Protein stabilized nanoformulation of a superfluorinated 19F-MRI contrast agent

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19F-MRI has indeed emerged as one of the most promising diagnostic tools providing hot spot imaging along with 1H-MRI. Here, we report a unique fluorinated imaging agent PERFECTA [1] bearing 36 equivalent 19F atoms and therefore showing a single, intense resonance peak. Most of the superfluorinated contrast agents are highly hydrophobic, which makes their use it difficult to be used as they are in biological environment systems. In this work, an ampiphilic molecule protein, hydrophobin (HFBIIfb), which is a natural biosurfactant protein with filming properties, was used to disperse PERFECTA in aqueous solutions. We optimized a protocol to obtain colloidally stable formulations of PERFECTA. The obtained formulations were characterized by NMR, DLS, 19F-MRI and FTIR. The results showed that these nanoformulations were composed of monodispersed PERFECTA nanoparticles coated by a HFBIIfb shell and have good NMR relaxation times to be used as 19F-MRI tracking contrast agents [Figure 1]. Cytotoxicity and cellular uptake studies in HeLa and MG 63 cells also demonstrated nanoparticle biocompatibility. Thus, the obtained nanoparticles represent a versatile theranostic platform that could be further used to deliver therapeutic drugs and nucleic acids.

References

[1] I. Tirotta, A. Mastropietro, C. Cordiglieri, L. Gazzera, F. Baggi, G. Baselli, M. G. Bruzzone, I. Zucca, G. Cavallo, G. Terraneo, F. Baldelli Bombelli, P. Metrangolo, G. Resnati, *J. Am. Chem. Soc.*, **2014**, *136*, 8524.Ilaria Tirotta, Alfonso Mastropietro, Chiara Cordiglieri, Lara Gazzera, Fulvio Baggi,Giuseppe Baselli, Maria Grazia Bruzzone, Ileana Zucca, Gabriella Cavallo, Giancarlo Terraneo,Francesca Baldelli Bombelli, Pierangelo Metrangolo and Giuseppe Resnati "A Superfluorinated Molecular Probe for Highly Sensitive in Vivo19F-MRI", J. Am. Chem. Soc. 2014, 136, 8524−8527.

Figures

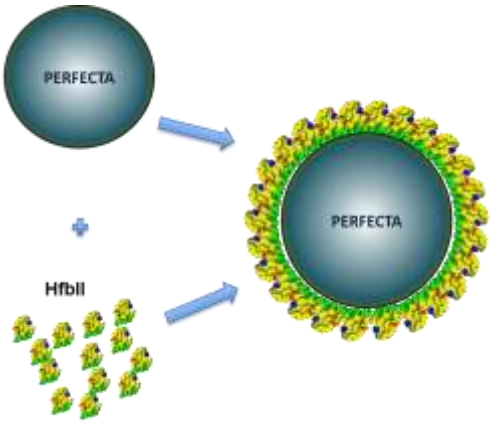

Figure 1. Nanoparticleformulation of the superfluorinated contrast agent PERFECTA coated with a HFBII shellfb.

Abbreviations: MRI-Magnetic Resonance imaging; H-MRI: Hydrogen MRI; F-MRI: Fluorine MRI; Hfb-Hydrophobin