Amphiphiles Are Surfactants [pln57]

The name *surfactant* is a contraction of "surface-active agent." Surfactant molecules owe this function to their *amphiphilic* structure, typically with hydrophilic headgroup and hydrophobic tail. The prefix "amphi-" stands for "both" and the word "philia" for "affection", both of Greek origin. Amphiphiles have two sides, one seeking polar, the other non-polar media.

Hydrophobic tails consist of one or several (non-polar) hycrocarbon chains.

Hydrophilic headgroups are classified as follows:

- uncharged (polar),
- anionic (negatively charged),
- cationic (positively charged),
- zwitterionic (containing equal positive and negative charges).

Anionic headgroups are common in detergents [psl13]. Cationic headgroups are useful as mild disinfectants due to anti-bacterial attributes.

Phospholipids are a major component of biological cell membranes. Their tails consist of two chains of linear hydrocarbons.

Amphiphiles have a propensity for self-assembly into hierarchical structures and (liquid crystalline) phases [tsl50].

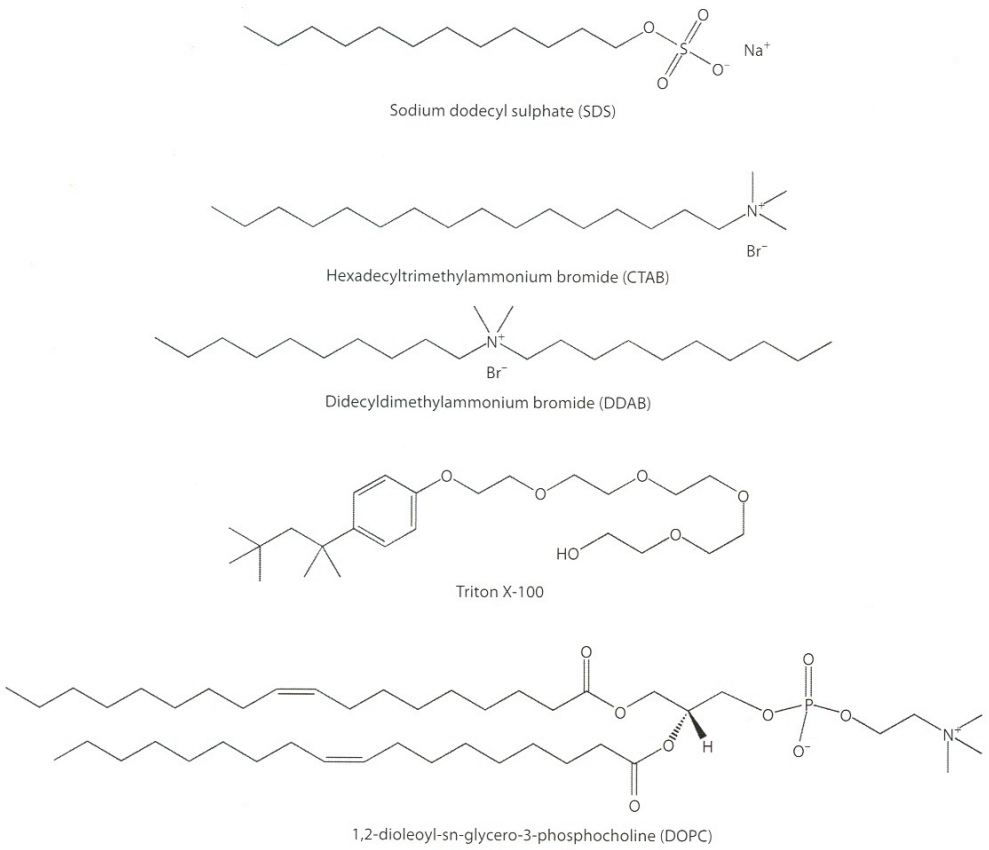
- *Spherical* micelles tend to order in a *cubic* phase.
- *Cylindrical* micells tend to order in a *hexagonal* phase.
- *Bilayers* tend to order in a *lamellar* phase.
- *Vesicles* (liposomes) tend to order like micelles if they are monodiperse.

Onset of ordering is lyotropic, taking place at sufficiently high concentration of self-assembled structures.

The size and shape of micelles depends on several factors:

- geometry and energetics of surfactant molecules,
- surfactant concentration,
- type of solvent,
- temperature.

Five common surfactant molecules:



[image fom Hirst 2013]