A real-time protein crystal growth approach to crystallization on the International Space Station

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Real-time protein crystal growth (RTPCG) represents an emerging and iterative approach to conducting crystallization experiments on the International Space Station (ISS). The essential features of this approach include ISS crew members assembling crystallization experiments in microgravity, and investigators (located on Earth) providing feedback – in real time – to direct adjustments to experimental conditions. Although straightforward in concept, RTPCG has only just become possible due to recent advancements in methods and hardware. One of these advancements includes the use of the a commercial 96-well crystallization plate that that was first validated for PCG experiments in April/ May 2016. Since then, the MiTeGen In Situ-1™ Crystallization Plate has been used in at least four investigations led by different experimenters. In this investigation, three ISS crew members were asked, and successfully grew, lysozyme crystals in crystallization plates by MiTeGen, LLC. Once on Earth, the crystals were frozen and analyzed using synchrotron radiation. Diffraction statistics were similar for all crystals evaluated as well as comparable to statistics published for lysozyme in previous microgravity experiments. This investigation reports on a novel application of the crystallization plates and their use in enabling a RTPCG approach to crystallization on the ISS.