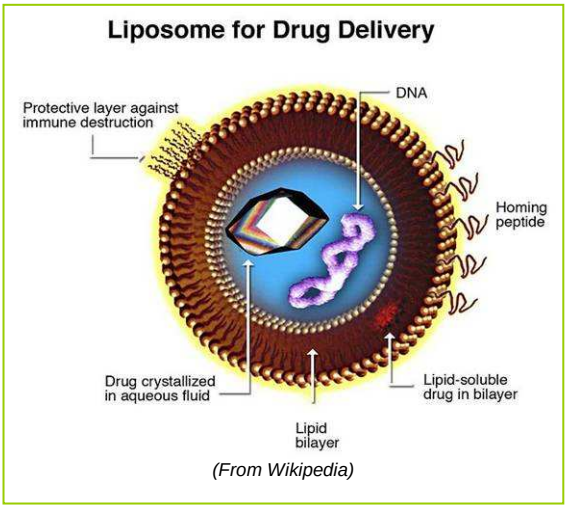
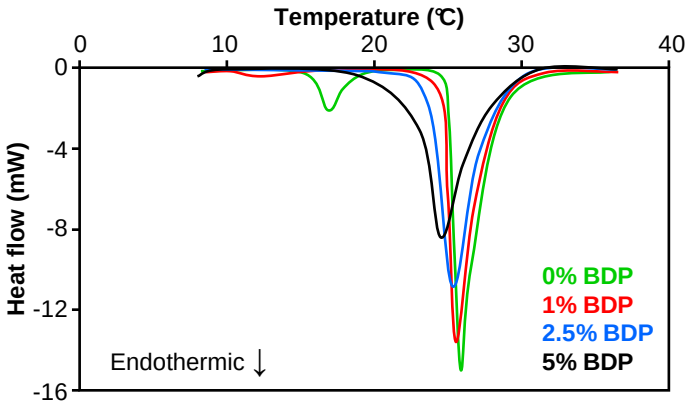
# A calorimetric study of steroid-liposome interactions

**Reference:** A calorimetric study of dimyristoylphosphatidylcholine phase transitions and steroid–liposome interactions for liposomes prepared by thin film and proliposome methods, A.M.A. Elhissi, M.A.A. O'Neill, S.A. Roberts, K.M.G. Taylor, International Journal of Pharmaceutics 320 (2006) 124–130

**Introduction:** Liposomes are spherical vesicles with a membrane composed of a phospholipid and cholesterol bilayer. They are used, for example, for drug delivery due to their unique properties. Therefore, calorimetry has been extensively employed to study the interaction of materials with liposomal bilayers. In this paper, high sensitivity differential scanning calorimetry was employed to investigate the interaction between dimyristoylphosphatidylcholine (DMPC) liposomal bilayers and the model steroid beclometasone dipropionate (BDP).




Phase transitions of DMPC liposomes prepared by the thin film method using a range of steroid concentrations.

## Experimental

Liposomes were produced by the conventional thin film method.

Experiments were conducted using a µDSCIII and Hastelloy-made vessels (1cm$^3$). Liposome dispersions (approx. 0.8 ml) containing 50 mg DMPC were loaded in the sample vessel, and the reference vessel was filled with the same components excluding the lipid phase (i.e. DMPC and BDP). Nitrogen was supplied in order to prevent vapour condensation on the vessels during cooling, and scanning was performed between 6 and 45℃ at a rate of 1K/min.

For more details ask for publication B2036

**Instrument**

**Micro DSC III**

**-20 to 120℃**

## Results

The thermal behavior of liposomes was evaluated by determining the linear onset temperature of the pretransition ($T_{pre}$) and main transition ($T_m$).

Inclusion of BDP caused a marked effect on the pretransition. Compared to the formulation without steroid, that containing 1% BDP had a significant reduction in $T_{pre}$ and $\Delta H_{pre}$. Higher steroid concentrations resulted in complete removal of the pretransition endotherm. Moreover, although the steroid exerted a smaller effect on the main transition parameters, the main transition peak broadened as BDP concentration was increased within formulations.

These findings suggest that after the pretransition was removed (i.e. at 1–2.5% BDP), the steroid started to form separate domains in the bilayers. Thus, it is suggested that 1–2.5% BDP may be optimal for inclusion in this liposome formulation.