Cystine-functionalized superparamagnetic iron oxide nanoparticles for medical applications

Sara DOLCI[1], Vincenzo IERARDI[2], Zvonco JAGLICIC[3], Celia DUCE[1], Roberto MANETTI[4], Lucia Gemma DELOGU[5], Maria Rosa TINE'[1] and Valentina DOMENICI[1]

[1]Dipartimento di Chimica e Chimica Industriale, Università di Pisa,Via Risorgimento 35, 56126-PISA, Italy.
[2]NanoMed Labs, Dipartimento di Fisica, Università di Genova, Largo R. Benzi 10, 16132-GENOVA, Italy.
[3]Institute of Mathematics, Physics and Mechanics & Faculty of Civil and Geodetic Engineering, University of Ljubljana, Jadranska 19, 1000 LJUBLJANA, Slovenia.
[4]Department of Clinical and Experimental Medicine, University of Sassari, 07100 Sassari, Italy.
[5]Department of Chemistry and Pharmacy, University of Sassari, 07100 Sassari, Italy.

Superparamagnetic iron oxide nanoparticles (SPIONs) are deeply investigated for many biomedical applications, such as imaging for diagnostic and theranostic purposes. A good functionalization that can combine the imaging goals together with a good biocompatibility remains one of the challenge for the particles translation into medical practice. Herein, we focus on a new functionalization of SPION withcystine (Cy-SPION) able to make SPION stable and dispersible in culture cell media [1,2]. To prove their potential as biomedical tools, we first gave new insights in the biological and immune effects of Cy-SPION with a wide variety of standard and molecular assays to evaluate cytotoxicity, cell activation, cytokine release and the expression of 84 genes related to the immune response. We found a good immune biocompatibility of Cy-SPION on *ex vivo* primary immune cells as well as in vitro cell lines pointing out their potential for perfect in vivo studies where the preferential route of administration is by intravenous injections, therefore in contact with immune cells [3].

In this presentation, we will show the main chemical physical properties of these new SPIONs, investigated by means of infrared (FT-IR) spectroscopy, transmission electron microscopy (TEM) and atomic force microscopy (AFM) image analysis. Zero-field-cooled (ZFC) and field-cooled (FC) magnetic susceptibility curves as well as the magnetization behaviour ware also reported. The potential use of Cy-SPIONs as contrast agents for magnetic resonance imaging (MRI) and as contrast agents in ultrasonography will be deeply discussed.

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