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Croslnps – The Potential of Cross-linked Lipid Scaffolds for Innovative Lipid-based Drug Delivery Systems

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The efficacy of lipid-based drug delivery systems (DDS) depends on their interaction with physiological components such as human serum albumin (HSA) after intravenous or bile salts after oral administration. We use hydrolyzed polymer of epoxidized soybean oil (HPESO) – a scaffold of cross-linked lipids – to investigate lipid-polymer interactions via isothermal titration calorimetry (ITC) allowing for a rational selection of lyso- and phospholipids for next-generation lipid-based

nanoparticles (crosLNPs). Thereby, crosLNPs enable for unique loading capacities of amphiphilic drugs due to an HPESO-based three-dimensional matrix of polar and apolar molecular environments.

Our study focuses (i) on the molecular interactions between lipids and HPESO, followed (ii) by the development of crosLNPs via dual centrifugation and (iii) on interactions with HSA and bile salts to assess potential administration routes.

In order to establish a fundamental comprehension for crosLNPs, we use asymmetric flow field flow fractionation (AF4), Cryo-TEM, ITC and time-resolved fluorescence (TRF).

This work provides key insights into the rational selection of nanomaterials for high-precision DDS, by in depth biophysical characterization.