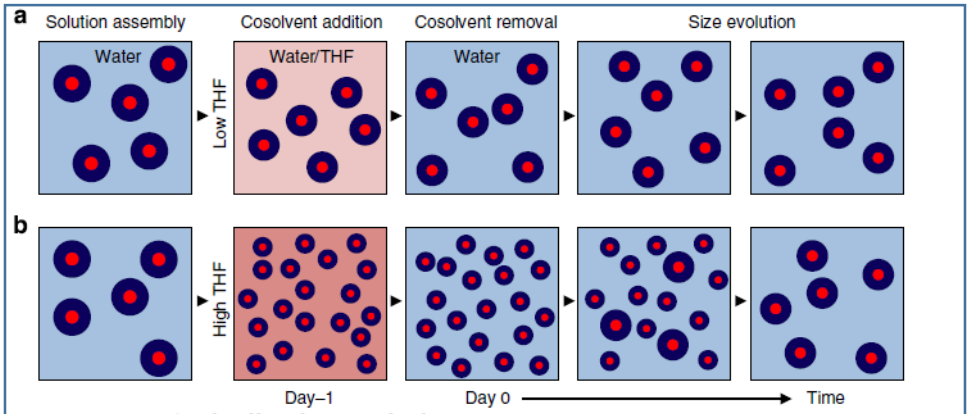
Nano Shake-up: Processing Nanocarriers for Targeted Drug Delivery

- Nanotechnology has unlocked new pathways for targeted drug delivery, including the use of nanocarriers, or capsules, that can transport cargoes of small-molecule therapeutics to specific locations in the body.
- Control of nanocarrier size dictates cell/tissue localization and efficacy/side effects, which is influenced by handling and processing.
- Molecular self-assembly of polymers offers the ability to create uniform, tailorable structures of predetermined size and shape.
- The problem lies in assuming that once nanocarriers are produced, they don't change.
- Cosolvent preparation methods affect long-term stability of macromolecular assemblies and demonstrate the strong interplay between thermodynamic versus kinetic constraints in these systems influencing micelle stability.



Summary of micelle size evolution.
Schematic representation of changes in micelle size after cosolvent addition and removal.
(a) Poly(butadiene-b-ethylene oxide) (PB-PEO) micelles self-assemble in pure water, decrease in size following THF cosolvent addition (o10% by volume) and remain kinetically trapped after solvent transfer to pure water. Micelles prepared in solutions containing low THF contents are not perturbed far from their equilibrium size and therefore do not undergo significant size relaxation. (b) Increasing the THF content (for example, 40% by volume) and subsequently removing the cosolvent perturbs the micelles far from their equilibrium size in water, leading to size relaxation through a bimodal pathway.

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