Rodent Research on the International Space Station
A Look Forward

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Agenda

• Rodent Research-1 update
• Upcoming Rodent Research flights
• New Capabilities
Rodent Research-1

• Launched on SpX-4 early in the morning of Sunday Sept 21, 2014 after a 24 hour scrub due to Florida weather!
• 2 day transit to the International Space Station with docking on Tuesday, Sept 23
• Animals were transferred from the Transporter to the two Rodent Research Habitats on Thursday, Sept 25
• All 20 animals were healthy and very active
• Twice daily video health checks performed and all animals continued to appear healthy and active throughout the mission
Rodent Research-1

• CASIS dissections/tissue transfer activities were completed on Oct 12 – 14
  – 21 days after launch
  – 10 hindlimbs fixed in formalin and transferred to Ethanol after 24 hours
  – Liver quick frozen from 5 animals
  – Spleen from 5 animals fixed in RNALater stored at 4°C then transferred to -80°C
  – All 10 carcasses were frozen at -80°C
• All samples were returned on SpX-4 which undocked on Oct 21
• NASA dissections were completed on Oct 24
  – 30 days after transfer to the Habitat
  – Liver and spleen from 2 animals
  – 8 intact carcasses frozen for body weight analysis
  – Samples will be returned on SpX-5 in January 2015
Rodent Research-1

- Mission Integration and Operations (MI&O) Team supported all on orbit operations from the Ames Research Center (ARC) International Space Station Science Operations Center (ISOC)
  - Privatized voice loops and video of activities
  - Realtime feedback to/from crew with ARC MI&O team
  - CASIS representative in ISOC to support CASIS operations
Rodent Research-1
Summary

• Successfully launched and delivered 20 healthy animals to the ISS
• Successfully maintained 10 animals in a Habitat for 30 days
  – Video health checks for 30 days indicated all animals appeared healthy and active
  – Final results pending analysis of samples after return on SpX-5
• Successfully completed on-orbit dissections
  – Simple – hindlimb
  – Complex – Liver and spleen
• Successfully conducted Tissue preservation – Rapid freeze (liver), Formalin (hindlimb), RNALater (spleen)
  – No major operational issues identified
  – Pending analysis of samples after return on SpX-4 and SpX-5 to determine scientific viability of the tissues
Rodent Research-1
Summary

• Collected timeline data on all operations to be used to develop timelines for future operations
  – Stowage gather activities take more time than originally planned
    • Transfer day had over 80 line items of stowage the crew needed to gather to complete the activities
  – Hardware configuration activities take more time than estimated
  – Training for the animal activities was “spot on”
  – Learning curve was incredible
    • Crew got faster between animals and from Day 1 to Day 2

11/4/13
Rodent Research-1
Summary
Overview of Upcoming Rodent Research on ISS

• NASA’s Rodent Research program traffic model is 2 flights per year on even numbered SpaceX flights
  – Flights will support up to 40 mice for up to 90 days
  – Resources will be shared between NASA sponsored investigators and investigators from the Center for the Advancement of Science in Space (CASIS)
Overview of Upcoming Rodent Research on ISS

- Rodent Research-2 will be the first NASA rodent mission on the ISS with a focus on science
  - Manifested for launch on SpX-6 (NET February 4, 2015)
  - 40 mice for up to 60 days
    - 20 mice assigned to support two NASA science investigations selected through the 2012 NASA Research Announcement (NRA), Research Opportunities in Space Biology
      - Investigations on antibody responses and affects on the blood brain barrier
      - Biospecimen sharing
        » Genelab
        » Additional Biospecimen Sharing investigators to be selected
    - 20 mice assigned to CASIS
Overview of Upcoming Rodent Research on ISS

- Rodent Research-3
  - Manifested for launch on SpX-8 (NET September 2, 2015)
  - 40 mice for up to 42 days
    - 20 mice assigned to support one NASA science investigations selected through the 2012 NASA Research Announcement (NRA), Research Opportunities in Space Biology
      - Investigations on antibody responses and affects on the blood brain barrier
      - Biospecimen Sharing
        » Genelab
        » Additional Biospecimen Sharing investigators to be selected
    - 20 mice assigned to CASIS
      - Requesting SCID mice
Overview of Upcoming Rodent Research on ISS

- Rodent Research-4
  - Manifested for launch on SpX-10 (NET February 9, 2016)
  - 40 mice
    - 20 mice assigned to support one NASA science investigations selected through the 2012 NASA Research Announcement (NRA), Research Opportunities in Space Biology
      - Investigations on antibody responses and affects on the blood brain barrier
      - Additional Biospecimen Sharing investigators to be selected
    - 20 mice assigned to CASIS
      - Requesting male mice
New Capabilities Developed to support Rodent Research

- Bone Densitometry
- Cardiac Puncture and blood collection
  - Centrifugation for blood separation
- Soft tissue fixation and fluid transfer
- RFID chip reader
- On-orbit water refill

11/4/13
New Capabilities Under Development to support Rodent Research

• Anesthesia Recovery system
• Grip strength measurement
• Second glovebox to support Life Sciences Research
Operational Updates for Rodent Research

- Foodbar changeout approximately every 14 days
- Water refill approximately every 30 days
- Habitat now certified for up to 90 days