Measure and Might of the MiTeGen In Situ-1™ Crystallization Plate for Microgravity Protein Crystal Growth

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The investigation describes the novel use of a commercial, high-throughput crystallization microplate for microgravity protein crystallization. Five *In Situ*-1™ crystallization plates (MiTeGen, LLC) were modified for flight with the addition of porous plastic inserts to precipitant subwells. The plates launched on board SpaceX CRS-8 in April 2016. After 28 days on the International Space Station, the plates returned to Earth. The flight hardware experienced two potentially catastrophic inflight anomalies during the return journey. Despite the hardware returning upside-down, only 3 of 480 (0.6%) wells were lost due to substantial fluid exchange between the protein and precipitant subwells. Crystals were observed in 436 of 480 (90.8%) wells with 238 of 480 (49.6%) wells containing crystals of size 50 µm or larger. Crystal diffraction was assessed despite the flight hardware warming beyond pre-defined temperature limits. On average, microgravity (n=29) and ground-control (n=29) crystals diffracted to 2.17 ± 0.19 Å and 2.22 ± 0.18 Å, respectively. Implicitly, crystals obtained in the flight hardware could be used for comparative analysis. The investigation demonstrates the MiTeGen In Situ-1™ Crystallization Plate as a high-throughput crystallization plate with the potential to support future microgravity protein crystal growth research.