

X-ray Crystallographic Structure of Virus like Particle from Hyperthermophilic Archaea *Pyrococcus furiosus*

Fusamichi Akita, Chong Khoon Tee, Hideaki Tanaka, Naoyuki Miyazaki, Kazunori Nanba, Yuichiro Nakaishi, Yasuko Ono, Eiki Yamashita, Mamoru Suzuki, Tomitake Tsukihara, Atsushi Nakagawa, *Institute for Protein Research, Osaka University*. E-mail: fusamiti@protein.osaka-u.ac.jp

Hyperthermophilic archaea is grown in an ultimate environment. Interesting protein was discovered from *Pyrococcus furiosus* of them. The proteins were assembled 180 copies subunits into a virus like particle (PfV: *Pyrococcus furiosus* virus), and it has virus like icosahedral symmetry. The atomic structure of PfV was determined at 3.6 Å resolution by X-ray crystallography.

Crystallization was performed by hanging-drop vapor diffusion against 16-20% MPD. The crystal belongs to the space group of *P41212* with cell dimensions of $a=b=631.5\text{Å}$, $c=351.3\text{Å}$. Diffraction data was collected at wavelength of 0.9 Å crystals at 100K using an imaging plate DIP6040 on beamline 44XU of the SPring-8. A diffraction data set at 3.6 Å resolution with 96.8% completeness with an *R*merge of 0.132 was obtained. Phase was determined by the SIRAS (Single Isomorphous Replacement with Anomalous Scattering) method using Tungsten cluster derivative. Phase improvement and extension was performed using the symmetry of a virus and electron density was calculated. The structure model was built based on this electron density map. The CNS program was used refinement against 20-3.6 Å intensity data. The crystallographic *R*-factor and free *R*-factor were 0.267, respectively.

PfV subunit was a mixed alpha/beta structure. Three dimensional structure of PfV and bacteriophage HK97 capsid protein were very similar. This suggests that PfV and HK97 have a common ancestor.

Keywords: *pyrococcus furiosus*, virus like particle, HK97