

Structural Basis for the Assembly of Virus-Like Particles, Encapsulin

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Encapsulins are protein-based organelles in prokaryotes that form icosahedral shells capable of packaging specific cargo proteins. Here we focus on the *Pyrococcus furiosus* encapsulin (PfV), a highly thermostable icosahedral particle whose exceptional stability and versatility have enabled applications in bioengineering and nanomaterial design [1,2]. However, cargo proteins inside encapsulins adopt random orientations, which complicates structural analysis by averaging-based methods such as X-ray crystallography [3] and cryo-EM analysis. To address this challenge, we used vacuum ultraviolet circular dichroism (VUVCD) spectroscopy to estimate the secondary structure content of the internal cargo proteins [4]. In parallel, we aim to elucidate the assembly mechanism of encapsulin particles by combining these structural biology methods. This combined approach provides a practical framework for characterizing disordered cargo proteins within icosahedral particles and supports the future development of encapsulin-based nanocapsules.

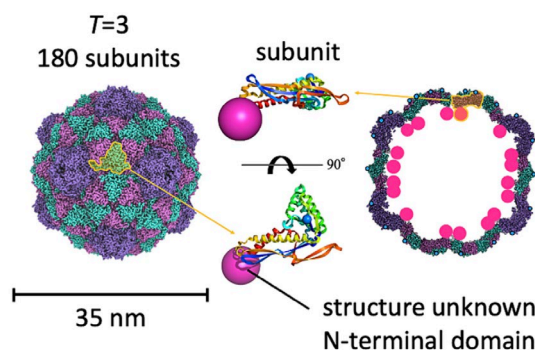


FIGURE 1. Overview of the *Pyrococcus furiosus* encapsulin [1].

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