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Niosome:- Novel Pharmaceutical Drug Delivery System

Baravkar Pratiksha Dada

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ABSTRACT
Niosomes are a novel drug delivery system, in which the medication is encapsulated in a vesicle. The vesicle is composed of a bilayer of non-ionic surface active agents andhence the name niosomes. Structurally, niosomes are similar to liposomes, in that they are also made up of a bilayer. However, the bilayer in the case of niosomes is made up of non- ionic surface active agents rather than phospholipids as seen in the case of liposomes. Most surface active agents when immersed in water yield micellar structures however some surfactants can yield bilayer vesicles which are niosomes. Niosomes may be unilamellaror multilamellar depending on the method used to prepare them. The niosomes are classified asa function of the number of bilayer (e.g. MLV, SUV) or as a function of size. (e.g. LUV, SUV) or as a function of the method of preparation (e.g.REV, DRV). Niosomes present a structure similar to liposome and hence they can represent alternative vesicular systems with respect to liposomes, due to the niosome ability to encapsulate different type of drugs within their multienvironmental structure. The technology utilized in niosomes is still greatly in its infancy, and already it is showing promise in the fields of cancer and infectious disease treatments

I. INTRODUCTION

In the last few decades, much research has been aimed at prevention and treatment of disease with a significant degree of success. Treatment of an acute disease or a chronic illness has been accomplished by administering various pharmaceutical dosage forms like tablets, capsules,creams ointments,syrups,suppositories andinjectablesto thepatients.Eventhough these dosage form ensure a prompt release of drug, it is necessary to administer these conventional dosage form several times a day to maintain the drug concentration within the therapeutically effective range for the treatment. In the past three decades several advancement in drug delivery system have been made. As a result new techniques have been developed as delivery systems. These techniques are capable of controlling the rate of drug, delivery. Sustaining the duration of the rapeutic activity and targeting the delivery of a drug to a tissues. New carrier system has been designed to procure site-specific pharmacological action drug or controlled release of drug or prolonged duration of action of the drug, thus enhancing efficacy while diminishing undesirable side effects.

TYPES OF NIOSOMES

Generally, the niosomes have been classified as a function of the number of bilayer (e.g. MLVs, SULVs) or as a function of size (e.g. LULVs, SULVs) or a function of the method of preparation (e.g. REV – Reverse Phase Evaporation, DRV – Dried Reconstituted vesicles).

1. Multilamellar Vesicles (MLVs)-1000 to 5000nm
2. Larger Unilamellar Vesicles (LULVs)-100 to 1000nm
3. Small Unilamellar Vesicles (SULVs)-25 to 500nm

METHODS OF PREPARATION OF NIOSOMES

1. Multi Lamellar Vesicles (MLVs)
- Thin film hydration method
2. Large Unilamellar Vesicles(LULVs)
- Reverse Phase Evaporation method
- Calciuminducedmethod
- Dehydration/Rehydration of small Unilamellar Vesicles
- Detergentremovalmethod
3. Small Unilamellar Vesicles(SULVs) Sonication method
- ✦ French press method
- ✦ Ethanol injection method
- ✦ Ether injection method
- ✦ Homogenization
- ✦ Dried Reconstituted Vesicles

COMPOSITION OF NIOSOMES:

The vital components used in then iosome formulation are:

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1. Non-ionic surfactants
2. Cholesterol
3. Charge inducer
4. Hydration medium

APPLICATIONS OF NIOSOMES:

1) Targeting of bioactive agents:

a) Toreticulo-endothelial system(RES):

The vesicles are preferentially taken by the cells of RES. It can be used in the treatment of animal tumors known to metastasize to the liver and spleen and in parasitic infestation of liver.

b) To organs other than RES:

It has been suggested that carrier system system reaches at specific site in the body by the use of antibodies. Immunoglobulin is a convenient means for targeting of drug carrier.

2) For the treatment of Leshmaniasis:

Leishmaniasis is a disease state in which the parasite invades cells and liver. Antimonials are most commonly preferred drugs. The antimony study was done on mice and itwas concluded that increased sodium stibogluconate efficacy of niosomal formulation, effect of two dose on successive days was additive. Niosomes are also effective as liposomes of loaded drug in experimental leishmaniasis.

3) Tumortargeting:

Foreffectivecancerchemotherapy,ahighcon centrationofanticanceragentisrequiredatthe tumor site. This minimizes the concentration of the drug in other tissue compartments of the body, thus minimizing their adverse reactions. Niosomes have been studied byseveral groups for enhanced delivery of anticancer agents to regional lymphatics prepared niosomes of cytarabine hydrochloride by lipid hydration method that excluded dicetyl phosphate to obtain vesicles ofsmaller size. Thesizeofthevesiclesobtained ranged from 600 to 1000nm. Among the different surfactants selected (Span 60, Span 80, Tween 20, Tween 80), Span 60 formulation yielded the slowest release rate. Release occurred in two phases, an initial burst release that lasted for 2-6h, followed by a sustained release that was maintained for at least 16h.

4) Niosome as carrier for haemoglobin:

Niosomes are used as carrier for haemoglobin. Vesicles are easily permeable to oxygen and haemoglobin curve can be modified similarly to non-capsulated haemoglobin. Niosomal suspension shows a visible spectrum which is superimposable onto that of free haemoglobin

FUTURE PROSPECTS:

Niosome is a promising drug delivery system. Noisome can be used to encapsulate toxic drugs like anti-cancer, anti- viral, anti-AIDs etc and can increase their bioavailability and targeting properties. Special storage and handling conditions are not required forn iosomes.

II. CONCLUSION:

Niosomes represent a promising and novel drug delivery technology. They are drug carriers to design effective drug delivery system. They offer a great opportunity for loading hydrophilic, lipophilic or both drugs together. Many studies have been demonstrated that niosomes improve the stability of entrapped drug, reduce the dose and enable targeted delivery to a specific site. Niosomes appears to be well preferred drug delivery system over liposome as niosomes are stable and economic. This system is widely accepted by the researchers as well as academicians. Niosomes have a great drug delivery potential for targeted delivery of anti- cancer, anti-infective, anti-inflammatory agents, transdermal drug delivery and recently as vaccine adjuvant and as diagnostic agents

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