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Multifunctional nanoparticles for targeted drug delivery and mri contrast agent

P. Pramanik

Nanomaterials Laboratory, Indian Institute of Technology-Kharagpur, India

Superparamagnetic iron oxide nanoparticles offer a unique carrier system, whose surface can be modified with multiple diagnostic and therapeutic entities to serve as both targeting contrasts and drug carriers simultaneously, allowing for real time monitoring of response from tumor to drug treatment. An effective approach towards improving the targeting capability and drug release efficiency of magnetic nanoparticles is to conjugate the nanoparticles with low molecular targeting agent, such as folic acid and small bio-molecule those have strong affinities for target cells and high efficiency for internalization of nanoparticle . Recently we have developed a series of novel technique to synthesize highly stable folic acid conjugated magnetite (Fe_3O_4) nanoparticles for targeting cancer cells, using derivatives of phosphonic acid and chitosan as vehicle . 2, 2'-(ethylenedioxy)-bis-ethylamine, a non-polymeric hydrophilic linker has been used as surface-coupling agent .These iron-oxide folate nano-conjugates are non-cytotoxic and shows high site-specific intracellular uptake against folate receptors over expressed onto cancer cells.

In our constant endeavor to design nanoparticles for site-specific drug targeting, "smart" superparamagnetic nanodevice has been developed which combines magnetic targeting, fluorescent-imaging, receptor-specific targeted delivery and pH responsive drug release into one system. The device has been synthesized by covalently grafting the widely used targeting agent folic acid, chemotherapeutic anticancer drugs and fluorochrome rhodamine isothiocyanate onto the surface of supeparamagnetic magnetite nanoparticles, functionalized with surface anchoring agent. The decorated magnetite nanoparticles serve as the core material to allow magnetically guided drug delivery and helps to enhance contrast due to T2-weighted magnetic resonance .Magnetically activated cell-sorting and confocal microscopy clearly establish that cells with over expressed with human folate receptors internalize efficiently the drug modified with nanoparticles than normal cells.

Biography

Prof P.Pramanik completed M.Sc and Ph.D from Indian Institute of Technology (IIT), Kharagpur, India . He is professor since 1993 in IIT, Kharagpur. His research interest is material chemistry and nano-biotechnology .He has publishes about 200 papers in international journals. He is member of many advisory board of government of India. He is key member of task force for nano-biotechnology of government of India.