

Applications of functionalised iron oxide nanoparticles in medicine

Mojica Piscioti, M.L.,¹ Lima Júnior, E.,² Vasquez Mansilla, M.,² Tognoli, V.E.,³ Pasa, A.A.,⁴ Crezynski-Pasa, T.B.,⁵ Silva, A.H.,⁵ Gurman, P.,⁶ Colombo, L.,⁷ Lamagna, A.,⁶ Goya, G.F.,⁸ Calatayud, P.S.,⁸ and Zysler, R.D.⁹

¹*Instituto Balseiro - Centro Atómico Bariloche, 8400, S. C. Bariloche, RN, Argentina*

²*Centro Atómico Bariloche / CONICET, 8400, S. C. Bariloche, RN, Argentina*

³*Centro Atómico Bariloche-CNEA, 8400, S. C. Bariloche, RN, Argentina*

⁴*Depto. de Física, Universidade Federal de Santa Catarina, Florianópolis, 88040-900, Brazil*

⁵*Depto. De Ciências Farmacêuticas, Universidade Federal de Santa Catarina, Florianópolis, 88040-900, Brazil*

⁶*Departamento de Micro y Nanotecnología, Centro Atómico Constituyentes, San Martín, 1650, Argentina*

⁷*Instituto de Oncología A.H. Roffo, UBA / CONICET / CAECIHS (UAI), Av. San Martín 5481, (1417) CABA, Argentina*

⁸*Instituto de Nanociencia de Aragón, Universidad de Zaragoza, Zaragoza, 50018, Spain*

⁹*Instituto Balseiro - Centro Atómico Bariloche / CONICET, 8400, S. C. Bariloche, RN, Argentina*

In the last 20 years, application of magnetic nanoparticles in medicine has become a field of great interest. The possibility of using them to deliver drugs to a specific site of the organism, and their potential use as a therapeutic tool have encouraged studies on superparamagnetic iron oxide nanoparticles (SPIONs). Another potential application of SPIONs in oncology is in magnetic fluid hyperthermia. Moreover, the fact that they can be used as contrast agents while treatment is carried out (detecting and treating a disease in real time) provides unequivocal evidence of the potential application of such particles. The application of these nanoparticles in living tissues involves toxicological studies. Also, magnetic nanoparticles could jeopardize the healthy tissues if they are not properly transported to the target organ. Therefore a comprehensive understanding of the distribution of magnetic nanoparticles throughout the body is useful. Although the mechanism of SPIONs uptake by different cell types has not been elucidated so far, it is known from several experimental results that a determinant factor about this process is the influence of the coating layer. Certainly, the variety of chemical coatings is enormous and reports on their properties like biocompatibility, and *in vitro* and *in vivo* behaviors are increasing. There are evidences of the significant changes in nanoparticles response within a living organism depending on its size, shape, surface composition, crystalline form among others.

In this talk, it will be presented results of *in vitro* biocompatibility of covered SPIONs in several cell lineages, the mechanism of NPs penetration in the cells, and *in vivo* distribution of the nanoparticles in different organs after their injection in mice.