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An Overall Review on Formulation and Applications of Lipid Based Drug Delivery System

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Abstract

Lipid Based Drug Delivery System (LBDDS) are capable of increasing solubilizing and it results in increasing the bioavailability of the drug by solubilizing the drug in lipid excipients which includes solid lipid nanoparticles, vesicular drug delivery systems. In this review detailed discussion was made upon the various approaches of formulation of lipid based drug delivery system.

Keywords: micro emulsion; reverse micellar technique; solid lipid nanoparticles; poor permeation

Introduction

For regulation of drug products world-wide, the biopharmaceutical classification system (BCS) has become an increasingly important tool, since its inception in 1995. Food and Drug Administration (FDA) introduced the classification system , has categorized drugs in terms of their solubility and intestinal permeability. The BCS classification has impact on the worldwide pharmaceutical fields, in discovery of drug, development, and regulation [1,2].

According to BCS classification drugs can be organized into four classes :class I (drugs with high solubility and permeability), class II (drugs with low solubility and high permeability), class III (drugs with high solubility and low permeability) and class IV (drugs with low solubility and permeability) [3,4]. WHO list, 61 out of 130 orally administered drugs classified. 21 (84%) of these belong to class I, 10 (17%) to class II, 24 (39%) to class III and 6 (10%) to class IV.Lipid-based formulations may include oil solution, emulsions, self-micro or self-nano emulsifying drug delivery systems [5,6].

1.1.1 Types of Lipid Based Drug Delivery System

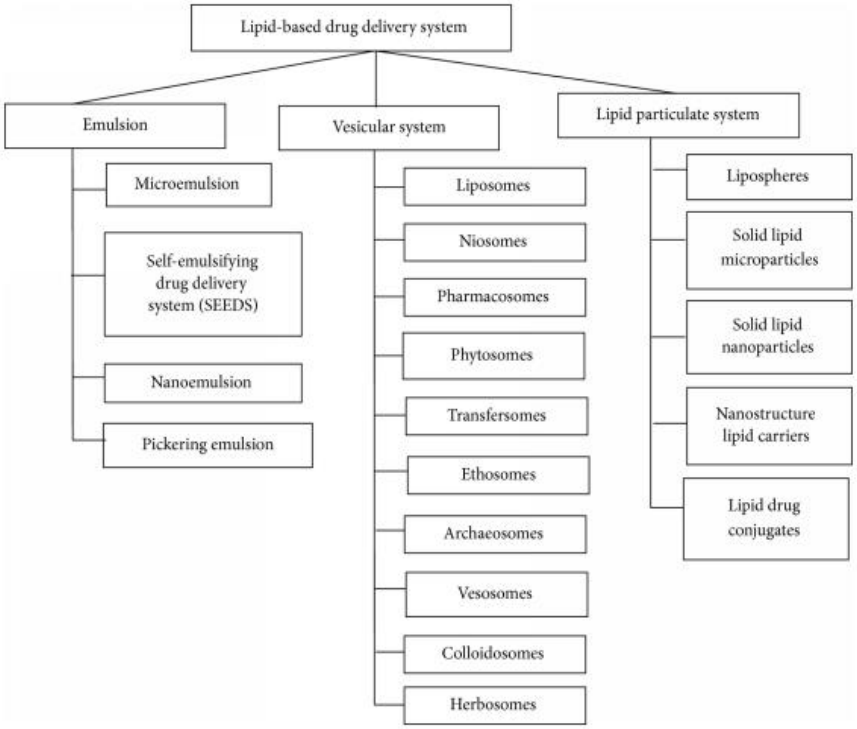

Figure 1.1.1classification of lipid based drug delivery system

1.1.3 Lipid Formulation Classification System

The lipid formulation classification system (LFCS) was found in 2000 as a active model and in 2006 an extra "type" of formulation was added. The LFCs have been discussed more widely within the pharmaceutical industry to lookup a agreement which can be adopted as a framework for comparing the performance of lipid-based formulations In recent years [7,8]. The main purpose of the LFCs is to allow in vivo studies of the formulation can be interpreted easily . With reference to the physicochemical properties of particular drugs, the most suitable formulation can be through detected LFCS. Most of the marketed products are Type III systems. Hence, further divided into Type III A (oils) and Type III B (water-soluble) based on the balance of oils and water-soluble substances [9,10].

Type I	Type II	Type IIIA (fine emulsion)	Type IIIB (microemulsion)	Type IV
Oils without surfactants	Oils and water insoluble surfactants	Oils, surfactants, cosolvents (both water-insoluble and water-soluble excipients)	Oils, surfactants, cosolvents (both water-insoluble and water-soluble excipients)	Water-soluble surfactants and cosolvents (no oils)
Non-dispersing	Emulsion (SEDDS)	SEDDS/SMEDDS formed with water-soluble components	SEDDS/SMEDDS formed with water-soluble components and low oil content	Disperses typically to form a micellar solution
Requires digestion	Will be digested	Digestion may not be necessary	Digestion may not be necessary	Limited digestion

Delivery Systems Employed in The Permeability Improvement Of Bcs Class Iii Drugs [11,12]

DRUG	DELIVERY SYSTEM	CONCLUSION
DOXORUBICIN	Double emulsion system	In this system drug is available in internal hydrophilic centre which act provide safe environment to drug and act as a storage cavity and from intestine these can get directly absorbed as oil droplets
ACYCLOVIR	Niosomes	Niosomal dispersion has improved the oral bioavailability of acyclovir by more than 2- folds as compared to free drug solution because they are osmotically active and chemically stable
PIDOTIMOD	Self-double emulsifying drug delivery system (SDEDDS)	In vivo study shows that time profiles of plasma concentration in mice shows increased absorption of pidotimod loaded SDEDDS loaded as compared to its plain solution
DOXORUBICIN	Nanoparticles	Nanoparticles control the release of doxorubicin in a pH dependent manner and enhance the efficacy of drug
METFORMIN	Liposomes	In vivo study performed on metformin-loaded liposomes coated with chitosan cross-linked with beta-glycerophosphate suggested that microcomplexes controlled the delivery of drugs and improve the oral bioavailability
ATENOLOL	Solid-lipid nanoparticles	In vitro permeability study suggested that drug-phosphotidylcholine solid dispersion increases percentage permeation as compared to pure drug and as the amount of phospholipid increases relative to that of drug, permeability of drug increases. This system has ability to enter through various anatomical boundaries, sustained release of their contents and their stability in nanometer size.

Conclusions

Lipid-based formulations increase the bioavailability of drug by avoiding erratic absorption. The emulsions facilitate the absorption of the drug through intestinal lymphatic pathway and by partitioning of drug into intestinal fluids which is aqueous phase. This technology is a key for formulating low bioavailability drugs.

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