ORS Spine Section
Orthopaedic Research Society
Monthly Newsletter

Spinal Column

October 2022

The Deadline is TODAY!

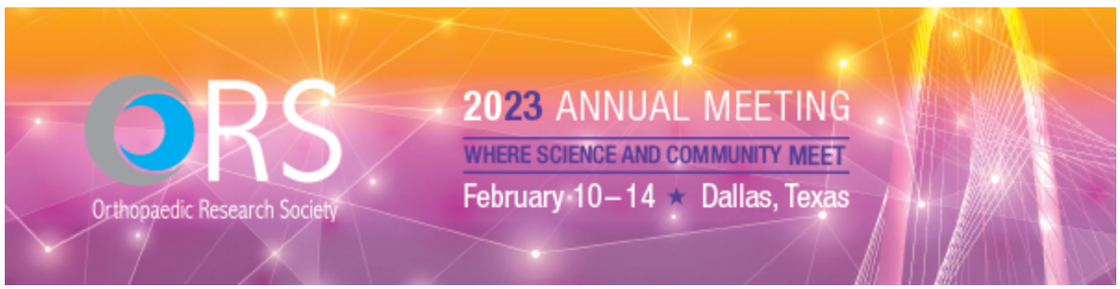
JOR Spine Early Career Award

Recognition

- Honorarium of $1,000
- Complimentary registration for the ORS Annual Meeting

Interested individuals should contact the Editorial Office at JORSpine@wiley.com by **October 31, 2022**

Learn more



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

This Session will Live Stream on the ORS 2023 Annual Meeting Virtual Platform.

When: Friday, February 10th, 2023

3:00 PM – 9:00 PM

Where: Hilton Anatole - Dallas, Texas

Who: **YOU** & your fellow section members!

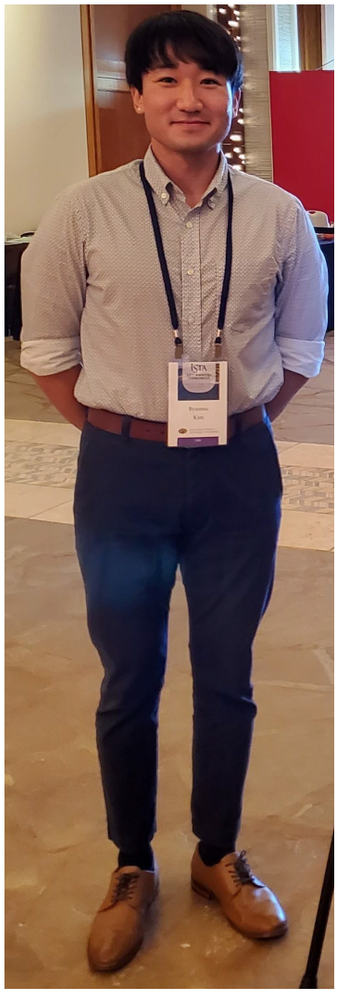
Join us for an expanded, half-day program with the overall theme of “Enhancing Spine Research through Diversity, Mentoring and Collaboration”.

The symposium will feature:

- Keynote speakers on each of these three topics
- Scientific presentations from leading researchers on the topic of “Leveraging Developmental Biology and Stem Cells for Disc Regeneration”
- Trainee poster teasers
- A networking speed-dating event
- Boxed dinners & a networking reception.

View the full schedule here.

Gather with your section



Research Section Member Spotlight

This issue features **Byumsu “Sean” Kim, M.S. Mechanical and Aerospace Engineering, Cornell University.**

Undergraduate Degree: *B.S. Mechanical Engineering, Purdue University*

Graduate Degree: *M.S. Mechanical and Aerospace Engineering, Cornell University*

Who do you consider your mentors?

My PI, Dr. Lawrence Bonassar, and my committee members, Dr. Itai Cohen and Dr. Nikolaos Bouklas, have been extremely helpful in guiding me through my Ph.D. studies. I cannot express my gratitude enough to them for teaching me the importance of effective scientific communication and rigor.

What is your specific area of interest in research?

I am interested in understanding the mechanical responses of scaffolds used in tissue-engineered intervertebral discs and the influence of such mechanical responses on cell fate.

What are you currently working on?

Pictured: ***Byumsu "Sean" Kim, M.S.***

Ph.D. Candidate in Mechanical and Aerospace Engineering, Cornell University

I am currently working on designing and optimizing the architecture of tissue engineering scaffolds through mechanical testing and finite element modeling. In addition, I study how local composition influences the local mechanical behavior in tissue-engineered constructs. I am excited to apply my mechanical engineering knowledge in the tissue engineering field!

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

Effectively communicating the importance of my research has been the biggest challenge for me.

What are projects are you looking forward to?

I am looking forward to an ***in vivo*** *study of the tissue-engineered intervertebral disc scaffold that Larry and I designed. Collaborating with neurosurgeons from Weill Cornell has been an eye-opening experience for me. Outside of our group, Mauck Lab at UPenn and Chahine Lab at Columbia do incredible research on tissue-engineered intervertebral discs. Furthermore, the computational approach to studying intervertebral disc mechanics from the O'Connell lab at UC Berkeley is fascinating. I look forward to seeing where their projects go next.*

What do you like to do outside of your work?

I love sailing, wind surfing, skiing, and rock climbing. I also love cooking!

What is the last book you read?

Salt Fat Acid Heat *by Samin Nosrat.*
Samin does a fantastic job on communicating the essential building blocks of good cooking. Her scientific approach to cooking and stories around each ingredient enabled me to be creative with my cooking and prepare better meals.

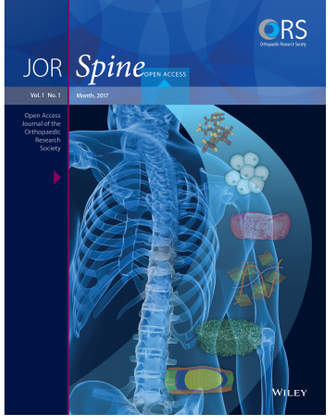
What is the most unusual/unexpected item sitting on your desk right now?

A bottle of Rowan's Creek Bourbon Whiskey.

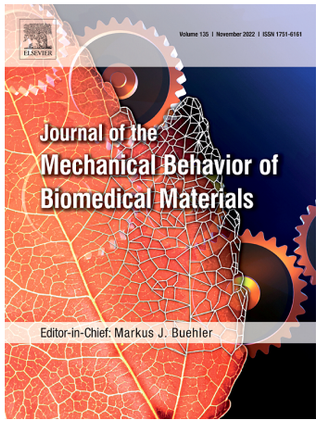
Volume 5, Issue 3 of JOR Spine is now available!

From the Editorial:

Dear Readers,



As noted in the last issue, we were overjoyed that the JOR Spine received its first impact factor (IF)-3.7 in 2022! While only one part of what distinguishes the JOR Spine, this underscores the outstanding content and mission of the journal. Now that we have achieved this first milestone, we turn our attention to continuing our goal of becoming the top journal within the spine basic and translational research field. Continue reading.



Paper Review

Byumsu also contributed to this paper review…

Saline-polyethylene glycol blends preserve in vitro annulus fibrosus hydration and mechanics: An experimental and finite-element analysis

Benjamin Werbner, Minhao Zhou, Nicole McMindes, Allan Lee, Matthew Lee, **Grace D. O'Connell**

Journal of the Mechanical Behavior of Biomedical Materials
Volume 125, January 2022, 104951

The primary role of the intervertebral disc (IVD) is purely mechanical in which the tissue acts as a cushion to facilitate painless movement of the spine. The IVD is comprised of the nucleus pulposus and annulus fibrosus (AF), both of which possess unique architectures to fulfill the tissue's mechanical role. Notably, the physical disruption of these components has shown to give rise to degenerative disc disease. During the progression of the disease, the IVD dehydrates and experiences reduction in the intradiscal pressure, ultimately leading to a loss of disc height. Overall, these factors highlight the importance of accurately characterizing the biomechanical properties of the IVD to prevent tissue degeneration.

A common way to characterize the IVD is through *in vitro* testing models. These testing models often require the samples to be harvested from the host and tested in a relatively dry ambient environment. The IVD tissues often lose hydration during this process. Multiple *in vitro* and *in vivo* studies have shown that the hydration level of the IVD has a significant impact on the mechanical properties of the tissue, indicating the importance of maintaining or

restoring the tissue hydration level during the test. As such, this study investigated the optimal solution to maintain the hydration level of the IVD. Specifically, this study found that saline and polyethylene glycol (PEG) blends successfully preserved the mechanical properties of the AF tissue. In addition, the study developed a computational model to describe the mechanical response of the AF tissue.

Bovine IVDs from coccygeal spine segments were obtained, and the AF tissue was harvested. Harvested AF tissues were submerged in various concentrations of a solution of saline and PEG solution for 18 hours, using phosphate-buffered solution (PBS) as the control. Submerged samples were stretched uniaxially, and multiple mechanical parameters were calculated from mechanical testing. In addition, computational models were generated to simulate the swelling and mechanical response of the tissue.

Overall, saline and PEG blends were able to preserve the mechanical properties of the fresh IVDs, and the computational models captured the mechanical behavior of the tissue accurately. More specifically, 6.25% w/v PBS and 6.25% w/v PEG solution maintained the physiological hydration level and tissue mechanics most effectively. These findings show the importance of maintaining physiological tissue hydration levels of tissues in in vitro testing models. Accurate mechanical characterization of the IVDs through saline and PEG solution will allow us to move a step forward in preventing degenerative disc disease.

View the latest job openings available via the ORS Career Center

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