Contribution ID: **54** Type: **Poster**

Stabilization of mRNA lipid nanoparticles

The Covid-19 pandemic resulted in the release of the new class of vaccine products- the mRNA vaccines. These consist of synthetic mRNA strands packed in lipid nano particle (LNP) that deliver the mRNA to the cells, initiate antigen production and lastly result in immune protection. The function of mRNA in vivo depends on effective, safe and stable delivery to allow cellular uptake and RNA release.

One of the main disadvantages of mRNA vaccines is that they need to be stored at ultra-low temperatures, hampering the world-wide distribution during the pandemic. To overcome this hurdle the characterization of the structure-activity relationship of mRNA LNPs formation is crucial for fully understanding their mechanism and in order to improve their stability. LNPs are multicomponent systems consisting of a shell and a core. The shell consists of PEG, a helper lipid such as DSPC and Cholesterol, whereas the core mainly consists of an ionizable lipid and mRNA. In particular, the interaction of mRNA, water and ionized lipids in the core of LNP seems to play a major role in degradation and understanding these processes will aid to optimize mRNA LNP design in the future.

Here, we determine structural features such as changes in morphology and degradation processes of mRNA LNP in different settings and with different lipid compositions by combining cryo-electron microscopy, SAXS, CV-SANS with LNP standard assays (DLS, Ribogreen, RNA integrity and protein expression) to gain insight in their formation kinetics and investigate the cause of their instability during storage.

Primary author: Dr UZUNCAYIR, Sibel (Lund University)

Presenter: Dr UZUNCAYIR, Sibel (Lund University)