



ZIHP *News*

Zurich Center for Integrative Human Physiology

02-2016 • December 2016

The 12th ZIHP Symposium: Integrative human physiology today and tomorrow

Sabina Huber-Reggi, Helen Aumayer

Bench-to-bed-side thinking, metabolism, human and animal studies, new technologies and technical implementation: All of this is integrative human physiology, and all of this was the topic of the 12th ZIHP symposium. Keynote lectures alternated with farewell lectures, presentations of successful implementations in industry, and with presentations by young scientists.

Animal models and human studies are both essential but not sufficient for scientific progress

Integrative Physiology is the combination of basic and clinical research, of animal and human studies. This is exactly the spirit of the ZIHP as it became clear once more after listening to the farewell lectures of the two assistant professors of the ZIHP.

Prof. Ian Frew started off by quoting statistician George E. P. Box who once said «all models are wrong, but some are useful». In his talk, he gave us an insight into the complicated aspects of tumor biology and how he developed the first mouse model of clear cell renal cell carcinoma (ccRCC) that represents the most common type of kidney cancer in



«Thinking outside the box» (Prof. Emanuela Keller). The ZIHP symposium is an outstanding opportunity for young scientists to broaden their horizons and to initiate networks and collaborations. → [More pictures of the symposium](#)

humans. The group mimicked the genetic changes that arise in human tumors by specifically deleting three genes simultaneously in mouse kidney cells, thereby generating the first mouse model of ccRCC. The development of tumors in this mouse model is preceded by loss of cilia in renal epithelial cells and cyst formation, a typical development observed in humans as well. To monitor tumor growth in mice, Prof. Frew teamed up with the ZIRP facility and used their micro-CT instrumentation, allowing for the non-invasive imaging of the mice throughout the course of

the study. Using this first ccRCC model, he aims to test drugs with the ultimate goal to improve treatment of ccRCC in humans. This will be his main goal at his new position as Professor for Oncogenic Signalling at the University of Freiburg, Germany.

The goal of our other ZIHP Professor, **Carsten Lundby**, was to establish human studies in integrative physiology at the University of Zurich. «80% of research in cells and animal models cannot be reproduced in humans. There is a huge need for human experimentation» – said

Prof. Lundby. No sooner said than done, he designed and performed elaborate and for participants quite demanding studies. Working on an integrative level, he showed for instance how the brain and heart work together during exercise. In line with his strong belief that human studies are crucial, Lundby and his team discovered that the central nervous system and the epidermis of the skin are not involved in production of EPO in response to hypoxic conditions such as high altitude. This is in contrast with data from animal studies, which show that glial cells and epidermal oxygen sensing are essential for hypoxia response in mice. His passion for endurance sports is also reflected in his research, and this is why Carsten Lundby conducted some intriguing exercise physiology studies. His bottom line is that there is no excuse for not exercising: «Everybody can benefit from exercise. The amount of exercise needed is different from person to person».

The rebirth of brown adipose tissue for metabolic health

The first keynote speaker, **Prof. Joerg Heeren** from the University Medical Center Hamburg-Eppendorf, combines research in mice and human clinical studies to unravel the role of brown adipose tissue (BAT) for metabolic health. BAT and its important function as generator of body heat are usually thought to play a role in newborns only. Prof. Heeren and his group demonstrated that this is not entirely true. Technical advances using PET-CT Scans showed that adults have small depots of BAT in the supraclavicular region along the neck, which are metabolically highly active. With age, the mass of BAT is reduced, while the classic white adipose tissue is increasing. This and the fact that BAT has a higher meta-

bolic activity than white adipose tissue, thus burning more calories, makes the BAT an interesting potential target for the treatment of metabolic diseases. To understand the mechanisms behind the induction of BAT and the downstream effects, Heeren employs a variety of methods, one of which uses intravital microscopy in mice. The tracking of nanoparticle-loaded triglycerides showed that cold-activation of BAT increased the uptake and clearance of harmful cholesterol by the liver. Further research including human subjects will show whether the effect of BAT activation can be targeted for therapeutic purposes.

New technologies in modern science: From mass spectrometry to robots

Progress today undoubtedly goes hand in hand with sophisticated technologies. New technologies facilitated great advances in the field of whole genome sequencing. Still, scientists and clinicians are left with the task of interpreting, in terms of biological functions, the ever increasing amount of genomic data that is generated. A mutated or duplicated gene may not have any functional consequences in one patient, but severe effects in another. A key to solve this question is to quantify how genetic variation between individuals affects the protein landscape (protein abundance and activity) and the phenotype. **Prof. Ruedi Aebersold** from the Institute of Molecular Systems Biology at the ETH Zürich discussed the technical advances of high-throughput mass spectrometry, a technique that enables accurate measurement of protein analytes. In combination with a digital approach to analyze individual peptides, this technique could find its way into a clinical setting, where for example a tumor biopsy can be analyzed for its

sensitivity to a certain drug, thereby optimizing the individual therapy of the patient. All this can be done in a fast, reproducible and high-throughput manner. To make things more exciting, Aebersold explained: «Not only the abundance of a protein, but also the connectivity of the protein to other components forming the functional modules is important». So simply looking at expression levels is not always sufficient, since the turnover and the interplay of a number of proteins are determining the biological effects of a protein.

It is evident that the massive increase in computing power has contributed to the success of the entire «ome» technology. But the great minds of computer technology are already thinking multiple steps ahead. The new field of computing is all about artificial intelligence, crowd intelligence, virtual reality, and machine learning. **Matthias Kaiserswerth**, previously director of the IBM research lab and current managing director of the Hasler Foundation, gave us insights how computers and smartphones are shaping our lives now and will continue to do so in the future. The videos he provided were not only entertaining, but also demonstrated that a clumsy looking robot can – through interactions with humans and the knowledge of the entire world wide web - learn, judge and reflect on its actions. A robot judging the scientist's use of pain medication seems amusing, but it provides an idea of the many different applications that it could be used for. But Kaiserswerth assured the audience that especially in the field of life sciences people cannot be completely replaced by computers. Despite the ever growing ability to obtain information, he cautions that we need to keep learning things by

heart, rather than relying on Google too much. It is only the knowledge in our head that allows new ideas to develop and unfold. Creative ideas and provocative hypotheses are crucial for us as researchers, and something a computer – despite all its advantages – cannot replace.

Implementation of inventions

Within the ZIHP, a huge amount of knowledge on integrative physiology has been generated, published and communicated to young researchers. This can lead the way to the development of new products, as demonstrated by two speakers from Zurich-based spin-off companies.

As we already heard during this symposium, one major challenge in biomedical sciences is the translation of research results from in vitro studies or animal models to the clinical setting. InSphero is a spin-off company that offers a range of 3D culture systems that more closely mimic organs as compared to traditional 2D cell culture in petri dishes. **David Fluri**, senior scientist at InSphero, explained to us how the team developed a liver tissue model that is morphologically and functionally as close to the native tissue as possible. In their lab, cells grown on a special 3D plate aggregate in an organized manner and produce their own extracellular matrix as if they were within their native organ. As a next step, InSphero is currently developing a system to perfuse these 3D microtissues with drugs. The goal is to improve quality of research on drug efficiency and toxicity in vitro. These technologies will not be able to replace animal experiments and clinical trials in humans, but will allow for increased validity of pre-tests in-vitro.

Awards

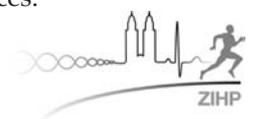
The Symposium ended with the awards ceremony for the best talk and the best four posters. **Congratulations** to: **Alexander Malafeev** from the Institute of Pharmacology and Toxicology, UZH (best presentation), **Daniel Gaul** from the Center for Molecular Cardiology, USZ, **Claudio Schuoler** from the Institute of Veterinary Physiology, UZH and the Division of Pulmonology, USZ, **Eric Olinger** and **Guglielmo Schiano** from the Institute of Physiology, UZH, and **Sergey Burnos** from the Department of Neurosurgery, USZ, and the Institute of Neuroinformatics, ETHZ (best posters).

«It is important to clearly identify user demand» – said **Prof. Emanuela Keller**, ZIHP-member and co-founder of NemoDevices. NemoDevices is a Spin-off company focused on medical technologies with the aim of optimizing monitoring of patients with stroke and brain injuries. To avoid secondary brain damages due to low oxygenation and blood flow, therapy requires monitoring of several neurological parameters. This monitoring is complicated by the fact that many patients are unstable and unconscious and can therefore not be transported to a conventional imaging system such as a CT scan. NemoDevices implemented a new monitoring system based on optical spectroscopy and imaging that can be brought to the bedside of the patient. This miniaturized system is based on the principle that light in the near infrared region travels through biological tissue and is absorbed differently by the blood containing deoxygenated and oxygenated haemoglobin. The system developed by NemoDevices is able to measure several parameters at once such as intracranial pressure, cerebral blood flow and oxygenation of the brain. Emanuela Keller reminded the audience that even with a great idea in mind, the implementation still remains a very arduous process. This is why she recommended

teaming up with strong allies, since «you cannot do it alone».

The future of integrative human physiology

Concluding the symposium, **Prof. Alan N. Schechter**, member of the Advisory Board of the ZIHP and Head of «Molecular Medicine» at the National Institutes of Health, summarized the main insights from this inspiring symposium. «Genomics, in-vitro studies and animal models are necessary but not sufficient to understand what physiology is doing», remarked Schechter. Human and patient-centered research is not only important but fundamental and needs to be pushed further. This is both necessary for translation to implementations such as therapies, but also for setting new directions for basic sciences. Prof. Schechter provided an example from his own experience several decades ago: When he started his research on nitric oxide in patients with sickle cell disease, experts in the field were skeptical because they thought that everything was already known. Far from it, years of clinical research gave new insights about nitric oxide and its influence on blood flow, which helped both pharmaceutical developments and basic sciences.



Die Herbstausgabe von

WISSEN-SCHAFT^F WISSEN

Die Entwicklung von Jung bis Alt



→ Antikörper gegen Alzheimer

UZH-Forscher Roger Nitsch ist Pionier in der Alzheimerforschung. In seinem Vortrag berichtete er darüber, wie der von seinem Team entwickelte Antikörper «Aducanumab» die Behandlung der Krankheit revolutionieren könnte.

→ «Dem Kind Vertrauen schenken»

Immer mehr Eltern sind verunsichert, ob sich ihr Kind «normal» entwickelt. Der Entwicklungspädiater Oskar Jenni erläuterte wie diese Verunsicherung entsteht und wie man den Eltern ihre Sorgen nehmen kann.

Congratulations!

ZIHP-Mitglied Prof. **Boris B. Quednow** wurde auf den 1. Oktober 2016 zum → **ausserordentlichen Professor ad personam für Experimentelle und Klinische Pharmakopsychologie** ernannt. Boris Quednow ist seit 2009 als Assistenzprofessor an der UZH tätig.

ZIHP-Mitglied Prof. **Reto Huber** wurde auf den 1. September 2016 zum → **ausserordentlichen Professor ad personam für Entwicklungsneurobiologie der Zustandsregulation des Kindes- und Jugendalters** ernannt. Ab 2007 war Dr. Huber SNF-Förderungsprofessor am Kinderspital Zürich. Seit Mitte 2013 wirkt er dort als Forschungsgruppenleiter.

ZIHP-Mitglied Dr. **Anna Bogdanova** wurde per 29. September 2016 zur → **Titularprofessorin** ernannt. Sie ist derzeit Independent Senior Group Leader am Institut für Veterinärphysiologie der UZH.

Saoussen Ben Halima und ZIHP-Mitglied **Lawrence Rajendran**, beide am Institut für Regenerative Medizin der Universität Zürich tätig, wurden für ihre Forschung zu Alzheimer mit dem → **Vontobel-Preis für Alter(n)sforschung** ausgezeichnet.



→ Warten auf das Wunschkind

Was tun, wenn der Kinderwunsch unerfüllt bleibt? Brigitte Leeners, leitende Ärztin am Universitätsspital Zürich, zeigte in ihrem Vortrag die Möglichkeiten und Grenzen der modernen Reproduktionsmedizin auf.

Vorankündigung der Frühlingausgabe 2017 von Wissen-schaf(f)t-Wissen

Technologien in der Medizin der Zukunft

20. März 2017

Prothesen und Roboter in der Rehabilitation
Prof. Robert Riener, ETHZ

3. April 2017

Neue Technologien in der Medizin
Dr. Matthias Kaiserswerth
Geschäftsführer der Hasler Stiftung

29. Mai 2017

Computer-assistierte Chirurgie am Nervensystem
PD Dr. med. Lennart Stieglitz, Klinik für Neurochirurgie, USZ

19. Juni 2017

Ersatz für krankes Gewebe
Prof. Karin Würzt, ETHZ

Press review

→ Zweiter Schweizer Flug in die Schwerelosigkeit geglückt

Am Samstag, 22. Oktober 2016 ist in Dübendorf zum zweiten Mal ein Forschungsflugzeug zu einem sogenannten Parabelflug gestartet, der für einige Sekunden Schwerelosigkeit verleiht. Mit an Bord waren wissenschaftliche Experimente und interessierte Personen.
NZZ, 22. Oktober 2016

Neugeborene sind an Höhenluft angepasst

Schon Neugeborene sind an den geringen Sauerstoffgehalt in grosser Höhe angepasst. Ihr Gewebe enthält mehr Blutgefässe, wie Medizinstudentin Norina Gassmann in ihrer Masterarbeit an der Universität Zürich herausgefunden hat.
Tages-Anzeiger, Print-Ausgabe, 18. Oktober 2016

→ Ausreifende Hirnregionen bei Kindern am stärksten von Schlafentzug betroffen

Ein Forscherteam rund um ZIHP-Mitglieder Reto Huber und Peter Achermann haben erstmals die Auswirkungen von akutem Schlafentzug bei Kindern untersucht.
UZH Medienmitteilung, 4. Oktober 2016

→ Neue Haut für Brandverletzte

Weil die Narben nach Verbrennungen nicht mitwachsen, müssen sich Kinder immer wieder neuen Behandlungen unterziehen. Nun sind Forscher des Zürcher Kinderspitals, unter Ihnen ZIHP-Mitglied Ernst Reichmann, einer besseren Ersatzhaut näher gekommen.
NZZ, 6. September 2016

→ Ein direkter Zugang zur Forschung

ZIHP-Mitglied Lawrence Rajendran will die Publikation wissenschaftlicher Studien revolutionieren. Dafür hat er die Internetplattform «Science Matters» gegründet.
Tages-Anzeiger, 15. August 2016

Congratulations!

Prof. **Max Gassmann**, Direktor des Instituts für Veterinärphysiologie und Vorsitzender des Leitungsausschusses des ZIHP, wurde aufgrund seiner Forschungsleistungen zum → **Sackler-Lecturer für das akademische Jahr 2016/17** ernannt. Zudem wurde er kürzlich in die → **Wissenschaftsakademie Leopoldina** aufgenommen.

Prof. em. **Heini Murer**, ehemaliger ordentlicher Professor am Physiologischen Institut der UZH und Mitgründer des ZIHP, wurde am 21. September 2016 → **von der Universität Patras (Griechenland) die Ehrendoktorwürde** verliehen.

Recent publications

A list of publications of all ZIHP members can be found on our website

→ www.zihp.uzh.ch/en/research/publications.html



Das ZIHP als Kompetenzzentrum 2017-2020

Wir freuen uns, die Verlängerung des ZIHP als Kompetenzzentrum für die kommenden vier Jahre bekannt zu geben. Das ZIHP wird weiterhin den wissenschaftlichen Austausch und den Nachwuchs fördern, indem es **Seminare und Kongresse finanziell unterstützt**, das jährliche **ZIHP Symposium** ausrichtet, und das **imMed PhD Programm** unterbringt. Die **Öffentlichkeitsarbeit** mit der Reihe «Wissen-Schaf(f)t Wissen» wird fortgeführt und ausgebaut. Zu guter Letzt werden sich das ZIHP und seine Mitglieder um eine langfristige **Sicherung der finanziellen Unterstützung** bemühen. Leider stehen zurzeit keine Mittel für die Förderung von Forschungsprojekten zur Verfügung.

Wir freuen uns auf eine weiterhin produktive und interaktive Zusammenarbeit.

We are pleased to announce the continuation of the ZIHP as a competence center of the University of Zurich beyond 2016! The ZIHP will continue to support scientific exchange and promote young researchers by **funding seminars and conferences**, by organizing the **annual ZIHP symposium**, and by hosting the **imMed PhD Program**. Our popular **lecture series for the public** will be continued and expanded. Last but not least the ZIHP and its members will work on **securing long-term funding**. Unfortunately, there are currently no funds available to support research projects.

We are looking forward to continuing to be the center for a productive and interactive community.

imMed PhD Program

Cats and dogs at the imMed retreat

Heidi Preisig

For their retreat on June 13 and 14, 2016, the students of the imMed PhD Program and its program commission were once again guests at the Sport- und Kongresszentrum of the Swiss Federal Institute of Sports (BASPO) in Magglingen high above the Lake of Biene. The retreat program was ambitious: Presentations of PhD projects on both days, a poster session and an invited speaker, Dr. Doris Wisler from the Clinical Trials Center, USZ.

The PhD presentations showed the broad range of research topics covered by the imMed students: the participants got a glimpse at forensic medicine, they learned about excellent networking in high-tech physiology, as well as the many new approaches and methods in regenerative medicine. A half hour walk gave the participants the opportunity to get some fresh air after a long day in the seminar room. In the meantime, the imMed BBQ team had set up everything wonderfully for dinner in the «Waldhaus», a cabin way up in the Jura forest. The evening started with an imMed tradition: students present their home country during the aperitif. This time, Sheng-Fu Huang gave an entertaining insight into her home country Taiwan.



A proverb says that too many cooks spoil the broth. On the contrary: Thank you very much for the delicious BBQ dinner, Francesco, Vidya, Daniel and their team! Soon after dessert, the group set out for a brisk walk down to the BASPO. Luckily, the cozy bar was open and the EURO 2016 football match Italy against Belgium was on the big screen.

On the second day, imMed student Penny Papageorgiou from the organizing committee of the Vision 2020 seminar series presented the fall semester topic «Tissue engineering». Daniel Gaul, imMed student and member of the board of the Life Science Zurich Young Scientists Network (LSZYSN), introduced his organization which supports career planning and networking with the industry. Thierry Hennet, Director of the imMed PhD Program, informed about the DissGo database, its development and its aims.

To round off the retreat and to fuel the team spirit, a team sports competition had been organized by a team of students. Heavy rainfall and wind, however, thwarted these plans and brought the retreat to an early end.

Looking back, one of the highlights of the 2016 retreat was the excellent quality of many presentations and posters. Congratulations on the best presentation award for Jakub Zimoch, and Beatrice Festa and Ermanno Malagola who ex-aequo won the best poster award! A big thank you goes to the retreat participants for their contribution to the success of this retreat, be it as presenters of talks and posters, in discussions, as session hosts, jury, preparing dinner or planning the team sports competition. They did not let the bad weather – it was raining cats and dogs for two full days - spoil the imMed retreat.

Changes in the PhD Program Commission

imMed PhD Program Director **Thierry Hennet** was elected **Vice Dean of Studies of the Faculty of Science (MNF)** as of fall semester 2016. Congratulations!

He stepped down from the PhD Program commission. The commission would like to thank Thierry Hennet for his continuous great work and support for the development of the program.

As his successor, longtime program commission member and deputy chairman of the ZIHP **Christian Grimm** was elected **PhD Program Director** as of November 1, 2016. Thomas Lutz will act as his deputy. **Hans-Peter Landolt** from the Institute of Pharmacology and Toxicology, UZH was elected **member of the commission**. Welcome!

imMed PhD Program

→ **Photo album of the 11th retreat of the imMed PhD Program**

Retreat 2017 - Save the date!

The → **12th retreat of the imMed PhD Program** will be held at the Youth Hostel in Solothurn on Tuesday/Wednesday, **June 13/14, 2017**.

New open PhD positions

→ **Cardio-metabolic beneficial effects of bariatric surgery**

Center for Molecular Cardiology, USZ/UZH and Institute for Veterinary Physiology, UZH

→ **PhD-Thesis in the field of obesity-associated insulin resistance and diabetes**

Paediatric Endocrinology, University Children's Hospital Zurich

→ **Sex Hormones and Vasculogenesis /Angiogenesis: Role of Micro RNA?**

Division of Reproductive Endocrinology, UZH

→ **Metabolic processes at the blood-brain barrier in vascular dysfunction and disease**

Department of Veterinary Physiology, UZH

→ **Bacterial proteases fooling human protease sensors, the protease activated receptors**

Surgical Intensive Care, USZ

→ **To identify disease-relevant epigenetic targets for the development of novel therapeutic strategies for the Complex regional pain syndrome (CRPS) and Osteoarthritis**

Department of Rheumatology, USZ

New students

Since last July, 13 new students who were accepted to the PhD Program in Integrative Molecular Medicine (imMed) started their work here in Zurich. Welcome!

Bapst Andreas, Institute of Physiology, UZH

Bonetti Nicole, Center for Molecular Cardiology, USZ/UZH

González Alvarado Nazareth María, Div. of Gastroenterology & Hepatology, USZ

Ivica Anja, Division of Oral Biotechnology & Bioengineering, USZ/UZH

Khera Nupur, Division of Oral Biotechnology & Bioengineering, USZ/UZH

Kirk Niels, Center for Molecular Cardiology, USZ/UZH

Maggi Jordi, Institute of Medical Molecular Genetics, UZH

Mathes Sebastian, Div. of Endocrinology, Diabetes and Clinical Nutrition, USZ

Oppi Sara, Center for Molecular Cardiology, USZ/UZH

Pajak Agnieszka, Department of Rheumatology, USZ

Panteloglou Griorgios, Institute of Clinical Chemistry, USZ

Polesel Marcello, Institute of Anatomy, UZH

Steiner Sabrina, Division of Visceral and Transplant Surgery Research, USZ

Postgraduate courses

January 16/17/18, 2017

→ **Introduction to Flow cytometry**

Deadline for registration:

December 22, 2016

June 7/8, 2017

→ **Introduction to human physiology: Membrane transport / Signal transduction**

Deadline for registration: May 12, 2017

June 22/23, 2017

→ **Mouse physiology and pathophysiology**

Deadline for registration: May 26, 2017

September 18/19, 2017

→ **Introduction to human physiology: Sensory systems: How we hear and see**

Deadline for registration:

August 31, 2017

October 3, 2017 and December 12, 2017

→ **Introduction to human physiology: Respiration and blood**

Deadline for registration:

August 31, 2017

Vision 2020

Current topic : → **«Tissue engineering»**

January 17, 2017

Novel bio-engineered dermo-epidermal skin grafts: a report on new findings and Phase I clinical data

Prof. Dr. Ernst Reichmann, Tissue Biology Research Unit, Children's University Hospital Zurich

Topic spring semester 2017 : **«The future of agriculture»**

Imprint

Zurich Center for Integrative Human Physiology (ZIHP), Winterthurerstr. 190, 8057 Zurich

Editorial staff: Sabina Huber-Reggi, Helen Aumayer (former Becker), Heidi Preisig, and Max Gassmann

URL: <http://www.zihp.uzh.ch>, E-mail: info@zihp.uzh.ch, Tel +41 44 635 50 88/47