ORS Spine Section
Orthopaedic Research Society
Monthly Newsletter

Spinal Column

April 2023

Meet the 2023 ORS Spine Section Officers

And the 2023 Membership Committee!

Research Section Member Spotlight

This issue features **Deepani W. Poramba-Liyanage, PhD** - Postdoc, Faculty of Veterinary Medicine, Utrecht

Pictured: ***Deepani W. Poramba-Liyanage, PhD***

University

Undergraduate Degree: *BSc. Human Biology, University of Sri Jayewardenepura, Sri Lanka.*

Who do you consider your mentors?

I consider Prof. Marianna Tryfonidou to be my mentor. As a young postdoc from an (epi)genetic background, she took me under her wing and introduced me to the joys and challenges of an academic career, steering me from the bench to the bedside while teaching me how to maneuver a balancing act with a young family. My Ph.D. mentor is Prof. Fred van Leeuwen, and I often hear myself echoing him while I work with the graduate students in our lab. Together, they have instilled in me a passion for creative and collaborative research.

What is your specific area of interest in research?

I am intrigued by the possibility of modulating the expression of key transcription factors for tissue regeneration of the disc. There are many options available, and we focus on CRISPR/Cas9 technologies as a powerful tool to induce the expression of key target genes. The disc presents a very unique environment to test and make a real impact with these types of gene-modulating interventions.

What are you currently working on?

In the lab, we use CRISPR/Cas9-based targeted gene activation technologies to direct the differentiation of induced pluripotent stem cells into notochordal cells, the most regenerative cell type found in juvenile or fetal discs. This is a European effort, as part of the EU-funded iPSpine consortium that is steered by Prof. Tryfonidou to look into iPSC-based strategies to repopulate the degenerate disc. Further, to expand our knowledge of these regenerative notochordal cells, we characterize notochordal cell-rich discs with single-cell approaches, both transcriptomic and epigenetic, using the dog as a model.

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

We are currently generating multiple single-cell datasets of disc cells, including 3' sequenced and full-length transcriptomic datasets and enrichment data for histone modifications, to characterize the cellular trajectories from health to degeneration. Linking and combining the different datasets and overlaying them is a challenge. Then there is the challenge of deconvoluting biology and pointing out what

matters. This is a real challenge, but I look forward to the awesome biological insights this type of analysis will bring.

What are projects are you looking forward to?

I am excited by the possibilities and creativity that multidisciplinary research brings. Collaborations that bring expertise from different fields, from skilled surgeons to fundamental scientists to bioinformaticians. Projects that leave you with completely different insights are pretty cool. Besides being a lot of fun, these collaborative projects pave the way for creative science.

What do you like to do outside of your work?

You'll often see me in the garden from early spring. It's a great way to be outside and clear your mind. Often, unlike in science, the benefits can be seen in a relatively shorter time.

What is the last book you read?

I recently read "The Truth About the Harry Quebert Affair" by Joël Dicker and found it to be a brilliant read. The book recounts an investigation with many twists, and I admire how the author plays with time, mixing a shady past and a shifting present.

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

I have a pair of walkie-talkies on my desk. I am quite bad at keeping track of my phone, and this is my husband's latest attempt at reaching me.

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Paper Review

Deepani also contributed to this paper review...

Harmonization and standardization of nucleus pulposus cell extraction and culture methods

Shaghayegh Basatvat, Frances C. Bach, Marcos N. Barcellona, Abbie L. Binch, **Conor T. Buckley**, Brian Bueno, **Nadeen O. Chahine**, **Ana Chee**, Laura B. Creemers, **Stefan Dudli**, **Bailey Fearing**, **Stephen J. Ferguson**, **Jennifer Gansau**, **Benjamin Gantenbein**, **Rahul Gawri**, Juliane D. Glaeser, **Sibylle Grad**, Julien Guerrero, **Lisbet Haglund**, **Paula A. Hernandez**, Judith A. Hoyland, **Charles Huang**, **James C. Iatridis**, **Svenja Illien-Junger**, Liufang Jing, Petra Kraus, Lisanne T. Laagland, **Gernot Lang**, **Victor Leung**, **Zhen Li**, Thomas Lufkin, Josette C. van Maanen, Emily E. McDonnell, **Chris J. Panebianco**, Steven M. Presciutti, Sanjna Rao, Stephen M. Richardson, **Sarah Romereim**, Tara C. Schmitz, **Jordy Schol**, **Lori Setton**, **Dmitriy Sheyn**, **Joseph W. Snuggs**, Y. Sun, **Xiaohong Tan**, **Marianna A. Tryfonidou**, **Nam Vo**, **Dong Wang**, Brandon Williams, **Rebecca Williams**, S. Tim Yoon, **Christine L. Le Maitre**.

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Should there be standardization in the methods used to extract and expand intervertebral disc (IVD) cells? An international group of spine scientists took up the challenge to explore, find solutions and provide a toolkit for in vitro research in Basatvat et.al, headed by Prof. Christine Le Maitre. This paper addresses the standardization of the methods for extraction of cells from IVD tissue and expanding IVD cells. Invitro studies have commonly utilized IVD cells to investigate disc biology and find specific molecular pathways and more recently for the development of cell therapies, with the possibility of using IVD cells for therapy or tissue engineering products. Yet, different methodologies for isolating and expanding IVD cells are utilized across different publications generating a high degree of lab-to-lab variation in the data acquired. This first phase focuses on the small, non-vacuolated nucleus pulposus (NP) cells.

Methodologies used for extraction of NP cells from IVD tissue and expansion and 3D culture of NP cells and cell cryopreservation were collected from research groups worldwide, and reviewed together with prior published method comparisons. Commonalities and recommendations for standardization were identified and where there were variances, these were identified for experimental testing.

Basatvat et.al, details variations in the cell extraction and cell culture methodologies for NP tissue of humans, dogs, pigs, rabbits, and rats, with a focus on the enzyme types, concentrations and combinations, and digestion durations used by different labs worldwide. Testing each of these factors, the authors establish extraction and culture methodologies that obtained the highest cell yield while maintaining key phenotypic factors seen in vivo. Due to the high batch-to-batch variability in FCS, special attention was given to the use of FCS alternatives to enable standardization across groups worldwide. The recommendations provided are a first step in generating an in vitro toolkit for IVD research to reduce variability and improve comparability between labs. Yet, as highlighted within the discussion, more work is required for the methodologies described to better mimic the native tissue niche. The spine field, being still relatively small and at the vicinity of exciting research, has the advantage of of being able to make these harmonizations and enable multidisciplinary collaborations to move the field forward and to generate impactful results.

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