Answers to questions received in Questionnaire from Dr. Sharmila Bhattacharya

Uploaded May 18, 2021

1. Have you overseen any experiments with Neoterics (Sturgeon, 1945) ?

In "Microcomsic God", this piece of fiction describes "Neoterics", but no such technology currently exists. NASA does, however, have a space synthetic biology research area that is developing technologies to biomanufacture valuable products on-demand such as vitamins and medicines
(see https://www.nasa.gov/directorates/spacetech/game_changing_development/projects/SynBio for more details)

2. Are 3D models being used for space biology? Do you think there will be opportunities for people with expertise in these models to do space related research?

To see the research that NASA is currently sponsoring or has sponsored in this area, please consult the NASA Taskbook, a searchable database that contains summaries of all the projects funded by the NASA Biological and Physical Sciences and Human Research Programs since 2004 at https://taskbook.nasaprs.com/tbp/welcome.cfm

The National Center for Advancing Translational Sciences (NCATS), part of the National Institutes of Health, funded "Tissue Chips in Space" in partnership with the International Space Station National Laboratory to understand how tissue chips could perform in a spaceflight environment and what type of science could be accomplished using these advanced 3D platforms. This effort has successfully launched and funded nine investigations on various 3D tissues/organs (see https://ncats.nih.gov/tissuechip/projects/space for more information). NASA believes 3D tissues and MPS will play a significant role in space related research in the future.

3. Regarding the CAL(Cold Atom Laboratory), how is food being preserved on long time mission (Lunar missions or ISS long time stay) and how ca I reach out to NASA members working on that project?

Cold Atom Laboratory is a part of Physical Sciences, and is not related to food storage, but rather how to use the spaceflight environment to observe quantum phenomena that would otherwise be undetectable from Earth.

Regarding Food Storage, NASA is working on developing methods for food storage and food generation amenable for long duration spaceflight/lunar missions. Currently, food for astronauts is resupplied from Earth to the ISS at regular intervals. NASA has test facilities on the International Space Station to grow plants and vegetables that may one day become part of extended missions on the lunar surface or a Mars transit
mission. https://www.nasa.gov/sites/default/files/atoms/files/veggie_fact_sheet_508.pdf Rese

arch related to plants and seeds can be found at: https://taskbook.nasaprs.com/tbp/welcome.cfm

In partnership with the Canadian Space Agency (CSA), NASA and CSA have issued a Deep Space Food Challenge (https://www.deepspacefoodchallenge.org/). The Deep Space Food Challenge is an **international competition** where NASA offers prize purse awards to U.S. teams and **recognition to international teams**. Teams are invited to create novel and game-changing food technologies or systems that require minimal inputs and maximize safe, nutritious, and palatable food outputs for long-duration space missions, and which have potential to benefit people on Earth. **Registration closes MAY 28, 2021.**

4. Have scientists done psychometrics test of executive functions or IQ of astronauts, during their longer stays on international space station?

NASA has funded numerous projects to assess an astronaut's mental health, executive functions and fine motor skills during spaceflight. NASA also performs numerous studies that involve isolation that could have an impact on crew dynamics, social interaction, long term mental health. Some of these analog facilities include HERA (Human Exploration Research Analog) that is located at NASA Johnson Space Center, winter overs in the Antarctic and the HI-SEAS: Hawai'i Space Exploration Analog and Simulation. (see https://humanresearchroadmap.nasa.gov/Evidence/other/Central%20Nervous%20System,%20Behavioral%20Health,%20and%20Sensorimotor%20(CBS)%20Integrated%20Research%20Plan%20Problem%20Statement.pdf for more details)

To find out more about the work that the NASA Human Research Program is doing and has done in this in this research area, please visit the Human Factors and Behavioral Performance (HFBP) Element's webpage at https://www.nasa.gov/hrp/elements/hfbp. Also, please consult the NASA Taskbook, a searchable database that contains summaries of all the projects funded by the NASA Biological and Physical Sciences and Human Research Programs since 2004, at https://taskbook.nasaprs.com/tbp/welcome.cfm

5. Is there a center or laboratory working on nanomaterials-based therapy against the brain damage in microgravity? Are there any changes in synapsis under microgravity?

Animal studies performed using the NASA Space Radiation Laboratory have identified synaptic changes due to simulated space radiation exposure and rodent investigations have reported alterations to synaptic densities in a microgravity environment. NASA conducts research to understand the risks and health impacts to astronauts during spaceflight and therapeutics will be evaluated as needed. Please consult the NASA Taskbook, a searchable database that contains summaries of all the projects funded by the NASA Biological and Physical Sciences and Human Research Programs since 2004 at https://taskbook.nasaprs.com/tbp/welcome.cfm, to see the research that NASA has sponsored in this area.

6. Are there any applications that astronauts are using today that came from experiments on animals on ISS?

NASA has learned a great deal from animal experiments on the ISS related to bone loss and muscle atrophy that has informed NASA on therapeutic interventions for astronauts such as exercise and bisphosphonates. Medical researchers on Earth have also learned a great deal from spaceflight research and ways to address human disease that leads to bone loss like osteoporosis or muscle atrophy from sedentary lifestyles. Please visit the NASA Human Research Program's webpage at https://www.nasa.gov/hrp to find out how the program uses research findings to develop procedures to lessen the effects of the space environment on the health and performance of humans working in that setting.

-End-