Fall 2020

Musculoskeletal Messenger

University of Pennsylvania Penn Center for Musculoskeletal Disorders

Inside this issue:

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for
Musculoskeletal Disorders
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If you have any news or information that you would like included in the next issue of this newsletter, please email us at:

pcmd@pennmedicine.upenn.edu

Remember to include reference to support from the Center in your abstracts and publications.

Cite Grant NIH/NIAMS P30AR069619 from the National Institute Of Arthritis And Musculoskeletal And Skin Diseases of the NIH.

Looking Forward to the 2020 PCMD Annual Scientific Symposium (Virtual) November 18, 2020—Registration Now OPEN

Preparations are underway for the 17th Annual Penn Center for Musculoskeletal Disorders Scientific Symposium on November 18, 2020. In these unprecedented times, this year's symposium will be held ***virtually.*** Information for symposium login is included in registration confirmation.

The day will begin at 9am with scientific presentations from new and Affiliate Center members, as well as recent PCMD Pilot Grant recipients.

The symposium will also feature a virtual poster session and opportunities for virtual interactions.

This year 's keynote speaker will be Richard Lieber, Ph.D., Chief Scientific Officer & Senior VP at the Shirley Ryan Ability Lab.

Registration is free but is required.

Registration is now open. To register please visit https://www.med.upenn.edu/pcmd/2020-registration-form.html

PCMD and the COVID-19 Pandemic!

In these challenging times with the COVID-19 pandemic, please note that the PCMD is now available for most in-person core services (both self– and full-service), as well as remote training. All our educational programs are ongoing and are being held virtually. If you have any questions, concerns, or requests, please contact us at pcmd@pennmedicine.upenn.edu or visit our website https://www.med.upenn.edu/pcmd/.

From the PCMD family, stay safe and we wish you and your family well!

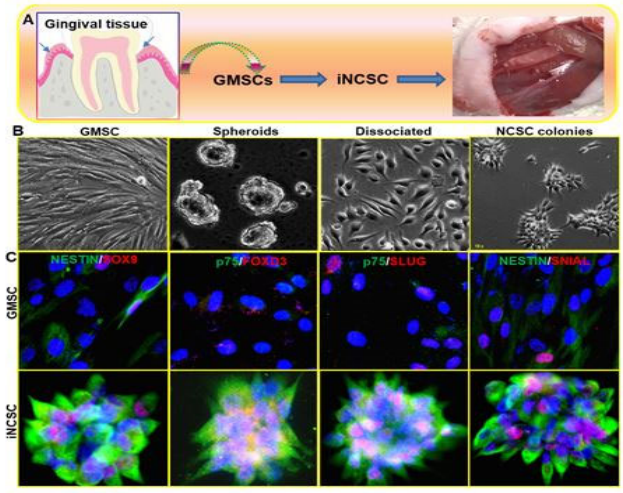
Research Update from PCMD Members

Qunzhou Zhang, PhD, University of Pennsylvania

Neural Crest Stem-like Cells Derived from Human GMSCs Facilitate Facial Nerve Regeneration in Rats

Fully functional recovery of severe peripheral nerve injuries (PNI) is one of the major clinical challenges. Nerve autografts remain the gold standard for reconstruction of PNIs with a large gap, but the limited availability and severe donor site morbidities have significantly impeded their clinic application. Recently, there has been growing enthusiasm to develop functional nerve guidance conduits (NGC) laden with living cells as alternatives to nerve autografts. Our laboratory pioneered in isolation and characterization of unique subpopulation of mesenchymal stromal cells from human gingiva tissues (GMSCs) and recently discovered that GMSCs could be directly reprogrammed into a neural crest stem-like cells (NCSCs) through nongenetic approaches without reprogramming to the pluripotent state. Compared to parental GMSCs, induced NCSC population had increased expression in NCSC-related genes and displayed robust differentiation into neuronal and Schwann-like cells. Using a facial nerve defect model in rats, we found that implantation of NCSC-laden nerve conduits exhibited enhanced beneficial effects on functional regeneration of the injured nerve as compared to parental GMSCs (Zhang Q et al. Mol Neurobiol 2018). These promising findings demonstrate that induced NCSCs derived from GMSCs represent an easily accessible and promising source of neural crest stem-like cells for repair/regeneration of peripheral nerve injuries with a large gap.

Zhang Q, Nguyen PD, Shi S, Burrell JC, Xu Q, Cullen KD, Le AD



GMSC-derived neural crest stem-like cells promote facial nerve regeneration in rats. ***A,*** implantation of collagen nerve guidance conduits laden with iNCSCs to bridge the gap defect of rat facial nerves. ***B,*** GMSCs were directly reprogrammed into NCSCs via non-genetical approaches. ***C,*** enhanced expression of neural crest-related genes in GMSC-derived NCSCs (*Zhang Q et al. Mol Neurobiol 2018).*

Hannah Dailey, PhD, Lehigh University

Virtual Mechanical Testing Holds Promise for In Vivo Fracture Healing Assessment

As a computational biomechanics group, our focus is on orthopaedic trauma, including bone fracture, the mechanics of bone healing and nonunion, and mechanoregulation models of fracture repair. One of our exciting long-term projects is translational application of image-based finite element analysis (FEA) for in vivo assessment of fracture healing. The goal is to develop reliable, non-invasive virtual mechanical tests that can quantitatively measure structural bone healing. For this work, we have been fortunate to partner with the large-animal research team in the Musculoskeletal Research Unit (MSRU) at University of Zürich. In our recent publication in Journal of Orthopaedic Research, we developed a material assignment law for ovine cortical bone and showed that virtual mechanical tests (see Figure) are superior to morphometric and radiographic measures of bone healing. This work was led by PhD student Peter Schwarzenberg who spent six months at MSRU on a Graduate International Research Experience (GIRE) Fellowship funded by NSF and the Institute for International Education (IIE). Follow our updates on Twitter @DaileyOrthoLab.

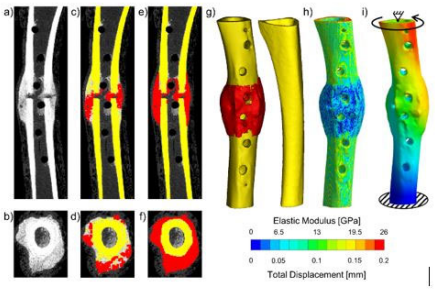


Figure Description – Workflow for virtual mechanical testing of ovine fracture healing: a-b) Coronal and axial slice views of raw CT image without masks applied. c-d) Coronal and axial slice views with density thresholds of 400-2500 HU for callus and 2500-4000 HU for bone. e-f) Coronal and axial slice views after contour-based segmentation. g) 3D surface models of operated and intact limbs. h) Contour plot of elementwise elastic modulus in the finite element model. i) Simulated torsion test with displacement contours.

In the News!

Orthopaedic Surgery New Faculty Recruited

Ernestina Schipani, MD, PhD will be joining as a new faculty member within the Department of Orthopaedic Surgery in November 2020. Dr. Schipani will serve as the inaugural William Wikoff Smith Professor of Orthopaedic Surgery. Her office and lab space will be within the McKay Orthopaedic Research Laboratory on the 3rd floor of Stemmler Hall.

Dr. Schipani earned her MD and PhD at St. Anna School of Advanced Studies-University of Pisa, Italy, then did her postdoctoral studies at MGH-Harvard Medical School, where she rose through the ranks and became Associate Professor. Dr. Schipani was recruited to Indiana University-Medical School as a Full Professor and then to the University of Michigan.

Dr. Schipani has a long-standing interest in the study of skeletal development. Early in her career, Dr. Schipani discovered that gain-of-function mutations of PTHR1 cause Jansen disease. Next, she pioneered the notion that hypoxia-driven pathways control skeletal development. Her laboratory has established novel principles in the broader fields of G-protein coupled receptors and hypoxia biology. She currently studies the role of hypoxia-driven pathways, mitochondria, and reprogramming of metabolism in skeletal development, homeostasis, and disease. Dr. Schipani has received numerous national and international recognitions. She is an ASCI member since 2005. She is the recipient of many awards and honors, including in 2019, the prestigious ASBMR Paula Stern Achievement Award.

Please join us in welcoming Dr. Schipani to Orthopaedic Surgery and the Perelman School of Medicine!

PCMD Histology Core - virtual equipment training now available

The PCMD Histology Core is now pleased to offer virtual training for self-service users. Specifically, virtual training is available for:

Paraffin Microtome – Basic Operation and Safety
Cryostat Microtome – Basic Operation and Safety
Cryofilm Sectioning

If you are interested in receiving training, please email the Core Technical Director, Dr Waixing Tang (waixing@pennmedicine.upenn.edu). He will email you a link to the training video. After watching the video, email Dr Tang to arrange a phone call to review key training aspects, including safety.

He will then provide you with calendar access so you can sign up and use the equipment. Note that standard training fees still apply. Users must continue to adhere to COVID-safe work guidelines as outlined on the core website:

https://www.med.upenn.edu/pcmd/histologymain.html

PCMD FUNDS AVAILABLE: Summary Statement Driven Funding Request

If you have a recent summary statement from an NIH grant (eligible NIH mechanisms include all "R" grants such as R03, R21 and R01 and "K" grants such as K01, K08 on their first submission—please inquire regarding eligibility of other proposal mechanisms) which requires you to run additional experiments, gather additional data, provide feasibility for an approach, or similar, we can provide small funds ($1,000-$15,000) with a very short turn-around time in order to allow you to complete these experiments and resubmit your proposal with the best chance of success. Requests for funding will be evaluated on a rolling basis and priority will be given to Assistant Professors with encouraging initial review priority scores better than ~30-35%. The format of the "Summary Statement Driven Funding Request", which is limited to **one page**, is as follows:

- Name of PI (must be a PCMD full member)
- Title of Project Request
- Specific Purpose of Request with Stated Outcome/Goal Referring Explicitly to the Summary Statement for Justification
- Research Design and Methods
- Budget with Brief Justification

Funding through this mechanism is available by submitting the one page proposal to pcmd@pennmedicine.upenn.edu

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PCMD Visiting Professorship Series

Tuesday, October 20, 2020, 1:30pm – 2:30pm, Virtual
Gauging Tendon Mechanics by Observing Tissue Dynamics.
Darryl Thelen, Ph.D., Professor, Mechanical and Biomedical Engineering; Affiliate Professor: Orthopedics and Rehabilitation, University of Wisconsin-Madison

Wednesday, November 18, 2020,
Annual Scientific Symposium Presented Virtual
900am-12:00pm; Keynote Speaker:
Richard Lieber, Ph.D., Chief Scientific Officer & Senior VP at the Shirley Ryan Ability Lab

Tuesday, December 10, 2020, 1:30-2:30pm, Virtual
Osteoarthritis: Thinking Beyond the Cartilage.
Kyle Allen, PhD, Associate Professor, Associate Chair for UG Studies, ABET Coordinator
J. Crayton Pruitt Family, Biomedical Engineering, University of Florida

Tuesday, January 12, 2021, 1:30pm – 2:30pm, Virtual
Biomanufacturing, Biomaterials and Biomechanics for Improved Treatment of Volumetric Muscle Loss Injuries.
George Christ, PhD, Professor of Biomedical Engineering and Orthopaedic Surgery; Mary Muilenburg Stamp Professor of Orthopaedic Research; Director of Basic and Translational Research in Orthopaedic Surgery; University of Virginia

Tuesday, February 23, 2021, 1:30pm – 2:30pm, Virtual
TBD
Matthew R. Allen, Ph.D., Assistant Dean for Faculty Affairs and Professional Development and Professor of Anatomy, Cell Biology & Physiology, Indiana University

Tuesday, March 16, 2021, 1:30pm – 2:30pm, Virtual
Mechanisms of Human Tendon Plasticity: Links from Molecules to Cells to Athletes to Patients.
Dr. Jess Gerrit Snedeker, Professor of Orthopaedic Biomechanics, Balgrist Campus, University of Zurich and ETH Zurich

Tuesday, April 13, 2021, 1:30pm – 2:30pm, Virtual
Targeting the Gut to Prevent Osteoporosis.
Laura McCabe, Ph.D., MSU Foundation Professor, Department of Physiology, Department of Radiology

Tuesday, May, 2021, 1:30pm – 2:30pm, Virtual
TBD

Tuesday, June, 2021, 1:30pm – 2:30pm, Virtual
TBD