Preparation of nanoliposomes and nanocrystals using microfluidic strategies

[Powerpoint Presentation]

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PREPARATION OF NANOLIPOSO-MES AND NANOCRYSTALS USING MICROFLUIDIC STRATEGIES

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Liposomes and nanocrystals

- **Liposomes** are spherical nanostructures composed of single or multiple concentric bilayers resulting from the self-assembly of **phospholipids** in an aqueous solution.

- Nanocrystal is a crystalline particle having at least one dimension smaller than 500 nanometres and composed of atoms in either a single- or polycrystalline arrangement.

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Microfluidic generation of hydrocortisone nanocrystals

- Organic solution: 7 mg/ml hydrocortisone in ethanol/water mixture
- Anti-solvent: Milli-Q water with collection in a cocktail of stabilisers – Polyvinyl pyrrolidone (0.2g/ml); Sodium dodecyl sulfate (0.05g/ml); and Hydroxypropylmethyl cellulose (0.2g/ml)

A Co-flow

B Counter-current flow

Microengineered nickel membranes and device used for liposome fabrication.

Shear distribution on membrane surface

Maximum surface shear:
\[
\tau_{\text{max}} = \frac{0.825 \eta_{\text{aq}} \omega r_{\text{trans}}}{\sqrt{\eta_{\text{aq}}} / (\rho_{\text{aq}} \omega)}
\]

Characterisation of nanoliposomes

Size distribution of nanoliposomes

CryoTEM of Drug-free vesicles
CryoTEM of drug-loaded vesicles