Space company develops centrifuge to test impact of gravity on crystalline-structured drug molecules

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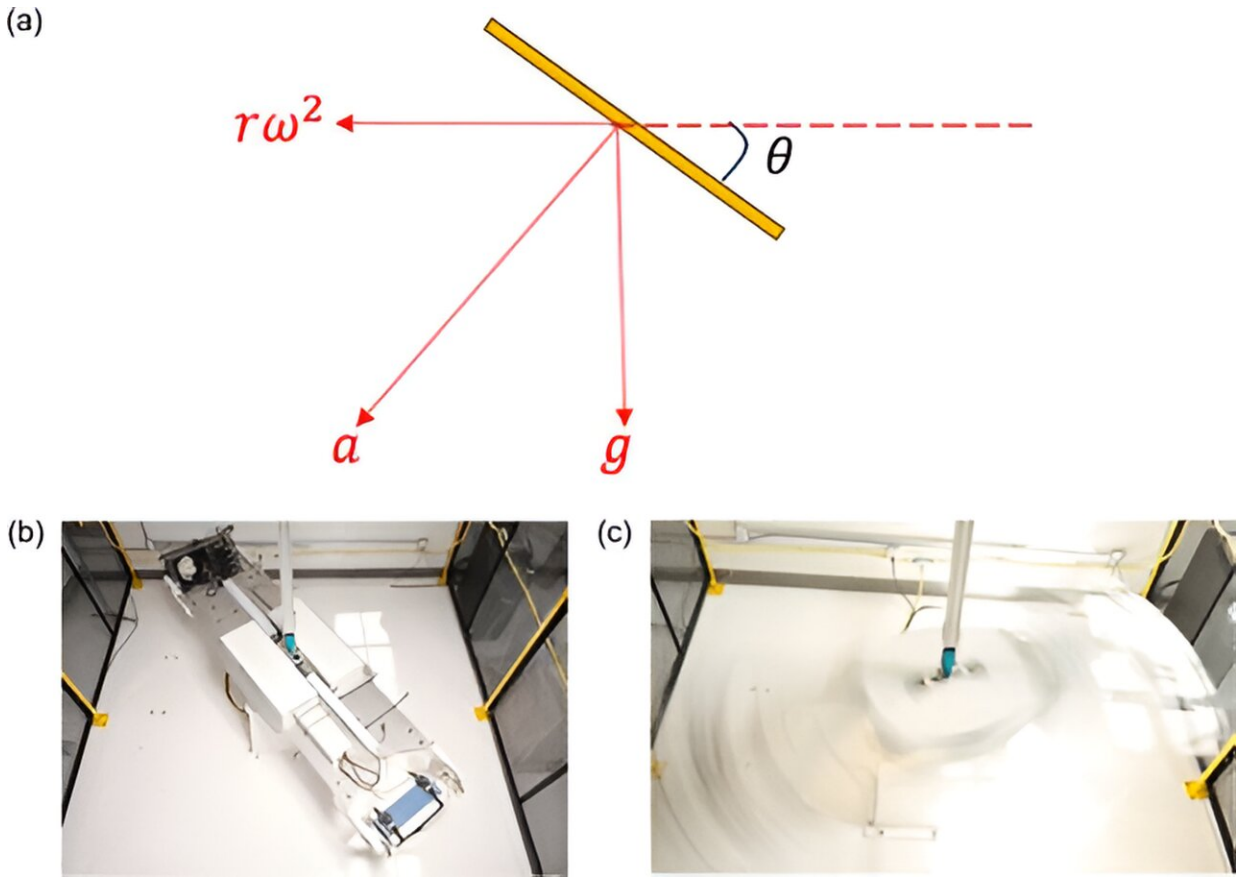

(a) Illustration of the net force experienced during crystallization, which is the vector sum of the gravitational force and the centrifugal force. (b) Photographs

of the centrifuge, which features a tiltable basket at rest and (c) in motion. Credit: *Crystal Growth & Design* (2024). DOI: 10.1021/acs.cgd.3c01274

Kanjakha Pal and Adrian Radocea, a pair of engineers at Varda Space Industries, a company working to develop space-based drug facilities, has developed a centrifuge-based device to test the impact of gravity on crystalline-structured drug molecules as they grow. Their paper is published in the journal *Crystal Growth & Design*.

This past February, a team at Varda recovered a capsule from the Utah desert dropped via parachute after nearly eight months in orbit. The capsule held a tiny pharmaceutical plant used to grow a crystal-based HIV drug in a low-gravity environment. Prior research has suggested some drugs may be more effective if grown in low gravity, while other studies have suggested they could result in reduced costs.

Vargas, unlike competing entities, is betting that it will be less expensive to develop drugs in low-gravity environments by sending up space capsules rather than relying on orbiting stations such as the ISS.

Their researchers developed a centrifuge-based device that could be used to determine if a given drug might be a good candidate for growing in a low-gravity environment. They found that it demonstrates the impact of gravity on the crystallization process as a crystal is spun at high RPMs. Materials spun in the device reveal that gravity appears to play a major role in the way small molecules crystalize.

Thus far, the researchers have used the device to test L-histidine, an amino acid with a unique shape found to be useful in preserving organs

for use in transplant surgery. The researchers call their device a "hypergravity crystallization platform." Officials at Varda have suggested that after further testing, they expect to use the device to offer pharmaceutical testing of drugs for clients. Those that are shown to be viable prospects could find themselves aboard a Varda space vehicle sometime in the near future.

Researchers at Varda have been studying the HIV drug sample returned from space to determine if it is superior to those grown on Earth, and to find out if other factors, such as radiation, may result in damage, preventing the approach from use in a medical setting.

More information: Kanjakha Pal et al, Gravity as a Knob for Tuning Particle Size Distributions of Small Molecules, *Crystal Growth & Design* (2024). DOI: 10.1021/acs.cgd.3c01274