Understanding double arginine's role in tunnel structure and genome synthesis in dsRNA viruses

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Omono river virus (OmRV) is a double-stranded (ds)RNA virus and closely related to Totiviridae viruses. The OmRV has a single-layered capsid that employs T = 1 icosahedral symmetry and consists of 60 asymmetric units. One notable feature of the virus capsid is that the asymmetric subunits form a tunnel at each 5-fold axis. We theorize that the tunnel has a role in intraparticle genome transcription and synthesis of nascent viral RNA genome similar as in other icosahedral dsRNA viruses. The surface of the tunnel is clustered with positively charged Arginine residues, ten in total (five R925 and five R926 residues), which might have importance for their molecular functions, yet no molecular studies have been done yet. Hence, we explore the structure and function of the capsid tunnel and the positively charged amino acid cluster.

In doing so, we generated two virus mutants (OmRV-R925A, OmRV-R926A) based on our established reverse genetics system (OmRV-WT). Both mutants showed reduction of the propagation rate in host cells thus suggesting the impairment in the tunnel functions. We have determined the atomic model of the two mutants to discuss which structural changes are involved in the functional impairment. We have also attempted to determine an activated tunnel structure by triggering genome synthesis *in vitro* by adding nucleotide triphosphates to the virus concentrate.