



**ORS PSRS**  
**4th International Spine  
Research Symposium**  
**October 23–27, 2017**  
Split Rock Resort - Lake Harmony, Pennsylvania



*The presenting author will be standing at their poster during the poster session indicated next to their poster number.*

## **Cell and Molecular Biology & Physiology**

Poster Session 1 - Poster # 1

### **Ca<sup>2+</sup> and PO<sub>4</sub> Regulate Matrix Protein Synthesis in Intervertebral Discs**

Michael Grant, Yazeed Alsarani, Laura Epure, Rakan Bokhari, John Antoniou, Fackson Mwale  
McGill University, Lady Davis Institute for Medical Research

Poster Session 2 - Poster # 2

### **The Role of Indian Hedgehog and Parathyroid Hormone Related Protein in the Intervertebral Disc**

Frances Bach, Kim de Rooij, Joseph Snuggs, Willem de Jong, Ying Zhang, Laura Creemers, Danny Chan,  
Christine Le Maitre, Marianna Tryfonidou  
Utrecht University, Sheffield Hallam University, The University of Hong Kong, University Medical Center Utrecht

Poster Session 1 - Poster # 3

### **Notochordal Cell-derived Extracellular Vesicles Exert Regenerative Effects on Nucleus Pulposus Cells**

Frances Bach, Sten Libregts, Laura Creemers, Björn Meij, Keita Ito, Marca Wauben, Marianna Tryfonidou  
Utrecht University, University Medical Centre Utrecht, University of Technology Eindhoven

Poster Session 2 - Poster # 4

### **Regulation of Wnt Signaling by SHH in Postnatal Mouse Intervertebral Disc**

Raffaella Bonavita, Robert Pinelli, Chitra Dahia  
Hospital for Special Surgery, Weill Cornell Medical College

Poster Session 1 - Poster # 5

### **Primary Cilia do not Play a Role in Osmo-sensing in Nucleus Pulposus Cells**

Hyowon Choi, Irving Shapiro, Makarand Risbud  
Thomas Jefferson University

Poster Session 2 - Poster # 6

### **Notochordal Cell-Rich Nucleus Pulposus Matrix for Intervertebral Disc Regeneration**

Keita Ito, Stefan de Vries, Marina van Doeselaar, Björn Meij, Marianna Tryfonidou  
Eindhoven University of Technology, Utrecht University, University Medical Center Utrecht

Poster Session 1 - Poster # 7

### **New Insights into Tissue and Age-specific Bovine Intervertebral Disc Tissue Markers Revealed by RNA-Sequencing**

Rebekah Decker, Amber Faust  
Genomics Institute of the Novartis Research Foundation

Poster Session 2 - Poster # 8

**Arp2/3 Promotes the Nucleus Pulposus Cellular Response to Osmotic Stress**

Alexandra Doolittle, Irving Shapiro, Makarand Risbud  
Thomas Jefferson University

Poster Session 1 - Poster # 9

**Cytoskeletal Regulation of Nucleus Pulposus Cell Phenotype Through Actin Dynamics and Associated Mechano-Sensing Transcription Factors**

Bailey Fearing, Savannah Est, Luifang Jing, Michael Kelly, Lukas Zebala, Jacob Buchowski, Munish Gupta, Lori Setton  
Washington University in St. Louis

Poster Session 2 - Poster # 10

**Bone Morphogenetic Proteins' Influence On Intervertebral Disc Cells' Nutrient Consumption And Protein Production: Differences in Healthy and Degenerated Cells**

Morgan Giers, Liudmila Bardanova, Evgenii Belykh, Vadim Byvaltsev, Nicolas Theodore, Mark Preul  
Barrow Neurological Institute - St. Joseph's Hospital and Medical Center, Irkutsk Scientific Center of Surgery and Traumatology, Johns Hopkins University

Poster Session 1 - Poster # 11

**The Development of a 2D In Vitro Culture System to Realise the Potential of Human Notochordal Cells**

Matthew Humphreys, Stephen Richardson, Judith Hoyland  
The University of Manchester

Poster Session 2 - Poster # 12

**WITHDRAWN**

Poster Session 1 - Poster # 13

**Characterization of Human Lumbar Intervertebral Disc Glycosaminoglycan Sulfation Patterns using Multiple Reaction Monitoring with Liquid Chromatography-mass Spectrometry**

Divya Krishnamoorthy, X Liu, L Lin, P Xue, Emily Zhang, F Zhang, R Linhardt, James Iatridis  
Icahn School of Medicine at Mount Sinai, Rensselaer Polytechnic Institute

Poster Session 2 - Poster # 14

**The role of O-GlcNAcase (OGA) and O-GlcNAc transferase (OGT) on Hypoxia Inducible Factor 1  $\alpha$  (HIF-1  $\alpha$ ) activity in Nucleus Pulposus (NP) cells**

Vedavathi Madhu, Rouzana Khayat, Makarand Risbud  
Thomas Jefferson University

Poster Session 1 - Poster # 15

**The Intervertebral Disc Possesses an Autonomous Circadian Clock that is Essential for Tissue Homeostasis**

Judith Hoyland, Qing-Jun Meng, Michal Dudek, Nan Yang, Jayalath Ruckshanthi, Ping Wang  
The University of Manchester

Poster Session 2 - Poster # 16

**Novel Role of RNA Binding Protein HuR in Regulation of Matrix Genes in Nucleus Pulposus Cells**

Hehai Pan, Adam Strickland, Irving Shapiro, Makarand Risbud  
Thomas Jefferson University, Sun Yat-sen University

Poster Session 1 - Poster # 17

**Donor-Dependent Effects on the Survival and Extracellular Matrix Producing Capacity of Mesenchymal Stem Cells following Hypoxia and TGF- $\beta$  Conditioning**

Lachlan Smith, Sun Peck, Justin Bendigo, George Dodge, Robert Mauck, Neil Malhotra  
University of Pennsylvania, Philadelphia VA Medical Center

Poster Session 2 - Poster # 18

**Myofibroblast Differentiation in Disc Degeneration: A Possible Contribution of Local and Non-Local Cells**

Victor Leung, Yan Peng, Fengjuan Lv, Tiffany Au, Wai-Kit Tam, Yi Sun, Kathryn Cheah, Kenneth Cheung  
The University of Hong Kong

Poster Session 1 - Poster # 19

**Transient Brachyury Activity Initiates Primitive Streak Mesodermal Cells Differentiation toward a Notochordal Fate**

Dmitriy Sheyn, Shiran Ben-David, Wafu Tawackoli, Zhengwei Zhou, Maxim Bez, Joseph Giaconi, Debiao Li, Dan Gazit, Zulma Gazit  
Regenerative Medicine Institute, Cedar-Sinai Medical Center, Hebrew University

Poster Session 2 - Poster # 20

**HIF-1 $\alpha$ -Carbonic Anhydrase Axis Controls Acid-Base Metabolism in Hypoxic Nucleus Pulposus Cells**

Elizabeth Silagi, Zachary Schoepflin, Erin Seifert, Ernestina Schipani, Irving Shapiro, Makarand Risbud  
Thomas Jefferson University, University of Michigan

Poster Session 1 - Poster # 21

**Expression and Regulation of Aquaporin 1 and 5 in Human Nucleus Pulposus Cells Exposed to Altered Osmolality**

Joseph Snuggs, Neil Chiverton, Ashley Cole, Makarand Risbud, Rowena Bunning, Matthew Conner, Christine Le Maitre  
Sheffield Hallam University, Northern General Hospital, Thomas Jefferson University

Poster Session 2 - Poster # 22

**Micropatterned Islands of Varying Stiffness Differentially Regulate Behaviors of Human Intervertebral Disc Cells**

Julie Speer, Bapi Sarker, Bailey Fearing, Liufang Jing, Munish Gupta, Amit Pathak, Lori Setton  
Washington University in St. Louis

Poster Session 1 - Poster # 23

**Loss of ENT1 Alters Cell Cycle Processes in the Annulus Fibrosus of the Intervertebral Disc**

Matthew Veras, Neil Tenn, James Hammond, S. Jeffrey Dixon, Cheryle Séguin  
University of Western Ontario, University of Alberta

Poster Session 2 - Poster # 24

**Metabolic Effects of Inorganic Polyphosphates on Human Intervertebral Disc Annulus Fibrosus Cells in Vitro**

Xiangjiang Wang, Dong Wang, Qing Dong, Prashanti Patil, Joon Yung Lee, Gwendolyn Sowa, Rahul Gawri, Rita Kandel, Nam Vo  
The Sixth Affiliated Hospital of Guangzhou Medical University, University of Pittsburgh, University of Toronto

Poster Session 1 - Poster # 25

**The Transcriptome of the Human Fetal Notochord: Implications for Intervertebral Disc Regeneration**

Lizzy Ward, Stephen Richardson, Ricardo Rodrigues-Pinto, Matthew Humphreys, Judith Hoyland  
The University of Manchester

Poster Session 2 - Poster # 26

**Elucidating the Role of TGF $\beta$  in Resegmentation and Intervertebral Disc Development**

Sade Williams, Rosa Serra

University of Alabama at Birmingham

Poster Session 1 - Poster # 26A

**Nucleus Pulposus Cells have Epithelial Cell-Like Cytoskeleton and Highly Express N-Cadherin**

Yeji Zhang, Robert Tower, Zuozhen Tian, Youlong Wei, Brian Cosgrove, Robert Mauck, Ling Qin,

Motomi Enomoto-Iwamoto

University of Pennsylvania, University of Maryland

Poster Session 2 - Poster # 26B

**Pathophysiological Role of ADAM8 (A Disintegrin And Metalloproteinase 8) in Intervertebral Disc Degeneration**

Yeji Zhang, Zuozhen Tian, Miersalijiang Yasen, Robert Mauck, Maurizio Pacifici, Motomi Enomoto-Iwamoto

University of Pennsylvania

**Pathobiology and Pain**

Poster Session 1 - Poster # 27

**Facet Joint Cartilage Degeneration in Adolescent Idiopathic Scoliosis**

Daniel Bisson, Polly Lama, Emerson Krock, Fahad Abduljabbar, Derek Rosenzweig, Neil Sarah, Jean Ouellet, Lisbet Haglund

McGill University, Shriners Hospital for Children

Poster Session 2 - Poster # 28

**Senescent Cells in Disc Degeneration**

Hosni Cherif, Daniel Bisson, Sems Kocabas, Lisbet Haglund

McGill University, Shriners Hospital for Children, Université de Montréal

Poster Session 1 - Poster # 29

**TNF- $\alpha$  Promotes Nuclear Enrichment of TonEBP/NFAT5 to Selectively Control Inflammatory but not Osmoregulatory Responses in Nucleus Pulposus Cells**

Alexandra Doolittle, Zariel Johnson, Joseph Snuggs, Irving Shapiro, Christine Le Maitre, Makarand Risbud

Thomas Jefferson University

Poster Session 2 - Poster # 30

**Aging and Cytokines Disrupt Circadian Rhythm in the Intervertebral Disc**

Judith Hoyland, Michal Dudek, Nan Yang, Jayalath Ruckshanthi, Qing-Jun Meng

The University of Manchester, Murdoch Children's Research Institute

Poster Session 1 - Poster # 31

**The Effect of Tungsten in the Intervertebral Discs**

Michael Grant, Alicia Bolt, Laura Epure, Hsiang Chou, John Antoniou, Koren Mann, Fackson Mwale

SMBD-Jewish General Hospital, Lady Davis Institute, McGill University

Poster Session 2 - Poster # 32

**Back Pain and Disc Degeneration are Decreased by Chronic Toll-like Receptor 4 Inhibition in an Animal Model**

Lisbet Haglund, Emerson Krock, Magalie Millecamps, Laura Stone

McGill University, Shriners Hospital for Children

Poster Session 1 - Poster # 33

**Toll-like Receptor2 Activation Induces Human Intervertebral Disc Degeneration**

Lisbet Haglund, Emerson Krock, Derek Rosenzweig, J. Brooke Currie, Daniel Bisson, Jean Oueller  
McGill University, Shriners Hospital for Children

Poster Session 2 - Poster # 34

**Pain & Axonal Damage from Nerve Root Compression are Prevented by Antioxidant Porous Vesicle Treatment**

Sonia Kartha, Christine Weisshaar, Andrew Tsourkas, Zhiliang Cheng, Beth Winkelstein  
University of Pennsylvania

Poster Session 2 - Poster # 35

**Establishment of a plasmid reporter for measuring disc matrix catabolism**

Rebecca Kritschil, Bing Wang, Joon Lee, Gwendolyn Sowa, Nam Vo  
University of Pittsburgh

Poster Session 1 - Poster # 36

**The Expression of Transient Receptor Potential (TRP) Channels in Intervertebral Disc Cells is Regulated by Pro-inflammatory Cytokines**

Olga Krupkova, Takuya Kameda, Joel Zvick, Elena Cambria, Karin Wuertz-Kozak  
ETH Zurich, Fukushima Medical University

Poster Session 1 - Poster # 37

**Molecular and Functional Changes of DRG Neurons in Rats with Puncture-Induced Intervertebral Disc Degeneration**

Elizabeth Leimer, Matthew Gayoso, Liufang Jing, Simon Tang, Munish Gupta, Lori Setton  
Washington University in St. Louis, Duke University, Albany Medical College

Poster Session 2 - Poster # 38

**Anti-inflammatory and Regenerative Drug Therapy for the Treatment of Degenerative Disc Disease: Validation in Organ Culture Model**

Zhen Li, Gernot Lang, Fabian Heizmann, Yishan Liu, Janna Geries, David Kubosch, Norbert Südkamp, Mauro Alini, Sibylle Grad  
AO Research Institute Davos, University Hospital Medical Center Freiburg

Poster Session 1 - Poster # 39

**Characterization of p16ink4a Conditional Null Mice's Intervertebral Disc**

Emanuel Novais, B Diekman, Makarand Risbud  
Thomas Jefferson University, University of Minho, University of North Carolina School of Medicine

Poster Session 2 - Poster # 40

**Hypertrophic Differentiation of Human Cartilage Endplate Cells Promotes Catabolism and Expression of Pain Predictors in Discogenic Back Pain**

Devina Purmessur, Katherine Lakstins, Taylor Yeater, Lauren Arnold, Safdar Khan, William Marras, Judith Hoyland  
The Ohio State University, The University of Manchester

Poster Session 1 - Poster # 41

**Investigating the Role of Pannexin 3 in Intervertebral Disc Health and Disease**

Meaghan Serjeant, Paxton Moon, Silvia Penuela, Dale Laird, Frank Beier, Cheryle Séguin  
University of Western Ontario

Poster Session 2 - Poster # 42

**Redundant Sensitization Mechanisms in the Degenerative IVD to Mechanical Loading at Physiological Strain Levels**

Joshua Stover, Corban Bothell, Jared Zitnay, Brandon Lawrence, Jeffrey Weiss, Robby Bowles  
University of Utah

Poster Session 1 - Poster # 43

**Redundant Nociceptive Thermal Sensitization Mechanisms Present in the Degenerative IVD**

Joshua Stover, Brandon Lawrence, Robby Bowles  
University of Utah

Poster Session 2 - Poster # 44

**OGT/OGA Enzyme System Antagonizes Cytokine-NF- $\kappa$ B Axis to Control Inflammation and Matrix Catabolism in Nucleus Pulposus Cells of the Intervertebral Disc**

Steven Tessier, Carmen Acosta, Irving Shapiro, Makarand Risbud  
Thomas Jefferson University

Poster Session 1 - Poster # 45

**Resistin Promotes CCL4 Expression Through Toll-like Receptor-4 and Activation of the p38-MAPK and NF- $\kappa$ B Signaling Pathways: Implications for Intervertebral Disc Degeneration**

Jianru Wang, Hui Liu, Zemin Li, Zhaomin Zheng  
The First Affiliated Hospital of Sun Yat-sen University

Poster Session 2 - Poster # 46

**Regulation of a Disintegrins and Metalloproteinase with Thrombospondin Motifs 7 During Inflammation in Nucleus Pulposus (NP) Cells: Role of AP-1, Sp1 and NF- $\kappa$ B Signaling**

Wei Ye, Xiaofei Wang, Chunhai Li, Anjing Liang, Yan Peng, Jianchao Sun, Dongsheng Huang, Kang Xu  
Sun Yat-sen Memorial Hospital of Sun Yat-sen University

Poster Session 1 - Poster # 47

**MicroRNA-155 Suppressed the Catabolic Effect Induced by TNF- $\alpha$  and IL-1 $\beta$  by Targeting CCAAT/Enhancer Binding Protein  $\beta$  in Rat Nucleus Pulposus Cells**

Wei Ye, Jie Jhou, Anjing Liang, Jianchao Sun, Xiaofei Wang, Junmin Hong, Kang Xu  
Sun Yat-sen Memorial Hospital of Sun Yat-sen University, Affiliated Cancer Hospital  
& Institute of Guangzhou Medical University

Poster Session 2 - Poster # 48

**TNF-  $\alpha$  Strengthen Endoplasmic Reticulum Apoptosis Pathway Through Promoting CHOP Expression in Nucleus Pulposus Cells: Role of the Mitogen-activated Protein Kinase and NF- $\kappa$ B Pathways**

Zhaomin Zheng, Jianru Wang, Jian Zhjng  
The First Affiliated Hospital of Sun Yat-sen University

Poster Session 1 - Poster # 49

**Melatonin Inhibit Intervertebral Disc Degenerated by Suppressing the NF- $\kappa$ B Signaling Pathway in Nucleus Pulposus Cells**

Zhaomin Zheng, Fan Chen, Jianru Wang  
The First Affiliated Hospital of Sun Yat-sen University

Poster Session 2 - Poster # 50

**Phlpp1 in Cell Proliferation and Apoptosis During IVD Growth and Degeneration**

George Zhou, Elizabeth Bradley, Jennifer Westendorf, James Iatridis, Svenja Illien-Junger  
Icahn School of Medicine at Mount Sinai, Mayo Clinic

Poster Session 1 - Poster # 51

**An Organ Culture Model for Early Onset of Disc Degenerative Disease Induced by One Strike**

Zhiyu Zhou, Mauro Alini, Sibylle Grad, Zhen Li

AO Research Institute Davos, Guangdong Provincial Key Laboratory of Orthopedics and Traumatology

**Biomechanics & Modeling**

Poster Session 2 - Poster # 52

**Age-Related Changes in The Rabbit Thoracic Vertebral Geometry Parameters**

Ausilah Alfraihat, James Peters, John Casey Olson, Brian Snyder, Robert Campbell, Sriram Balasubramanian  
Drexel University, The Childrens Hospital of Philadelphia, Harvard Medical School

Poster Session 1 - Poster # 53

**The Role of L5-S1 Disc Shape in the Progression of Bilateral L5 Spondylolytic Defect to Spondylolisthesis: A Biomechanical Investigation Using Finite Element Analysis**

Ashish Diwan, Vivek Ramakrishna, Luke Viglione, Naomi Tsafinat, Uhar Chamoli  
University of New South Wales, University of Technology Sydney

Poster Session 2 - Poster # 54

**Kinetics of Vancomycin and Cefepime Penetration in Human Intervertebral Discs: A Quantitative Study**

Weiyong Gu, Qiaoqiao Zhu, Xin Gao, Mark Brown  
University of Miami

Poster Session 1 - Poster # 55

**Increasing Severity of Disc Herniation is Associated with Changes in Cellular Biophysical Properties**

Timothy Jacobsen, Hayley Jacobsen, Aysha Khan, Mitchell Levine, Christopher Filippi, Nadeen Chahine  
Columbia University, Feinstein Institute for Medical Research, Lenox Hill Hospital

Poster Session 2 - Poster # 56

**Actomyosin Contractility Mediates Response of the IVD to Inflammatory Stimulation at the Cell and Tissue Levels**

Timothy Jacobsen, Nadeen Chahine  
Columbia University

Poster Session 1 - Poster # 57

**WITHDRAWN**

Poster Session 2 - Poster # 58

**A Magnetic Resonance Imaging Framework for Quantifying Intervertebral Disc Deformation In Vivo: Reliability and Application to Diurnal Variations in Lumbar Disc Shape**

John Martin, Alexander Oldweiler, Charles Spritzer, Brian Sober, Melissa Erickson, Adam Goode, Louis DeFrate  
Duke University Medical Center

Poster Session 1 - Poster # 59

**Changes in Combined Hydrostatic and Osmotic Pressures Promote Anabolic Synthesis in Nucleus Pulposus Cells in vitro**

Shuichi Mizuno, Kaori Kashiwa, James Kang  
Brigham and Women's Hospital and Harvard Medical School

Poster Session 2 - Poster # 60

**Sex-Related Differences in Bone Microstructure Adjacent to the Intervertebral Disc: Correspondence to Spine Fracture**

Elise Morgan, Timothy Jackman, Amira Hussein, Yuanqiao Wu  
Boston University

Poster Session 1 - Poster # 61

**In Vitro Models to Study the Influence of Inflammation And Mechanical Stress on the Translamellar Bridging Network of the Anulus Fibrosus**

Cornelia Neidlinger-Wilke, Taryn Saggese, Lydia Moll, Kelly Wade, Hannah Friedrich, Dimitris Kletsas, Anita Ignatius, Hans-Joachim Wilke  
Institute of Orthopaedic Research and Biomechanics, Ulm University

Poster Session 2 - Poster # 62

**Comparative Analysis of the Destabilizing Effects of Anterior versus Posterior Releases on the Thoracolumbar and Lumbar Spine**

Xiangjiang Wang, Bryan Rynearson, Rahul Ramanathan, Marcus Allen, Nicholas Vaudreuil, Kevin Bell, Patrick Bosch  
University of Pittsburgh

Poster Session 1 - Poster # 63

**Multivariate Thoracic Deformity Model for Predicting Pulmonary Function in Early Onset Scoliosis**

Jennifer Sanville, Hank Mayer, Robert Campbell, Jr., Shiker Nair, Shuait Nair, Ananya Ganesh, Sriram Balasubramaniam  
Drexel University, Children's Hospital of Philadelphia

Poster Session 2 - Poster # 64

**Morphological Adaptations of Individual Lumbar Intervertebral Discs in Humans during Standing**

Christian Weber, Garrett Easson, Simon Tang  
Washington University in St. Louis

Poster Session 1 - Poster # 65

**WITHDRAWN**

**Tissue Engineering and Imaging**

Poster Session 2 - Poster # 66

**Evaluation of Novel Chitosan Scaffolds Encapsulating Intervertebral Disc Cells with Enhanced Mechanical Properties for Nucleus Pulposus Supplementation**

Atma Adoungotchodo, Alinejad Yasaman, Michael Grant, Laura Epure, John Antoniou, Sophie Lerouge, Fackson Mwale  
Centre de recherche du CHUM, École de Technologie Supérieure, McGill University



Poster Session 1 - Poster # 67

**TGF-Beta Promotes Differentiation of MSCs on Biomimetic Electrospun Polycaprolactone Scaffolds**

Bashar Alkhatib, Ga Ban, Swetha Surianarayanan, Susan Bellis, Rosa Serra  
University of Alabama at Birmingham

Poster Session 2 - Poster # 68

**WITHDRAWN**

Poster Session 1 - Poster # 69

**Prestrain Regulates Sensation of Fibrous Microenvironments by Annulus Fibrosus Cells**

Edward Bonnevie, Tonia Tsinman, Sarah Gullgrand, Dawn Elliott, Robert Mauck  
University of Pennsylvania, Philadelphia VA Medical Center, University of Delaware

Poster Session 2 - Poster # 70

**Adipose-Derived Mesenchymal Stem Cell Differentiation in an Injectable Adhesive Composite for Nucleus Pulposus Regeneration**

Thomas Christiani, Andrea Vernengo  
Rowan University

Poster Session 1 - Poster # 71

**High Frequency Magnetic Resonance Elastography of the Spine In-vivo**

Daniel Cortes, Sean Rothenberger, Che-Yun Lin, Gregory Billy, Jesse Bible  
Pennsylvania State University, Milton S. Hershey Medical Center

Poster Session 2 - Poster # 72

**Towards Combining Cell Printing and CRISPR Epigenome Editing for Engineered IVD and Musculoskeletal Tissues**

David Ede, Nikki Davidoff, Jake Weston, Leann Lam, Alejandro Blicht, Robby Bowles  
University of Utah, Carterra Inc.

Poster Session 1 - Poster # 73

**Provision of Latent TGF- $\beta$  Improves Cell Viability in Human-Sized Disc-Like Angle Ply Structures (DAPS)**

Robert Mauck, Dong Hwa Kim, Sarah Gullbrand, Dawn Elliott, Lachlan Smith, Harvey Smith  
University of Pennsylvania

Poster Session 2 - Poster # 74

**In-Hospital 3D Modeling and Virtual Planning in Spinal Fusion Surgery for Complex Pediatric Scoliosis**

Brian Mikolasko, Anya Skae, Corin Kinkhabwala, Yaacov Chein, Evan Garfein, Oren Tepper, Jacob Schultz  
Montefiore Medical Center/Albert Einstein College of Medicine, Ichan School of Medicine at Mount Sinai

Poster Session 1 - Poster # 75

**Establishing Normative Vertebral Deformities using MR Imaging**

Ibukunoluwa Olubowale, Kiara Honma, Alexandra Batzdorf, Sun Kim, Alyssa Johncola, Amanda Jankelovits, Rishika Sharma, Sheenali Patel, Malika Shukurova  
University of Pennsylvania

Poster Session 2 - Poster # 76

**Early Diffusion of Biomimetic Proteoglycans Results in Pericellular Augmentation**

Michele Marcolongo, Evan Phillips, Brett Haislup, Joseph Sincavage, Katsiaryna Prudnikova, Mary Mulcahey  
Drexel University

Poster Session 1 - Poster # 77

**Autologous Nucleus Pulposus Cell-Seeded Hydrogel Delivery to Isolated Human Intervertebral Discs in Dynamic Culture Promotes Tissue Repair**

Derek Rosenzweig, Rayan Fairag, Li Li, Janet Moir, Axel Mathieu, David Eglin, Thomas Steffen, Jean Ouellet, Lisbet Haglund

McGill University, King Abdulaziz University, The Douglas Mental Health Institute, The AO Research Institute Davos, McGill Scoliosis & Spine Research Group

Poster Session 2 - Poster # 78

**Quantifying Active Contraction of Lumbar Spine Muscles using a Novel Shear Wave Elastography Protocol**

Seyedali Sadeghi, Che-Yu Lin, Gregory Billy, Jesse Bible, Daniel Cortes

Pennsylvania State University, The Milton S. Hershey Medical Center

Poster Session 1 - Poster # 79

**Optimization of Hydrostatic Pressure Loading on Nucleus Pulposus Cells using a High-throughput Bioreactor**

Bhranti Shah, Nadeen Chahine

Columbia University

Poster Session 2 - Poster # 80

**Inhibition of Intervertebral Disc Degeneration by Small Molecule in the Mouse Anular Needle-Puncture Model**

Eric Yi Sun, Yan Peng, Mengqi Yu, Kenneth Cheung, Victory Leung

The University of Hong Kong

Poster Session 1 - Poster # 81

**Mesenchymal Stem Cell delivery within a Thermally Triggered Hydrogel Regenerates Nucleus Pulposus Matrix Following Injection into Degenerate Nucleus Pulposus Tissue**

Abbey Thorpe, Louise Vickers, Fiona Charlton, Ashley Cole, Neil Chiverton, Christopher Sammon, Christine Le Maitre

Sheffield Hallam University

Poster Session 2 - Poster # 82

**Automated classification of spinal MRIs as a means of improving clinical usefulness and diagnostic capabilities**

Jill Urban, Amir Jamaludin, Timor Kadir, Andrew Zissermann, Jeremy Fairbank

Oxford University

Poster Session 1 - Poster # 83

**3D Printing of Biomimetic Framework for Annulus Fibrosus Regeneration**

Andrea Vernengo

Rowan University

Poster Session 2 - Poster # 84

**Thermally Triggered Hydrogel Inhibits Catabolic Response on Mesenchymal Stem Cells and Promotes Nucleus Pulposus Phenotype.**

Abbey Thorpe, Louise Vickers, Christopher Sammon, Christine Le Maitre

Sheffield Hallam University

## **Preclinical Animal Models and Clinical**

Poster Session 1 - Poster # 85

### **The Regenerative Effects In Vitro and In Vivo Of Notochordal Cell Matrix on Canine and Human Nucleus Pulposus Cells**

Frances Bach, Martijn Beukers, A. Tellegen, Stefan de Vries, Laura Creemers, Karin Benz, Keita Ito, Björn Meij, Marianna Tryfonidou  
Utrecht University

Poster Session 2 - Poster # 86

### **Tomographic and Histological Analysis of Ectopic Calcification in Diffuse Idiopathic Skeletal Hyperostosis (DISH)**

Dale Fournier, Ryan Beach, Christopher Bailey, Katherine Willmore, Chris Norley, David Holdsworth, Jeffrey Dixon, Cheryle Séguin  
Bone and Joint Institute, The University of Western Ontario

Poster Session 1 - Poster # 87

### **Inflammation Ain't All Bad: Insights from Human Tumor Necrosis Factor- $\alpha$ Over-expression in Mice**

Deborah Gorth, Irving Shapiro, Makarand Risbud  
Thomas Jefferson University

Poster Session 2 - Poster # 88

### **PrimeGrowth™ IVD Cell Medium: A Novel Optimized Medium for Culturing Intervertebral Disc Cells**

Michael Grant, Laura Epure, Yazeed Alsaram, John Antoniou, Fackson Mwale  
SMBD-Jewish General Hospital, Lady Davis Institute for Medical Research, McGill University

Poster Session 1 - Poster # 89

### **Development of Disc-Like Angle Ply Structures for Total Disc Replacement at Clinically Relevant Size Scales**

Sarah Gullbrand, Dong Hwa Kim, Beth Ashinsky, Dawn Elliott, Lachlan Smith, Robert Mauck, Harvey Smith  
University of Pennsylvania, Philadelphia VA Medical Center, University of Delaware

Poster Session 2 - Poster # 90

### **The Effect of Remobilization on the In Vivo Maturation and Integration of an Endplate-Modified Engineered Disc**

Sarah Gullbrand, Dong Hwa Kim, Beth Ashinsky, Lachlan Smith, Dawn Elliott, Harvey Smith, Robert Mauck  
University of Pennsylvania, Philadelphia VA Medical Center, University of Delaware

Poster Session 1 - Poster # 91

### **HMGB1: The First Biomarker of Intervertebral Disc Herniation Severity in Patients**

Hayley Jacobsen, Aysha Khan, Christopher Filipi, Timothy Walden, Mitchel Levine, Nadeen Chahine  
Feinstein Institute for Medical Research, Hofstra Northwell School of Medicine, Columbia University

Poster Session 2 - Poster # 92

### **The Local Cytokine and Growth Factor Response to rhBMP-2 after Spinal Fusion**

Dessislava Markova, John Koerner, Gregory Schroeder, Anuj Shah, Brian Calio, Corbin Brooks, Alexander Vaccaro, D. Anderson, Chris Kepler  
Hackensack University Medical Center, Thomas Jefferson University, Indiana University

Poster Session 1 - Poster # 93

**Surface Chemistry of a Silicon Nitride Bioceramic Enhances Spinal Fusion: A Case Study**

Bryan McEntire, Giuseppe Pezzotti, Naoki Oba, Wenliang Zhu, Elia Marin, Alfredo Rondinella, Francesco Boschetto, Kengo Yamamoto, B. Sonny Bal

Kyoto Institute of Technology, Tokyo Medical University, Kyoto Prefectural University of Medicine, Osaka University, Amedica Corporation, University of Missouri

Poster Session 2 - Poster # 94

**Conditional Targeting of Shh Accelerates Intervertebral Disc Aging and Degeneration**

Chitra Dahia, Sarthak Mohanty

Hospital for Special Surgery, Weill Cornell Medical College

Poster Session 1 - Poster # 95

**WITHDRAWN**

Poster Session 2 - Poster # 96

**Short Link N Promotes Repair of Disc Degeneration, but More May not be Better**

Peter Roughley, Koichi Masuda, Michael Grant, Laura Epure, John Antoniou, Fackson Mwale

Shriners Hospital for Children, McGill University

Poster Session 1 - Poster # 97

**Evaluation of Intervertebral Disc-Derived Progenitor Cells Implanted into Subcutaneous Pouches of Athymic Mice**

Lara Silverman, Galina Dulatova, Terry Tandeski, Isaac Erickson, Kevin Foley

DiscGenics, Inc., University of Tennessee, Semmes-Murphey Neurologic Clinic

Poster Session 2 - Poster # 98

**Conditional Knockout of Sonic Hedgehog in the Nucleus Pulposus Leads to Back Pain in Adult Mice**

Kathleen Vincent, Robert Pinelli, Chitra Dahia

Hospital for Special Surgery, Weill Cornell Medical College