POIWG #40: CASIS OVERVIEW

April Spinale

July 26-28, 2016

SUMMARY

Overview Topics:

- Cardiac Stem Cells
- Lung Cells
- Chips in Space
- Commercial Protein Crystal Growth Program
- Synthetic Bone
- National Science Foundation Program
- National Design Challenge-3

CARDIAC STEM CELLS

Summary

- PI: Robert Schwartz, Texas Medical Center and University of Houston
- Implementation Partner: Techshot
- Experiment: Conversion of Adipogenic Mesenchymal Stem Cells into Mature Cardiac Myocytes
- Hardware: Advanced Space Experiment Processor (ADSEP)
- Flight: SpX-12

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CARDIAC STEM CELLS

Hardware

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LUNG CELLS

Overview

- PI: Dr. Jason Sakamoto, Ocularix, LLC
- Implementation Partner: BioServe Space Technologies
- Experiment: The effect of microgravity on stem cell mediated recellularization
- Will study the effects of microgravity and radiation on mesenchymal stem cells grown on a novel scaffold of human acellularized lung tissue
- Knowledge provided by this study will develop a stem cell mediated regeneration capability for human acellular lungs to engineer a functional new organ
- Target Increment: 51/52

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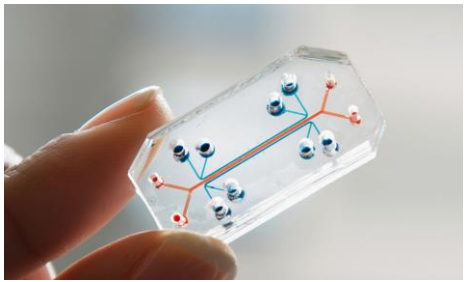
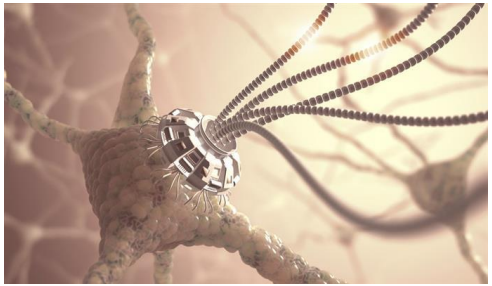
CHIPS IN SPACE

Summary

- 3D Microphysiological Systems for Organs-On-Chips Grand Challenge
- Winners announced in June 2016
- 3D Microphysiological Systems, aka Organs-on-Chips, consist of cells grown on an artificial structure that acts as a scaffold for cells to grow on and build tissue
- Goal is to understand whole organ responses to drug exposure or disease onset and progression





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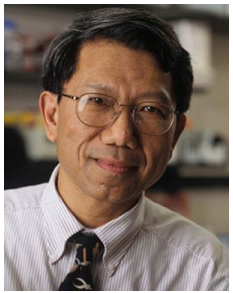
CHIPS IN SPACE

Awardee #1

- PI: Dr. Rocky Tuan, University of Pittsburgh
- Experiment: "A Microphysiological 3D Organotypic Culture System for Studying Degradation and Repair of Composite Skeletal Tissues in Microgravity Environment"
- Will test potential therapies related to osteoporosis and other musculoskeletal disorders
- 3D Microphysiological System induces bone loss, to confirm the protective role of bisphosphonates for protection during long-term microgravity exposure



CHIPS IN SPACE

Awardee #2

- PI: Dr. Siobhan Malany, Micro-gRx
- Experiment: "Development and Validation of a Microfluidic Lab-on-a-Chip to Track Growth and Biomarker Expression in Human Skeletal Muscle Cells"
- Implementation Partner: Space Tango
- Will test potential therapies related to muscle atrophy
- Seeks to advance microfluidic technologies that better mimic the body's cells and tissues to provide more accurate models for preclinical efficacy and safety screening
- May result in providing novel therapeutics

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micro-gRx

COMMERCIAL PCG PROGRAM

Overview

- RFI/RFP to be released in the next few months
- Goal is to stimulate commercial demand to satisfy a broad spectrum of user's highest priorities/not single missions for single PIs
- Reduce complexity of hardware and customer interfaces through limited, well understood and existing program options


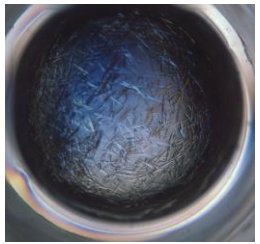
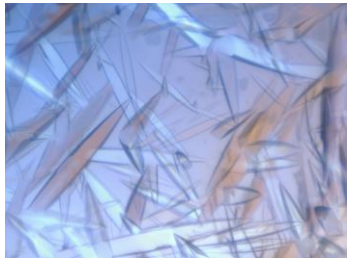

Photo Credit: Paul Reichert, Merck

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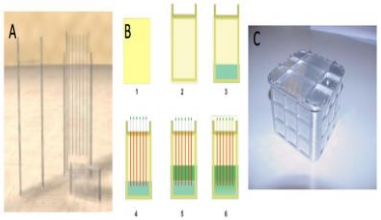
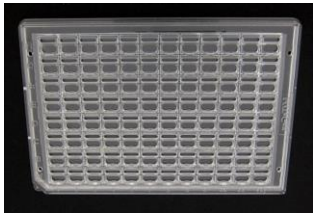
COMMERCIAL PCG PROGRAM

Initial Hardware Options

- Initial plan is to feature a limited number of flight hardware options (HDPCG, PCF, GCB, COTS multiwell plates)





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COMMERCIAL PCG PROGRAM

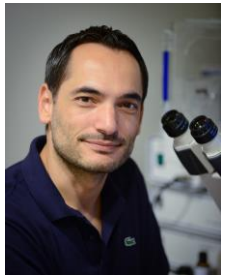
Future Plans

- Broaden flight hardware options
- Promote iterations with multiple flight commitments; lowers costs
- Expect all to have late load and cold stowage requirements; will target every SpaceX flight
- Share non-proprietary results and build on best practices

SYNTHETIC BONE

Summary

- PI: Dr. Nikolaos Tapinos, LaunchPad Medical
- Experiment: Assessing Osteoblast Response to Tetranite™
- Implementation Partner: BioServe Space Technologies
- Tetranite™ is a synthetic bone material capable of adhering bone to metal within minutes, to accelerate bone repair
- Will assess Tetranite™ to provide insight into the post-fracture bone healing response and assist in the development of more effective treatments for patients with osteoporosis
- Target Increment: 51/52



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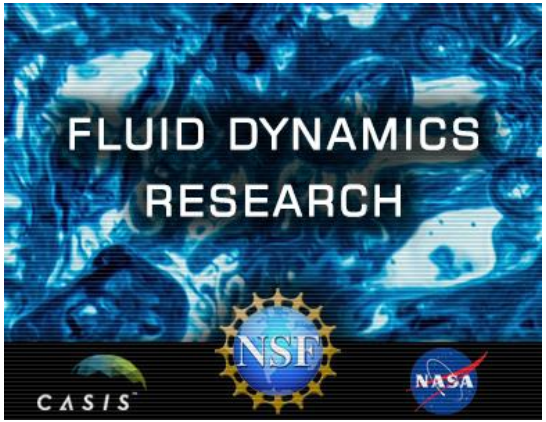
launchPad Medical LLC

NATIONAL SCIENCE FOUNDATION PROGRAM

- Fluid Dynamics Research on ISS to Benefit Life on Earth
- Partnership between the NSF Division of Chemical, Bioengineering and Environmental Transport and CASIS
- Research areas associated with fluid phenomena include multiphase flow, capillary flow, diffusion and biological and physiological transport
- Closed January 2016



NATIONAL DESIGN CHALLENGE-3

Awardee #1

- Leader: Norm McFarland
- Seek to determine the effect that microgravity has on the rate of mutation in *E. coli* bacteria
- Implementation Partner: NanoRacks
- Target Flight: SpX-11

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NATIONAL DESIGN CHALLENGE-3

Awardee #2

- Leader: Sandra Rogers
- Seek to understand, build and utilize the Fluorescence Spectrometer and to complete structural determination of the Alzheimer's beta-amyloid peptide
- Implementation Partner: NanoRacks
- Target Flight: SpX-11

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MORE INFORMATION

- CASIS resources: http://iss-casis.org/
  http://www.spacestationresearch.com/

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