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

   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 Easson, 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-a 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 Disease: 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:

- Department of Neurosurgery
- Department of Orthopaedic Surgery
- Department of Physical Medicine and Rehabilitation
- Leni and Peter W. May Department of Orthopaedics
- Department of Materials Science and Engineering
- Department of Orthopaedic Surgery
- The Children’s Hospital of Philadelphia
- Institute for Regenerative Medicine Penn IRM