Lipid Coated Droplets: From Bubbles to Cells - therapy to diagnostics

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In the presence of a gas bubble in solution lipids spontaneously assemble at the air/gas boundary presenting a lipid monolayer with the zwitterionic head groups oriented to the aqueous phase. The lipids both stabilize the gas from dissolution and present a biocompatible interface to reduce identification by the immune system. The natural echogenicity of such bubbles combined with their biocompatibility makes them ideal theragnostic agents for ultrasound aided drug delivery. Here we describe our recent approaches for the bubble formation, characterisation and the treatment of cancer.[1]

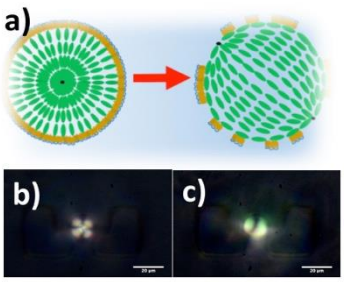

Figure 1 AMP induced transition in LC alignment in LC droplets

Microfluidically produced liquid crystal (LC) droplets generate hydrophobic interfaces in aqueous solutions lipids in solution adsorb at these interfaces to produce a lipid monolayer which in turn controls the anchoring of the liquid crystal. Here we describe how interactions with the lipid can lead to transitions in LC alignment and be used to create LC droplet-based sensors for antimicrobial peptides. [2]

Deformability of a droplet/cell in response to mechanical stress depends strongly on the forces experienced by the droplet/cell. Here, we use cell deformability in both shear-dominant and inertia-dominant microfluidic flow regimes to probe different aspects of the droplet and cells. [3]

[1] Peyman SA, et al. *Lab Chip* **16(4)**, 679-87, 2016 ; Peyman SA, et al. *Lab Chip* **12(21)**, 4544-52, 2012
[2] Bao P, et al. *Lab on a Chip* **19 (6),** 1082-1089, 2019

[3] Armistead F, Biophysical journal 116 (6), 1127-1135, 2019