



FACTSHEET

Prof. Josef Penninger



CURRICULUM VITAE

Josef Martin Penninger

CURRENT POSITIONS

since 2023	Scientific Director, Helmholtz Centre for Infection Research	Braunschweig, Germany
since 2018	Director, Life Sciences Institute	University of British Columbia
since 2018	Professor, Department of Medical Genetics	University of British Columbia
since 2018	Canada 150 Research Chair in Functional Genetics	University of British Columbia
since 2004	Professor of Genetics	University of Vienna
since 2004	Full Professor in Immunology (Status only)	University of Toronto

EDUCATION

2008	Leadership course, Harvard Kennedy School of Government, USA
1994	Post-doctorate, Immunology, Ontario Cancer Institute, Canada
1990	Doctorate, MD, Medicine, University of Innsbruck, Austria
1986-1990	Doctoral Thesis in Immunology as part of Medical School: „Phenotypical and functional analysis of intra-thymic nurse (TNC)-lymphocytes.“ Institut for General and Experimental Pathology (Prof. Dr. G. Wick), University of Innsbruck, Medical School
1982-1990	University of Innsbruck, Medical School, Austria; graduated as Dr. med.Univ.

EMPLOYMENT HISTORY

- 2002-2018** Founding Director, Institute of Molecular Biotechnology of the Austrian Academy of Sciences (IMBA), Vienna, Austria
- 2002-2004** Full Professor, Departments of Immunology and Medical Biophysics, University of Toronto, Canada
- 1994-2003** Associate Scientist, The Ontario Cancer Institute, Dept. of Molecular and Cellular Biology, Princess Margaret Hospital, Toronto, Canada
- 1999-2002** Associate Professor, Departments of Immunology and Medical Biophysics, University of Toronto, Canada
- 1994-2002** Principal Investigator, Amgen Institute, 620 University Avenue, Toronto, Canada
- 1994-1999** Assistant Professor, Departments of Immunology and Medical Biophysics, University of Toronto, Canada
- 1990-1994** Postdoctoral fellow, The Ontario Cancer Institute, Princess Margaret Hospital, Toronto, Canada

AWARDS AND HONORS (SELECTED)

- 2021** Allen Distinguished Investigator
- 2020** Austrian of the Year, International Success category
- 2020** Chosen #30 by OOOM 100: The Most Inspiring People in the World
- 2019** Honorary Professor, Qingdao University, China
- 2018** Canada 150 Research Chair in Functional Genetics
- 2018** Austria Order of Merit for Arts and Sciences
- 2017** CEE Innovation Award (AtoS Austria)
- 2015** Among the 400 most influential Thought Leaders in the world (#11 in German speaking countries <https://www.nachrichten.at/>)
- 2014** Wittgenstein Prize (highest Austrian Science Award)
- 2009** Medal of The Australian Society for Medical Research (ASMR)
- 2009** ESCI Award by the European Society for Clinical Investigation
- 2008** Karl Landsteiner prize of the Austrian Society of Immunology and Allergology
- 2008** Among 1000 most important Austrian immigrant/emigrants in Politics, arts, sports, philosophy, business or music from 1900-2008
- 2008** Carus Prize of the City of Schweinfurt
- 2007** Ernst Jung Prize for Medicine
- 2006** Descartes Prize (the highest EU research prize)
- 2005** Designation of the asteroid 48801 as Penninger

ELECTED MEMBERSHIPS (SELECTED)

2015	Elected Member – European Academy of Sciences and Arts
2012	Elected AAAS Fellow for “efforts on behalf of the advancement of science or its applications are scientifically or socially distinguished”
2010	Elected member – European Academy for Tumor Immunology (EATI)
2009	Elected member – European Research Institute for Integrated Cellular Pathology (ERI – ICP)
2009	Elected to the Academy of Europe (Academia Europaea)
2008	Elected as EMBO member
2007	Elected as the youngest full member to the Austrian Academy of Sciences
2004	Elected to the Deutsche Akademie der Naturforscher Leopoldina
2001	Honorary member of the Golden Key International Honor Society

LEADERSHIP

As Director, and with Deputy Director Dr. James Johnson, I led a successful application to designate the Life Sciences Institute (LSI) as a new **Global Research Excellence (GREx) Institute** at UBC, and launched the **Biological Resilience Initiative** – the first initiative in Canada to study life sciences questions through the lens of innate resilience. This application brought in \$2M in funding to the LSI to enhance shared technology-driven resources and expertise, to improve research efficiencies and sustain collaborative efforts, and for recruiting and nurturing the next generation of scientists.

RECENT GRANT SUPPORT

I have held competitive grants since 1995 in Canada and since 2003 in Austria and the European Union, including a C150 Canada Research Chair, EU Excellence grant, and ERC Advanced grants. Below are selected recent grants:

Current grant support:

2022 – 2026	Leducq Foundation Transatlantic Networks of Excellence in Cardiovascular Research Program , “Recalibrating mechanotransduction in vascular malformations” (co-PI; portion to my lab USD 1,038,000)
2022 – 2023	Frankel Innovation Initiative , “Sweet CARs: Attacking Glycans to Treat Pancreatic Cancer” (co-PI; portion to my lab USD 75,000)

- 2022 – 2023** **Canadian Glycomics Network**, “Identification of immune-regulatory glycol-antigens as biomarkers for immunotherapy in melanoma” (co-PI; portion to my lab CAD 30,500)
- 2021 – 2024** **2021 Allen Distinguished Investigator Program**, “A fate-mapped human pluripotent stem cell library for designer organoids” (PI with N. Shakiba, N. Yachie; portion to my lab USD 485,900)
- 2021 – 2024** **ASAP Collaborative Research Network Grant**, “Olfactory Circuits: -Synuclein-Rich Neurons Respond to Environmental Triggers at the Origin of Parkinson Disease” (Collaborator; portion to my lab USD 459,479)
- 2021 – 2024** **Fundació La Marató de TV3**, “Exploiting organoid model systems to explore systemic conditions worsening COVID19: merging cellular and genetic engineering (SYSTORG)” (co-PI, portion to my lab EUR 133,000)
- 2020 – 2025** **John R. Evans Leaders Fund (CFI)**, “Hapscreen-RD: A platform for large-scale screening of human haploid cells for rare disease research” (PI; CAD 1,996,647)
- 2020 – 2024** **Innovative Medicines Initiative**, “Modern approaches for developing antivirals against SARS-CoV-2” (co-PI; portion to my lab EUR 1,100,000)
- 2020 – 2025** **Canadian Institutes of Health Research Project Grant**, “Investigating the role of the BH4 pathway in Parkinson’s Disease (PD)” (PI; CAD 868,275)
- 2018 – 2025** **Canada 150 Research Chairs Program: Canada 150 Research Chair in Functional Genetics** (PI; CAD 7,000,000)

Completed grants:

- 2020 – 2023** **UK-Canada Diabetes Partnership Initiative: UK-Canada Diabetes Research Team Grants (CIHR)**, “Bridging the gap to translation by understanding and preventing diabetic vascular complications using human organoid culture (Canadian PI; MRC NPI: David Andrew Long)” (CAD 449,090)
- 2020 – 2022** **COVID-19 Rapid Response Grant (CIHR)**, “Molecular and cellular therapies against COVID-19 using angiotensin-converting enzyme 2 (ACE2)” (co-PI; portion to my lab CAD 200,000)

- 2020 – 2021** **COVID-19 Rapid Research Funding Opportunity (CIHR),**
 “Mechanistic studies on ACE2 as a rational therapy for COVID-19”
 (CAD 578,090)
- 2020 – 2021** **Vienna Science and Technology Fund (WWTF),** “Molecular
 understanding of COVID-19 pathogenesis in human blood vessel
 organoids” (EUR 50,000)
- 2020 – 2021** **International Joint Research Project (Medical Research Institute
 of TMDU),** “Establishment of a mouse sarcopenia model due to
 MKK7-deficiency” (JPY 500,000)
- 2019 – 2021** **UBC Faculty of Medicine, Barbara Opperman
 Kidney Research Fund,** “Generating a vascularized kidney organoid
 for diabetic vasculopathy” (CAD 150,000)
- 2015 – 2021** **Wittgenstein Prize, FWF Austrian Science Fund** (EUR 1,500,000)
- 2014 – 2019** **Advanced European Research Council (ERC) grant,**
 “‘Yeast’ genetics in mammalian cells to identify and validate
 fundamental mechanisms of physiology and
 pathophysiology” (EUR 2,500,000)
- 2015 – 2018** **ERA-Net Infectious Diseases – Austria Science Fund (FWF),**
 “Lethal Virus Infection in Haploid Stem Cells” (EUR 300,000)
- 2012 – 2018** **Innovator Award of the US Department of Defense;** “Novel
 approaches to breast cancer prevention and inhibition of
 metastases” (USD 7,400,000)

RECENT INVITED AND KEYNOTE LECTURES AND PRESENTATIONS

- 2022** “The Enigmas of ACE2” at the RAAS: Molecular Networking to Multi-System Pathophysiology, Angiotensin Gordon Research Conference, Ventura, CA, USA. Nov 13. Invited
- 2022** “Functions of ACE2 in SARS-CoV-2 pathology and beyond” at the Rady Faculty of Health Sciences Edge of Science and Medicine Visiting Speaker Series, University of Manitoba. Nov 7. Invited.
- 2022** “Bone and Beyond – Focus on RANKL and RANK” at the 12th Biennial Scientific Meeting of the Asian Pacific Paediatric Endocrine Society 2022 (APPES 2022), Seoul, Korea. Oct 8. Plenary talk.
- 2022** “RANKL and RANK: bone and beyond” at the 10th International Conference on Children’s Bone Health (ICCBH), Dublin, Ireland. July 3. Keynote.
- 2022** “ACE2 and spike glycosylation” at the Canadian Glycomics Symposium, Banff, Canada. May 12. Keynote.

- 2022** “ACE2 – from fly hearts to the heart of a pandemic” at the Brain and Mind Research Institute, University of Ottawa. May 6. Virtual. Invited.
- 2022** “Humans vs. Virus – the Battle continues” at the Institut f. Anästhesie und Intensivmedizin, Ordensklinikum Linz Elisabethinen, Linz, Austria. April 22. Invited.
- 2022** “From fly hearts to the heart of a pandemic” at the University of Sydney, Australia. Apr 7. Invited.
- 2022** “Organoids to model SARS-CoV-2 infections” at the Frontiers in Stem Cell & Organoid Medicine Symposium, Cincinnati Children’s Hospital Medical Center, Cincinnati, Ohio, USA. Mar 24. Virtual. Invited.
- 2022** “A universal therapy for SARS-CoV-2 variants” at the Probus Club of Vancouver, Canada. Mar 8. Virtual. Invited.
- 2021** “Organoids and disease modelling” at the DAAD Digital Symposium for the Care-for-Rare Foundation, Munich, Germany. Nov 19. Virtual. Invited.
- 2021** “What can we learn from the ACE2 cellular receptor – past, present, and future?” at Harvard University, Boston. Nov 19. Online. Invited.
- 2021** “ACE2 – from discovery to the heart of a pandemic” at the 2021 ITMAT Symposium. Institute for Translational Medicine and Therapeutics, Perelman School of Medicine, University of Pennsylvania. Oct 12. Virtual. Invited.
- 2021** “ACE2 – from discovery to the heart of a pandemic” at the 13th ÖGMBT Annual Meeting –From Molecular Machines to Translational Medicine. Online. Sept 30. Plenary Speaker.
- 2021** “ACE2 – from fly hearts to the heart of a pandemic” at the IMPC 10th Anniversary Conference – Mouse Genetics and Genomic Medicine Virtual Conference. Sept 24. Invited.
- 2021** “ACE2: From discovery to a possible universal COVID therapy” at the National Psoriasis Foundation (2021) Research Symposium. Sept 10. Invited.
- 2021** “ACE, from fly hearts to the heart of a pandemic” at the 19th Surugadai International Symposium (Understanding COVID-19 from Biological Perspectives). Medical Research Institute of Tokyo Medical and Dental University. Online. Sept 3. Invited.
- 2021** “ACE2 – from discovery to the heart of a pandemic”. Webinar for the CNR Immunology Network. July 13. Invited.
- 2021** “Human Genetics: Challenges and Limits” Roundtable discussion at the City and Science Biennial, Barcelona. Public Event. June 8. Invited Guest Speaker.
- 2021** “ACE2 – from fly hearts and malnutrition to the heart of a pandemic” at the 6th World Congress of Pediatric Gastroenterology, Hepatology and Nutrition. June 3. Keynote speaker.
- 2021** “ACE2 – from discovery to the heart of a pandemic” at the Association for Cancer Immunotherapy CIMT/2021 Annual Meeting. May 10. Virtual. Plenary Speaker.

- 2021** “ACE2 inhibitors/ARBs and COVID-19” at the Renal Research Institute 23rd International Conference on Dialysis Advances in Kidney Disease. April 20-23. Charlotte, NC. April 21. Speaker.
- 2021** “Organoids as a drug screening model for COVID-19” at the World Congress of Nephrology 2021. Virtual. April 19. Speaker.
- 2021** “ACE2 – from discovery to the heart of a pandemic” Raymond G. Perelman Center for Cellular and Molecular Therapeutics, Children’s Hospital of Philadelphia Research Institute. Online. April 8. Invited.
- 2021** “IgA-driven autoimmunity in severe COVID-19 – are surfactant proteins the cause” at the CIC-BC symposium. March 30. Vancouver, BC. Speaker.
- 2020** “ACE2 – from fly hearts to the centre of the COVID-19 pandemic” at the SYSU-UBC Virtual COVID-19 Symposium (online due to COVID-19). Dec 1. Invited.
- 2020** ACE2 – from cardiovascular research to the heart of a pandemic. Dr. J. David Grimes Lecture at Research Day, Ottawa Hospital Research Institute (online due to COVID-19). Nov 19. Keynote.
- 2020** Engineered human tissues for COVID-19 research. Till & McCulloch Meetings (TMM) 2020 Virtual Conference (online due to COVID-19). Oct 26 – 29. Plenary Lecture.
- 2020** ACE2 – from discovery to COVID-19. Seminar at the University of Toronto Mississauga (online due to COVID-19). Oct 23. Invited.
- 2020** Organoids to study COVID19 infections. EUROoCS conference (online due to COVID-19). July 8. Keynote.
- 2020** Potential therapeutic strategies to prevent and conquer COVID-19. Digital Novel Coronavirus Investment Forum. Sachs Forum (Switzerland). Online due to COVID-19. July 8. Panelist.
- 2020** COVID-19 – the global challenge. MCI Management Center Innsbruck – International Hochschule GmbH, Austria. June 8. Distinguished guest – live talk.
- 2020** A Race Against the Clock: COVID-19 Vaccine and Treatment R&D in Canada – one of the featured presenters on a virtual Panel for Research Canada, Parliamentarians, and esteemed guests. May 21 and June 15.
- 2020** ACE2 – a rational frontline therapy for COVID-19. 2020 European Congress of Radiology (online due to COVID-19), Austria. March 12. Free livestream online lecture.
- 2019** Life Sciences Today. President’s Concert Series – Sounds and Science: Vienna meets Vancouver. November 30, Vancouver BC, Canada. Keynote.
- 2019** Molecular control of T cell activation. 47th annual meeting of the Austrian Society of Allergology and Immunology (ÖGAI 2019) November 21 – 23, Graz, Austria. Invited.

- 2019** Tissue Engineering to understand diabetes patho-Physiology (in German). Salzburg Congress 2019 (Europasaal), Salzburg, Austria. Keynote.
- 2019** The Dream of Eternal Life – top science and biotech entrepreneurs. Tyrolean Economic Forum, November 5 – 7, Innsbruck, Austria. Invited.
- 2019** Human blood vessel engineering. BC Regenerative Medicine Cascadia Corridor Research Symposium, October 24 – 25, Victoria, BC, Canada. Invited.
- 2019** Biomedicine and the Future of Health, a conversation moderated by Karin Pollack. Vienna Humanities Festival 2019: Hope and Despair, September 26 – 29, Vienna, Austria. Invited.
- 2019** From haploid stem cells to blood vessel engineering. Annual meeting of the Anatomical Society (Anatomische Gesellschaft), September 25 – 27, Wurzburg, Germany. Keynote.
- 2019** RANKL and RANK: Bone and Beyond. 58th annual meeting of the European Society for Paediatric Endocrinology (ESPE), September 19 – 21, Vienna, Austria. Keynote.
- 2019** RANK Ligand: the key regulator of bone loss in aging. 1st Scientific Committee meeting of INSPIRE project of Toulouse Gerontopole, September 9 – 10, Toulouse, France. Invited.
- 2019** The role of science in the age of artificial intelligence. 40th Ars Electronica Festival - Out of the Box: the midlife crisis of the digital revolution. September 5 – 9, Postcity Linz, Austria. Invited.
- 2019** From haploid stem cells to blood vessel engineering. From the Laboratory to the Clinic: Generating new therapeutic targets for unmet needs conference, September 3 – 6, Trinity College, Oxford, United Kingdom. Invited.
- 2019** Human blood vessel organoids as a model of diabetic vasculopathy (Zoom session). Hudson Institute of Medical Research, Melbourne, Australia. Invited.
- 2019** Preventive healthcare and technology session at the Healthy Longevity: Future and Potential for Europe 2030 roundtable meeting, June 17-18, 2019, Vaduz, Liechtenstein. Invited.
- 2019** From Haploid Stem Cells to Blood Vessel Engineering. Max Planck Institute for Biology of Ageing (MPI AGE), Cologne, Germany. Invited.
- 2019** BH4 – a critical new metabolite for T cell proliferation. 17th annual meeting of the Association for Cancer Immunotherapy (CIMT), May 21 -23, 2019, Mainz, Germany. Keynote.
- 2019** From Haploid Stem Cells to Blood Vessel Engineering. BC Regenerative Medicine Spring Symposium, UBC, Vancouver, BC Canada. Invited.

- 2019** Molecular control of bone loss. Invention of Age: 14th Common Austrian-German Geriatric Congress, 59th Congress of the Austrian Society for Geriatrics and Gerontology, April 25 – 27, 2019, University of Vienna, Vienna, Austria. Keynote. From haploid stem cells to blood vessel engineering. Department of Molecular Medicine and Medical Biotechnology, University of Napoli Federico II Medical School, Naples Italy. Invited.
- 2019** Cancer immunology – cbl-b and beyond. Department of Molecular Medicine and Medical Biotechnology, University of Napoli Federico II Medical School, Naples Italy. Invited.
- 2019** RANKL – regulation of bone loss and breast cancer. Department of Molecular Medicine and Medical Biotechnology, University of Napoli Federico II Medical School, Naples Italy. Invited.
- 2019** From haploid stem cells to blood vessel engineering. Department of Molecular Medicine and Medical Biotechnology, University of Napoli Federico II Medical School, Naples, Italy. Invited.
- 2019** Interview. Stem Cell Podcast (moderated by Daylon James, Asst Professor of Stem Cell Biology in the Center for Reproductive Medicine at Weill Cornell Medicine). Invited.
- 2019** From haploid stem cells to human blood vessel engineering. Developmental and Stem Cell Biology Special Seminar, Hospital for Sick Children, University of Toronto, Toronto, Canada. Invited.

MOST SIGNIFICANT SCIENTIFIC CONTRIBUTIONS

Our basic approach is to genetically manipulate and change genes in mice and to determine the effects of these mutations in development of the whole organism and in diseases. From these mutations we are trying to establish basic principles of development and basic mechanisms of disease pathogenesis.

Total life time publications: 766; Total Times Cited: 89,275;

Web of Science H-index 145.

For complete citations and citation metrics please see: <https://www.webofscience.com/wos/author/record/48812> or <http://orcid.org/0000-0002-8194-3777>

Below I snapshot my most significant contributions. On all the listed contributions I am the principal investigator who coordinated the research and came up with the ideas.

ACE2:

This research began with my lab providing the first genetic proof that ACE2 is a negative regulator of the renin-angiotensin system, and redefining the molecular control of heart functions. We then went on to show that ACE2 is the key receptor for SARS infections in vivo, and how SARS infections and ACE2 control lung injury. Subsequently we showed

a role for ACE2 in the dietary control of intestinal inflammation, highlighted on the cover of Nature, and that a homologue of ACE2, collectrin, controls amino acid transporters in the kidney. In 2020, these pioneering findings became critical and ACE2 became the most researched molecule globally as the cellular receptor for SARS-CoV-2. We published a breakthrough paper demonstrating that a drug based on human recombinant soluble (hrs)

ACE2 (APN01) can inhibit replication of SARS-CoV-2 by 1000 to 5000-fold in cell lines and human blood vessel and kidney organoids. This drug is now being tested for acute lung injury in humans and early data in a study describing compassionate use of APN01 showed promising results. I am also part of the Long COVID Web, a pan-Canadian network of leading researchers and experts investigating post-COVID condition.

1. Monteil V, et al. Inhibition of SARS-CoV-2 Infections in Engineered Human Tissues Using Clinical-Grade Soluble Human ACE2. *Cell*. 2020; 181(4):905-13.
2. Monteil V, et al. Human soluble ACE2 improves the effect of remdesivir in SARS-CoV-2 infection. *EMBO Mol Med*. 2021;13(1):e13426.
3. Zoufaly A, et al. Human recombinant soluble ACE2 in severe COVID-19. *Lancet Respir Med*. 2020;8(11):1154-1158.
4. Capraz T, et al. Structure-guided glycol-engineering of ACE2 for improved potency as soluble SARS-CoV-2 decoy receptor. *Elife*. 2021;10:e73641. doi: 10.7554/eLife.73641.
5. Garreta E, et al., A diabetic milieu increases ACE2 expression and cellular susceptibility to SARS-CoV-2 infections in human organoids and patient cells. *Cell Metab*. 2022;S1550-4131(22)00136-X. doi: 10.1016/j.cmet.2022.04.009.
6. Garreta E, et al., Protocol for SARS-CoV-2 infection of kidney organoids derived from human pluripotent stem cells. *STAR Protocols*. 2022; 34(6):857-873.e9.
7. Shoemaker RH, et al. Development of an aerosol intervention for COVID-19 disease: Tolerability of soluble ACE2 (APN01) administered via nebulizer. *PLoS One*. 2022; 17(7):e0271066.
8. Hashimoto T, et al. ACE2 links amino acid malnutrition to microbial ecology and intestinal inflammation. *Nature*. 2012; 487(7408):477-81.
9. Danilczyk U, et al. Essential role for collectrin in renal amino acid transport. *Nature*. 2006;444(7122):1088-91.
10. Imai Y, et al. Identification of oxidative stress and Toll like receptor 4 signaling as a key pathway of acute lung injury. *Cell*. 2008; 133, 235-249.
11. Imai Y., et al. The SARS-coronavirus receptor ACE2 protects from severe acute lung failure. *Nature*. 2005; 436, 112-116.
12. Kuba K, et al. A critical role of angiotensin converting enzyme 2 (ACE2) in SARS pathogenesis. *Nature Medicine*. 2005; 11, 875-879.
13. Crackower M, et al. Angiotensin-converting enzyme 2 is an essential regulator of heart function. *Nature*. 2002; 417(6891):822-828.

RANK/RANKL:

My collective work on RANK/RANKL unlocked key mechanisms underlying osteoclast development and bone loss and revealed a crucial role for RANK/RANKL in bone metastasis in various cancers and the development of BRCA1-driven breast cancer. These discoveries contributed to the development of Denosumab, a RANKL antagonist, approved as osteoporosis and bone loss treatment in cancer. An international clinical trial to test whether blocking RANKL with Denosumab could prevent breast cancer in BRCA1 mutation carriers is currently underway. Recently, we also demonstrated that RANK plays a critical role in the rewiring of the thymus by pregnancy hormones to maintain Treg production in order to prevent miscarriage and gestational diabetes.

1. Paolino M et al. RANK links thymic regulatory T cells to fetal loss and gestational diabetes in pregnancy. *Nature*. 2021; 589(7842):442-7.
2. Sigl V, et al. RANKL/RANK control Brca1 mutation-driven mammary tumors. *Cell Research*. 2016; 26(7): 761-774.
3. Schramek D, et al. Osteoclast differentiation factor RANKL controls development of progestin driven mammary cancer. *Nature*. 2010; 468(7320):98-102.
4. Hanada R, et al. Central control of fever and female body temperature by RANKL/RANK. *Nature*. 2009; 462 (7272):505-9.
5. Jones DH, et al. Regulation of cancer cell migration and bone metastasis by RANKL. *Nature*. 2006; 440(7084):692-6.
6. Wada T, et al. The molecular scaffold Gab2 is a crucial component of RANK signaling and osteoclastogenesis. *Nature Medicine* 2005; 11(4):394-9.
7. Teng Y, et al. Functional human T-cell immunity and osteoprotegerin ligand control alveolar bone destruction in periodontal infection. *J Clin Invest*. 2000; 106(6): R59-67
8. Fata J, et al. The osteoclast differentiation factor osteoprotegerin-ligand is essential for mammary gland development. *Cell*. 2000; 103 (1):41-50.
9. Kong Y, et al. Activated T cells regulate bone loss and joint destruction in adjuvant arthritis through osteoprotegerin ligand. *Nature*. 1999; 402(6759):304-9.
10. Kong Y, et al. OPGL is a key regulator of osteoclastogenesis, lymphocyte development and lymph-node organogenesis. *Nature*. 1999; 397(6717):315-23.

3D Human Blood Vessel Organoids:

My lab recently developed self-organizing 3D human blood vessel organoids from ES cells. These, organoids faithfully recapitulate the structure and function of human blood vessels and are amenable systems for modelling and identifying the regulators of diabetic vasculopathy, a disease affecting hundreds of millions of people globally.

1. Wimmer R et al. Generation of blood vessel organoids from human pluripotent stem cells. *Nature Protocols*. 2019; 14: 3082-3100.
2. Wimmer R et al. Human blood vessel organoids as a model of diabetic vasculopathy. *Nature*. 2019; 565(7740): 505-510.

Haploid Embryonic Stem (ES) Cells:

My lab generated first haploid ES cells and systems for whole genome mutagenesis. We can introduce 50-70 million mutations/day allowing for genome wide screens, and have developed a bank of > 100000 haploid ES cell clones where every single gene is reparably mutated; allowing direct clone-to-clone comparisons. To empower reproducible research, we have made these systems freely available to the scientific community via

1. Elling U, et al. Derivation and maintenance of mouse haploid embryonic stem cells. *Nature Protocols*. 2019; 14(7): 1991-2014.
2. Elling U, et al. A reversible haploid murine embryonic stem cell biobank resource for functional genomics. *Nature*. 2017; 550(7674):114-118
3. Elling U, et al. Forward and reverse genetics through derivation of haploid mouse embryonic stem cells. *Cell Stem Cell*. 2011; 9(6):563-74

Glycoproteomics Technology Platform:

My lab has developed a new technology platform for glycoproteomics. > 50% of human proteins are glycosylated, altering their activities in many biological processes; yet, identification and functional validation of complex glycoproteins remains largely unexplored. Our quantitative approach identifies intact glycopeptides, allowing us to infer complex glycan structures and directly map them to sites within the associated proteins at the proteome scale.

1. Stadlmann J, et al. Analysis of PNGase F-Resistant N-Glycopeptides Using SugarQb for Proteome Discoverer 2.1 Reveals Cryptic Substrate Specificities. *Proteomics*. 2018; 18(13): e1700436
2. Stadlmann J, et al. Comparative glycoproteomics of stem cells identifies new players in ricin toxicity. *Nature*. 2017; 549(7673): 538-542.
3. Taubenschmid J, et al. A vital sugar code for ricin toxicity. *Cell Research*, 2017; 27(11):1351-64.

Cancer Immunotherapy and T Cell Biology:

I am a trained immunologist and my lab has made several discoveries in T cell biology. My key contributions to cancer immunotherapy set the molecular groundwork for the currently transformative immune checkpoint therapies.

1. Uribealago I, et al. (2019). Apelin inhibition prevents resistance and metastasis associated with anti-angiogenic therapy. *EMBO Molecular Medicine*. 2019; 11(8):e9266
2. Cronin S, et al. The metabolite BH4 controls T cell proliferation in autoimmunity and cancer. *Nature*. 2018; 563(7732): 564-568.
3. Paolino M, et al. The E3 ligase Cbl-b and TAM receptors regulate cancer metastasis via natural killer cells. *Nature*. 2014; 507(7493):508-512.
4. Griffiths E, et al. Defective T cell proliferation, in vivo immune responses, and TCR-induced integrin-mediated adhesion in the absence of the adapter protein Fyb/Slap130. *Science*. 2001; 293:2260-2263.
5. Bachmaier K, et al. Negative regulation of lymphocyte activation and autoimmunity by the molecular adaptor Cbl-b. *Nature*. 2000; 403(6766):211-216.
6. Sasaki T, et al. Function of PI3Kgamma in thymocyte development, T cell activation, and neutrophil migration. *Science*. 2000; 287(5455):1040-1046.
7. Fischer K, et al. The Proto-Oncoprotein Vav regulates antigen receptor oligomerization and cytoskeletal rearrangements in T Cells. *Curr. Biol*. 1998; 554-562.

RESEARCH TRAINING AND SUPERVISORY EXPERIENCE

I have supervised 17 PhDs, 53 Postdocs and 11 Masters Students. Many are PIs at internationally recognized research institutions or University Professors. Some examples: Daniel Schramek (Univ. of Toronto); Magda Paolino (Karolinska Inst., Stockholm); Reiko Hanada and Toshi Hanada (Oita Univ., Japan); Vanja Nagy (LBI, Vienna); Manu Rangachari (CHUL, Quebec); Greg Neely (Univ. of Sydney); Uli Elling (IMBA, Vienna); Shuan Rao (Nonfang Hospital, China); Takehiko Sasaki, Hiroshi Nishina, Tomoki Nakashima (Tokyo Medical and Dental Univ., Japan); Keiji Kuba (Akita Univ., Japan); Yumiko Imai (Osaka Univ., Japan); Yun Kong (Seoul National Univ., Korea); Urs Ericsson (GZO Wetzikon Hospital, Zurich); Kurt Bachmaier (Univ. of Illinois); Andrew Pospisilik and Connie Krawczyk (Van Andel Research Inst., Grand Rapids); Johannes Stadlmann (BOKU, Vienna). Some of my former trainees have leadership positions in industry, including Michael Crackower (CSO, Ventus Therapeutics); David Hoffman (co-founder and CSO, Angios Biotech).

Current list of trainees (UBC and IMBA):

Master's Students

2020/9 Sahra Tasdelen (in progress, IMBA)

PhD Students

2020/9 Jesse Fox (in progress, UBC)

2019/9 Nicolas Werschler (in progress, UBC)

- won prize in Engineering in Scrubs (CAD 12,000)

- British Columbia Graduate Scholarship (CAD 15,000)

2019/9 Meilin An (in progress, UBC)

2019/10 Gustav Jonsson (in progress, IMBA)

2020/12 Kirill Salewskij (in progress, IMBA)

2021/02 Max Josef Kellner (in progress, IMBA)

Postdoctoral Fellows

2019/9 Jun Seong Lee (in progress, UBC)

2020/4 Ania Bogoslowski (in progress, UBC)

- Banting Postdoctoral Fellowship

2020/4 Hirofumi Omori (in progress, UBC)

2020/5 Omar Hasan Ali (in progress, UBC)

- Swiss National Science Foundation Postdoc Mobility

Fellowship

2020/5 Jun Wang (in progress, UBC)

2020/10 Jie Jiao (in progress, UBC)

2021/06 Kohei Fujikura (in progress, UBC)

2022/01 Jingqiang Wang (in progress, UBC)

2015/11 Masahiro Onji (in progress, IMBA)

2019/5 Stefan Mereiter (in progress, IMBA)

- Marie Curie Fellowship

2020/10 Simon Licht-Mayer (in progress, IMBA)

2021/12 Tiago Oliveira (in progress, IMBA)

Research Associates

2011/4 Shane Cronin (now Staff Scientist, IMBA)

2015/4 Astrid Hagelkruys (IMBA)