W0186

Investigating the Role of Protein and Surfactant Interactions in Membrane Protein Crystallization. Bryan Berger, Colleen Gendron, Gabriella Santonicola, Clifford Robinson, Eric Kaler, Abraham Lenhoff, Chemical Engineering, Univ. of Delaware, 150 Academy St. Newark, DE 19716 USA.

Membrane protein characterization is severely hindered by the poor prevailing understanding of the protein-detergent interactions leading to crystallization, which results in time- and material-consuming empirical screens. Our goal is to understand how such interactions influence properties of protein-detergent complexes (PDCs) to develop a rational approach to crystallization. Previous work has shown that a correlation exists between the osmotic second virial coefficient (B_{22}), protein solubility and crystallization for a variety of soluble proteins, and similar behavior has been observed for PDCs approaching a detergent phase boundary or 'cloud point'. However, the extent to which interactions among the various components in solution contributed to the overall process of crystallization remained unclear.

Using self-interaction chromatography (SIC), we have measured such interactions for bacteriorhodopsin under various solution conditions. Although in many cases qualitative agreement is found between the 'crystallization slot' and conditions approaching a detergent 'cloud point', we find contrasts in the underlying behavior between PDCs and free micelles, particularly in how they may influence PDC crystallization. Despite these differences, a direct relationship is observed between the 'cloud point' temperature of a given surfactant solution and the corresponding B_{22} value of the PDC solution for a wide range of additives or precipitants used. These results suggest that detergent interactions may play a constructive role in promoting crystallization from a PDC as well as offer a means by which to affect these in a systematic way.