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Investigation on nano-sized drug delivery systems for ocular application

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The unique characteristics of the eye and the presence of strong defense mechanisms make difficult to achieve therapeutic concentrations of drug in the different parts of the eye after topical instillation of eye-drop. One of the main challenges to increase the poor ocular bioavailability of conventional formulations is to improve the low drug-contact time by reducing drainage, tear turnover and dilution or lacrimation. In addition, another strategy is to enhance the drug penetration across the cornea, which represents an effective barrier to drug permeation due to the presence of the annular tight junctions on corneal epithelium. Various drug delivery systems have been developed to increase the bioavailability of ophthalmic drug. In particular, nano-sized carriers like liposome, nanoparticle, SLN and nano-micelle have gained wide interest, providing an increase in the pre-corneal residence time, muco-adhesion and penetration across the eye tissues of drugs. Conventional delivery systems usually require administering at regular time intervals, whereas nano-sized carriers often release drugs at constant rate for a prolonged period of time and thus enhance their absorption and promote a site specific delivery especially when dispersed or suspended in polymer solutions with muco-adhesion properties. In fact, when applied topically as eye-drop, liposomes can attach to the hydrophobic corneal epithelium, where they continuously release the encapsulated drug, improving pharmacokinetics behavior and decreasing toxic side effects of encapsulated drugs. Polymeric nanoparticles protect drug from metabolic degradation and interact strongly with both ocular surface and drug, more than the same mucoadhesive polymer in solution. SLN for their lipophilic nature, favor drug permeation through the highly hydrophobic corneal epithelium and furthermore, transscleral route might contribute to drug absorption in vitreous humor. The consistent progress in formulation efficiency of nano-sized carriers will be described in view of their application in ophthalmic field.

Biography

Patrizia Chetoni completed her PhD in Pharmaceutical Sciences in 1991. She is currently an Associate Professor of Pharmaceutical Technology in Department of Pharmacy at University of Pisa. She has conducted extensive researches in the technologies for drug delivery. In particular, she has worked in the development of strategies to improve absorption of drugs through biological barriers (cornea, skin, buccal mucosa and nail) and in the development of cell cultures models for prediction of drug bioavailability and of their cytotoxicity. She has also studied animal models to determine the bioavailability of topically applied drugs and experimental methods for the characterization of mucoadhesive properties of drug delivery systems. She has published more than 70 research papers in international referred journals and has also contributed to some book chapters and international patents.

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