Three-Dimensional Reconstruction of Viruses: Challenges and Strategies

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Abstract

Viruses are cellular parasites. A deeper understanding of many aspects of viral life cycles has emerged from coordinated molecular and structural studies carried out with a wide range of viral pathogens. Structural studies of viruses by means of transmission electron cryo-microscopy (cryo-EM), 3D image reconstruction, and pseudo-atomic modeling methods have grown explosively in the last decade. These methods have been successfully employed in the investigation of a wide range of icosahedral viruses, ranging in size from as small as 30nm to larger than 200nm. The talk will review the current technologies involved in obtaining 3D structural information on viruses and briefly highlight some recent results at better than 10 Å resolution on both enveloped and non-enveloped icosahedral viruses. Numerous technological obstacles stand in the path of obtaining near atomic resolution (0.4 nm or better) structural data on symmetric as well as non-symmetric viruses. Particular emphasis will be devoted to describing the development of new computational tools designed to provide high throughput data analysis at high resolution.