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Protein-based nano-carriers as promising drug and gene delivery systems

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In recent years, there has been a considerable interest in the development of novel drug delivery systems using nanotechnology. Polymeric materials used for preparing nanoparticles for drug delivery must be at least biocompatible and best biodegradable. Among the available potential colloidal drug carrier systems, protein-based nanocarriers are particularly interesting. Meeting requirements such as low cytotoxicity, low inflammation and significant uptake into the targeted cells present protein-based nanocarriers as promising candidates for efficient *in vivo* drug and gene transfer in the future. Proteins as natural polymers are heterogeneous mixtures of different sized proteins with a wide range of molecular weights which may hinder the scaling-up process for industrial application. An interesting strategy to overcome this drawback is the recombinant protein technologies. The monodispersity and precisely defined properties of polymers as well as the predictable placement of crosslinking groups, binding moieties or their programmable degradation rates makes them useful for drug delivery and tissue engineering. The current presentation highlights the main advances achieved in utilizing protein nanocarriers as natural vehicles for drug delivery tasks with respect to types (animal or plant proteins), formulation aspects, major outcomes of the *in vitro* and *in vivo* investigations as well as site-specific drug targeting using various ligands modifying the surface of protein nanocarriers. Nanocomplexes of protein with polysaccharides, lipids, synthetic polymers or metals in the area of drug delivery will be also discussed.

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