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In meso crystallization: Compatibility of Different Lipid Bicontinuous Cubic Mesophases with the Cubic Crystallization Screen in Aqueous Solution.

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A novel in meso crystallization method has facilitated the structural determination of several biologically relevant integral membrane proteins (IMPs). However, the method remains poorly understood as IMPs are difficult to express and handle. Analogous to solution based crystallization, in meso crystallization requires extensive screening of precipitant conditions. Bicontinuous cubic phases are the most commonly used lipid phases for in meso crystallization. The compatibility of the crystallization screen used with the cubic phase is important; if the underlying 3-D cubic nanostructure is destroyed, the screen or protein and lipid combination may not be suitable for in meso crystallization experiments.

We looked at the impact of a screen specifically marketed as compatible with the cubic mesophase, the Cubic crystallization screen (Emerald Biosystems), on the cubic mesophases formed by three different lipids: monoolein, monopalmitolein and phytantriol. The Cubic screen was found to be compatible with cubic mesophase retention under most crystallization conditions studied. The effect of the individual components comprising the multicomponent screen was deconvoluted in two ways. Initially, the effect of specific poly(ethylene glycol) (PEG) and salt components on the cubic mesophase was determined using high-throughput synchrotron Small-Angle X-ray Scattering (SAXS). The effect of high-molecular-weight PEG was shown to dominate the phase behavior within the screen. Finally, a recently developed multiple linear regression modeling method was shown to deconvolute the effect of individual components within the screen effectively.[1]

[1] van 't Hag, L. et al., Crystal Growth & Design, 2014, 14, 1771-1781.

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Summary

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