Nanoscaled systems for drug delivery

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Within past few decades nanotechnology became an extremely important component of pharmaceutical sciences and finds various utilizations in drug delivery systems in enhancing therapeutic performance of drugs. The prefix "nano" refers to one-billionth of a meter. The term "nanotechnology" is used to refer to the creation of objects with dimensions between 1.0 and 100.0 nm. Encapsulation of active compounds into nanoparticles becomes a very promising way of preventing drug degradation, decreasing toxic effects, improving bioavailability, and controlling the rate of drug release. The main advantage of particulate drug delivery systems such as polymeric nanoparticles, liposomes and solid lipid nanoparticles is their ability to cross membrane barriers, particularly in the CNS and the gastrointestinal tract and deliver drugs with higher efficiency with fewer adverse side effects. Polymer-based nanoparticles (PNPs) are widely investigated means for controlled drug delivery and are made from biocompatible and biodegradable materials such as polymers, either natural or synthetic. Their important technological advantages as drug carriers are: high stability; high carrier capacity; feasibility of incorporation of both hydrophilic and hydrophobic substances; and feasibility of variable routes of administration, including oral administration. In addition, their uptake by paracellular, intracellular, or intercellular pathways and their stability in the gastrointestinal tract indicate that nanoparticles display the potentials of those carriers for the transport of drugs. Liposomes are colloidal spheres of lipid bilayer membranes, which are composed of self-assembled amphiphiles (mostly pospholipids) in contact with water. Among their advantages over other delivery systems are their high biocompatibility and low immunogenicity. The considerable attention have received liposomes, made of the native tetraether lipids from the thermo-acidophilic archae bacterium Sulfolobus acidocaldarius, for applications in biotechnology; these liposomes showed high stability in acidic environments, ability to perform drug deposition in colon and they can be successfully used for drug delivery. Solid lipid nanoparticles (SLP) are a new generation of colloidal drug carrier systems comprising by surfactant-stabilized lipids that are solid both at room and body temperatures. SLP merge the advantages of liposomes, PNPs, and emulsions while reducing some of their individual disadvantages. Solid lipid nanoparticles offer the possibility of a sustained release due to their solid matrix. Moreover, particulate systems can alter the bio distribution of drugs and provide the possibility of drug targeting to the intended diseased site in the body, since the surface of SLN can easily be modified. In conclusion we can say that nano drug delivery systems hold great potential to overcome some of the biological barriers to specific and efficient targeting of drug molecules in diseased site; reduce the risk of adverse reactions, allow for more predictable and extended duration of action, reduce the frequency of re-dosing and improve patient acceptance and compliance.

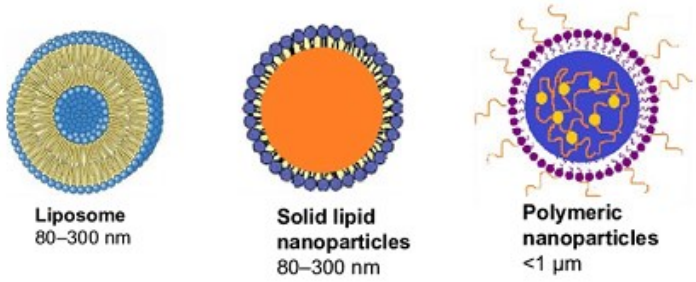

Figure. Nanoscaled Drug Delivery Systems

Key Words: *Nanoscaled drug delivery systems, polymer-based nanoparticles, liposomes, solid lipid nanoparticles.*