GEN Genetic Engineering & Biotechnology News

# Growing Proteins, 240 Miles Above Earth

A series of experiments on board the International Space Station (ISS) is expected to shed light on whether protein crystals grown in microgravity can offer insights that will someday help researchers on earth in developing new drugs.

Using microfluidic protein crystallization technology developed by Emerald Bio, two researchers set up some 5,000 crystallization experiments set to unfold within the ISS, now orbiting 240 miles above the earth. The experiments are designed to yield new knowledge about the structure and function of the proteins, though the research has not focused on a particular target or drug.

“The idea is to have a platform by which any investigator working on disease X or Y can have more way to try to get that little bit more of resolution in their protein structure that they need, to get the information they need to go the next step down the road in their drug discovery or research effort,” Cory J. Gerdts, Ph.D., instrument systems product manager with Emerald Bio, told GEN.

The experiments were contained within 25 of Emerald Bio’s plastic CrystalCards, each the size of a one-inch by three-inch microscope slide. The CrystalCards, in turn, are filled with the protein crystals through Emerald Bio’s PlugMaker™, a next-generation protein crystallization workstation, then flash frozen in liquid nitrogen at temperatures between 196 and 210 degrees Celsius.

Commercial spacecraft Dragon hauled the CrystalCards to the ISS, arriving at the space station March 3. ISS astronauts placed the CrystalCards for thawing in the NASA-approved Crystal-NanoLab, created by NanoRacks of Houston and in use aboard the space station. Once thawed in the nanolab, the proteins can resume nucleation and crystallization at the space station’s ambient temperature of 24 degrees Celsius.

“For crystallography-based drug discovery, there’s a fundamental requirement that you need high-quality protein crystal structures, and in many cases those are very difficult to grow,” Dr. Gerdts said. “The process of crystallization itself is a bit of a bottleneck, and this is one way that we and NanoRacks have found to see if we can improve that process overall.”

Dr. Gerdts and biochemist Carl Carruthers, research assistant II with NanoRacks client The Methodist Hospital Research Institute, will be studying protein crystallization using still and moving images to be recorded by the ISS astronauts over the next two months or so, using NanoRacks’ digital USB microscope. The images will be transmitted directly to NanoRacks for sharing with Dr. Gerdts and Carruthers.

The researchers will compare what they see with results from another 25 CrystalCards kept on earth for use as controls. Each card allows researchers to vary the concentrations and percentages of protein, its buffer, and its precipitate for growth. CrystalCards can accommodate between 400 and 800 variations of crystal growth conditions, while requiring just four microliters of a single protein.

“The endpoint is to determine if this process is viable. Fundamentally, we are looking for higher-quality crystal structures. It’s not necessarily about the length of the crystal or the size of the crystal. It’s really about trying to understand if this microgravity environment really does lead to a higher-quality protein crystal,” Dr. Gerdts said.

The samples on board the ISS will be transported to Russia in May on Soyuz TMA-07M, then returned within three days to NanoRacks. Results will take months to determine.

For Emerald Bio and NanoRacks, the protein crystallization research marks an opportunity to show that their off-the-shelf equipment can work at least as well as, if not better than, the space unique hardware used in past research.

The researchers and the companies they represent hope to see additional microgravity research in space. NanoRacks said it will work with Emerald Bio and the Center for the Advancement of Science (CASIS) to alert government and industry researchers to the next such opportunity, when SpaceX 4 is launched in April 2014.