“Magnetism in Life Sciences”

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The use of magnetic nanoparticles in biomedicine is currently being investigated, proving to have great potential in the fields of diagnosis and treatment of certain deseases.[1] In particular, “small“ iron oxide particles, meaning small that the particles are in the nanometric scale, are currently used as contrast agents in Magnetic Resonance Imaging (MRI) in order to visualize blood cells, macrophages or tracking cells.[2] A very interesting application still on progress involves the use of these nanoparticles to detect and treat brain damage, i.e. neurodegenerative diseases.[3]

There exist another application that is particularly promising for the localized treatment of cancer (specific destruction of cancer cells), called intracellular magnetic hyperthermia. Magnetic nanoparticles, after recognizing the tumoral cells and accumulate inside, they could heat locally by applying a moderate AC external magnetic field until they reach sufficient temperature (42-45 ºC), above which the tumoral cells can be destroyed.[4]

Finally, magnetic nanoparticles can be used for drug delivery, carrying a therapeutic agent to a specific target in the organism.[5] The efficacy of all these techniques depends on the control over the nanoparticle-cell interaction and the sufficient intake of magnetic nanoparticles by the cells of interest. Lastly, toxicity must be assessed and controlled.

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