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Nanocochleates: A novel lipid-based nanocarrier system for drug delivery

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7.1 Introduction

In contemporary ages, nanotechnology is a widespread area of science and technology that has fascinated attention to the researchers from the various fields like physics, chemistry, biology, and engineering. Nanotechnology is expanding rapidly in the field of medicine which is currently termed as nanomedicine that uses the knowledge and tools of nanotechnology for the prevention and treatment of various diseases such as cancer, diabetes, respiratory diseases, and ocular diseases. Last 10 years, scientific community worldwide has been involved in discovering “nanoscale” solutions in order to prevent and treat these diseases by using nanoparticle-based drug delivery system, biocompatible nanorobots and such related devices [1]. The design and production of suitable nanoparticle-based drug delivery systems provide an innovative approach to optimize bioavailability and stability of the drug through controlling the drug delivery as well as sustaining drug stability during transport to the site of action. An effective nano-based drug delivery system should acquire an extended shelf life, optimal drug loading capacity, and also the ideal release properties, so that this carrier system exerts an improved therapeutic efficacy along with much lower side effects [2].

Various novel strategies have been reported to enhance drug absorption through cross-membrane diffusion that include pro-drug analogue, application of enzyme inhibitors and bioenhancer by using lipid-based drug delivery system. Several methods are used for oral delivery of tissue impermeable drugs such as (1) converting a drug to lipophilic pro-drug, (2) conjugation of drug molecules with lipophilic moieties, and (3) encapsulation of a drug into particulate system which may protect the bio-active molecules in biological systems without altering their original chemical structure [3]. Recently, nano-vesicles have become popular as a carrier system in drug delivery system for encapsulating the bio-active molecules which provides prolong release of the existence drug in the systemic circulation [4].

Nanocochleate is a lipid-based solid particulate system made from large continuous sheets of natural as well as synthetic anionic lipid bilayers rolled up such a manner that developed a spiral structure with little or no internal aqueous phase. It is most adaptable technology for the delivery of a wide range of bio-active molecules such as