# PROSPECTS FOR MAGNETIC NANOPARTICLES IN IN VIVO BIOMEDICAL APPLICATIONS: SYNTHESIS, BIODISTRIBUTION AND DEGRADATION

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**Abstract**

Recent developments indicate that magnetic nanoparticles could help to improve clinical practice in the treatment of cancer, most probably in synergy with other conventional treatments [1]. There already exist methods to obtain magnetic nanoparticles with the appropriate properties to be used in diagnosis and therapy but these properties need to be optimized to avoid its alteration after intravenous injection, via interaction between the nanoparticles and the blood components, aggregation in lysosomes inside cells or accumulation in tissues [2].

In this work we will describe a number of proven synthesis routes for magnetic nanoparticles intended for their use in biomedical applications [3]. We will show the effect of different characteristics of the magnetic colloids, such as particle size and size distribution, colloidal properties of the aqueous suspensions, such as hydrodynamic size and surface modification, and magnetic properties on their MRI relaxivity and heating capacity. Finally, it will be shown that magnetic nanoparticles biodistribution following systemic administration and its transformation over time can be tracked by AC magnetic susceptibility measurements, which allow identifying and quantifying magnetic nanoparticles in tissues, differentiating them from other endogenous species such as the ferritin iron cores [4].

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**REFERENCES:**

[1] M. Colombo, et al, Chem. Soc. Rev., 41, 4306, 2012.

[2] Y. Luengo, et al, Nanoscale, 5, 11428, 2013; A. Ruiz, et al, Nanoscale, 5, 11400, 2013.

[3] L. Gutiérrez, et al, Dalton Transactions 2015 (in press).

[4] R. Mejías, et al, Journal of Controlled Release 171, 225, 2013; L. Gutiérrez, et al, Phys. Chem. Chem. Phys., 16, 4456-4464, 2014;

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