ORS Spine Section
Orthopaedic Research Society
Monthly Newsletter

Spinal Column

May 2023

Pictured: ***Ateeque Siddique, B.Sc.***

Research Section Member Spotlight

This issue features **Ateeque Siddique, B.Sc.** - Ph.D. Student, Department of Surgery - McGill University

Undergraduate Degree: *Physiology & Physics (McGill), Ecological Determinants of Health (McGill)*

Graduate Degree: *Ph.D., Surgical and Interventional Sciences (in progress)*

Who do you consider your mentors?

I'm truly grateful for the invaluable mentorship provided by my lab colleagues and supervisors, Dr. Derek Rosenzweig and Dr. Michael Weber. Their guidance, expertise, and support have shaped my academic journey, pushing me to reach new heights.

What is your specific area of interest in research?

My research focuses on the development of an augmented acrylic bone cement functionalized with mesoporous silica nanoparticles for an improved local chemotherapeutic release. The aim is for the cement to mechanically stabilize and locally treat spine metastases.

What are you currently working on?

I'm developing a 3D-printed in vitro tumor metastasis resection model to test the efficacy of the drug-loaded bone cement. I'm also testing the efficacy of combined

chemotherapeutics against patient-derived metastatic spine tumor cells.

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

With so many tools available in our lab, it's hard not to come up with so many ideas and get distracted!

What are projects are you looking forward to?

I'm really looking forward to developing the in vivo aspect of this project which will be a novel bone metastasis model in rats. I'm excited to test the drug-loaded cement in an animal model to hopefully see it preventing tumor recurrence after an incomplete resection.

What do you like to do outside of your work?

I love volunteering with my local EMS service to give back to my community and to be there to help people when it matters most. I enjoy running with my lab colleagues, spending time with family and friends, and cooking breakfast meals for dinner.

What is the last book you read?

A book I'm still reading is "A History of Western Philosophy" by Bertrand Russell, it's a captivating exploration of philosophical ideas – highly recommend it!

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

On my desk at home, I have mini battery-powered wacky waving inflatable tube guy that dances just like the real thing. At the lab, my desk is a ketchup packet resource for those delicious hospital French fries.

Find or Post Spine Events on the New Orthopaedic Events Calendar

A new orthopaedic events calendar has been added to the ORS website. The events listed are of potential interest to those in the orthopaedic community. ORS Members are welcome to submit applicable events at no charge through the Submit Event button at the top of the calendar on the site. Institutions or sponsors interested in posting an event are welcome to do so in exchange for a donation to ORS. For information, please email ors@ors.org.

Find or Post Events

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educational content for potential use in LearnORS? We regularly accept suggestions for content which might be implemented into training to be made available throughout the year on the ORS website.

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Paper Review

Ateeque also contributed to this paper review...

Repairing Annulus Fibrosus Fissures Using Methacrylated Gellan Gum Combined with Novel Silk

Croft, Andreas S., Slavko Ćorluka, Janine Fuhrer, Michael Wöltje, Joana Silva-Correia, Joaquim M. Oliveira, Georg F. Erbach, Rui L. Reis, and **Benjamin Gantenbein.**

Materials 16, no. 8 (2023): 3173.

Intervertebral disc (IVD) degeneration is one of the most frequent diagnoses associated with low back pain. It is part of the natural aging process and can be driven by genetic and environmental factors. The outer portion of IVDs, the annulus fibrosis (AF), increasingly develops fissures as the disc degenerates, accompanied by herniation. Since the AF has limited healing ability and the gold standard for the treatment of herniation is discectomy, these is a need to develop a better AF repair strategy. This study conducted by Croft et al. investigates a tissue engineering approach to repair and regenerate the AF tissue. They used a bovine IVD organ culture model to generate an injury and then used methacrylated gellan gum in conjunction with silk fibroin patches as their biomaterials.

Caudal IVDs were freshly isolated from the tails of one-year-old cows and processed. A 2% methacrylated gellan gum was prepared, and silk yarn patches were braided on an embroidery machine. After a day of incubation, the IVDs were divided into control, damage, or repair groups. The control IVDs were left intact, while the other two were punctured with a 2 mm biopsy punch. The injury of the IVDs in the repair group was filled with the 2% gellan gum solution in the cavity, and the silk patch was sutured onto the defect. The IVDs were then placed under no load, static loading, or dynamic loading. After two weeks, changes in the IVD height from baseline, tissue metabolic activity, glycosaminoglycan content, nitric oxide content, and gene expression were examined.

After 14 days of culture under various loading conditions, there were no significant differences between damaged IVDs and those repaired with methacrylated

gellan gum and silk patches. However, only the damaged IVDs (without repair) under dynamic loading showed a significant decrease in relative disc height compared to baseline. This study did demonstrate that the gellan gum and silk patches always stayed in place and withstood the static and dynamic forces. The authors propose that insufficient injury was produced with a 2 mm biopsy punch, and therefore the damaged IVDs resembled too closely the controls. In summary, this paper presents an innovative approach to address the challenging issue of annulus fibrosus fissures and the highlights the importance of an adequate injury model and organ culture. The study's findings demonstrate the potential of methacrylated gellan gum and silk-based composites for promoting tissue regeneration and functional recovery.

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