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Crystal-NanoLab

EMERALD BIO and NANORACKS TEST SPACE'S MICROGRAVITY AS A NEW LAB FOR DRUG DISCOVERY

BEDFORD, MA – April 5, 2013 – The frontier of biomedical research is in a low orbit above the Earth this month. [Emerald Bio](#) scientist Cory J. Gerdts, Ph.D. and [The Methodist Hospital Research Institute](#) biochemist Carl Carruthers on behalf of NanoRacks LLC are trying to learn if protein crystals grown in microgravity will help researchers on Earth create drugs that better fight diseases.

Twenty-five of Emerald Bio's [CrystalCards](#) containing more than 5,000 protein crystallization experiments are orbiting 240 miles above Earth in the International Space Station. They reached the space station March 3rd by the commercial spacecraft Dragon operated by SpaceX. Leading protein resource Emerald Bio was financed by [NanoRacks](#) of Houston, Texas to make the space station's unique microgravity environment available to crystallography researchers.

At Emerald Bio's Bainbridge Island (Seattle) laboratory before liftoff, Carruthers and Gerdts, Emerald Bio's instrument systems product manager, used the Emerald Bio's microfluidic protein crystallization technology to set up an estimated 5,000 crystallization experiments. The *CrystalCards* were filled using Emerald Bio's [Plug Maker™](#) instrument and then they were flash frozen in liquid nitrogen (between -196C and -210C) to halt protein crystal nucleation.

Flash Freezing Proteins for Space Travel

"Working in microgravity to set up experiments is difficult," [Gerdts](#) said. "The process of setting up experiments on *CrystalCards* in advance and flash freezing them reduces the risk of experiments failing and lets us try thousands more crystal-growing experiments in space than ever before."

Growing protein crystals to learn the intricacies of their structure and function is an early step toward creating new drugs that can improve human health.

"We selected Emerald Bio precisely because their hardware and procedures are industry standards," said Michael Johnson, NanoRacks' chief technology officer. "It's time to move beyond space-unique hardware where possible."

On the space station, the Emerald Bio *CrystalCards* in NanoRacks' Crystal-NanoLab thaw so their nucleation and crystallization behavior resumes in microgravity. Once thawed, these *CrystalCards* (1-inch by 3-inch) are maintained at 24 C, the ambient temperature of the space station. During the mission,

astronauts will twice record still and moving images of protein crystallization using an off-the-shelf digital universal serial bus (USB) microscope provided by NanoRacks. The images will be transmitted directly to NanoRacks and shared with Carruthers and Gerdts for review. While low resolution, the microscope offers sufficient image clarity to determine if crystal growth is present. Another 25 matching *CrystalCards* with an estimated 5,000 experiments remain on Earth as controls.

“We’re trying to determine if better quality protein crystals can be grown in the absence of gravity than on earth,” Gerdts said. “Microgravity of the space station offers us an unadulterated situation that may improve the quality of protein crystals, which in turn we hope pushes the frontier of drug discovery.”

Crystallographers Next Space Lab Opportunity April 2014

Emerald Bio’s *CrystalCards* are optimized for success because they allow researchers to vary the concentrations and percentages of a protein, the buffer and the precipitate for the growth of a single protein on a single card. Each card requires only 4uL of one protein, and can accommodate from 400 to 800 variations of crystal growth conditions.

The investigation samples are currently scheduled to return to Russia on Soyuz TMA-07M in May. Once landed, Emerald Bio’s *CrystalCards* will be returned to NanoRacks in about 24 hours. Determining the results of the experiments will take several months.

“Crystals have been grown in space before but never on this scale,” Gerdts said. “Our goal is to demonstrate the feasibility of biomedical research in microgravity and offer the drug-discovery community the opportunity to participate in advancing medicine in space.”

NanoRacks plans to offer crystallography researchers that opportunity again when SpaceX 4 lifts off in April 2014. NanoRacks will be working with the Center for the Advancement of Science (CASIS) and Emerald Bio to alert government and industry researchers to this new opportunity.

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About Emerald Bio

[Emerald Bio](#) is the leading protein resource offering consultations, instruments, reagents and software to solve clients’ protein-science challenges. For 14 years Emerald Bio has leveraged its unique assets and know-how in biochemistry and structural biology to provide clients insights into proteins structure and function to improve human health. Emerald Bio supports leading research institutes and therapeutic and diagnostic companies worldwide that wrestle life science challenges. Privately owned, the company has facilities in Seattle and Boston. www.embios.com.

About NanoRacks

NanoRacks LLC was formed in 2009 to provide quality hardware and services utilizing the U.S. National Laboratory onboard the International Space Station and beyond. The company developed and has two research platforms onboard the U.S. National Laboratory, which can house plug and play payloads using the CubeSat form factor. The current signed customer pipeline of over 80 payloads including domestic and international educational institutions, research organizations and government organizations, has propelled NanoRacks into a leadership position in understanding the emerging commercial market for low- earth orbit utilization. Visit us at <http://www.nanoracks.com> and follow us at @nanoracks.

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