

Stanford



Gernot Neumayer

Postdoctoral Research Fellow, Stem Cell Biology and Regenerative Medicine

Bio

BIO

I am a passionate cellular and molecular biologist with expertise in research related to cancer, genomic/chromosomal instability, DNA damage response, epigenetics, cellular identity (transdifferentiation, induced neurons), and proteomics (interactions, biomarkers). My extensive practical experience is reflected by 10 publications that score a total impact factor of >45. I possess excellent communication and technical writing skills (English/German), as evidenced by over \$460,000 won from scholarships, grants & awards. Recent highlight: Postdoctoral Young Investigator Award from Stanford University for scientific merit, commitment & leadership.

HONORS AND AWARDS

- BSc Scholarship for Academic Achievement, University of Salzburg, Austria
- MSc awarded with highest distinction, University of Salzburg, Austria
- Achievers in Medical Science Graduate Recruitment Scholarship, Anonymous Donor via the University of Calgary, Canada
- Faculty of Graduate Studies PhD Scholarship, University of Calgary, Canada
- Travel Award for Scientific Symposium: DNA Damage-From Causes to Cures, The Biochemical Society, London, UK
- DOC-PhD Scholarship, Austrian Academy of Sciences, Vienna, Austria
- 4x Achievers in Medical Science Research Excellence Award, Anonymous Donor via the University of Calgary, Canada
- Travel Award for Gordon Research Conference: Mammalian DNA repair, Gordon Research Conferences, Ventura, USA
- Award for best poster at the 2009 HBI Conference, Hotchkiss Brain Institute, University of Calgary, Canada
- 2x Graduate Student Award, Department of Biochemistry and Molecular Biology, University of Calgary, Canada
- Award for best poster at the 2010 BMB Departmental Retreat, Department of Biochemistry and Molecular Biology, University of Calgary, Canada
- ACF Graduate Studentship, Alberta Cancer Foundation, Calgary/Edmonton, Canada

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Member, ASCINA-Austrian scientists in North America (2014 - present)

PROFESSIONAL EDUCATION

- Bachelor of Science, Universitat Salzburg (2004)
- Magister, Universitat Salzburg (2006)
- Doctor of Philosophy, University of Calgary (2013)

STANFORD ADVISORS

- Marius Wernig, Postdoctoral Faculty Sponsor

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

My MSc project, carried out at the University of Salzburg in cooperation with the biotechnology company ProComCure, investigated the molecular interface between human cells and the bacterium *Staphylococcus aureus*. *S. aureus* exhibits a dramatic increase in resistance to antibiotics, thereby causing enormous challenges for health care. Using proteomics platforms, I identified numerous novel host-pathogen interactions. These findings are being developed further by ProComCure in order to design innovative therapies for *S. aureus* infections.

My dissertation project, carried out at the University of Calgary, defined the functions of the human protein TPX2. TPX2 has been discovered over 17 years ago for its unique property to mediate cell division. However, when not involved in cell division TPX2 resides in the cell nucleus where its role had remained unknown. Building on my background in proteomics, I discovered a novel TPX2-containing protein complex that resides in the nucleus. Analysis of this complex unraveled a completely unexpected role for TPX2 in cellular reactions triggered by insults to DNA. To avoid cancers, cells respond to damaged DNA by either attempting its repair or, if this is not possible, by committing 'suicide'. My findings established that TPX2 impacts the molecular mechanisms that underlie these responses to DNA damage. More specifically, I found that TPX2 accumulates at DNA lesions and that the cellular levels of TPX2 negatively correlate with the 'strength' of the DNA damage response. Thus, TPX2 affects cellular proliferation, DNA repair, and survival upon genomic insult. This was the first function discovered for TPX2 in the cell nucleus. Since abnormally high levels of TPX2 are often found in human cancers, my discovery sheds light on the mechanistic implication of this protein in carcinogenesis. Furthermore, TPX2 is also a promising therapeutic target and my findings may advance novel cancer therapies. We propose that future treatments may attempt to reduce TPX2 levels in order to increase the strength of the DNA damage response. Subsequently, chemo- and radiotherapy doses may be lowered but still stay effective.

In 2014, I joined the Wernig laboratory at Stanford University. Here, I capitalize on my expertise in mechanisms of DNA damage response to develop a pioneering technique capable of repairing pathogenic mutations in the genetic material of patients suffering from Epidermolysis Bullosa (a devastating and often lethal disease that causes chronic erosion of the skin). This novel technique, called CRISPR, introduces experimentally controlled and transient damage to the mutated DNA of patient cells and exploits naturally occurring DNA repair mechanisms to transform the disease-causing mutation to a normal state. I will combine development of CRISPR with Dr. Wernig's expertise in regenerative medicine to generate patient derived stem cells with repaired (i.e. normal) genes. Subsequently, these stem cells will be employed to regenerate the skin of Epidermolysis Bullosa patients.

PROJECTS

- Revealing the protein interface between *Staphylococcus aureus* and Human - University of Salzburg
- Defining a role for TPX2 in the nucleus: Regulation of the DNA damage response - University of Calgary
- Epigenetic-based mechanisms of DNA damage response - University of Calgary
- Investigating the function of the SIRT1 deacetylase - University of Calgary

Publications

PUBLICATIONS

- **Phosphorylation of Targeting Protein for Xenopus Kinesin-like Protein 2 (TPX2) at Threonine 72 in Spindle Assembly** *JOURNAL OF BIOLOGICAL CHEMISTRY*
Shim, S. Y., Perez de Castro, I., Neumayer, G., Wang, J., Park, S. K., Sanada, K., Minh Dang Nguyen, M. D.
2015; 290 (14): 9122-9134
- **TPX2 Impacts Acetylation of Histone H4 at Lysine 16: Implications for DNA Damage Response** *PLOS ONE*
Neumayer, G., Minh Dang Nguyen, M. D.
2014; 9 (11)

- **TPX2: of spindle assembly, DNA damage response, and cancer** *CELLULAR AND MOLECULAR LIFE SCIENCES*
Neumayer, G., Belzil, C., Gruss, O. J., Minh Dang Nguyen, M. D.
2014; 71 (16): 3027-3047
- **p600 regulates spindle orientation in apical neural progenitors and contributes to neurogenesis in the developing neocortex** *BIOLOGY OPEN*
Belzil, C., Asada, N., Ishiguro, K., Nakaya, T., Parsons, K., Pendolino, V., Neumayer, G., Mapelli, M., Nakatani, Y., Sanada, K., Minh Dang Nguyen, M. D.
2014; 3 (6): 475-485
- **A Ca²⁺-dependent Mechanism of Neuronal Survival Mediated by the Microtubule-associated Protein p600** *JOURNAL OF BIOLOGICAL CHEMISTRY*
Belzil, C., Neumayer, G., Vassilev, A. P., Yap, K. L., Konishi, H., Rivest, S., Sanada, K., Ikura, M., Nakatani, Y., Minh Dang Nguyen, M. D.
2013; 288 (34): 24452-24464
- **Targeting protein for xenopus kinesin-like protein 2 (TPX2) regulates γ -histone 2AX (γ -H2AX) levels upon ionizing radiation.** *journal of biological chemistry*
Neumayer, G., Helfricht, A., Shim, S. Y., Le, H. T., Lundin, C., Belzil, C., Chansard, M., Yu, Y., Lees-Miller, S. P., Gruss, O. J., van Attikum, H., Helleday, T., Nguyen, et al
2012; 287 (50): 42206-42222
- **Targeting Protein for Xenopus Kinesin-like Protein 2 (TPX2) Regulates gamma-Histone 2AX (gamma-H2AX) Levels upon Ionizing Radiation** *JOURNAL OF BIOLOGICAL CHEMISTRY*
Neumayer, G., Helfricht, A., Shim, S. Y., Hoa Thi Le, H. T., Lundin, C., Belzil, C., Chansard, M., Yu, Y., Lees-Miller, S. P., Gruss, O. J., van Attikum, H., Helleday, T., Minh Dang Nguyen, et al
2012; 287 (50): 42206-42222
- **The Cytoskeletal Protein Ndel1 Regulates Dynamin 2 GTPase Activity** *PLOS ONE*
Chansard, M., Wang, J., Hong Chi Tran, C. T., Neumayer, G., Shim, S. Y., Park, Y., Belzil, C., Hoa Thi Le, T. L., Park, S. K., Minh Dang Nguyen, D. N.
2011; 6 (1)
- **Ndel1 controls the dynein-mediated transport of vimentin during neurite outgrowth** *JOURNAL OF BIOLOGICAL CHEMISTRY*
Shim, S. Y., Samuels, B. A., Wang, J., Neumayer, G., Belzil, C., Ayala, R., Shi, Y., Shi, Y., Tsai, L., Nguyen, M. D.
2008; 283 (18): 12232-12240
- **Ndel1 Promotes Axon Regeneration via Intermediate Filaments** *PLOS ONE*
Toth, C., Shim, S. Y., Wang, J., Jiang, Y., Neumayer, G., Belzil, C., Liu, W., Martinez, J., Zochodne, D., Nguyen, M. D.
2008; 3 (4)
- **Protein 600 is a microtubule/endoplasmic reticulum-associated protein in CNS neurons** *JOURNAL OF NEUROSCIENCE*
Shim, S. Y., Wang, J., Asada, N., Neumayer, G., Tran, H. C., Ishiguro, K., Sanada, K., Nakatani, Y., Nguyen, M. D.
2008; 28 (14): 3604-3614