Vault Nanoparticles: a Platform Technology for Therapeutic Delivery and Vaccine Development

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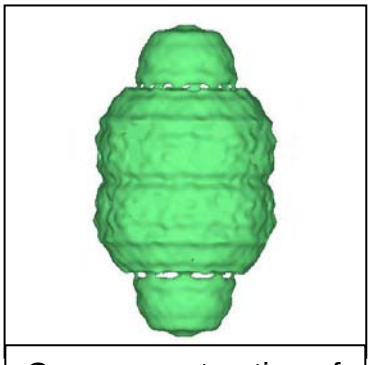
Vaults are novel nano-scale particles first described in 1986 and found to exist in thousands of copies in most eukaryotic cells. They have an intricate shape composed of multiple arches reminiscent of cathedral vaults, hence their name. Vault size (~74 x 42 x 42 nm), shape, molecular composition and facile assembly suggest that they have the potential to be engineered to deliver of a wide variety of therapeutics. The baculovirus expression system is currently being used to produce recombinant vaults in order to test the concept that vaults can have a broad nanosystems application as malleable nanocapsules. Toward this aim, the particles are currently being designed with encapsulated fluorescent probes, enzymatically active protein domains and candidate antigens. In addition, a number of strategies are under development to encapsulate chemically active small molecules, drugs, nucleic acids and immune modulators into the vault particle. If successful, vault nanocapsules can be bioengineered to allow their use in a wide variety of biological applications including drug delivery, cancer immunotherapy, vaccine production, biologically-compatible coatings, biological sensors, enzyme delivery, and gene therapy.



Cryo-reconstruction of the vault particle.