Contribution ID: **480** Type: **Talk (17 + 3 min)**

CANCELLED!!!!!!! New insights in stability of protein-based and lipid nanoparticles solutions using SANS/WANS techniques.

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Many pharmaceuticals products are stored as frozen solutions or in amorphous solid (lyophilized) phases to minimize chemical and physical degradation during their shelf life.
However, freezing and drying per se could also destabilize proteins. There are multiple protein degradation pathways, including, e.g., oxidation, deamidation, and aggregation. Protein aggregation, in particular, can lead to undesirable immunogenic reactions, and it often represents the main destabilization pathway.
In order to stabilize pharmaceutical proteins against aggregation and chemical degradation during freezing, drying, and storage, cryoprotectors and lyoprotectors are usually used, with polyhydroxycompounds (PHC) (including sugars and sugar alcohols) being the most common choice.
Despite its importance for pharmaceutical applications, there is only limited information on the freezing and thawing-dependent protein/protein separation and aggregation property of therapeutic proteins.
In this presentation, we will show the impact of various polyhydroxycompounds (PHCs) on the structural arrangement and on protein-protein interaction in the dried state using small/wide angle neutron scattering (SANS/WANS) technique at D16 instrument at ILL.
Similarly, we will show first SANS/WANS results of structural characterization of lipid nanoparticles (LNPs) solutions. LPNs represent a novel and promising drug delivery system and rose to prominence recently with the remarkable success of Covid-19 vaccines from BioNTech/Pfizer and Moderna.
The LNP-based vaccines are stored in a frozen state (at -20 or -70 ℃) and cannot be re-frozen due to a potential disruption of the PL making up the LNPs. This can be caused by freeze-induced dehydration, high local pressure as the result of volume expansion during water-to-ice transformation, and pH changes. In this study, we have studied 4-component lipid system to elucidate LNP phase transitions during freezing and thawing using SANS and WANS reproducing the same storage conditions that are used nowadays for the vaccines.
These studies can give new insights in proteins and LNPs solutions stability in different pH solutions, temperature conditions, and under both aqueous and lyophilized conditions.
After the recent upgrade with the new large detector on D16 instrument, the larger detection solid angle and dynamical q-range, combined with the high flux, will open new perspectives to improve our knowledge of the stability and the effect of storage conditions of pharmaceuticals following in real-time the kinetics during the freezing process. Some improvement of these kinds of measurements now possible on D16 will be shown as well.

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