthanathil	Kevin	Functional analysis of NSD1: a gene at the intersection of congenital hypergrowth syndromes and cancer	Jürg Schwaller	Childhood Leukemia
Winter	Rebecca	The balance reaction to an enhanced stress level (VR) and the correlation with the spinal reflex activity in children with cerebral palsy – a cross-sectional Pilot study.	N. Singh/ Rosa Visscher	Clinical Biomechanics: Paediatric Orthopae- dics and Musculoskel- etal Modeling
Zumstein	Jana	Decline of pertussis in hospitalised children following the introduction of immunisation in pregnancy	Ulrich Heininger	Paediatric Infectious Diseases and Vaccinology

# Appointments

Name	First name	Organisation	Appointment	Research Group
Büttcher	Michael	SwissPedNet	Member of the SwissPedNet board	Paediatric Pharmacology and Pharmacometrics Research Centre
Hammer	Jürg	European Respiratory Society	Election as Fellow of ERS	Paediatrics and Paediatric Pulmonology Research
Koch	Gilbert	International PAGE Conference	Member of the Scientific Organizing Committee of the international PAGE conference	Paediatric Pharmacology and Pharmacometrics Research Centre
Schulzke	Sven	Swiss Society of Neonatology	Election as President of the Swiss Society of Neonatology	Neonatal Respiratory and Clinical Epidemiology Research
Schulzke	Sven	Swiss National Science Foundation	Member of Evaluation Panel Ambizione	Neonatal Respiratory and Clinical Epidemiology Research
Soleman	Jehuda	Frontiers in Neurology	Member of Editorial Board	Clinical Research in Paediatric Neurosurgery
Viehweger	Elke	French Speaking Society in Children and Adults (SOFAMEA)	Nomination as President 2021–2024	Clinical Biomechanics: Paediatric Orthopaedics and Musculoskeletal Modeling
von der Weid	Nicolas	Swiss Academy of Medical Sciences (SAMW)	Election as UKBB Delegate of ASSM Senat	Outcomes Research in Paediatric Oncology
UKBB and USB		Nationale Koordination Seltene Krankheiten (kosek, Haus der Akademien, Bern)	Nomination as Reference Center for Rare Neuromuscular Diseases (Heads Prof. A. Klein, UKBB, and Prof. M. Sinnreich, USB)	The Basel University Center for Rare and Undiagnosed Diseases
UKBB and USB		Nationale Koordination Seltene Krankheiten (kosek, Haus der Akademien, Bern)	Nomination as Associated Center for Rare Metabolic Diseases (Heads Prof. G. Szinnai, UKBB, and Prof. Emanuel Christ, USB)	The Basel University Center for Rare and Undiagnosed Diseases

# Awards

Name	First name	Congress/ Society	Project/Title	Research Group	Award
Anlicker-Ort	Marion	American College of Clinical Pharmacology (ACCP) conference, USA	Novel Oral Complement Factor 5a Receptor 1 (C5aR1) Antagonist ACT-1014-6470 for the Treatment of Rare Inflammatory Diseases: Single-Ascending Dose Study Including Food Effect Assessment	Paediatric Pharmacology and Pharmacometrics Research Centre	Student abstract award
Berben	Lut	Stiftung Pflege-wissenschaft Schweiz	Rheumatology Transition for Young People in Switzerland (HEROES)	Transition to adult care in paediatric rheumatology research group	Research Award
Bielicki	Julia Anna	National Institute for Health and Care Research (NIHR) London	NeoSep-ADAPT project	Infection Prevention and Control and Antibiotic Stewardship	Advanced Fellowship
Bilang	Remo	Swiss Paediatric Surgery Society	Patient derived 3D models for preclinical drug response evaluation	Molecular strategies in paediatric surgery	Prix Nachwuchs
Bilang	Remo	Swiss Paediatric Oncology Group	Patient derived 3D models for preclinical drug response evaluation	Molecular strategies in paediatric surgery	Jack Plaschkes Award
Bracht-Schweizer	Katrin	German Society of Biomechanics (DGfB)	Contribution of the affected side to propulsion and body weight support during gait in unilateral cerebral palsy	Clinical Biomechanics: Paediatric Orthopaedics and Musculoskeletal Modeling	Poster Award 2 <sup>nd</sup> prize
Burckhardt	Marie-Anne	University of Western Australia, Perth	Improving patient care in young people with Type 1 Diabetes using advances in technology	Paediatric Endocrinology and Diabetology	Honourable mention on the Dean's List for Phd Thesis



Name	First name	Congress/Society	Project/Title	Research Group	Award
Decrue	Fabienne	University of Basel	Increased impact of air pollution on lung function in preterm vs. term-infants: The BILD-Study	Pulmonary Research Group	Best Oral Presentation
Decrue	Fabienne	University of Basel	Impact of environmental factors on preterm and term-born infants and children	Pulmonary Research Group	Best PhD Thesis
Diesch	Tamara	American Society of Hematology (ASH) Meeting Atlanta	Impact of hydroxyurea and vaso-occlusive crisis on ovarian follicle density in girls and young females with sickle cell disease	Outcomes Research in Paediatric Oncology	Oral Presentation Award
Fritschi	Nora	Swiss Foundation for Tuberculosis Research	Subclinical Tuberculosis in Children: Diagnostic Strategies for Identification Reported in a 6-year National Prospective Surveillance Study	Mycobacterial and Migrant Health Research	Swiss TB Award
Furlano	Raoul	University of Basel		Paediatric Gastroenterology & Nutrition	Lecturer of the year 2 <sup>nd</sup> place
Golhen	Klervi	Swiss Society of Nephrology Annual Meeting Interlaken	Haematologic factors associated with favorable long-term outcomes in paediatric patients with chronic kidney disease on maintenance haemodialysis	Paediatric Pharmacology and Pharmacometrics Research Centre	Poster Award

# Awards

Name	First name	Congress/Society	Project/Title	Research Group	Award
Gotta	Verena	European Renal Association-European Dialysis and Transplant Association (ERA-EDTA) virtual conference	Relationship between dialysis adequacy, ultrafiltration rate and survival in young hemodialysis (HD) patients having initiated chronic HD in childhood	Paediatric Pharmacology and Pharmacometrics Research Centre	Abstract Award 1 <sup>st</sup> prize
Gotta	Verena	Swiss Association of Public Health Administration and Hospital Pharmacists (GSASA) conference Lucerne	In silico studies to evaluate dosing intervals associated with low risk of amikacin accumulation in preterm neonates	Paediatric Pharmacology and Pharmacometrics Research Centre	Poster Award 1 <sup>st</sup> prize
Müller & Usemann	Loretta & Jakob	Swiss Aerosol Group (SAG)	Diesel exposure increases susceptibility of primary human nasal epithelial cells to rhinovirus infection	Pulmonary Research Group	SAG Research prize
Richard	Mélina	Swiss Metabolomics Society	Placebolomics, Breath Metabolomics of Placebo Effects	Translational Medicine Breath Analysis	Poster Award 1 <sup>st</sup> prize
Schifferli	Alexandra	Platelet Disorder Support Association (PDSA)	Adolescents and young adults with Immune Thrombocytopenia (AYAs) projects	Immune Thrombocytopenia Research	PDSA Award
Schifferli	Alexandra	American Society of Hematology (ASH) Meeting Atlanta	Long-Term Outcome of Adolescents and Young Adults with Chronic Primary Immune Thrombocytopenia (ITP)	Outcomes Research in Paediatric Oncology	Poster Award

Name	First name	Congress/Society	Project/Title	Research Group	Award
Schindera	Christina	UKBB Research Day	Risk factors for overweight and obesity after childhood acute lymphoblastic leukemia in North America and Switzerland	Outcomes Research in Paediatric Oncology	Best Oral Presentation
Schulzke	Sven	Swiss Society of Neonatology	Respiratory physiology and evidence-based approach in neonatology	Neonatal Respiratory and Clinical Epidemiology Research	Fred Bamatter Award
Studer	Daniel	Christian Toggenburger Foundation	Spine-Bot Project	Computational Spine Biomechanics	Christian Toggenburger Prize
Szinnai	Gabor	European Society for Paediatric Endocrinology/ Host Centre: Hôpital Necker Enfants-Malades Paris	Personalized Dosing Strategies in Rare Thyroid Diseases	Paediatric Endocrinology and Diabetology	Advanced Fellowship
Vaezipour	Nina	European Society for Paediatric Infectious Diseases (ESPID)	sweat-and urine metabolomics for the diagnosis of childhood tuberculosis	Mycobacterial and Migrant Health Research	Fellowship Award

# Awards

Name	First name	Congress/Society	Project/Title	Research Group	Award
Visscher	Rosa	Swiss Academy for Childhood Disability (SACD)	Evaluation of Developmental Trajectories in Gait Variability.	Clinical Biomechanics: Paediatric Orthopaedics and Musculoskeletal Modeling	Research Day Award 1 <sup>st</sup> prize
Welzel	Tatjana	German Society of Rheumatology (DGRh)	Treat-to-target in interleukin-1 mediated autoinflammatory diseases	Paediatric Pharmacology and Pharmacometrics Research Centre	Scientific Research Award
Welzel	Tatjana	Deutsche Rheumastiftung	Improving health of patients with autoinflammatory diseases	Paediatric Pharmacology and Pharmacometrics Research Centre	Research Prize «Ideenwettbewerb»

# Young Investigators

Name	First name	Supervisor	Research Group	Program	Project Title
Troxler	David	Michael Ramser	Emergency Department	Botnar Special Program Paediatric Research	Umsetzen einer ultraschallbasierten primären Frakturdiagnostik an den Kindernotfallstationen in der Schweiz
Angresius	Rebecca	Stefan Holland-Cunz	Congenital intestinal malformations	THOMI-HOPF Special Program Paediatric Research	Impact of missing enteric innervation on mucosal cell water permeability and its clinical implication for the child – AQP1 in Hirschsprung's Disease.
Fusch	Stephanie	Roland Gerull	Neonatal Respiratory and Clinical Epidemiology Research	THOMI-HOPF Special Program Paediatric Research	Electrical impedance tomography for identification of optimal positive end-expiratory pressure in newborn infants
Roth	Michèle	Felicitas Bellutti	Paediatric Allergic Diseases	THOMI-HOPF Special Program Paediatric Research	Correlation and potential prognostic value of skin and stool microbiome and of blood cytokine profile in children with food allergies
Henzi	Bettina	Dirk Fischer	Neuromuscular Research Group	Research Fond University of Basel	Digital biomarker for upper limb function in Duchenne muscular dystrophy
Schindera	Christina	Nicolas von der Weid	Outcomes Research in Paediatric Oncology	Research Fond University of Basel	Prospective multicentre cohort study for diagnosing cardiac dysfunction in childhood cancer survivors

# Young Investigators

Name	First name	Supervisor	Research Group	Program	Project Title
Decrue	Fabienne		Paediatrics and Paediatric Pulmonology Research	University of Basel antelope Program	
Fritschi	Nora		Mycobacterial and Migrant Health Research	University of Basel antelope Program	
Schindera	Christina		Outcomes Research in Paediatric Oncology	University of Basel antelope Program	
Decrue	Fabienne		Paediatrics and Paediatric Pulmonology Research	SNF Postdoc Mobility Grant	Association of air pollution exposure with early origins of common paediatric diseases









# Facts and Figures

# Funding and Research

## Overview Third Party Funds UKBB 2021 (CHF)

Category	Balance 1.1.2021	Inflow of Funds	Use of Funds	Balance 31.12.21
Competitive Research	3'733'421	2'461'332	-2'885'056	3'309'697
Non-Competitive Research	3'121'845	2'927'041	-2'698'072	3'350'813
Contract Research (from 2020 on)	340'098	-43'261	-189'880	106'957
Research and Teaching	1'027'438	596'393	-718'038	905'793
Patients	1'448'630	752'219	-745'895	1'454'954
<b>Total</b>	<b>9'671'433</b>	<b>6'693'723</b>	<b>-7'236'942</b>	<b>9'128'214</b>
<b>Research Total</b>	<b>7'195'365</b>	<b>5'345'111</b>	<b>-5'773'008</b>	<b>6'767'468</b>
Thereof competitive	3'733'421	2'461'332	-2'885'056	3'309'697
% Competitive of Total	39%	37%	40%	36%
<b>EU-Funding</b>	<b>0</b>	<b>0</b>	<b>-40'352</b>	<b>-42'800</b>
% EU-Funding of Total	0%	0%	1%	0%

Administered by	Balance 1.1.2021	Inflow of Funds	Use of Funds	Balance 31.12.21
UKBB	7'188'520	3'717'864	-3'835'489	7'070'896
Uni Basel	2'482'052	1'254'539	-1'653'152	2'083'440
UBS	861	41'223	-68'205	-26'121
Uni BS/UKBB	-	1'680'097	-1'680'097	-
<b>Total</b>	<b>9'671'433</b>	<b>6'693'723</b>	<b>-7'236'942</b>	<b>9'128'214</b>

DBM	Balance 1.1.2021	Inflow of Funds	Use of Funds	Balance 31.12.21
DBM UKBB	326'182	239'528	-205'974	359'736
DBM Unibas	489'738	250'135	-442'568	297'305
DBM USB	861	41'223	-68'205	-26'121
<b>Total</b>	<b>816'781</b>	<b>530'885</b>	<b>-716'747</b>	<b>630'920</b>

## Overview Third Party Funds UKBB 2022 (CHF)

Category	Balance 1.1.2022	Inflow of Funds	Use of Funds	Balance 31.12.22
Competitive Research	3'309'697	1'561'913	-2'106'583	2'765'027
Non-Competitive Research	3'350'814	2'826'473	-3'003'513	3'173'774
Contract Research	106'957	75'256	-99'946	82'266
Research and Teaching	905'792	411'603	-642'950	674'445
Patients	1'454'953	740'601	-826'610	1'368'943
<b>Total</b>	<b>9'128'213</b>	<b>5'615'845</b>	<b>-6'679'603</b>	<b>8'064'455</b>
<b>Research Total</b>	<b>6'767'469</b>	<b>4'463'642</b>	<b>-5'210'043</b>	<b>6'021'067</b>
Thereof competitive	3'309'697	1'561'913	-2'106'583	2'765'027
% Competitive of Total	36%	28%	32%	34%
<b>EU-Funding</b>	<b>-42'800</b>	<b>35'716</b>	<b>-50'001</b>	<b>-57'085</b>
% EU-Funding of Total	0%	1%	1%	-1%

Administered by	Balance 1.1.2022	Inflow of Funds	Use of Funds	Balance 31.12.22
UKBB	7'070'895	2'969'292	-3'259'780	6'780'407
Uni Basel	2'083'440	610'016	-1'410'340	1'283'116
USB	-26'121	112'339	-85'285	932
Uni BS/UKBB	-	1'924'198	-1'924'198	-
<b>Total</b>	<b>9'128'213</b>	<b>5'615'845</b>	<b>-6'679'603</b>	<b>8'064'455</b>

DBM	Balance 1.1.2022	Inflow of Funds	Use of Funds	Balance 31.12.22
DBM UKBB	359'736	191'641	-194'234	357'143
DBM Unibas	297'305	147'385	-398'033	46'656
DBM USB	-26'121	112'339	-85'285	932
<b>Total</b>	<b>630'920</b>	<b>451'364</b>	<b>-677'552</b>	<b>404'732</b>

# Funding and Research

## Change of Third Party Funds UKBB 2021/2022

Category	Balance 1.1.	Inflow of Funds	Use of Funds	Balance 31.12.
Competitive Research	-423'724	-899'418	778'472	-544'670
Non-Competitive Research	228'969	-100'568	-305'441	-177'040
Contract Research	-233'141	118'517	89'934	-24'691
Research and Teaching	-121'647	-184'790	75'088	-231'348
Patients	6'322	-11'618	-80'715	-86'011
<b>Total</b>	<b>-543'220</b>	<b>-1'077'878</b>	<b>557'339</b>	<b>-1'063'759</b>
<b>Research Total</b>	<b>-427'896</b>	<b>-881'469</b>	<b>562'965</b>	<b>-746'400</b>
Thereof competitive	-423'724	-899'418	778'472	-544'670
% Competitive of Total	-2%	-9%	-8%	-2%
<b>EU-Funding</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
% EU-Funding of Total	0%	0%	0%	0%

Administered by	Balance 1.1.	Inflow of Funds	Use of Funds	Balance 31.12.
UKBB	-117'625	-748'572	575'709	-290'489
Uni Basel	-398'612	-644'523	242'811	-800'324
Uni BS/UKBB	-26'982	71'116	-17'080	27'054
USB	-	244'101	-244'101	-
<b>Total</b>	<b>-543'220</b>	<b>-1'077'878</b>	<b>557'339</b>	<b>-1'063'759</b>

DBM	Balance 1.1.	Inflow of Funds	Use of Funds	Balance 31.12.
DBM UKBB	33'554	-47'888	11'740	-2'593
DBM Unibas	-192'433	-102'750	44'534	-250'648
DBM USB	-26'982	71'116	-17'080	27'054
<b>Total</b>	<b>-185'861</b>	<b>-79'521</b>	<b>39'194</b>	<b>-226'188</b>

### University Budget and Third-Party Funds

Year	2015	2016	2017	2018	2019	2020	2021	2022	
University Budget	8.93	8.95	9.12	8.95	8.89	8.42	8.24	8.25	Million CHF
External Funds	5.56	6.19	8.45	7.65	7.82	7.06	5.35	4.46	Million CHF

### Distribution of the Research Funds by Categories (CHF)

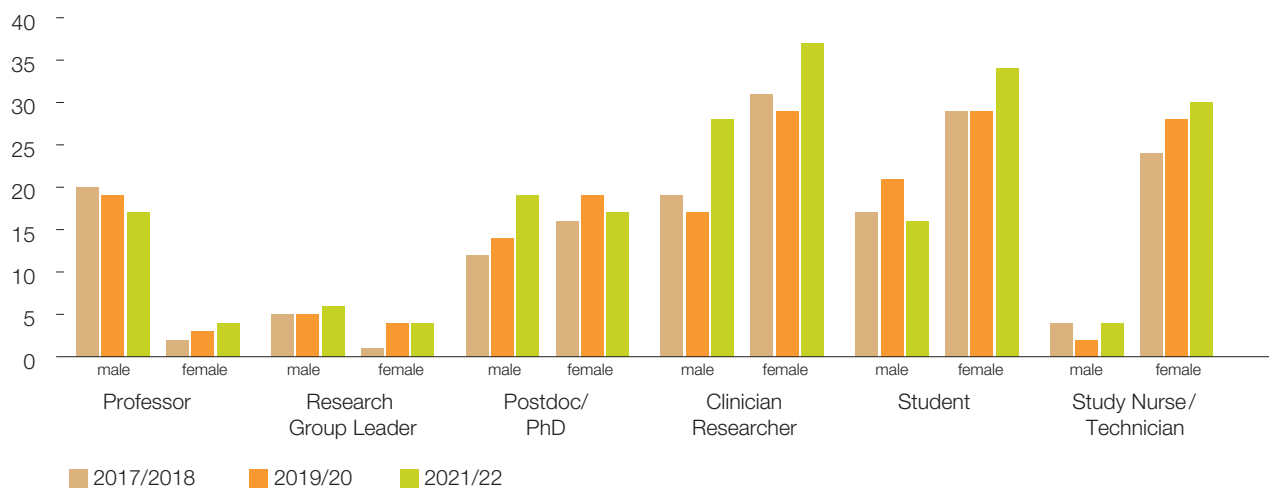
Botnar Professorship	390'235
Eckenstein-Geigy Professorship	1'533'963
EU	35'716
Research Fund Junior Researchers (University)	4'873
SNF	398'921
Special Program Paediatric Research	80'719
University Budget	8'253'542
Other foundations and donations	2'019'214
<b>Total</b>	<b>12'717'183</b>

### Funding by Research Areas (CHF)

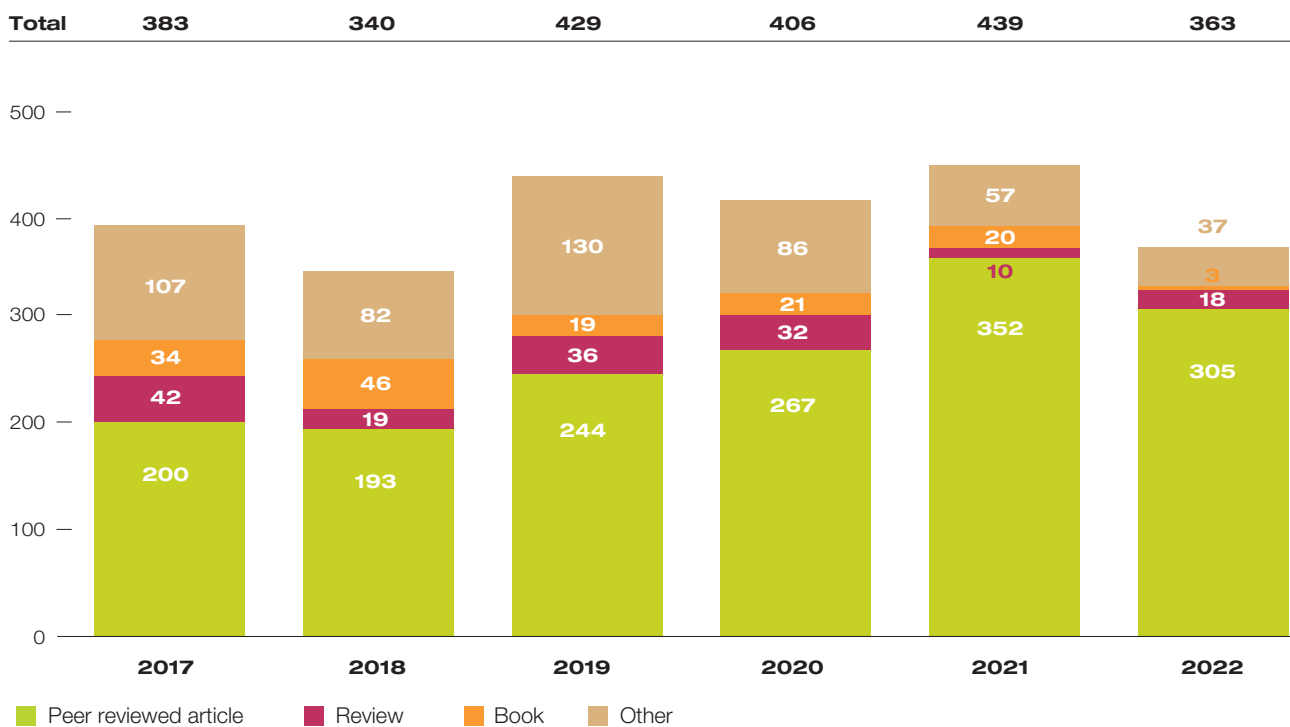
Immunology (2)	154'938
Infectiology and Vaccinology (2)	264'080
Neuropaediatrics (3)	228'057
Oncology/Haematology (3)	608'899
Orthopaedics/Neuroorthopaedics (3)	183'421
Pharmacology (3)	2'107'956
Pneumology/Neonatology (4)	692'534
Surgery (3)	115'000
Others (6)	108'756
<b>Total</b>	<b>4'463'642</b>

# Employees and Publications

## Gender Distribution/UKBB Research



## Number of published articles 2017 – 2022



# Notes

A series of horizontal dotted lines for writing notes.









# Impressum

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