

The development and characterisation of an in vivo ¹⁹F MRI imaging agent

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Our group works with polymer-entrapped perfluorocarbon (PFC) particles for in vivo imaging using ¹⁹F MRI, ultrasound, fluorescence and nuclear imaging. These particles have been spun-out to a company for clinical imaging, and production at GMP grade. PFCs are simultaneously lipophobic and hydrophobic. The production process, consisting of a triphasic continuous, microfluidic system, results in particles of about 200 nm diameter with a fractal, multicore structure. We do not fully understand why small changes in the production process can result in a single or multicore internal structure. Regardless, the multicore structure has a significant biological impact, as the clearance half-life of the PFC drops nearly 15-fold with the multicore over the single core (core-shell) structure. In addition, the particles, unlike traditional (relatively fragile) gas-containing ultrasound contrast agents, are extremely stable, even for probe sonication. In addition, the internal structure impacts the ¹⁹F relaxation when paramagnetic Gd is included.

We have applied these particles to tracking various cell types in vitro and in vivo in a range of disease models, in a longitudinal and quantitative manner, and are approved for a clinical trial in the NL.