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Novel magnetite nano bioconjugates for bypassing endosomal routes of drug delivery

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Nanomedicine has become one of the most attractive avenues to promote targeted delivery and increase bioavailability of drugs that fail to spontaneously pass the cell membrane due to their high hydrophobicity and low solubility. As a result, over the past two decades an enormous body of knowledge has been developed where nanostructured materials served as the main platforms for conjugation and subsequent intracellular delivery of various pharmacological agents for the treatment of different conditions including several types of cancer, Alzheimer's and Parkinson's. Despite the important success both *in vitro* and *in vivo* of the proposed vehicles, a major challenge is to assure that the delivered therapeutics remain active upon delivery. This is mostly due to the formation of endosomes that act as traps for the delivered molecules. To overcome this major issue, we proposed the conjugation of a transmembrane protein from *E. coli* to nanostructured materials and particularly to magnetite nanoparticles. The vehicle was successfully tested in liposomes, vero cells and monocytes. The findings suggest that the obtained nano bioconjugate is capable of translocating the cell membrane and bypass intracellular endosomal routes. Due to the potency of this novel vehicle, we are exploring applications in the delivery of therapeutics for the treatment of Parkinson's disease in primary astrocyte cultures.

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