



Philadelphia Spine Research Symposium
Friday, November 2nd, 2018
Glen Gaulton Auditorium
University of Pennsylvania

PROGRAM

- 8:00 - 8:50 A.M. Breakfast and Registration
- 8:50 - 9:00 A.M. Welcome
Lachlan Smith, Neil Malhotra and Tom Schaer, Co-Chairs

Session One: Development and Pediatric Disorders

Moderators: Svenja Illien-Junger and Nam Vo

- 9:00 - 9:10 A.M. *Deletion of TonEBP/NFAT5 Alters Sonic Hedgehog Signaling and the Notochord Molecular Phenotype During Intervertebral Disc Embryogenesis*
Steven Tessier, Thomas Jefferson University
- 9:10 - 9:20 A.M. *Discovery of a unique bi-partite mechanism of transcriptional activation for SOX9, a key cell fate determinant in cartilage and spine development*
Abdul Haseeb, Children's Hospital of Philadelphia
- 9:20 - 9:30 A.M. *Ciliary IFT20 and IFT80 are Required for Intervertebral Disc Development and Maintenance*
Xinhua Li, University of Pennsylvania
- 9:30 - 9:40 A.M. *Whole Exome Sequence Analysis in Patients with Cervical Segmentation Abnormalities Identifies KIAA1217 as a Candidate Causative Gene*
Philip Giampietro, Drexel University
- 9:40 - 9:50 A.M. *Quantitative Methods in Classification-Based Surgical Outcome Prediction in Adolescent Idiopathic Scoliosis*
Saba Pasha, Children's Hospital of Philadelphia
- 9:50 - 10:00 A.M. *Age- and Deformity-Related Changes in Rabbit Thoracic Vertebral Geometry*
Ausilah Alfraihat, Drexel University
- 10:00 - 10:10 A.M. *The Effect of Hypoxia on ATP and Proteoglycan Production of Intervertebral Disc Cells under Glucose Deprivation*
Xue Yin, University of Miami
- 10:10 - 10:30 A.M. **Coffee Break and Posters**

Session Two: Aging, Degeneration and Injury

Moderators: Dawn Elliott and Makarand Risbud

- 10:30 - 10:40 A.M. *HMGB1 Induces Inflammation and ECM Degradation in a 3D Model of Human Nucleus Pulposus Cells*
Kevin Burt, Columbia University
- 10:40 - 10:50 A.M. *Fate Mapping Studies Reveal the Identity of Chondrocyte-Like Cells In Mouse Intervertebral Disc*
Chitra Dahia, Hospital for Special Surgery
- 10:50 - 11:00 A.M. *Differing Effects of High-Fat Diet and the Receptor for Advanced Glycation End Products on Lumbar Vertebrae and Intervertebral Discs in Growing Male and Female Mice*
Divya Krishnamoorthy, Icahn School of Medicine at Mt Sinai
- 11:00 - 11:10 A.M. *Alterations in Fibrous Network Topography Regulates Onset of Fibrotic Phenotypes in Annulus Fibrosus Cells*
Eddie Bonnevie, University of Pennsylvania
- 11:10 - 11:20 A.M. *Ciliary PTH Signaling Activates TGF- β to Maintain Intervertebral Disc Homeostasis during Aging*
Xu Cao, Johns Hopkins University
- 11:20 - 11:30 A.M. *LRP5-deficiency in Osx-CreERT2 mice recapitulates intervertebral disc degeneration from aging and mechanical compression*
Nilsson Holguin, Indiana University

Moderators: James Iatridis and Simon Tang

- 11:30 - 11:40 A.M. *Phlpp1 Regulates Intervertebral Disc Cellularity via the Akt Pathway during Degeneration*
Svenja Illien-Junger, Icahn School of Medicine at Mt Sinai
- 11:40 - 11:50 A.M. *Ionizing Radiation Exposure to the Spine Contributes to Inter-Vertebral Disc Degeneration In-Vitro and in Mouse Model*
Joseph Chen, University of Pittsburgh
- 11:50 - 12:00 P.M. *The Monocarboxylate Transporter, MCT4, is Required for Maintenance of Nucleus Pulposus Cell Metabolism and Intervertebral Disc Health*
Elizabeth Silagi, Thomas Jefferson University
- 12:00 - 12:10 P.M. *Overexpression of Human Interleukin (IL)-8 in Mouse Intervertebral Disc Tissue to Model Patients with Back Pain*
YeJia Zhang, University of Pennsylvania

- 12:10 - 12:20 P.M. *The Mechanical Consequence of Exposure to An Inflammatory Environment in the Intervertebral Disc*
Diane Gregory, Wilfrid Laurier University
- 12:20 - 12:30 P.M. *Anxiety and Depression are Associated with Increased Healthcare Utilization in Low Back Pain*
Anna Bailes, University of Pittsburgh
- 12:30 - 12:35 P.M. JOR Spine Update
Robert Mauck, Co-Editor-in-Chief
- 12:35 - 2:00 P.M. **Lunch Break and Posters (with judging 12:45 - 2:00 P.M.)**

Keynote Session

- 2:00 - 3:00 P.M. **Anthony M. Lowman, Ph.D.**
 Professor and Dean, Henry M. Rowan College of Engineering
 Rowan University, New Jersey, USA
Biomaterial strategies for non-invasive treatment of degenerative disc disease

Moderator: Tom Schaer

- 3:00 - 3:10 P.M. ORS/PSRS 2019 Symposium Announcement
James Iatridis, Co-Chair
- 3:10 - 3:30 P.M. **Coffee Break and Posters**

Session Three: Therapeutics, Imaging and Biomarkers

Moderators: Ed Vresilovic and Michele Marcolongo

- 3:30 - 3:40 P.M. *In Vivo Fluid Convection in Human Intervertebral Discs Varies by Disc Region and Degeneration Grade*
John Martin, Duke University
- 3:40 - 3:50 P.M. *Combined Annulus Fibrosus and Nucleus Pulposus Repair Prevents Degeneration in the Ovine Lumbar Spine*
Stephen Sloan, Cornell University

- 3:50 - 4:00 P.M. *Accuracy of Quantitative MRI T2 Measurements of the Intervertebral Disc with Noise and a Noise Floor*
Kyle Meadows, University of Delaware
- 4:00 - 4:10 P.M. *Measurement of C-Spine Kinematics during Simulated Work Conditions using Dual Ultrasound*
Amin Mohamadi, Harvard Medical School
- 4:10 - 4:20 P.M. *Lithium Treatment Improves Vertebral Trabecular Bone Architecture in Mucopolysaccharidosis I Dogs during Postnatal Growth*
Sun Peck, University of Pennsylvania
- 4:20 - 4:30 P.M. *Ultrahigh Field (14.1 Tesla) Proton and Sodium MRI of Rat Tail Intervertebral Discs In-vivo*
Tyler Williams, Pennsylvania State University

Moderators: Daniel Cortes and Harvey Smith

- 4:30 - 4:40 P.M. *Cellular Response of MC3T3 E1 Cells on Nanofiber Shish Kebab Periodicity and Size*
Tony Yu, Drexel University
- 4:40 - 4:50 P.M. *Serum miRNA-155 as a Potential Biomarker of Degenerative Disc Disease in Patients with Low Back Pain*
Srikanth Divi, Thomas Jefferson University
- 4:50 - 5:00 P.M. *The In Vivo Monitoring of Intervertebral Discs at Multiple Spinal Sites in Young- and Middle- Aged Mice using Contrast-Enhanced MicroCT*
Remy Walk, Washington University in St Louis
- 5:00 - 5:10 P.M. *Evaluation of a Human-Scale Tissue Engineered Intervertebral Disc in a Large Animal Model*
Sarah Gullbrand, University of Pennsylvania
- 5:10 - 5:20 P.M. *Recapitulating the Complex Biomechanical Properties of Intervertebral Disc Using Tunable 3D Printing*
Tim Jacobsen, Columbia University
- 5:20 - 5:30 P.M. *Lack of Cell Adhesion Sites in Genipin-Crosslinked Fibrin Gels Causes Encapsulated Cells to Undergo Apoptosis*
Christopher Panebianco, Icahn School of Medicine at Mt Sinai
- 5:30 - 5:45 P.M. Concluding Remarks and Presentation of Awards
- 5:45 - 7:00 P.M. Reception

POSTERS

Development and Pediatric Disorders

1. *Continuous Disc and Vertebral Morphological Changes in the Unfused Lumbar Spine: a Changing Paradigm in Adolescent Idiopathic Scoliosis Surgical Planning*
Saba Pasha, Children's Hospital of Philadelphia
2. *SOX9 is Required to Prevent Growth Plate Cartilage Closure, but not to Maintain the Overall Integrity of Adult Articular Cartilage*
Ranjan Kc, Children's Hospital of Philadelphia
3. *Sustained In Vivo Mechanical Tension Promotes Intervertebral Disc Growth in Juvenile mice*
Garrett Eason, Washington University in St Louis
4. *Klhl14 Antisense RNA is a Target of Key Skeletogenic Transcription Factors in the Developing Intervertebral Disc*
Thomas Lufkin, Clarkson University
5. *Two Dimensional Model to Predict the Mechanical Response of Pediatric functional spine unit*
Ausilah Alfraihat, Drexel University
6. *Estimation of Normative Lung Volumes from Two-Dimensional Lung Measures in Pediatric Subjects*
Mattan Orbach, Drexel University
7. *Development and Validation of a Pediatric Finite Element Model of the Thoracic and Lumbar Spine with Pelvis*
Girish Viraraghavan, Drexel University
8. *Spatial-Temporal Distribution of Type II Collagen Gene Expression in the Mouse Intervertebral Disc*
YeJia Zhang, University of Pennsylvania

Aging, Degeneration and Injury

9. *Multiscale and Multimodal Structure-Function Analysis of Intervertebral Disc Degeneration in a Rabbit Model*
Beth Ashinsky, University of Pennsylvania
10. *Thoracic Spine Extension Injuries in Occupants with Pre-Existing Conditions during Rear End Collisions*
Jessica Isaacs, Exponent, Inc

11. *Nucleus Pulposus Isolation from Systemic Inflammation: Insights from Human Tumor Necrosis Factor- α Over-Expression in Mice*
Deborah Gorth, Thomas Jefferson University
12. *Sex Dependent Effects of Leptin Receptor Deficiency and High Fat Diet on the Spine in a Type 2 Diabetes Mouse Model*
Devorah Natelson, Icahn School of Medicine at Mt Sinai
13. *Diurnal Changes in Lumbar Facet Joint Width and Disc Height are Affected by Disc Degeneration*
Alexander Oldweiler, Duke University
14. *Disc Degeneration Alters Endplate Morphology and Mechanics and Reduces Disc Nutrition in a Rabbit Model*
Sarah Gullbrand, University of Pennsylvania
15. *Intradiscal Inflammation Induces Degeneration and Axial Mechanical Hypersensitivity in Rat Caudal Injury Model*
Hayley Jacobsen, Columbia University
16. *Mechanobiological Dysfunction of Disc: Cell Stiffness Decreases with Increasing Severity of Human Disc Degeneration*
Timothy Jacobsen, Columbia University
17. *p16ink4a Deletion in Cells of the Intervertebral Disc Affects their Secretory Phenotype without Altering Senescence Status*
Emanuel Novais, Thomas Jefferson University
18. *In Situ Multiphoton Microscopy of Advanced Glycation End-Products in the Intervertebral Disc*
Robert Hoy, Icahn School of Medicine at Mt Sinai
19. *Sex Differences in the Interaction between Biomechanical Tissue Properties of Rat Intervertebral Discs and Mechanical Pain Following Annular Puncture Injury*
Grace Mosley, Icahn School of Medicine at Mt Sinai
20. *Release of Residual Strain Activates Mechanosensing and Contractility-Dependent Apoptosis in AF Cells*
Edward Bonnevie, University of Pennsylvania
21. *Nucleus Pulposus Cells have Epithelial Cell-Like Cytoskeleton and Highly Express N-Cadherin*
Yejia Zhang, University of Pennsylvania
22. *Genetic Lineage Tracing of Intervertebral Disc Cells Following Herniation Injury in Neonatal Mice*
Olivia Torre, Icahn School of Medicine at Mt Sinai

23. *Reduced Inflammation in Injured Tail Intervertebral Disc of TIPE and TIPE2-Deficient Mice*
YeJia Zhang, University of Pennsylvania
24. *Differences in Autophagy Measured in Aged Rat Nucleus Pulposus and Annulus Fibrosus*
Rebecca Kritschil, University of Pittsburgh
25. *Biomechanical Threshold of In Vivo Neonatal Brachial Plexus after Stretch Injury*
Anita Singh, Widener University
26. *Genetic Background and Gender Influence on Gene Expressions in the Mouse Tail Intervertebral Disc Injury Model*
Julie Brent, University of Pennsylvania

Therapeutics, Imaging and Biomarkers

27. *The Exploration of Normal Metabolic Trends in the Spine Using Molecular Imaging Probes*
Cyrus Ayubcha, University of Pennsylvania
28. *Metformin Suppresses Pro-Inflammatory and Catabolic Gene Expression in Rat Annulus Fibrosus*
Rahul Ramanathan, University of Pittsburgh
29. *Biomimetic Proteoglycan Diffusion in Articular Cartilage*
Evan Phillips, Drexel University
30. *Systemic Levels of Cytokines, Chemokines and Growth Factors in Patients with Modic Changes: Identification of Potential Biomarkers*
Ryan Guzek, Thomas Jefferson University
31. *Tissue Integration of Acrylate-Based Hydrogels via Multifunctional Chondroitin Sulfate for Annulus Fibrosus Repair*
Tyler DiStefano, Icahn School of Medicine at Mt Sinai
32. *Humans with Inducible Symptoms of Low Back Pain Show Intervertebral Disc Changes in the Lumbar Spine during Prolonged Standing*
Christian Weber, Washington University in St Louis
33. *Multigenerational Growth Approach to Incorporate Residual Stress in an Intervertebral Disc Finite Element Model with Validation in Multi-Axial Loading*
John DeLucca, University of Delaware
34. *Sacrificial Fibers Improve Matrix Distribution and Mechanical Properties in a Tissue-Engineered Intervertebral Disc*
Beth Ashinsky, University of Pennsylvania

35. *Bone-Therapeutic Raloxifene Can Improve the Structural Properties of the Intervertebral Disc in Mice*
Nilsson Holguin, Indiana University
36. *Fixation of Disc-Like Angle Ply Structures in a Rabbit Model*
Michael Eby, University of Pennsylvania
37. *A Dual Screw Technique for Vertebral Compression Fractures Using Robotic Navigation in the Osteopenic Lumbar Spine: An In-Vitro Biomechanical Analysis*
Jessica Riggleman, Globus Medical, Inc
38. *Dual Pedicle and Cortical Screws Using Robotic Navigation Improves Load to Failure in the Osteopenic Lumbar Spine: An In-Vitro Biomechanical Analysis*
Jessica Riggleman, Globus Medical, Inc
39. *Non-Invasive Imaging of Therapeutic Cells Delivered Percutaneously to the Mouse Intervertebral Disc*
Chenghao Zhang, University of Pennsylvania
40. *Effects of Enzyme Replacement Therapy on Skeletal Disease in Mucopolysaccharidosis VII Dogs: Preliminary Findings*
Adrian Yian Kai Lau, University of Pennsylvania

SPONSORS

The organizers gratefully acknowledge the generous financial support provided by:



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