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Iranian Journal of Basic Medical Sciences

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E-mail: jbms@munm.ac.ir, Tel/ fax: +98-511-8543295

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BS Fazly Bazzaz, MSc, PhD  
**Editor in-Chief**  
Iranian Journal of Basic Medical Sciences  
P.O. Box: 9138813944-445  
Tel/Fax: +98 511 8543295  
Email: fazlis@mums.ac.ir; jbms@mums.ac.ir  
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Biomedical Application of Magnetic Nanoparticles: A Review of Therapy Aspects

*Maryam Yaldagard, 1,2 Ali Ahmadvand

Abstract
Nanoparticles are at the leading edge of rapidly developing field of nanotechnology. Recent successful synthesis of monodispersed magnetic nanoparticles have offered a unique opportunity to control and probe biological interactions using magnetic force. Magnetic nanoparticles have been advocated for using as effective means for metal ion (or catalyst) separation in engineering systems, and as a contrast agent in magnetic resonance imaging improvement in clinical trials for many years. However, it is only in recent years that the fields of nanotechnology, material science and cell biology have been combined to enable us to fully comprehend the potential uses of such nanoparticles in biomedical applications. A very promising application of magnetic nanoparticles in biomedical research is in drug delivery as drug carriers. The concept of magnetic targeting is to inject the magnetic nanoparticles to which drug molecules are attached, to guide these particles to the chosen site under the localized magnetic field gradients, hold them there until the therapy is completed, and then to remove them. The use of magnetic nanoparticles as therapeutic agent carriers in conjunction with a modulated external magnetic field is hypothesized to allow the dispersion of the therapeutic products throughout the tumor volume. This review focuses primarily on the nanoparticles which are used for targeted drug and gene delivery. In addition, it tries to summarize the most recent advances using magnetic nanoparticles in the field of biological research, in particular the results of in vitro and clinical experiments as well as hyperthermic treatment of malignant cells.

Keywords: Gene delivery, Hyperthermic treatment, Magnetic nanoparticles, Targeted drug

1- Department of Chemical Engineering, Faculty of Engineering, Ferdowsi University of Mashhad, Iran.
2- Nanotechnology Center, Ferdowsi University of Mashhad, Iran

* Corresponding author: Tel: +98-511-8795618; Fax: +98-511-8787430; email: m_yaldagard@yahoo.com;
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