Cell-surface mimics to study virus-membrane interactions

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Viruses are small pathogenic particle that rely on hijacking a cellular host to replicate and spread. Throughout their life cycle, viruses will therefore on several occasions, come into contact with cellular membranes. Understanding the mechanisms by which virus particles interact with these lipid membranes is of central importance to the development of new antiviral therapies, new drug delivery vectors and new diagnostic tools. In our work, we take advantage of artificial lipid bilayers to mimic in vitro the basic architecture of the cell membrane. Using these minimal models we gain insights into the mechanisms by which viral pathogens interact with the cell's barriers and cross them.

In my presentation, I will address different aspects of viral entry and egress using well-known viral pathogens as examples. First, I focus on the interaction between norovirus and glycolipid-containing membranes and investigate the role of ligands mobility and ligand clustering in modulating the affinity of the virus particle to the membrane.[1] In a second example, I concentrate on the role of Influenza's matrix protein in virus egress and search for mechanisms by which the protein can induce membrane deformations to bud out of a host cell. [2] In a last example, we use model membranes carrying glycosaminoglycans, to elucidate the molecular mechanisms modulating attachment and release of the herpes simplex virus. [3-5]

Taken together, these examples illustrate the potential of artificial cell membrane mimics in the study of processes occurring at the surface of a cell and demonstrate how such biophysical data can complement more classical cell-biology experiments.

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3. Altgarde, N., et al., Mucin-like Region of Herpes Simplex Virus Type 1 Attachment Protein Glycoprotein C (gC) Modulates the Virus-Glycosaminoglycan Interaction. Journal of Biological Chemistry, 2015. 290(35): p. 21473-21485.
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