Development of Perfluorocarbon-Loaded Polymeric Nanoparticles For 19F Magnetic Resonance Imaging

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Magnetic resonance imaging (MRI) offers high-resolution, non-invasive preclinical and clinical imaging. Creating MRI contrast agents is a crucial field of research. A new generation of MRI contrast chemicals includes perfluorocarbon (PFC) and fluorinated molecules, but most PFCs are unstable or hard to handle. Our work aims to create a stable and scalable new generation of PFC-based nano-diagnostic agents. For this purpose, we used poly (lactic-co-glycolic acid) (PLGA) as a polymer for the preparation of nanoparticles (NPs) and perfluoro-15-crown-5-ether (PFCE) as the PFC. PFCE-loaded NPs were formulated using the double emulsification/solvent evaporation technique using different molecular weights of PLGA and surfactant, comparing sonication against homogenisation under the same conditions. The obtained PFCE-loaded NPs were evaluated based on size, polydispersity index (PDI), PFCE encapsulation efficiency (EE %), loading capacity (LC % w/w), and morphology (SEM). It was observed that homogenisation generally gave a higher size and PDI, i.e., 406.4 nm (PDI 0.24), while sonication generated a particle size ranging from 255.6 to 340.5 nm (PDI 0.25). Homogenisation gave a higher loading capacity and encapsulation efficiency ranging between 44.66 - 55.15 % and 65.59 - 65.59%, respectively. To encapsulate more PFCE, rotary evaporation performed better than overnight evaporation based on magnetic stirring, and that initial mechanical mixing was critical for achieving a high loading capacity. More research is being conducted to determine how various factors might be varied to produce customisable PFCE-loaded NPs.