Translocation of nanoparticlesthroughlipidbilayer of vesicles

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Abstract

Innumerousmolecules, molecularaggregates and particles, fromsimply water to complexproteins or self-assembledsmallliposomal carriers, canfrequently cross the cell membrane. According to the size and nature of the crossingspecies, the cell membrane plays an important role as an active or passive sievecontrolling or facilitating the translocation of molecules. Despite a constant increase of the variety of new particles or molecularassembliesthatcanpotentiallyinteractwith the plasma membrane, due to rapidprogress in nanotechnology, the molecularfeaturesdetermining how permeable a membrane iswith respect to a givenmolecule or nanoparticle are not yetelucidated.

Here, wewillintroducecryo-electrontomography as a relevant technique to investigate the translocation of the nanoparticlesthrough the lipidbilayer of liposomes. Cryo-electronicmicroscopyallows not only to inspect the structure of the membrane, by resolving for instance the twoleaftlets of the bilayer, but revealsalso composition and geometricfeatures of nanoparticlessuch as size, shape and densitythatplay an important role for the translocation through the lipidbilayer. The tomographic projections of cryo-electrontomographyresolve in 3D space the relative positions of particles and membranes, providing insight into the interplaybetweenparticle-lipid interactions and the ensuingbilayer transformations.