

## **Development of a novel magnetic resonance imaging contrast agent for pressure measurements using lipid-coated microbubbles: the effect of air and N<sub>2</sub> as filling gases**

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Gas-filled microbubbles have been used to spatially resolve the pressure of a liquid saturating a porous medium, which has potential applications to improving oil recovery<sup>1</sup>. The aim of this study was to prepare a magnetic resonance imaging (MRI) contrast agent for imaging of fluid pressure. Microbubbles were prepared by homogenising 1,2-distearoyl-*sn*-glycero-3-phosphocholine (DSPC) in water at temperatures below the phase transition temperature ( $T_c$ , ~60°C) of the lipid with the headspace filled with the desired gas core, air or nitrogen (N<sub>2</sub>). These microbubbles were evaluated in terms size measured by dynamic light scattering and stability before their efficacy as pressure sensitive probes was investigated. The microbubble sizes for both preparations were found to remain stable over the 28 days. For the MRI studies the two preparations were combined with gellan gum (2% w/v) to a concentration of 3% gas v/v. It was found following pressure change, the sensitivity exhibited by the N<sub>2</sub>-filled microbubbles was extremely robust, whilst that of the air-filled microbubbles demonstrated a continuous drop due to continuous bubble damage. It can be concluded that whilst maintaining high sensitivity, a novel contrast agent, which allows stable MRI measurements of fluid pressure over time, could be produced using lipid-coated microbubbles.

<sup>1</sup>Vangala, A. et al. *Liposome Res.* **2007**, 17, 263-272.