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Life and Microgravity Sciences on board ISS and beyond (Part II) (7)

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REMOTE CONTROLLED MINIATURIZED LAB PLATFORM FOR SPACE RESEARCH

Abstract

The microgravity conditions of space offer a unique environment to perform drug research with the potential to lead to new therapeutic products. Microgravity provides an opportunity for experimentation in the absence of thermally-induced convection, no sedimentation/stratification, no hydrostatic pressure, and reduced contact with vessel walls. The potential scientific, technological and commercial benefits of microgravity research to humankind are substantial, especially in the drug discovery sector and will revolutionize traditional Earth-bound processing methods. Under conditions of microgravity, symptoms develop more rapidly and therefore solutions can be accelerated. Today access to microgravity research is carried out in International Space Station and performed by astronauts who are extremely busy with their daily tasks and can dedicate limited time to research activities. SpacePharma approach is to provide a complimentary microgravity lab platform that does not require human intervention and operates independently through a remote-controlled nanosatellite. SpacePharma has developed sophisticated end-to-end miniaturized lab systems provided with sensors and readers capable of working in different microgravity platforms, ground simulators, parabolic flights, and nano-satellites. All experiments are remotely controlled and commanded from ground by the users using SpacePharma's scientist front-end proprietary software installed in a laptop or smartphone. Scientists can see the results using miniature readers like light microscope or spectrometer incorporated close to the reaction chamber. Customized lab-on-chips microfluidics-based fluid handling system generating microdroplets are used to perform colloidal chemistry or biological experiments increasing significantly the magnitude of microgravity research. The capabilities of SpacePharma's Mgnify CubeSat Lab Platform to perform chemical reactions and biological processes in space were demonstrated successfully on February 2017 during SpacePharma first launch to space from India through the ISRO PSLV-C37 rocket which carried SpacePharma's DIDO-2 nanosatellite. In this first mission formation of crystals, enzymatic reaction and self-assembling of macromolecules were tested in orbit. On November 2017 SpacePharma launched its second successful Nexus Lab on board of Orbital ATK's Antares rocket from Wallops (VA) to the ISS in collaboration with STaARS Inc. Following successful Cygnus docking to the ISS it was the first-ever remote lab performing chemical and biological experiments on ISS, this time demonstrating the ability to return samples from space for further analysis and characterization on Earth achieved on Jauary 2018.