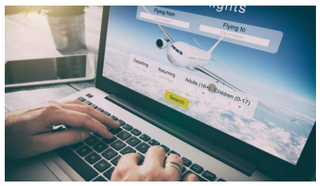
ORS Spine Section Orthopaedic Research Society

Monthly Newsletter

Spinal Column

November 2022

Did you register for the ORS 2023 Annual Meeting yet?
Be sure to do so ASAP before rates increase on January 10, 2023!



2023 Spine Section Diversity Stipend Awards

Award Details

- $500 award to offset registration, travel and accommodation for attending the 2023 ORS Spine Section Symposium and ORS Annual Meeting in Dallas, Texas.
- Open to both ORS members and non-members.

Learn more

Don't Miss the ORS Spine Section Scientific Symposium & Reception!

When: Friday, February 10th, 2023
3:00 PM – 9:00 PM

Join us for an expanded, half-day program with the overall theme of ***"Enhancing Spine Research through Diversity, Mentoring and Collaboration".***

View the full schedule here.

Gather with your section

We hope all attendees had a wonderful time at the ORS PSRS 6th International Spine Research Symposium!

Congratulations again to...

Judith Hoyland, PhD
Judith was selected as the 6th International Spine Research Symposium Lifetime Research Achievement Award recipient.

Bahiyah Watson
Sabrina Delva
Mary Bucklin
Christian Gonzalez
These individuals were the recipients of the 2023 ORS/PSRS Diversity Travel Fellowship Awards.

Pictured: ***Rachad Aita, B.Sc.***

Research Section Member Spotlight

This issue features **Rachad Aita, B.Sc.** - Master Candidate, Division of Experimental Surgery, McGill University

Undergraduate Degree: *Bachelor of Science, Major in Microbiology and Immunology*

Graduate Degree: *Master of Science, Experimental Surgery (Thesis – In Progress)*

Master Candidate, Division of Experimental Surgery, McGill University

Who do you consider your mentors?

*As mentors, I especially consider my PI, Dr. Chan Gao, and my co-supervisor **Dr. Rahul Gawri**, for their crucial guidance in my master's thesis and their continued support and constructive criticism. Throughout my thesis, they taught me the importance of scientific thinking and curiosity in biomedical research and how to effectively compile, summarize, and communicate our findings in a succinct yet engaging manner.*

What is your specific area of interest in research?

Our specific area of research focuses on animal modeling of spinal cord injury (SCI) -associated heterotopic ossification (HO), with a major focus on nerve and bone interplay and the contribution of aberrant neuronal responses in the initiation and progression of HO.

What are you currently working on?

I am currently working on characterizing, establishing, and validating our novel and a clinically relevant mouse model for SCI-associated HO to accurately mimic the morbidity of polytrauma patients who sustain SCIs and peripheral damage.

What has been the biggest challenge for you lately in your research?

To date, the biggest challenge has been maintaining the rigors of animal modeling, with great emphasis on standardizing our polytrauma surgeries, tissue processing, and histology. While SCI-associated HO does involve interdisciplinary research, the literature on niche topics like HO is limited, which warrants the need for further investigations and summarizing available literature.

What are projects are you looking forward to?

I am looking forward to utilizing our animal model to find targets for HO therapy and communicating our findings globally to strengthen the body of evidence for our SCI-associated HO mouse model. The translational aspect of HO research to help improve patient care is an interest of mine.

What do you like to do outside of your work?

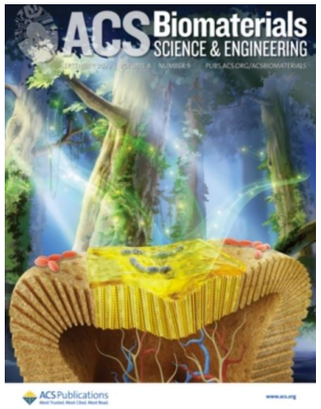
I enjoy chess, hiking, and pet-sitting!

What is the last book you read?

Crucial Conversations *by Kerry Patterson is a must-read if you are looking to sharpen your communication skills under pressure. Although I haven't finished the book yet, it already seems like a wonderful self-development read!*

What is the most unusual/unexpected item sitting on your desk right now?

A textbook on the Immunophysiology of the Gut …



Paper Review

Rachad also contributed to this paper review…

Toward the Next Generation of Spine Bioreactors: Validation of an Ex Vivo Intervertebral Disc Organ Model and Customized Specimen Holder for Multiaxial Loading

Amra Šećerović, Aapo Ristaniemi, Shangbin Cui, **Zhen Li**, **Astrid Soubrier**, **Mauro Alini**, **Stephen J Ferguson**, Gilles Weder, Sarah Heub, Diane Ledroit, and **Sibylle Grad**

ACS Biomaterials Science & Engineering
Publication Date: August 17, 2022

Low back pain (LBP) is a globally prevalent and costly disease mainly caused by intervertebral disc degeneration. One of the main aspects of IVD degeneration is the dynamics involved in IVD mechanics. Mimicking multiaxial loading on intervertebral discs (IVD) and its effect on IVD health and degeneration has been challenging. From in vitro approaches such as organ-on-chips to ex vivo IVD uniaxial bioreactors, interest has greatly risen to recapitulate the physiological functions of multiaxial loading on disc health and disease. Currently available bioreactors, which exert mechanical loads such as axial compression and torsion, are commonly used for these studies; however, bioreactors that attempt more complex multidirectional loading on natural IVDs, so-called 6 degrees of freedom (DOF) spine simulators, have only been recently implemented in research.

6 DOF bioreactors utilize an innovative ex vivo approach to exert not only translations in the x, y, and z axes but also rotations along these axes on short-term IVD organ cultures. A few of these bioreactors also include long-term organ models to investigate the effects of multiaxial loading.

The present study aims to examine the biological relevancy, and feasibility of a bovine IVD organ model and specifically investigates the effects of these 6 DOF bioreactors on IVD height change and cell viability and characterizes the mechanical properties of the loads delivered to bovine IVDs in uniaxial and multiaxial bioreactors. Fresh bovine IVDs were acquired from calves aged six to twelve months and were prepared according to standard procedure for IVD explant culture. IVD explants were loaded for 3 weeks in uniaxial and multiaxial bioreactors to assess the weekly IVD height changes relative to initial IVD height after dissection, and outer and inner annulus fibrosis and nucleus pulposus cell viability was assessed via lactate dehydrogenase and ethidium homodimer staining. Mechanical properties of loads delivered to IVDs, such as tension, lateral bending, compression, and axial torsion, were also characterized.

IVD height changes were similar in both uniaxial and multiaxial bioreactors and were within the range of physiological conditions. IVD cell viability in both bioreactors remained high after 2 weeks and began to decrease in the annulus fibrosis at 3 weeks. When multidirectional loads were applied, the organ model remained stable under hyper-physiological conditions and was mechanically reliable in both the uniaxial and multiaxial bioreactors.

This study presents a proof-of-concept for the use of the next generation of spine bioreactors and validates a biologically compatible application to mimic IVD dynamics.

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