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Editorial

Drug Delivery with Nanoparticles

Current advances in nanotechnology have led to the development of the new field of nanomedicine, which includes many applications of nanomaterials and nanodevices for diagnostic and therapeutic purposes. In particular, new approaches to site-specific drug targeting using nanoparticle drug carrier systems have been developed.

Drug delivery and related pharmaceutical development in the context of nanomedicine should be viewed as science and technology of nanometer scale complex systems (10-1000 nm), consisting of at least two components, on of which is a pharmaceutically active ingredient, although nanoparticles formulations of the drug itself are also possible. The whole system leads to special function related to treating, preventing or diagnosing diseases some times called smart-drugs or theragnostics.

Nanoparticles are made from biocompatible and biodegradable materials such as polymers, either natural (e.g., gelatin, albumin) or synthetic (e.g., polylactides, polyalkylcyanoacrylates), or solid lipids (e.g., tristearin, glyceryl monostearate). In the body, the drug loaded in nanoparticles is usually released from the matrix by diffusion, swelling, erosion, or degradation.

The following are among the important technological advantages of nanoparticles as drug carriers: high stability (i.e., long shelf life); high carrier capacity (i.e., many drug molecules can be incorporated in the particle matrix); feasibility of incorporation of both hydrophilic and hydrophobic substances; and feasibility of variable routes of administration, including oral administration and inhalation. These carriers can also be designed to enable controlled (sustained) drug release from the matrix.

Today, biopharmaceuticals account for 25% of all pharmaceuticals in the development pipeline. Detailed profiling, fingerprinting, and computational analysis (including DNA and RNA sequencing) are required to establish relationships between physicochemical characteristics of a typical nanocarrier and adverse population based immunological responses.

Generation of biologically and environmentally safe nanoparticulate drug delivery systems makes it possible to formulate drugs in an optimal way and for personalized therapies.

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