Master‘s Thesis Topics Biomedicine

(alphabetically sorted by supervisor name)

Various MSc Projects in Prion Science	
Short description	Various MSc project are available in the realm of prion science. It is possible to choose between projects dealing with (1) diagnosis of human prion diseases, (2) prion immunology, (3) prion genetics, and (4) animal models of prion diseases. Candidates should have an outstanding academic track record: for Swiss candidates, all grades *must* be 5 or higher. Candidates should be prepared to commit themselves fully to their thesis in a very demanding research environment.
Keywords	
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Adriano Aguzzi Institut für Neuropathologie Adriano.aguzzi@usz.ch
Conditions	100% commitment. Above-average grades in molecular biology.
Links	http://www.uzh.ch/pathol/neuropathologie/index.html

Investigating the role of soluble epoxide hydrolase in lipid metabolism	
Short description	Mammalian soluble epoxide hydrolase (sEH) comprises an epoxide hydrolase as well as a phosphatase activity, both involved in lipid metabolism. The sEH is implicated in cardio-vascular and inflammatory diseases, mostly based on the metabolism endogenous epoxides by the EH. The phospha-tase turns over intermediates of the cholesterol biosynthesis pathway. We will analyse the role of sEH in sterol and lipid homeostasis to investigate the mechanistic link between these two sEH activities. Techniques: mass spectrometry, cell culture, molecular biology and protein biochemistry
Keywords	
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Michael Arand Institute of Pharmacology and Toxicology arand@pharma.uzh.ch 044 635 59 79
Conditions	-
Links	http:// www.pharma.uzh.ch

Microbes in Health and Forensics	
Short description	Our projects focus on the investigation of microbial genetic diversity for applications in the clinic and in forensics. On the one hand, examing the genetic diversity of pathogenic bacterial strains data has the potential to improve our epidemiological understanding. On the other hand, microbial community profiling is a valuable tool in the study of diseases and also in the characterisation of body sites and individuals. This characterisation is promising for application to forensic body fluid and individual identification.
Keywords	microbiome, forensic body fluid identification, epidemiology, bacterial communities, next-generation sequencing
Supervisor **Institute** **E-mail** **Phone**	Dr. Natasha Arora Institute of Forensic Medicine, IRM/Forensic Genetics natasha.arora@irm.uzh.ch 044 635 60 70
Conditions	none
Links	https://www.irm.uzh.ch/de/forschung/genetik/team/NArora.html

Pathomechanisms of ciliopathies	
Short description	Ciliopathies are a group of human disorders caused by dysfunction of primary cilia, ubiquitous organelles found on the surface of most vertebrate cells where they transduce a variety of signals to the cell, including sensory signals (light in photoreceptors), chemical and mechanical signals (kidney tubules) and signaling pathways during development and cell homeostasis (Hedgehog, Wnt). Various master projects are available to elucidate the role of primary cilia and the function of ciliopathy genes, relying on zebrafish and/or iPSC-based models and applying modern techniques such as CRISPR gene editing, live imaging and -omics approaches.
Keywords	primary cilia, zebrafish, iPSC, organoids, genetics
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr.med. Ruxandra Bachmann Institute of Medical Genetics ruxandra.bachmann@mls.uzh.ch 044 556 33 11
Conditions	interest in genetics, development and molecular biology
Links	https://www.medgen.uzh.ch/en/forschung/gagescu.html

Immunology: Inflammation Research	
Short description	For the complex immune system to work, the individual cell types have not only specialized functions, but also a complex communication network. **Cytokines** are soluble factors with the capacity to serve as signals for the communication (*or words in the complex language*) between immune cells. Our goal is to uncover this communication network and to translate the ***language of the immunesystem*.** Our research aims to understand the development of tissue-specific **inflammation** in particular in the context of interactions of the nervous system with the immune system. Related to our studies of autoimmunity (an undesired process) we expanded our interest to apply our tool-set and expertise to study the impact of immunity to combat cancer (a desired process). Our main research interests can be categorized as such: • **Cytokine networks** in chronic inflammatory disease with a focus on *multiple sclerosis, psoriasis, graft-versus host disease* in preclinical mouse models and human patients • **Cancer-immunotherapy**: specifically the interaction of immune cells with cancer cells and therapeutic interventions to mount immune responses against tumors We offer several MSc positions on various projects in the research team
Keywords	Cytokines, lymphocytes, single cell technologies, transgenic mice, chronic inflammation
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Burkhard Becher University of Zurich, Institute of Experimental Immunology, Inflammation Research becher@immunology.uzh.ch 044 635 37 03
Conditions	Solid understanding of basic immunology. Good communication skills. Some understanding of computational biology (e.g. R) Interest to work in a highly motivated and team-oriented research environment
Links	http://www.immunology.uzh.ch

Evolution of human diet and body composition	
Short description	Nutrition and obesity are major topics in medicine and research. We explore insights on the evolution of human nutrition and the propensity for human obesity by studying modern data on human diet and body composition. We use data from published studies or large cohort data on the one hand, and collect own data on the other hand. We use food questionnaires, bioelectrical impedance analysis, and 3D body scanner, to collect data on nutrition, body composition, and body form of healthy and diseased human populations.
Keywords	Evolutionary Medicine, Nutrition, Obesity, Body composition, Diet
Supervisor **Institute** **E-mail** **Phone**	PD Dr. Dr. med. Nicole Bender Institute of Evolutionary Medicine nicole.bender@iem.uzh.ch 044 635 05 31
Conditions	None
Links	https://www.iem.uzh.ch/en/research/clinical_evolutionary_medicine_group_bender.html

Genetic Basis of Eye Diseases	
Short description	A Master / Diploma student position is available to identify new genes involved in the pathogenesis of human eye diseases and to investigate their function in order to better understand the molecular basis of this group of disorders. In our lab, we focus on the investigation of the molecular mechanisms of the disease phenotypes. More information is also available on our website: http://www.medmolgen.uzh.ch/research/eyediseases.html We found several, probably disease-causing, DNA sequence alterations in different genes of patients, which are being characterized in more detail. The project involves functional analysis of mutations *in vitro* and sequencing of new candidate genes for eye diseases. Duration: Nine month to one year. Entrance upon: As soon as possible.
Keywords	Eye diseases, genetics, next generation sequencing (NGS), molecular analyses, cell culture
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Wolfgang Berger Institute of Medical Molecular Genetics berger@medmolgen.uzh.ch 044 655 70 34
Conditions	Motivated students in the area of biology and biomedical sciences are encouraged to send applications. Interest in human genetics as well as basic training or practical experience in molecular genetics and molecular biology is an advantage.
Links	www.medmolgen.uzh.ch

Inflammatory microenvironment and metastasis	
Short description	Metastasis is the primary cause of cancer-related mortality. Tumor microenvironment is composed of leukocytes and stromal cells that significantly affect cancer progression. Chemokines are the key cytokines, which promote the recruitment and the polarization of leukocytes. Our projects aim to understand the function of particular chemokine-chemokine receptors pairs using in vitro techniques (e.g. co-culture assays) and validate their role in vivo.
Keywords	
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Lubor Borsig Institute of Physiology lborsig@access.uzh.ch 044 635 51 34
Conditions	The project may include animal models
Links	http://www.physiol.uzh.ch/research/institutegroups/grborsig.html

Hematologic malignancies	
Short description	Different MSc projects are available in the leukemia research group at the University Children's Hospital Zurich. Projects will deal with different aspects of drug resistance in childhood acute leukemia. One project will address the role of an alternative cell death mechanism, necroptosis, in the resensitization of resistant leukemia cells to steroids. We have furthermore developed a platform to analyze the antileukemic potential of new agents in primary leukemia cells from highly drug resistant patients. This project will deal with the analysis and characterization of the hereby identified new antileukemic agents also with respect to their activity in combination with current chemotherapy.
Keywords	
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Jean-Pierre Bourquin / Dr. Beat Bornhauser Labor Molekulare Dept of Oncology, University Children's Hospital jean-pierre.bourquin@kispi.uzh.ch / beat.bornhauser@kispi.uzh.ch 044 266 73 04 / 044 634 88 17
Conditions	Commitment and motivation
Links	http://idcmskispi.unizh.ch/lenya/kispi/live/af/ForschungLehre/onkoonco/Leukaemie_de.html

Modulation of immune responses by cytokines	
Short description	We are interested in the function of cytokines in the immune system during health and disease. We study how cytokines coordinate immune homeostasis and responses, and how they affect various immune cells in different models of cancer, inflammatory and autoimmune disease, as well as allograft rejection. To this end, we develop and characterize natural versus modified cytokine formulations, including cytokine/anti-cytokine antibody complexes, in order to better understand cytokine biology and improve cytokine-mediated immunotherapy.
Keywords	cytokine biology, cytokine engineering, autoimmunity, transplantation, tumor immunotherapy
Supervisor **Institute** **E-Mail** **Phone**	Prof. Dr. Onur Boyman Dept. of Immunology, University Hospital Zurich, University of Zurich onur.boyman@usz.ch +41 44 255 20 69
Conditions	none
Links	http://www.boymanlab.com/

Cognitive neuroscience in childhood an adolescence	
Short description	Our research group examines cognitive brain networks and their development in healthy children and adolescents as well as patients. We apply behavioural tests and non-invasive, child-friendly neuroimaging techniques such as electroencephalography (EEG), functional (fMRI) and structural (sMRI) magnetic resonance imaging or combined EEG-fMRI (sequential or simultaneous). The core patient groups include children suffering from developmental dyslexia, as well as children and adolescents suffering from child-psychiatric disorders (e.g. depression, ADHD, OCD). We are particularly interested in comparing typically developing children with patients, aiming to i) clarify and delineate dysfunction of specific cognitive brain networks in different child psychiatric disorders; ii) characterize trajectories for typical and atypical functional and structural brain development; iii) identify neuroimaging measures suited to advance prediction or diagnosis; iv) evaluate and track learning-related changes in the brain during specific interventions; and v) advance the combination of child-friendly neuroimaging techniques and analyses (e.g. computational modelling).
Keywords	neuroimaging, EEG, (f)MRI, children, learning
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Silvia Brem, Department of Child and Adolescent Psychiatry and Psychotherapy, Psychiatric Hospital, University of Zurich sbrem@kjpd.uzh.ch 043 499 27 60
Conditions	Very good knowledge of German is essential for the work with children and their families
Links	www.kjpd.uzh.ch/de/multimod/neuroimaging/team/brem.html

Molecular Analysis of Human Biological Clocks	
Short description	Our laboratory studies the molecular mechanisms and neural circuitry underlying sleep and circadian physiology. Our approach is a broad one, and includes biochemical approaches leading to transcriptomics and phosphoproteomics in both model organisms and humans, as well as optogenetic and chemogenetic techniques in mice. Please see our recent publications on our lab website!
Keywords	sleep, circadian, neuroscience, molecular biology, biochemistry
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Steven A. Brown Institut für Pharmakologie und Toxikologie Steven.brown@pharma.uzh.ch 044 635 59 99
Conditions	Knowledge of basic cell biology
Links	www.sbrownlab.com

T cell development and negative selection	
Short description	Hematopoietic precursor cells migrate from the bone marrow to the thymus where T cell development is taking place. During their development thymocytes have to pass different check points called positive and negative selection that ensure that randomly generated T cell receptors (TCR) of double positive (DP) cells can interact with the self-peptide presented on MHC. These check points are controlled by the avidity of the interaction, which means that cells which interact with a low avidity to self-antigen can survive and those with a high avidity die by apoptosis (negative selection). Consequently, negative selection ensures that self-reactive thymocytes are eliminated and autoimmunity avoided. However, the exact molecular pathway of the same TCR stimulation of thymocytes leading to apoptosis (negative selection) or survival (positive selection) within the thymus or the activation of peripheral T cells leading to proliferation are not fully understood. Therefore, we are analyzing the role of specific transcription factors in different transgenic mouse strains. Furthermore, we are comparing the signal transduction in thymocytes and peripheral T cells upon TCR stimulation. You will learn how to use state-of-the-art techniques like CRISPR/Cas9, flow cytometry, RT-PCR, Western blot and others to analyze the T cell development in mice. This knowledge will help to understand the development and protection of autoimmune diseases.
Keywords	
Supervisor **Institute** **E-Mail** **Phone**	Prof. Dr. Thorsten Buch / PD Dr. Sabine Specht Institute of Laboratory Animal Science, University of Zurich Wagistrasse 12, 8952 Schlieren jane.beil-wagner@uzh.ch 044 635 50 57
Conditions	We are looking for a highly motivated master student with a strong interest in immunology, T cell development, autoimmune diseases and genetics.
Links	http://www.ltk.uzh.ch/

Vascular Dysfunction in Aging & Disease	
Short description	Vascular homeostasis is critical for the correct supply of nutrients and oxygen to all organs. The endothelium -the innermost layer of a vessel- functions as an active barrier to allow the passage of different substances; additionally, it mediates vascular dilatation and constriction. In disease states and with aging the endothelium becomes dysfuctional and through complex cascades of events leads to several complications such as myocardial infarction and stroke. Several key factors such as free radicals and inflammation are implicated in endothelial dysfnction and age-dependent cardiovascular diesease. Our group performs research aimed at elucidating the interaction of regulators and mediators of vascular disease in aging, arterial thrombosis and stroke.
Keywords	Aging, cardiovascular disease, stroke
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Giovanni G. Camici Center for Molecular Cardiology, UZH, Schlieren Campus giovanni.camici@ uzh.ch 044 635 64 68
Conditions	None
Links	http://www.cmc.uzh.ch/en.html

Stem cells and osteology	
Short description	Stem cells are a powerful tool not only for the study of biological processes, but also for their potential therapeutic application. One of the main issues with the use of stem cells for clinical applications is the ability to maintain these cells outside of the body (in vitro) in a self-renewing pluripotent and/or multipotent state and to differentiate them precisely to specific cell types. The mechanisms underlying maintenance and determination of pluripotency as well as the ones driving differentiation are nevertheless still largely unknown. We are interested in following research topics: 1) Understanding the molecular mechanisms involved in the regulation of pluripotency and differentiation pluripotent stem cells (ESCs and iPSCs) and mesenchymal stem cells (MSCs). 2) Development and optimization of tissue engineering approaches for bone regeneration with pluripotent and multipotent stem cells.
Keywords	Pluripotent stem cells Mesenchymal stem cells, bioengineering, bone
Supervisor **Institute** **E-mail** **Phone**	PD Dr. Paolo Cinelli Department of Trauma Surgery, University Hospital Zurich paolo.cinelli@usz.ch 044 255 36 78
Conditions	
Links	http://www.traumatologie.usz.ch/forschung/

Neurorehabilitation in spinal cord injury	
Short description	A spinal cord injury is a devastating life event leading to impairment in sensory, motor and autonomic function. In order to diagnose the patient, predict and measure the functional outcome sensitive readouts are necessary. Our lab focuses on the functional assessment of human spinal cord injury employing a variety of state-of-the-art techniques, such as gait analysis, neuroimaging, electrophysiology, and sensor based technology.
Keywords	neurorehabilitation, sensorimotor control, neuroimaging, robotics, spinal cord injury
Supervisor **Institute** **E-mail** **Phone**	Prof. Armin Curt, PD Dr. Marc Bolliger Spinal Cord Injury Research Center marc.bolliger@balgrist.ch 044 510 7201
Conditions	- BSc in Biomedicine/Biology incl. basic knowledge in neuroanatomy - independent working attitude, curious to learn something new, full commitment and motivation for the thesis - fluent in German and English
Links	https://www.sci-research.uzh.ch/en/aboutus.html

System biology and epigenetic changes in rheumatic diseases	
Short description	There is an unmet need for novel therapies, biomarkers and humanized models for rheumatic diseases. Our laboratory focuses on the analysis of molecular pathways in inflammation, cartilage destruction and multi organ fibrosis. We investigate epigenetic mechanisms such as post-translational histone modifications, DNA methylation, DNA hydroxymethylation and non-coding RNAs, as well as signaling pathways in primary cells (fibroblasts, monocytes) derived from patients' biopsies and peripheral blood and 3D-cell cultures. Master students can select between different topics within the field of rheumatology including rheumatoid arthritis, systemic sclerosis and vertebral bone marrow lesions (modic changes).
Keywords	Epigenetics, inflammation, fibrosis, RNA Sequencing, 3D cultures
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Oliver Distler Center for Experimental Rheumatology, USZ, Schlieren Campus oliver.distler@usz.ch 044 255 29 70
Conditions	We are looking for enthusiastic master students. Basic knowledge of techniques in molecular biology is of advantage.
Links	http://www.en.rheumatologie.usz.ch/research/pages/default.aspx

Projects in Urologic Tissue Engineering and Prostate Cancer Therapy	
Short description	Our lab offers several master projects. Interested students can choose between projects associated with (1) Urological Tissue Engineering and Regenerative Therapies (2) Smooth Muscle Cell Characterization and Functional Assays (3) Therapy and Biomarkers in Prostate Cancer (4) Exosome in Blood Plasma for Early Detection of Prostate Cancer.
Keywords	
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Daniel Eberli, Dr. Souzan Salemi University Hospital Zürich, Department of Urology, Souzan.salemi@usz.ch 079 578 86 54 (Lab phone)
Conditions	Motivation, team player, basic knowledge of molecular biology.
Links	https://www.usz.ch/fachbereich/urologie/forschung/eberli-gruppe/

Targeting vulnerabilities in pediatric cancer metabolism	
Short description	We work at the intersection of pediatric cancer and metabolism. The central interest of our laboratory is to understand how cancers reprogram their metabolism to facilitate growth, adapt to different environments and how this knowledge could be used in modern personalized medicine approaches. Projects are developed as an independent work or in a highly collaborative environment by contributing to a larger project. It is the basis of our work to integrate knowledge from pediatric oncology, inborn errors of metabolism and genetics to learn about basic disease mechanisms and identify new therapeutic targets. Techniques include CRISPR, immunoblotting, -fluorescence, cell culture (primary and cell lines), proliferation assays, drug sensitivity testing, metabolic tracing, and metabolomics. Depending on the student's interest and expertise we will define the techniques used and whether the emphasis will be more on the metabolic or cancer biology aspect.
Keywords	Pediatric cancer metabolism, cell biology, CRISPR, metabolomics
Supervisor **Institute** **E-mail** **Phone**	PD Dr. Sean Froese Universitätskinderspital Zürich, Dep. für Stoffwechsel &Dep. für Onkologie raphael.morscher@kispi.uzh.ch 044 266 81 51
Conditions	--
Links	www.kispi.uzh.ch

Role of Myoglobin in brown fat oxygenation and mitochondrial structure and function	
Short description	Brown adipose tissue (BAT) in mice is a very active tissue. When oxygen is present the tissue oxidizes fatty acids and lipids to generate heat rather than biochemical energy (ATP) in its uncoupled mitochondria. Through BAT small rodents can keep warm without the typical muscle contracting shivering. Hence, this mode of heat production is called non-shivering thermogenesis (NST). We and others recently discovered myoglobin (Mb), the oxygen carrier known from skeletal and cardiac muscle, to also occur within lipid-producing and -secreting cells in breast tissue of mice and men as well as in BAT cells (brown adipocytes) of mice. Moreover, expression of Mb in BAT is especially active when cold temperatures (e.g. 10°C) challenge a mouse. Thus, Mb quantities strongly increase once BAT mitochondria need to generate extra heat via NST. To better understand this apparent correlation between Mb and mitochondrial function in the non-muscle context of brown adipocytes, this Master project will look at brown fat oxygenation, respiration and mitochondrial structure and function parameters in mice, with and without Mb. For this purpose, the student will work, under the supervision of an experienced PhD Student and the PI listed below, with the Mb-wild type (Mbwt) and ubiquitous Mb-knockout NMRI mice that we routinely utilize in our group. Moreover, the student will also learn cell isolation, cultivation and state-of-the-art molecular techniques as they apply to key concepts of thermoregulation and energetics. He/she will also be part in perhaps assigning a novel function to an "old protein (Mb)".
Keywords	Myoglobin, brown adipose tissue, non-shivering thermogenesis, warm- and cold-adaptation
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Max Gassmann Institute of Veterinary Physiology maxg@access.uzh.ch 044 635 88 03
Conditions	Motivated students in the area of biology, biomedical sciences, veterinary medicine or equivalent are encouraged to send applications. Experience with cell cultures is beneficial, an accepting attitude towards animal experimentation required.
Links	http://www.vetphys.uzh.ch/index.html;

Single-cell analysis strategies for immunophenotyping of preclinical Alzheimer's disease (AD)	
Short description	Evidence of immune cells responding to pathological hallmarks of AD has raised the question of whether immune markers could be used as indicators for early and progressing AD pathology in the brain. We use multidimensional single-cell analysis combined with unbiased machine learning techniques to immunophenotype cell populations of interest. Our methods range from single-cell analysis by cytometry to cell culture of primary patient-derived immune cells and subsequent testing for their antigen response.
Keywords	Neuroscience, Immunology, Flow cytometry, In vitro cell assays, Computational analysis
Supervisor **Institute** **E-mail** **Phone**	Dr. Christoph Gericke Institute for Regenerative Medicine (IREM) christoph.gericke@irem.uzh.ch 044 635 76 86
Conditions	Basic understanding of Immunology, ideally basic knowledge in computational analysis (e.g. R) but it is not an exclusion criterion
Links	https://www.irem.uzh.ch/en/research/Group-R.-M.-Nitsch/Immunology-of-Neurodegeneration.html

Molecular Mechanisms of Retinal Degeneration	
Short description	Many blinding diseases are caused by the degeneration of photoreceptor cells. Using several animal models of induced and inherited retinal degeneration, our research aims at the understanding of the molecular mechanisms and signalling pathways induced during the degenerative process. The acquired knowledge is used to develop and test therapeutic strategies to improve cell viability and rescue vision. Strategies include AAV-mediated gene therapy to inhibit (RNAi, CRISPRi) or activate (CRISPRa) specific gene expression, and neuroprotection. Available projects will investigate aspects of molecular mechanisms during retinal degeneration or refine therapeutical approaches to rescue vision.
Keywords	Retina, gene therapy, CRISPR/Cas9, molecular signalling, vision
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Christian Grimm Lab for Retinal Cell Biology/Dept Ophthalmology, University Hospital Zurich cgrimm@opht.uzh.ch 043 253 30 01
Conditions	Interest in the visual system, the retina and strategies to rescue vision. Background in molecular biology desirable. Good knowledge of the English language is an advantage.
Links	http://home.ggaweb.ch/LabForRetinalCellBiology/

Molecular and cellular investigation of neurodevelopmental psychiatric disorders and therapies	
Short description	The Translational Molecular Psychiatry research group has set its aims to investigate the etiopathologies of neurodevelopmental psychiatric disorders such as attention-deficit hyperactivity disorder (ADHD), autism spectrum disorder (ASD), early-onset obsessive-compulsive disorder (OCD) and psychosis. Furthermore, the lab aims to elucidate mechanisms of action of drug therapy and prediction of response. We offer projects: (a) involving modelling ADHD using patient specific induced pluripotent stem cells (iPSC) to assess different neuro-developmental stages hypothesized to be altered in ADHD and to find its molecular mechanism. (b) Assessing the effects of the psychostimulant, methylphenidate (MPH), at the cellular and molecular levels (e.g. Wnt-signaling activation). (c) Assessing the transcriptional alterations of the SSRI treatment in early-onset OCD. And (d) Investigate (epi)genetic risk factors in neurodevelopmental psychiatric disorders. The Master candidate will have the chance to learn various techniques e.g. neuronal cell culture, immunostaining, multi-electrode array electrophysiology, molecular genetics and biochemical techniques, live-cell imaging, data assessment using several software, statistical software and to interpret scientifically the results obtained.
Keywords	Psychiatry, Neurodevelopmental, cell culture, psycho-pharmacology, (epi)genetic
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Edna Grünblatt Translational Molecular Psychiatry; Department of Child and Adolescent Psychiatry and Psychotherapy (KJPP), University Hospital of Psychiatry Zurich (PUK) edna.gruenblatt@kjpd.uzh.ch 043 556 40 39 / 043 556 40 38
Conditions	Motivation and high interest in molecular and cellular neuropsychiatric research, using novel methods e.g. induced stem cells, with interest in individual development into independence.
Links	https://www.kjpd.uzh.ch/de/translationale-molekularpsychiatrie.html

Innate Immunity and Human Respiratory Viruses	
Short description	The human interferon system constitutes a critical defense against viruses. Its importance is underscored by the fact that rare loss-of-function variants in the interferon pathway increase infection susceptibility. Further, interferon is tightly regulated to prevent aberrant activation, as some autoinflammatory diseases are associated with mutations in the system. We combine genetics, proteomics, cell biology and virology to identify molecular mechanisms governing the action of interferon against influenza and coronavirus infections, and how human genetic variation impacts pathogenesis.
Keywords	Interferon, influenza, signaling, immunity, proteomics
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Benjamin G. Hale Institute of Medical Virology hale.ben@virology.uzh.ch 044 634 26 31
Conditions	Interest and solid background in virology and innate immunity (BIO615 needs to be included in learning agreement)
Links	https://www.virology.uzh.ch/de/research/ghale.html

Evolutionary aspects of musculoskeletal disorders and human birth	
Short description	Evolutionary medicine seeks to explain the ultimate causes of human diseases, such as musculoskeletal disorders, or the complexity underlying the tortuous birth process in humans. Musculoskeletal disorders of the vertebral column, shoulder, hip, knee or foot affect most humans at some point during their lifetime and are thus among the top causes of health costs, while human birth is notably complex and hazardous compared to that of other primates and often entails Caesarean sections. Our research group explores the hypothesis that these issues may be trade-offs to the adaptation of our skeleton to upright bipedal locomotion. Our methodological approach utilizes imaging techniques and comparative morphological studies together with analyses of the fossil/skeletal record to understand how such conditions evolve.
Keywords	
Supervisor **Institute** **E-mail** **Phone**	PD Dr. med. Dr. sc. nat. Martin Häusler Institut für Evolutionäre Medizin martin.haeusler@iem.uzh.ch 044 635 05 30
Conditions	None
Links	https://www.iem.uzh.ch/en/people/evolmorph.html

The role of pH receptors OGR1 and GPR4 in IBD	
Short description	Inflammatory bowel disease (IBD) is a prototypic chronic inflammatory disease with increasing incidence in the industrialized world (20000 Swiss people suffer from IBD) and is characterized by a chronic inflammation of the intestinal wall. A local acidification in the gut lumen as well as in the mucosa has been observed during intestinal inflammation. Our aim is to show that pH-sensing receptors OGR1 and GPR4 play a key role in modulation of intestinal fibrosis and suggest that selective inhibition pH-sensing receptors by antagonists is a promising therapeutic strategy for the treatment of intestinal fibrosis in CD.
Keywords	GPR4, OGR1, inflammatory bowel disease (IBD), fibrosis, fibroblast differentiation
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Martin Hausmann UniversityHospital Zurich, Department for Gastroenterology and Hepatology, Raemistrasse 100, 8091 Zurich martin.hausmann@usz.ch 044 255 98 08
Conditions	no
Links	http://www.gastroenterologie.usz.ch/forschung/Seiten/default.aspx

Human milk oligosaccharides and intestinal bacteria	
Short description	Human milk contains a large group of complex oligosaccharides, which influence the bacterial colonization of the newborn intestine. Recently, specific human milk oligosaccharides have also been shown to regulate immune cell functions. Using pure milk oligosaccharides, our group investigates the role of these compounds on intestinal bacterial composition (in vitro and in vivo) and on the maturation of mucosal immune cells (in cell culture and mouse models). Methods applied are leukocyte isolation, cell culture, flow cytometry, real-time PCR, gene expression and inactivation in bacteria.
Keywords	Breast milk, prebiotics, antibodies, antigens, immunity
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Thierry Hennet Institute of Physiology thierry.hennet@uzh.ch 044 635 50 80
Conditions	Interest in genetics and pathogenesis of diseases
Links	http://www.uzh.ch/physiol/

Molecular mechanisms involved in the homeostasis of phosphate	
Short description	The maintenance of the extracellular concentration of inorganic phosphate (Pi) is crucial for a variety of cellular processes, bone formation and the prevention of vascular calcification. Projects related to this topic will focuss on molecular aspects (cellular regulations, interacting proteins, structure-function relationships) of different sodium-dependent phosphate cotransporters. Also, whole animal studies aim to understand the role of the different Na/Pi-cotransporters (in different organs) in the physiology and pathophysiology of inorganic phosphate metabolism.
Keywords	
Supervisor **Institute** **E-mail** **Phone**	Dr. Nati Hernando Institute of Physiology-University Zürich-Irchel hernando@physiol.uzh.ch 044 635 50 32
Conditions	Some projects will include animal experiments
Links	www.uzh.ch/physiol

Omega-3 Fatty Acids and their Lipidome	
Short description	We are interested in the mechanism of the omega-3 fatty acid mediated regulation of the resolution of inflammation with the aim to find novel therapeutic approaches. For this, we investigate the regulation and the molecular pathways of enzymes and receptors, which are involved in the metabolism of omega-3 fatty acids, in the generation of lipid mediators, and in signal transduction of these lipid mediators.
Keywords	Q-PCR, FACS, Western blot, cell culture, ELISA, LC-MS
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Martin Hersberger Division of Clinical Chemistry and Biochemistry University Children's Hospital Zürich Steinwiesstrasse 75, 8032 Zürich martin.hersberger@kispi.uzh.ch 044 266 75 41
Conditions	None
Links	https://www.kispi.uzh.ch/fzk/de/abteilungen/uebersicht/klinische-chemie-biochemie/Seiten/default.aspx#a=akk3

Serine-Palmitoyltransferase and Sphingolipid Metabolism	
Short description	Sphingolipids and their metabolites are ubiquitous constituents of cell membranes and involved in various cellular functions like apoptosis, signal transduction and membrane trafficking. The serine-palmitoyltransferase (SPT) is the key regulatory enzyme in the sphingolipid synthesis pathway. Mutations in the SPT gene result in an inherited sensory neuropathy (HSN1). Pathological changes in sphingolipid metabolism have been implied to play pathogenetic roles in various diseases including Diabetes Type 2, atherosclerosis and cancer. We previously identified and characterized a third subunit of SPT and offer several MSc projects to further characterize the structure, function and regulation of the subunits of SPT.
Keywords	
Supervisor **Institute** **E-mail** **Phone**	Dr. Thorsten Hornemann Institut für Klinische Chemie (IKC), Unispital Zürich thorsten.hornemann@usz.ch 044 255 47 19
Conditions	Experiences in cell culture, protein chemistry and molecular biology are preferable
Links	

The role of ADP-ribosylation in the regulation of inflammation	
Short description	Our laboratory is interested to understand the molecular regulatory mechanisms of inflammation. Inflammation is the complex biological response to harmful stimuli, such as pathogens, damaged cells, or irritants. We investigate inflammatory signaling (e.g. oxidative stress) with special focus on the role of post-translations modifications (PTM) such as ADP-ribosylation. We study the patterns of ADP-ribosylation using cutting-edge systems biology approaches including ADP-ribosyl-specific high-resolution and quantitative mass spectrometry.
Keywords	Inflammation/ NAD/ ADP-ribosylation/ Signaling/ cell compartimentalization/
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Michael O. Hottiger, Department of Molecular Mechanisms of Disease michael.hottiger@dmmd.uzh.ch 044 635 54 74
Conditions	The applicant should also have good communication and writing skills, a curiosity-driven attitude and should demonstrate enthusiasm and flexibility.
Links	https://www.dmmd.uzh.ch/en/research/hottiger.html

Zusammenspiel von Schlaf-Wach-Prozessen und Entwicklung bei gesunden Kindern und Jugendlichen und klinischen Populationen	
Short description	Die Gehirnentwicklung sowie Verhalten und Kognition werden massgeblich durch Schlaf-Wach-Prozesse beeinflusst. Insbesondere erforschen wir mit stark interdisziplinärem Ansatz grundlegende Mechanismen der Schlaf-Wach-Regulation und wie diese mit der Hirnentwicklung zusammenhängen. Dazu untersuchen wir gesunde Kinder und Jugendliche sowie klinische Populationen, welche zum Beispiel an Epilepsie oder ADHS erkrankt sind oder ein Schädel-Hirn-Trauma erlitten haben. Zur Untersuchung der Schlaf-Wach-Prozesse und deren Auswirkungen verwenden wir EEG (Elektroenzephalografie), MRT (Magnetresonanztomografie) und verschiedenste kognitive Tests und Fragebögen. Des Weiteren setzen wir neuromodulatorische Ansätze ein, um die Prozesse beeinflussen zu können, beispielsweise Schlafvertiefung durch akustische Stimulation (siehe Links, SleepLoop).
Keywords	
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Reto Huber Interdisziplinäres Schlafzentrum, Entwicklungspädiatrie, Kinderspital Zürich reto.huber@kispi.uzh.ch 044 266 81 60
Conditions	Interesse an neurowissenschaftlicher Forschung. Selbstständiges, zuverlässiges und sehr sorgfältiges wissenschaftliches Arbeiten. Hohe Teamfähigkeit und zeitliche Flexibilität. Freude im Umgang mit Kindern und Jugendlichen. Gute Deutschkenntnisse. Erfahrungen mit Matlab/R oder die Motivation, sich in diese einzuarbeiten, sind wünschenswert.
Links	www.kispi.uzh.ch/sleep, SleepLoop: https://www.hochschulmedizin.uzh.ch/de/projekte/sleeploop.html

Neurophysiology in spinal cord injury	
Short description	Objective and quantitative measures of sensory, motor, and autonomic function based on electrophysiological techniques are promising tools to diagnose patients with spinal cord injury and to track their neurological recovery. My group is especially interested in neurophysiological measures of nociceptive processing which is ultimately applied in patients with neuropathic pain after spinal cord injury. Techniques: evoked potentials, noxious withdrawal reflexes, quantitative sensory testing, experimental pain paradigms
Keywords	neurophysiology, neuropathic pain, autonomic nervous system, spinal cord injury
Supervisor **Institute** **E-mail** **Phone**	Dr. Michèle Hubli Spinal Cord Injury Research Center michele.hubli@balgrist.ch 044 510 7203
Conditions	- BSc in Biomedicine / Biology incl. basic knowledge in neuroanatomy - independent working attitude, curious to learn something new, full commitment and motivation for the thesis - fluent in German and English
Links	https://www.sci-research.uzh.ch/en/aboutus.html

Ecology and health among the indigenous Tsimané of Bolivia	
Short description	The Tsimané have been extensively studied because their lifestyle - small communities, high physical activity, high pathogen load, high fertility - is radically different from modern societies, but resembles conditions of our evolutionary past. As a consequence, they can teach us much about the causes and risk factors for diseases of cilvilization. At the same time, Tsimané society is changing and facing new health challenges stemming from access to high-caloric foods (sugars, oils) or increasing social inequalities. Against this backdrop, various Master's projects can be designed; contact me with ideas!
Keywords	Human ecology, Human variation, Mismatch, Diseases of civilization, Life history
Supervisor **Institute** **E-mail** **Phone**	Prof Dr. Adrian Jäggi Institute of Evolutionary Medicine, University Zürich-Irchel adrian.jaeggi@iem.uzh.ch 044 635 50 40
Conditions	Experience with data manipulation and statistical analyses (especially using R) is strongly recommended; if field work is desired need to be in good physical condition, speak Spanish, be a team player, and enjoy working under challenging conditions - ideally already have field work experience
Links	www.iem.uzh.ch/en/research/human_ecology_group_jaeggi.html

To identify biomarker for Complex regional pain syndrome (CRPS)	
Short description	Complex regional pain syndrome (CRPS) is a condition of extreme pain affecting a part of the body with clinical features including chronic inflammation, sensory and motor dysfunctions and changes to skin and bones. Symptoms usually appear after trauma or surgery. At a cellular level, CRPS is characterized by inflammation and reduced intra epidermal nerve fiber density in the patients' skin. Later in the chronic phase, signs of central nervous system reorganization such as dystonia, body perception disturbances or sensory deficits can become apparent. The clinical signs of CRPS can range from a mild and self-limiting to a chronic condition. There is a high-unmet need for biomarkers or phenotypic characteristics to facilitate early diagnosis, monitoring of the disease progression and treatment control.
Keywords	Biomarker, skin fibroblasts, keratinocytes, epidermal nerve fibers, pain scoring
Supervisor **Institute** **E-mail** **Phone**	PD Dr. Astrid Jüngel Center of Experimental Rheumatology, Department of Rheumatology, University Hospital, UZH, Balgrist Campus astrid.juengel@usz.ch 044 510 75 13
Conditions	We are looking for enthusiastic Master Students. Basic knowledge of techniques in molecular biology is of advantage (cell culture, qPCR, ELISA, Flow Cytometry, Histology).
Links	Research Groups – University Hospital Zurich (usz.ch)

Cellular and molecular mechanisms of cardiac fibrosis and dysfunction	
Short description	Cardiovascular diseases are a leading cause of mortality and morbidity in the developed countries with sudden cardiac death accounting for about 15-20% of all cause deaths. Sudden cardiac deaths are often the consequence of abnormal heart rhythms called arrhythmias. Clinical studies demonstrated that ventricular fibrosis represented a strong predictor of ventricular arrhythmia and sudden cardiac death in ischemic and non-ischemic cardiac conditions. Cardiac fibrosis, usually followed by cardiac inflammation, is characterized as an excessive accumulation of stromal cells/fibroblasts and extracellular matrix proteins in the myocardium leading to heart dysfunction. Research interests/projects in the lab: • Role of stromal cell populations and fibrosis in myocardial remodelling • Role of autophagy and cellular senescence in myocardial dysfunction • Evaluation of fibrosis-triggered arrhythmia and heart functions • 3D human cardiac microtissue fibrosis/arrhythmia models using induced pluripotent stem cell (iPSC) and tissue-on-chip technology • Role of specific (similar or distinct) myeloid and stromal cell populations in multiorgan pathology
Keywords	cardiac inflammation, cardiac fibrosis, conduction system, fibroblast, myeloid cells, systemic sclerosis, 3D microtissue, autophagy.
Supervisor **Institute** **E-mail** **Phone**	PD Dr. Gabriela Kania Center of Experimental Rheumatology, Department of Rheumatology, USZ, Wagistrasse 14, 8952 Schlieren gabriela.kania@uzh.ch 044 556 30 13
Conditions	Basic knowledge in molecular biology, cell culture, heart physiology, fibrosis. Methodology: This Master Thesis offers an excellent possibility to learn range of conventional and molecular biology techniques such as primary cell isolation, cell culture, 3D cells culture, quantitative PCR, gene silencing and overexpression methods, Western Blot, ELISA, flow cytometry, immunofluorescence and immunohistochemistry, advanced microscopy, non-invasive electrocardiogram, high-speed video analysis, mouse models. On the other hand, it might be a valuable opportunity to be involved in the innovative and clinically oriented project that will give the basis for the future PhD thesis.
Links	http://www.en.rheumatologie.usz.ch

Development and characterization of blood capillaries in tissue-engineered human skin substitutes	
Short description	The survival of tissue-engineered skin substitutes during the initial phase after their transplantation depends on the rapid development of an adequate vascularization capable of delivering oxygen and nutrients throughout the engineered construct. This can be achieved through preforming blood capillaries in vitro (prevascularization). In this project, we aim to preform capillary networks in vitro using human dermal microvascular endothelial cells (HDMECs) or adipose-derived stem cells.
Keywords	3D vascular networks, angiogenesis, endothelial cells, adipose stem cells, regenerative medicine
Supervisor **Institute** **E-mail** **Phone**	Dr. Agnes Klar Tissue Biology Research Unit, Kinderspital Zurich, Campus Schlieren Agnes.Klar@kispi.uzh.ch 044 634 89 19
Conditions	-
Links	http://www.skingineering.ch

Implication of microRNAs in age-related and endocrine myopathies	
Short description	Skeletal muscle possesses a remarkable capacity to regenerate after disturbances like exercise or acute or chronic injury. Muscle regeneration is characterised by a well-timed network of different cell types providing an environment that allows the activation of muscle stem cells, called satellite cells (SCs) to regenerate the damaged tissue. One of the cell types involved in the regenerative stem cell niche are fibro/adipogenic progenitors (FAPs). Upon injury, FAPs enter the cell cycle and expand to produce cytokines and deposit extracellular matrix (ECM) to enhance differentiation of SCs into muscle fibers. In ageing as well as in pathological conditions such as muscular dystrophies, FAPs differentiate into adipocytes and contribute to fibrosis. Master thesis projectes are available to better understand the role of microRNAs in this process using mouse models for muscle regeneration and work with primary muscle cells from mice and humans.
Keywords	Skeletal muscle regeneration, stem cell niche, ageing, miRNA, cell culture, flow cytometry, immunofluorescence
Supervisor **Institute** **E-Mail** **Phone**	PD Dr. Jan Krützfeldt Klinik für Endokrinologie, Diabetologie und Klinische Ernährung Universitätsspital Zürich, Schlieren Campus jan.kruetzfeldt@usz.ch 044 255 36 27
Conditions	You should be (1) a team player, (2) familiar with cell culture and techniques in molecular biology (3) intrinsically motivated to be involved in research with interest in individual development into independence. Projects may include animal experiments.
Links	http://www.endokrinologie.usz.ch/forschung/seiten/rolle-der-mikrornas.aspx

Virulence evolution and novel treatments against opportunistic human pathogens	
Short description	We study bacterial opportunistic human pathogens such as Pseudomonas aeruginosa and Staphylococcus aureus. We combine approaches from microbiology, molecular biology and evolutionary biology to: (i) understand how pathogens evolve inside and outside the host and how this affects virulence; (ii) develop novel treatment approaches that target virulence factors, such as biofilm formation and quorum sensing; and (iii) combine these novel approaches with traditional antibiotics to come up with effective treatments against these pathogens.
Keywords	opportunistic human pathogens, bacterial infections, evolutionary, microbiology, antibacterial therapies, bacterial virulence factors
Supervisor **Institute** **E-Mail** **Phone**	Prof. Dr. Rolf Kümmerli Department of Quantitative Biomedicine rolf.kuemmerli@uzh.ch 044 635 48 01
Conditions	Good knowledge in microbiology
Links	https://www.dqbm.uzh.ch/en/research/groups/kuemmerli.html

Bridging the interfaces of engineering, biological and medical research	
Short description	Research in biology and medicine is growing ever more multidisciplinary. Integrating engineering methods into biological and medical research provides new possibilities to investigate fundamental questions and establish new approaches for clinical needs. Following this vision, our group – The Interface Group - focuses on the interface between biology, medicine and biomedical engineering. We combine experimental methods with computational techniques to establish comprehensive models on the cellular, tissue, organ and organism level. Our current projects address challenges posed by pathologies in the cardiovascular system, the brain and the kidneys. They include the investigation of: - Blood damage in artificial hearts - Mechanosensation of the vascular endothelium - Methods for non-invasive acquisition of intracranial pressure - Link between T cell distribution in CNS and Multiple Sclerosis Open student projects are published on our group's website (see link below). However, we also encourage open applications if none of the published projects fit your current situation.
Keywords	Biofluidics, Mechanobiology, Biophysics, Computational Biology, Artificial Intelligence, Cardiovascular Physiology, Vascular Biology, CNS Fluid Physiology
Supervisor **Institute** **E-Mail** **Phone**	Prof. Dr. Vartan Kurtcuoglu Institut für Physiology vartan.kurtcuoglu@uzh.ch 044 635 50 55
Conditions	
Links	https://interfacegroup.ch/teaching/open-student-projects/

Neuroscientific approaches in neuro-urology	
Short description	The control of the lower urinary tract (LUT) requires intact nervous signal conduction and modulation at the peripheral level as well as in neuronal centres in the spinal cord and brain. Neuro-Urology deals with diseases and functional disorders of the LUT due to damage or lesion of the nervous system. In order to investigate neural correlates of LUT control we apply neuro-urological tests and treatments (e.g. neuromodulation), evoked potentials, electroencephalography (EEG), structural, diffusion and functional magnetic resonance imaging (MRI) in healthy adults and in patients with neurological disease.
Keywords	Neuro-Urology, lower urinary tract dysfunction, neurological diseases, neuroimaging, neurophysiology
Supervisor **Institute** **E-Mail** **Phone**	Dr. Martina D. Liechti / Prof. Dr. Thomas M. Kessler Neuro-Urology, Balgrist University Hospital martina.liechti@balgrist.ch / thomas.kessler@balgrist.ch 044 386 3827
Conditions	We are looking for highly motivated and scientifically interested candidates to conduct clinical research joining neuroscience with neuro-urology in humans; willing to work in an interdisciplinary team (e.g. health care professionals, neuroscientists) at the Neuro-Urology and the Spinal Cord Injury Center, University of Zürich, and Balgrist University Hospital; holding BSc in Biomedicine, Biology incl. basic knowledge in neurosciences; with high interest in neuroscience research and data analysis; high commitment, availability and motivation for the thesis and independent working attitude; fluent in German and English
Links	https://www.sci-research.uzh.ch/en/aboutus.html

Obesity, eating control and metabolic diseases	
Short description	Obesity and type 2 diabetes are worldwide health epidemics that dramatically increase the risk for metabolic and cardiovascular diseases. The control of food intake and body weight involves numerous hormones released from the gastrointestinal tract. Some of these hormones, like the pancreatic peptide amylin or GLP-1, contribute to the control of meal ending satiation. Other hormones, like leptin, reflect the amount of body fat stores. Our research focuses on the central neural pathways mediating amylin's anorectic action as well as on the interaction of amylin with other hormones. Interestingly, some of the same hormones directly affect the cardiovascular system. We also study various aspects of the role of bariatric surgery (Roux-en-Y gastric bypass) in improving metabolism. Experimental techniques include behavioral feeding studies, immunocytochemistry, electrophysiology and functional tests of the reward system. Further, by using indirect calorimetry, we can assess energy intake and energy expenditure simultaneously. We are also interested in dissecting the molecular pathways of vascular disease in the development of type 2 diabetes, and the improvement of cardiovascular health after gastric bypass surgery. We focus on the following collaborative projects between the Institute of Clinical Chemistry at UZH/USZ, the Department of Visceral Surgery at USZ, and the Institute of Veterinary Physiology: - The role of gut hormones in energy metabolism; - The role of gastric bypass surgery and gut hormones on the improvement of vascular dysfunction and HDL metabolism and a rat model of non-diabetic diet-induced obesity; - The role of gastric bypass surgery and liraglutide treatment on the improvement of HDL metabolism in human obese patients.
Keywords	obesity; diabetes mellitus; cardiovascular disease; amylin; GLP-1
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Thomas A. Lutz Institute of Veterinary Physiology tomlutz@vetphys.uzh.ch 044 635 88 08
Conditions	Master students willing to participate in one or more of these projects will learn the following skills and methods: animal handling (rat, mouse) including in vivo tests of glucose and insulin sensitivity and animal necropsy; in vitro dissecting of molecular pathways by western blot, primary human endothelial cell culture, blood HDL isolation and characterization, various enzymatic and ELISA assays.
Links	www.vetphys.uzh.ch

Sirtuins in atherosclerosis	
Short description	Atherosclerosis is a chronic inflammatory disease of the vascular system in our aging population. Endothelial activation and subsequent infiltration of the arterial intima promote plaque formation. Rupture of these plaques leads to myocardial infarction and stroke. Sirtuins are a family of NAD-dependent deacetylases that regulate cellular function through deacetylation of a wide range of protein targets. Many sirtuins are critically involved in regulating metabolism and cellular fate in age-related diseases, such as atherosclerosis. The study of sirtuins in atherosclerosis is one of the focuses of our group and provides frequent opportunities for master projects. Please inquire.
Keywords	
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Chrisitian Matter Center for Molecular Cardiology, UZH, Schlieren Campus christian.matter@access.uzh.ch 044 635 64 67
Conditions	None
Links	http://www.kardiologie.usz.ch/LehreUndForschung/Grundlagenforschung/Seiten/Atherosclerosisandmetabolicdisease.aspx

The skin microbiome - a novel key player of skin fibrosis in systemic sclerosis	
Short description	Systemic sclerosis is a rare, yet devastating multisystemic fibrotic autoimmune disease with high morbidity and mortality. The innnate immune system plays an important role in the early, inflammation-dependent stage of skin fibrosis. In the presented project, we assess whether the interaction of skin microbiota and dermal fibroblasts contributes to the development of fibrosis in vivo via innate immune mechanisms. To evaluate the biological significance and the therapeutic potential, functional *in vitro* as well as *in vivo* experiments are being performed.
Keywords	
Supervisor **Institute** **E-mail** **Phone**	PD Dr. Britta Maurer Research Systemic Autoimmune Diseases, USZ, Schlieren Campus USZ, britta.maurer@usz.ch 044 255 29 77
Conditions	none
Links	http://www.rheumatologie.usz.ch/forschung/systemische-autoimmunerkrankungen/Seiten/forschungsgruppe-research-systemic-autoimmune-diseases-(sid).aspx

Neuronal and vascular responses to reduced oxygenation : physiology and pathology	
Short description	Efficient oxygen delivery to brain tissues is crucial for neuronal function and thus proper brain function. Hypoxia characterises a variety of physiological events but also contributes significantly to progression of pathogenesis and widespread diseases including, cancer, stroke and neurodegenerative disorders. When oxygen is limited cells activate key adaptive responses mediated largely by hypoxia-inducible factor-1 (HIF-1). We recently found that the multifunctional Rho GTPases are involved in the neuronal hypoxic response and likely modulate HIF stabilisation. Our group performs research investigating the molecular mechanisms of neuronal and vascular adaptation to oxygen deprivation with emphasis on the role of RhoGTPases in regulation of HIF-1 in primary neurons and other brain specific cells in disease states and during aging.
Keywords	
Supervisor **Institute** **E-mail** **Phone**	Dr. Lara Ogunshola Institute of Veterinary Physiology larao@access.uzh.ch 044 635 88 05
Conditions	Basic knowledge in molecular biology and/or medical physiology
Links	www.vetphys.uzh.ch

Keratinocyte lineages in human epidermal autografts	
Short description	Epidermal self-renewal in native skin or epidermal autografts indispensably requires the presence of unipotent stem cells. This particular keratinocyte population is thought to reside in the basal layer of the interfollicular epidermis. The existence of different lineages of epidermal keratinocytes appears evident, but the identification of stem cells is still pending, since no reliable immune markers are available. Using a lentiviral expression system this project aims at the definition of the role of particular keratinocyte lineages and eventually at the identification of self-renewing epidermal keratinocytes.
Keywords	
Supervisor **Institute** **E-mail** **Phone**	Dr. Luca Pontiggia Tissue Biology Research Unit, Kinderspital Zürich luca.pontiggia@kispi.uzh.ch 044 634 89 12
Conditions	-
Links	www.skingineering.ch

Strahlenresistenz auf molekularer und zellulärerEbene	
Short description	Schädigung der DNA ist die wichtigste Ursache für den strahleninduzierten Zelltod. Während den letzten Jahren zeigte die moderne Krebsforschung jedoch, dass ionisierende Strahlung auch Signalübermittlungskaskaden unabhängig von der DNA-Schädigung in der Zelle auslöst, welche das Therapieansprechen und die Therapieresistenz massiv mitbestimmen. Das Ziel unserer Projekte ist a) die molekulare und zellbiologische Untersuchung solcher strahleninduzierten Signalüber-mittlungskaskaden in genetisch-kontrollierten und klinisch-relevanten Tumormodellen, und b) die Entwicklung von Kombinationstherapie-modalitäten mit klinisch-relevanten Substanzen, die zur Ueberwindung der Strahlenresistenz führen.
Keywords	
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Martin Pruschy Labor Molekulare Radiobiologie, Universitätsspital Zürich martin.pruschy@usz.ch 044 255 85 49
Conditions	
Links	http://www.cnz.uzh.ch/pruschy.html

Epidemiology	
Short description	We conduct cohort studies, randomized controlled studies and modelling studies in five topic areas (chronic lung disease, cancer, multiple sclerosis, myocardial infarction and currently also COVID 19). The studies address questions on burden of disease, prognosis, treatment and health care epidemiology). Closely related we have a focus on key determinants of health and disease for these chronic conditions like physcial activity and nutrition. Methods include the study designs mentioned above and a broad range of regression-based approaches and modelling for benefit harm balance, causal inference and predictions.
Keywords	
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Milo Puhan Institut für Epidemiologie, Biostatistik und Prävention miloalan.puhan@uzh.ch 044 634 46 10
Conditions	
Links	https://www.ebpi.uzh.ch/en/translational_research.html

Animal models for psychopathologies and their treatment	
Short description	Animal studies provide critical insights into the aetio-pathogenesis of stress-related psychiatric states. Our approach is to study the effects of chronic social stress (CSS) on neurobehavioural states in mice, at the inter-dependent levels of cell populations, neural circuits and behaviour. We focus on increasing understanding of the aetio-pathogenesis and pharmacological treatment of specific trans-diagnostic psychopathologies, including reduced interest in reward, apathy, aversion hyper-sensitivity and deficient environmental control.
Keywords	Animal model, stress, neural recoding, behaviour, pharmacology
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Christopher Pryce University Clinic for Psychiatry, UZH christopher.pryce@bli.uzh.ch 044 634 8921
Conditions	Reward and aversion learning and motivation pathologies
Links	

Pluripotent stem cell-derived organoid models to study inner ear development and model disease	
Short description	Loss or damage of inner ear sensory cells results in permanent hearing deficit. The long-term goal of our research is to develop novel therapeutic strategies to counteract sensorineural hearing loss by uncovering fundamental biological principles that underlay development and disease. We are making use of in vitro models known as “inner ear organoids”, derived from differentiation of pluripotent stem cells (PSCs), to gain insight into inner ear sensory organ development and we use them as unique tools to model disease. By leveraging recent advances in bioengineering, organoid culture and organ-on-chip technology, we aim to develop reproducible and robust models to validate novel drug-based or gene-based therapeutics for hearing restoration.
Keywords	Inner ear development, Hearing loss, Neuroscience, Disease Modeling, IPSC-organoids
Supervisor **Institute** **E-mail** **Phone**	PD Dr. Marta Roccio Department of Otorhinolaryngology, Head and Neck Surgery, USZ marta.roccio@usz.ch 043 253 3278
Conditions	We are looking for master student(s) interested in stem cell biology and tissue regeneration to help develop in vitro models of the inner ear sensory components. The laboratory is located at the Schlieren Campus, Wagistrasse 18 in a totally new lab space. Microscopy and flowcytometry facility of UZH on campus. Techniques: stem cell culture, immunostaining, microscopy, molecular biology
Links	https://www.scopus.com/authid/detail.uri?authorId=24345169900 https://www.ipsc-research.uzh.ch/en/Research-groups/Sensory-organs.html

Transendothelial lipoprotein transport	
Short description	The accumulation of low density lipoproteins (LDL) in the arterial wall plays a pivotal role in atherosclerosis.The classical anti-atherogenic function of high-density lipoproteins (HDL) – removal of cholesterol from macrophages for reverse transport of cholesterol to the liver – requires both entry into and exit from the arterial wall. The entering and leaving of the arterial wall by LDL and HDL require their transport through the endothelial barrier. The underlying mechanisms are little investigated. Our lab characterizes several transporters and receptors towards their contribution to the transport of lipoproteins through cultivated endothelial cells. atherosclerosis
Keywords	Atherosclerosis, vascular biology, endothelial cells, LDL, HDL,
Supervisor **Institute** **E-mail** **Phone**	Dr. Lucia Rohrer / Prof. Dr. A. von Eckardstein Institut für Klinische Chemie, Universitätsspital lucia.rohrer@usz.ch / arnold.voneckardstein@usz.ch 044 255 47 93 / 044 255 22 60
Conditions	
Links	https://www.ncbi.nlm.nih.gov/pubmed/28360088

Evolutionary perspectives of human disease	
Short description	Evolutionary perspectives of human health and disease can be studied on a macroscopic or molecular level. For example, musculoskeletal disorders are extremely common in modern people. One factor in their aetiology is biomechanical stress, part of which might be directly attributable to modern daily behavior. Using radiographs, comparative anatomical studies and analyses of the fossil / skeletal and soft tissue record help to investigate important etiological disease factors. Using ancient DNA techniques from a number of archaeological contexts e.g. mitochondrial DNA sequences can be compiled and also functional gene data can be compared across different regions and time period. Such molecular analyses allow e.g. to achieve a more complete picture of the evolutionary dynamics of human immunity and pathogen susceptibility. Opportunities for Master theses exist in different areas of the interdisciplinary research field.
Keywords	Paleoradiology, Human Ecology, Paleogenetics, Evolutionary, morphology, Clincial evolutionary medicine
Supervisor **Institute** **E-mail** **Phone**	Prof Dr. F. Rühli Institute of Evolutionary Medicine, University Zürich-Irchel frank.ruehli@iem.uzh.ch 044 635 01 11
Conditions	None (for aDNA projects own DNA needs to be analysed to be able to rule out modern contamination)
Links	http://www.iem.uzh.ch/

Next-generation cell therapy to promote functional recovery following stroke	
Short description	Cell-based therapies are emerging as a novel and promising treatment paradigm following stroke. Major bottlenecks of current cell therapies is the correct migration and homing of the transplants in the damaged brain circuits. In our group, we genetically engineer and functionalize iPSC-derived human neuronal progenitor cells and transplant them into mouse models of stroke. The efficacy of cell transplantation is assessed using state-of-the-art in vivo imaging and functional testing
Keywords	neuroscience, stroke, cell therapy, IPSCs, regeneration
Supervisor **Institute** **E-mail** **Phone**	Dr. Ruslan Rust Institute for Regenerative Medicine (IREM) ruslan.rust@irem.uzh.ch 044 635 7682
Conditions	LTK 1 course
Links	https://www.irem.uzh.ch/en/research/Group-NitschHoerstrup/AGITA.html

Mycobacterium abscessus - physiology and resistance	
Short description	Mycobacterium abscessus is an emerging pathogen from the group of non-tuberculous mycobacteria. Pulmonary infections caused by M. abscessus are difficult to treat due to a broad range of antibiotic resistance determinants against broad-range as well as tuberculosis-specific drugs. We are interested in the molecular mechanisms of resistance and the physiology of M. abscessus. We generate and characterize isogenic mutants for growth, drug susceptibility and interaction with host cells.
Keywords	Mycobacterium abscessus, drug resistance, genetics, physiology
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Peter Sander Institute of Medical Microbiology, University of Zurich psander@imm.uzh.ch 044 634 26 84
Conditions	strong background in microbiology, molecular biology, work with BSL2 pathogens
Links	https://www.imm.uzh.ch/de/research/experimental/sander.html

Human intracranial recordings to understand epilepsy and cognitive processes	
Short description	Epilepsy surgery is among the most efficient treatment options to achieve seizure freedom. Our research on intracranial recordings before and during surgery aims to improve seizure outcome. We analyze recordings from the cerebral cortex, the hippocampus and the amygdala to detect electrophysiological signatures of epileptogenic brain tissue. In addition, we record while patients perform cognitive tasks. The analysis of local field potentials and the firing of single neurons helps us to understand the electrophysiological mechanisms that underlie higher cognitive functions like memory or emotion in humans.
Keywords	intracranial EEG, epilepsy surgery, single neuron firing, working memory
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Johannes Sarnthein Klinik für Neurochirurgie, Universitätsspital Zürich johannes.sarnthein@usz.ch 044 255 56 72
Conditions	Interest in neuroscience, Matlab experience or willingness to learn
Links	https://www.ini.uzh.ch/~johannes/

Establishing the DNA repair nuclease FAN1 as a novel therapeutic target	
Short description	DNA repair is essential for maintaining genome integrity and cancer avoidance. Vice versa, DNA repair proteins represent promising targets for potential therapeutic interventions in a variety of disease conditions, most notably cancers that are associated with defects in the DNA damage response. Human FAN1 is a multi-functional DNA repair nuclease that is tightly regulated by protein-protein interactions and post-translational modifications. Remarkably, FAN1 variants have not only been associated with cancer predisposition but also with karyomegalic interstitial nephritis (KIN) and early onset of Huntington's Disease (HD). In collaboration with the group of Prof. Dario Neri (ETH Zurich) we have recently screened DNA-encoded chemical libraries for small-molecules inhibitors (SMI) that selectively bind to FAN1 nuclease domain. You will extend from these findings and validate selected SMIs employing multiple biochemical and cell-based assays
Keywords	FAN1, DNA repair, small-molecule inhibitors (SMI), cancer, neurodegenerative disorders
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Alessandro A. Sartori Institute of Molecular Cancer Research sartori@imcr.uzh.ch 044 635 34 73
Conditions	Motivated students with knowledge in biochemistry and molecular biology. Experience with tissue cell culture work is an advantage.
Links	http://www.imcr.uzh.ch/en/research/Sartori.html

Pathogenesis of pediatric sarcomas – development of novel treatment strategies	
Short description	The focus of our laboratory are cellular and genetic studies of tumorigenesis using pediatric sarcomas such as rhabdomyosarcoma and Ewing sarcoma as model diseases. The majority of these tumors express fusion proteins generated from specific chromosomal translocations that act as oncogenic transcriptional drivers of the disease. Since direct inhibition by small molecules is challenging, we characterize the biology of the fusion proteins on different levels such as post-translational modifications, protein stability and epigenetic co-factors to develop indirect targeting strategies. In addition, we investigate tumor heterogeneity and signaling pathways in relation to chemoresistance mechanisms in primary tumor material and develop novel functional in vivo screens.
Keywords	
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Beat W. Schäfer Universitäts-Kinderklinik, Onkologie beat.schaefer@kispi.uzh.ch 044 266 75 53 oder 044 634 88 52
Conditions	
Links	www.kispi.uzh.ch/onkologie

Crosstalk between tissue-resident immune cells and their tissue niche environment	
Short description	Tissue-resident immune cells play key roles in organ physiology by their cross-talk with non-immune cells. Our lab has a strong interest in type 2 immune pathways, including ILC2s and epithelial tuft cells, and we explore the molecular mechanisms, which mediate critical sentinel function in detection of tissue perturbation (i.e. parasitic infections and injury) and regulation of tissue remodeling. Available master thesis projects will deal with the identification of processes that regulate the communication between tissue-resident immune cells and their tissue niche environment, with some focus on macrophage and ILC2 biology, in particular in the lung and intestine. Techniques include multiparameter flow cytometry, fluorescence microscopy, *in vivo* and Tg mouse models, *in vitro* organoids.
Keywords	Immunity, Tissue-resident immune cells, ILC2, Tuft cells, Parasitic infections, Transgenic mouse models
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Christoph Schneider UZH, Institute of Physiology, Immunophysiology Group christoph.schneider@uzh.ch 044 635 50 40
Conditions	You should be (1) interested in immunology/physiology, (2) a team player, (3) intrinsically motivated to explore basic research, (4) familiar with basic immunology.
Links	https://www.physiol.uzh.ch/en/research/institutegroups/grschneider.html

Genomik alter Pathogene	
Short description	Die Erforschung alter Pathogene ermöglicht Einblick in ihre evolutionäre Geschichte sowie ihre Anpassung an verschiedene Wirtsorganismen. Anhand der Analyse alter DNA können Verursacher historischer Pandemien identifiziert und die Evolution der Krankheitserreger nachvollzogen werden. In diesem Thema können je nach Ausrichtung der Masterarbeit Verursacher von historischen Pandemien identifiziert werden oder bestimmte alte Pathogene genauer untersucht werden.
Keywords	
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Dr. Verena Schünemann Institut für Evolutionäre Medizin verena.schuenemann@iem.uzh.ch 044 635 05 60
Conditions	
Links	https://www.iem.uzh.ch/en/people/abg.html

Neural regeneration and repair on traumatic brain injury (TBI)	
Short description	TBI is caused by an external force acting on the head, leading to the destruction of brain tissue and impairment of cognitive, physical, and psychosocial functions. Our lab focuses on investigating whether suppresion of Nogo-A can inhance functional/behavioral and structural/anatomical assessements after TBI with anti-Nogo-A antibody treatment as Nogo-A is one of the most potent known neurite outgrowth inhibitors present in the CNS. In this master project, the student will have the chance to learn various techniques e.g. neurobehavioral assessments, immunofluorescence staining, neuroimaging, statistical analysis and so on.
Keywords	Traumatic Brain Injury, Neural Regeneration, Immunohistology, Neurobehavioral Assessments
Supervisor **Institute** **E-mail** **Phone**	Prof. Martin E. Schwab Institute for Regenerative Medicine schwab@irem.uzh.ch, huimin.shan@uzh.ch 076 513 55 69
Conditions	- Background in Biology, Biomedicine or Neuroscience - A strong interest in Neuroscience and a keen interest in working with animals (License can be obtained in a 5-day course by LTK if you are interested in that).
Links	https://www.irem.uzh.ch/en/research/Group-M.-Schwab.html

Improvement and application of novel genome editing tools	
Short description	Genome editing represents an attractive approach for the treatment of monogenic diseases. Our laboratory focuses on developing and applying CRISPR-Cas-based genome editing tools, including base editors and prime editors. We aim to improve these technologies by rational design and directed protein evolution and apply them in vivo to treat liver and brain disorders. Prospective MSc students will get a comprehensive insight into the world of synthetic biology and genome editing by learning a broad set of skills such as molecular cloning, mammalian cell culture, next-generation sequencing, data analysis (Python), and more. Please refer to our website or contact the PI for a more detailed description of the available projects.
Keywords	Genome editing, prime editing, base editing, protein engineering, directed evolution
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Gerald Schwank Institute of Pharmacology and Toxicology, UZH Irchel Campus gerald.schwank@pharma.uzh.ch 044 635 59 26
Conditions	We are looking for highly motivated students that are willing to push the boundaries of currently existing genome editing tools. Students should be collaborative, curiosity-driven, and excited to work in a team with young scientists. Prior knowledge of the techniques described above is an advantage.
Links	https://schwanklab.org/people/open-positions/

Thesis Projects in the Neuroscience of Pain	
Short description	The Integrative Spinal Research group (ISR) at the Balgrist Campus studies pain processing and pain modulation in chronic patients and healthy controls using behavioral and neuroimaging techniques. We offer two types of Master projects: I1] For candidates who wish to gain experience with experimental techniques, a psychophysical and/or neuroimaging project an emphasis on data acquisition. I2] For candidates with a computational background, a project focusing on data-analysis (data-driven techniques, machine learning) and computational modeling on acquired data sets.
Keywords	neuroimaging, fMRI, data analysis, modeling, neuroscience, pain
Supervisor **Institute** **E-mail** **Phone**	PD Dr. Petra Schweinhardt UZH Department of Chiropractic Medicine, Balgrist Campus isr@balgrist.ch 044 510 73 81
Conditions	High commitment and availability to work, strong motivation, and high interest in neuroscience research and/or data analysis, with interest in individual development into independence
Links	https://www.balgrist.ch/en/research/research-units/research-chiropractic/

Klinische Forschung	
Short description	Das Clinical Trials Center verfügtüber eine klinische Forschungsabteilung (Clinical Research Ward / RW) im UniversitätsSpital Zürich (USZ), in welcher probanden- und patientenorientierte Forschungsprojekte durchgeführt werden. Das CTC unterstützt alle Forschungsgruppen des USZ und der Universität Zürich assoziierten Kliniken/Institute bei der Planung und Durchführung klinischer Forschungsprojekte gemäss Schweizerischem Humanforschungsgesetz HFG und internationalen Good Clinical Practice Standards (ICH-GCP-Standards. Durch aktive Mitarbeit in verschiedenen klinischen Forschungsprojekten sowie in sämtlichen Studienphasen von der Konzeption bis zum Abschluss einer Studie kann die gesamte Methodik der Pharmazeutischen Medizin und Klinischen Forschung erlernt werden.
Keywords	Klinische Forschung, Humanforschung, Good Clinical Practice, Studiendesign, Clinical Development
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Gabriela Senti Clinical Trials Center, UniversitätsSpital Zürich gabriela.senti@usz.ch 043 253 02 62
Conditions	Selbständiges Arbeiten, Organisations- und Teamfähigkeit, Grundkenntnisse der Klinischen Forschung von Vorteil
Links	www.ctc-zkf.usz.ch

Infectious diseases in Switzerland in the 20th century (pandemics, childhood diseases, etc.)	
Short description	Quantitatively, infectious diseases have been under-researched in Switzerland in the 20th century. This is mainly due to the fact that data have not been accessible until now. We changed this last year by digitizing larger amounts of historical data series from the 20th century. These data allow us to reconstruct outbreaks and to look at the impact of interventions (non-pharmaceutical measures, vaccinations, etc.). The topics announced here will complete selected data series (data transcription) and then analyze them for the first time. Possible topics include pandemics (1890, 1918, 1957, etc.) and childhood diseases. Statistical support is provided.
Keywords	Historical Epidemiology, Evolutionary Medicine
Supervisor **Institute** **E-mail** **Phone**	PD Dr. Kaspar Staub (Head Anthropometrics & Historical Epidemiology Group) Institute of Evolutionary Medicine kaspar.staub@iem.uzh.ch 044 635 05 13
Conditions	Interest in historical data/topics and quantitative methods
Links	https://www.iem.uzh.ch/en/research/anthropometrics_scanlab_group_staub.html

Host cell entry of influenza viruses	
Short description	Influenza viruses are of high medical and economic concern in humans. While we have vaccines and antiviral drugs available both come with severe limitations. A novel strategy currently being explored is to target host cell proteins that the virus requires for its replication. To identify such potential drug targets a detailed understanding of virus-host interactions at a molecular level is needed. With our work, we aim to identify host factors involved in the viral entry process and characterize their mode of action with the overall goal of revealing novel drug targets.
Keywords	influenza virus, antivirals, virus entry
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Silke Stertz Institute of Medical Virology Winterthurerstrasse 190 8057 Zürich stertz.silke@virology.uzh.ch 044 634 28 99
Conditions	Interest and solid background in virology (BIO615 needs To be included in learning agreement)
Links	https://www.virology.uzh.ch/de/research/gstertzd.html

Modeling and treating brain diseases with induced pluripotent stem cells (iPSCs)	
Short description	Our group applies human induced pluripotent stem cells, iPSCs, for modelling human brain diseases and for regenerative therapies. Using iPSCs expressing different risk genes for Alzheimer's disease (AD), we aim to uncover AD pathomechanisms in iPSC-derived neurons and astrocytes. We further establish protocols for the differentiation of iPSCs into clinicly-relevant neural progenitor cells to develop next-generation cell-based therapies for brain diseases such as stroke.
Keywords	
Supervisor **Institute** **E-mail** **Phone**	Dr. Christian Tackenberg Institute for Regenerative Medicine – IREM christian.tackenberg@irem.uzh.ch 044 634 09 29
Conditions	The applicant should show high motivation and dedication to perform research at high quality. Very good English skills, both oral and written, are expected. Experience in cell culture is of advantage.
Links	https://www.irem.uzh.ch/Tackenberg

The Impact of High Altitude on Cancer Growth	
Short description	Living at high altitude (HA) correlates with reduced cancer mortality in humans independent of ethnicity and socio-economical environment. Although the reasons and underlying mechanisms are unknown, we hypothesize that the systemic adaptation to hypoxia is involved in preventing cancer formation and tumor proliferation. For this master thesis we generated tumor-bearing mice (allografts) that will be exposed to hypoxia and HA to test tumor proliferation and response to chemotherapy. Studies will be conducted in our lab (Hypoxia Chamber to mimic high altitude) and at the Jungfraujoch research station (3500 m above sea level).
Keywords	Jungfraujoch, High Altitude, Hypoxia, Cancer, Animal Study
Supervisor **Institute** **E-mail** **Phone**	Dr. Markus Thiersch Institute of Veterinary Physiology markus.thiersch@uzh.ch 044 635 88 16
Conditions	We are looking for biology, medical or veterinary students. First experiences in animal experimentation are appreciated but not mandatory.
Links	www.vetphys.uzh.ch

Liver therapy using lipid nanoparticle encapsulated mRNA for murine phenylketonuria (PKU)	
Short description	We have developed viral/AAV- and non-viral/minicircle-based gene transfer methods to treat murine PKU, a model for a genetic liver defect. Here, we want to test systemic delivery of *mPah*-mRNA using lipid nanoparticles (LNP). LNPs have been successfully used for delivery of RNAi therapeutics in clinical settings while *in vitro* transcribed mRNA has become a recent focus as potential drug class to deliver genetic information. Such synthetic mRNA can be engineered to transiently express proteins by structurally resembling natural mRNA. Our goal is the development of mRNA-based treatment for PKU.
Keywords	
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Beat Thöny and Dr. Hiu Man Viecelli Division of Metabolism, University Children's Hospital Zurich beat.thony@kispi.uzh.ch 044 266 76 22
Conditions	LTK1
Links	http://www.kispi.uzh.ch/fzk/de/abteilungen/stoffwechsel/gentherapie-neurometabolische-krankheiten/Seiten/default.aspx

HIV-1 vaccine development	
Short description	HIV-1 infection remains a tremendous health burden worldwide. Antiretroviral treatment is highly effective in suppressing HIV-1 replication but cannot cure the infection and thus needs to be taken life-long. The development of a protective vaccine remains thus the ultimate goal to reduce HIV-1 spread. Broadly neutralizing antibodies (bnAbs) that inhibit genetically diverse HIV-1 strains are considered a critical component of a protective vaccine that is active against circulating HIV-1 subtypes worldwide. bnAbs are rare in HIV-1 infection and thus far cannot be elicited by vaccination. In our work we aim to identify bnAbs in infected individuals, define the determinants of their induction, characterize the bnAbs' activity and define their mode of action. By studying the HIV strains that co-evolved in these patients we retrieve information on the immunogens that gave rise to the bnAb response. Collectively, the gained information will be used to create novel bnAb inducing immunogens and bnAb therapeutics. Learning from the natural occurring bnAbs, we develop in parallel entry inhibitors, that share the capacity of bnAbs in blocking a wide range of diverse HIV-1 strains.
Keywords	HIV-1, vaccine, entry, inhibitor design, neutralizing antibody
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Alexandra Trkola Institute of Medical Virology Winterthurerstrasse 190 8057 Zürich trkola.alexandra@virology.uzh.ch 044 634 53 80
Conditions	Interest and solid background in virology (BIO615 needs To be included in learning agreement)
Links	https://www.virology.uzh.ch/de/research/gtrkolad.html

GABAergic Inhibition: A case for dynamic thinking	
Short description	My lab's research has played a significant role in shaping the idea that scaffolding protein phosphorylation can contribute to dynamic GABAergic inhibition, allowing flexible, input-specific adaptations of excitatory cells. Over the years, our research projects have offered unique perspectives to synaptic processes and consistently linked molecular mechanisms to a broad spectrum of diseases, namely bipolar disorder, intellectual disability, stroke, circadian and sleep regulation. We have obtained evidence to show that the scaffolding protein gephyrin acts as a signalling hub regulating sleep. In recent years, analysis of gephyrin phosphorylation in interneuron subtype has unravelled its role in sex dimorphic hippocampal circuit development and Autism. We employ diverse molecular, imaging, biochemical and functional techniques to address these exciting questions.
Keywords	synaptic plasticity, molecular mechanisms, protein modifications for brain function, GABAergic inhibition
Supervisor **Institute** **E-mail** **Phone**	Dr. Shiva Tyagarajan Pharmacology and Toxicology tyagarajan@pharma.uzh.ch 044 635 59 97
Conditions	The lab members come from diverse ethnic backgrounds adding to the collaborative and fun working atmosphere. We are looking for friendly, curiosity driven students motivated to challenge oneself, learn new techniques and collaborate with the team, thus contributing to the fun learning experience.
Links	https://www.pharma.uzh.ch/en/research/neurodevelopmentalpharmacology/projects.html

Mediators of vasoprotective or antidiabetic functions of high density lipoproteins (HDL)	
Short description	Low plasma levels of HDL cholesterol are associated with increased risk of coronary heart disease (CHD) or diabetes. HDL particles exert many effects on vascular cells as well as insulin producing and reactive cells which may explain these inverse associations. Nevertheless, HDL has not been exploited for prevention or treatment of CHD or diabetes. An important reason for this shortfall is the structural and functional complexity of HDL particles, which carry hundreds of lipid species and proteins. By a systems biology approach our lab has identified several candidates (lipids and proteins) that are undergoing mechanistic validation in cell culture experiments
Keywords	Atherosclerosis, diabetes, endothelial cells, beta cells, HDL
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Arnold von Eckardstein / Dr. Lucia Rohrer University Hospital Zurich, Institute for Clinical Chemistry arnold.voneckardstein@usz.ch / lucia.rohrer@usz.ch 044 255 22 60 / 044 255 47 93
Conditions	none
Links	https://www.ncbi.nlm.nih.gov/pubmed/31830004

The kidneys, phosphate and acid-base in health and disease	
Short description	Our group studies the regulation and relevance of phosphate metabolism and acid-base balance, two major homeostatic functions affecting virtually all cells and organs in the mammalian body. We combine state-of-the art technologies, cell culture and animal experiments with studies in healthy human subjects and patients to uncover the genetic basis, the impact of nutrition and metabolism, and the neuro-endocrine regulators of these functions. We are interested in studying the normal physiology, but also the development and consequences of diseases affecting phosphate or acid-base metabolism and to develop or test novel therapies. We are involved in several clinical studies and cooperate with various pharmaceutical companies. Organs of special interest are the kidneys, bone, the gastrointestinal system, and various endocrine organs. For more details on possible master thesis topics and background information, please visit our homepage (link below).
Keywords	Kidney, nutrition, bone, chronic kidney disease, cardiovascular disease, bone health, hormonal regulation, kidney stones, aging
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Carsten Wagner Institute of Physiology carsten.wagner@physiol.uzh.ch 044 635 50 23
Conditions	BSc in Biology, Biomedicine or related subjects. Some projects can involve animal experiments, in these cases the LTK1 module may be helpful but can be taken during the master studies.
Links	https://www.physiol.uzh.ch/en/research/institutegroups/Acidbasetransport.html

Cellular Oxygen Physiology	
Short description	The ability of cells to sense and respond to reduced oxygen conditions (hypoxia) is crucial for many (patho-)physiological processes. Hypoxia leads to the activation of the hypoxia-inducible transcription factor (HIF). In normoxia, the HIF alpha subunit is hydroxylated by HIF hydroxylases and rapidly inactivated/degraded. The elucidation of these molecular mechanisms has recently been awarded with the Nobel Prize in Physiology or Medicine. Our goals are to understand how oxygen-sensing protein hydroxylases are regulated and to identify novel hydroxylation targets. Ongoing projects deal with the cross-talk between asparagine hydroxylation and protein (de-)ubiquitination, oxygen sensing and erythropoietin regulation in the kidney, and the pathophysiology of fibrotic processes during chronic kidney disease.
Keywords	Chronic Kidney Disease, Erythropoietin, Hypoxia, Tissue Fibrosis , Ubiquitination
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Roland H. Wenger Institute of Physiology roland.wenger@access.uzh.ch 044 635 50 65 / 044 635 50 75
Conditions	Good knowledge of biochemistry, molecular and cell biology
Links	https://www.physiol.uzh.ch/en/research/institutegroups/CellularOxygenPhysiology.html

Automated cognitive assessment of mice in a social setting	
Short description	Our group has developed the IntelliCage, an apparatus permitting to assess and record cognitive performance of mice in a social setting with minimal exposure to stress. In a typical master project we expect that individual cognitive abilities of mice will be assessed both in the IntelliCage and in conventional individual tests such as swimming navigation or Pavlovian conditioning, permitting to validate novel IntelliCage protocols. Behavioral parameters may also be correlated to neuroanatomical measures obtained after histological processing of the brains.
Keywords	learning and memory, mouse models, cognition, behavior
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. David P. Wolfer Anatomisches Institut, Universität Zürtich-Irchel dpwolfer@anatom.uzh.ch 044 635 53 60
Conditions	Interest in behavioural research with mice, computer skills, basic knowledge of statistics
Links	http://www.uzh.ch/anatom/forschung/f_forschung_e.htm

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