Welcome ORS Spine Section Interns

The following interns will assist with programming and outreach, will receive mentoring from ORS section officers, and will be more involved with the broader spine research community.

Jordy Schol is a research fellow at Tokai University School of Medicine for the Department of Orthopaedic Surgery in Japan where he engages in a spectrum of research, spanning from basic science to clinical applications. His primary focus is on developing, optimizing, and evaluating regenerative strategies, such as cell therapy, to address intervertebral disc degeneration and associated pathologies. Jordy has been an active member of the ORS since 2017 and is eager to contribute to the society’s mission.

Giselle Kaneda is a first year PhD student in Cedars-Sinai’s Regenerative Medicine Institute in the Biomedical and Translational Sciences program. Her research focuses on the use of animal models and omics to elucidate the mechanism behind discogenic lower back pain and develop cell therapy-based LBP treatments.

Graciosa Quelhas Teixeira, PhD is a postdoctoral researcher at Institute of Orthopaedic Research and Biomechanics, Ulm University Clinic, Ulm, Germany, since 2017, and an ORS member since 2021. Graciosa’s work focuses on better understanding the mechanobiology of intervertebral disc degeneration and its crosstalk with the immune system, as well as on the development of cell- and molecular-based strategies to restore/regenerate the degenerated disc. Graciosa is looking forward to contributing to the ORS and Spine Section.
Who do you consider your mentors?
Dr. Rodney DeKoter (Western University) helped me to build my interest in research during my undergraduate years, which led me to stay at Western to pursue a graduate training. I was fortunate to have Dr. Cheryle Séguin (Western University) as my PhD advisor, who inspired to appreciate research and to do great science. During my time at Cheryle’s lab, I got to meet Dr. S. Jeff Dixon, Dr. Frank Beier, and Dr. Rithwik Ramachandran, excellent mentors who helped me to adopt multi-disciplinary and collaborative research projects, understanding the mechanobiology of annulus fibrosus cells using tools of live cell imaging, developmental biology, and transgenic mouse models. Dr. Nadeen Chahine (Columbia University) has also been a fantastic mentor since the first day I joined as a Postdoc, always supportive and open to having stimulating science chats.

What is your specific area of interest in research?
My research interest focuses on understanding the role of inflammation during intervertebral disc (IVD) degeneration. Specifically, I am interested in how local tissue inflammation occurs during age-associated IVD degeneration, at the molecular and tissue levels.

What are you currently working on?
I am currently working on understanding how molecular profiles change in the murine nucleus pulposus and annulus fibrosus tissues during aging, using bulk and single cell RNA sequencing technologies. Another project is focused on IVD-PNS crosstalk during inflammation-induced IVD degeneration.

What has been the biggest challenge for you lately in your research?
One of the biggest challenges of research is securing funding. This challenge is also exciting because the process involves putting together preliminary data, meeting collaborators, and being creative and open-minded about new directions. This excitement is also shared with fellow trainees around me, talking about their data, how data comes together for their thesis/paper, and supporting them in any way I can. However, finding my own time to dig deeper into my data, managing projects, and pushing forward can be overwhelming sometimes.

What are projects you looking forward to?
I am excited about multi- and trans-disciplinary approaches in research: Discoveries made in basic science inspiring biomedical engineers, industrial collaborators, and clinicians to develop therapeutic applications.

What do you like to do outside of your work?
I am fortunate to have Manhattan just outside of my doorstep. I enjoy post-work happy hour with lab mates, or, if the timing is right, I like to go watch a show or live performance.

What is the last book you read?
When Breath Becomes Air by Dr. Paul Kalanithi. Inspiring book that gets you to think about life and living to the fullest.

What is the most unusual/unexpected item sitting on your desk right now?
A 3D printed mouse model with wings! I inherited this model from Dr. Kevin Burt (UPenn) after taking over his desk area.

Paper Review

Nonviral Overexpression of Scleraxis or Mohawk Drives Reprogramming of Degenerate Human Annulus Fibrosus Cells from a Diseased to a Healthy Phenotype

https://doi.org/10.1002/jsp2.1270

Shirley Tang, Connor Gantt, Ana Salazar Puerta, Lucy Bodine, Safdar Khan, Natalia Higuita-Castro, Devina Purmessur (*Authors in bold indicate Spine Section Members)

One of the hallmarks of intervertebral disc (IVD) degeneration is tissue structural damage, such as disorganization of concentric lamellae structure of anulus fibrosus (AF). Despite the high prevalence of IVD degeneration, there currently lacks an effective treatment, hampered by the limited understanding of IVD tissue biology. Specifically for the AF, transcription factors, such as SRY-Box transcription factor 9 (SOX9), Mohawk (MKX), and Scleraxis (SCX) are known to regulate AF tissue development, homeostasis, and regeneration, and yet, the assessment of the effects of these transcription factors on mature AF cells are limited. Recent attempts to regenerate the diseased IVD focused on cell-injection, scaffold application, and viral gene therapy. These approaches show varying therapeutic effects, owing to the reported limitations, including cell retention, viability, scaffold instability, and potential risk of mutagenesis or immune responses. To overcome these limitations, Tang et al. conducted a proof-of-concept study to assess the therapeutic effect of non-viral delivery of MKX or SCX to diseased human AF cells, aimed to reprogram diseased cells to a healthy pro-anabolic phenotype.

Degenerate human AF cells were isolated from IVD tissue collected from two patient groups: autopsy lumbar spines (autopsy; moderately degenerate) and surgical samples of microdiscectomy (surgical; severely degenerate). AF cells were expanded and were subjected to electroporation with plasmids encoding for MKX or SCX at two different concentrations (0.05 and 0.1 µg/µL, low and high dose respectively) with sham group receiving pCMV6-GFP vector. Following transfection, AF cells were collected up to 2 weeks for morphology (48h), gene expression (48h, 7 days, 14 days) and collagen content (7 and 14 days) assessment as outcome measures.

Cells from all groups showed fibroblast-like morphology with comparable viability. Autopsy cells transfected with high SCX dose had higher cell density compared to sham cells, while surgical cells in high SCX and high MKX groups had lower cell density compared to sham group. Transfection was confirmed with dose-dependent increase in SCX and MKX expression as well as SOX9 expression. Interestingly, only the autopsy groups showed increased matrix genes. In both autopsy and surgical groups, SCX and MKX transfection led to decreased proinflammatory cytokine, matrix degrading enzyme, and neurotrophic factor expression. At the protein level, collagen content showed time-dependent increase in both SCX and MKX groups. The study by Tang et al. demonstrates the therapeutic potential of non-viral delivery of AF-associated developmental transcription factors to reprogram degenerate human AF cells to pro-anabolic and pro-regenerative phenotype.

To view other paper reviews in the Spinal Column archives, please visit the link below.
The Spine Section is excited to share their latest Article: *Impact of the COVID-19 Pandemic on the Productivity and Career Prospects of Musculoskeletal Researchers*. Authored by several section members, this Article addresses the impact the pandemic had on the MSK community and is a great example of how the Spine Section engages the community and issues while continuing to advocate for researchers.

Save the Date

**ORS PSRS 7th International Spine Research Symposium**

The ORS PSRS 7th International Spine Research Symposium, co-chaired by Dr. Lachlan J. Smith and Dr. Makarand V. Risbud, will be held at the Skytop Lodge located in picturesque Pocono Mountains, Pennsylvania, from **November 10-14, 2024**. The meeting website is now online and includes important deadlines for abstract submission and registration. Abstract submission will be open from **May 13-July 15, 2024**. More information on the speaker lineup and the scientific program will follow in the coming weeks.
Meeting Announcement

ISSLS-ORS Spine Section Joint Symposium

The ORS Spine Section is happy to announce that we will co-organize a symposium with the International Society for the Study of the Lumbar Spine (ISSLS) at their 50th Annual Meeting in Milan, Italy, from May 27-31, 2024. The symposium is titled ISSLS-ORS Low Back Pain Symposium – Understanding Mechanisms, Animal Models and Patient Management and is co-chaired by Dr. Lisbet Haglund and Dr. Dino Samartzis. It will be held on May 28, 2024, from 11:30 AM-12:15 PM.

ISSLS is the world’s oldest, international, and multidisciplinary spine society that shares a similar vision with the ORS and the ORS Spine Section. The co-branded symposium will provide an excellent opportunity to showcase ORS and the ORS Spine Section and motivate crosstalk to foster international research, collaborations, and partnerships. The symposia will present the latest development of accurate and specific markers to detect and follow disease, how pharmacological and non-pharmacological treatment methods can be evaluated in preclinical animal models, and current clinical phenotyping and treatment options.

Invited Faculty

Laura Stone, PhD
Professor, Department of Anesthesiology, University of Minnesota. Dr. Stone will discuss how to measure pain behavior and response to treatment in animal models.

Lars Arendt-Nilsen, PhD
Professor, Department of Health Science & Technology, School of Medicine, Aalborg University, Denmark. Dr. Arendt-Nilsen will discuss molecular, quantitative, & mechanistic pain biomarkers developed to measure pain in human patients.

Jaro Karppinen, PhD, MD
Professor, Department of Physical and Rehabilitation Medicine, Oulu University in Finland. Dr. Karppinen will discuss clinical phenotyping, current treatment options, and how trends have changed.

The speakers will each give a 15-minute presentation, followed by a panel discussion.

Register Here