IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

NIOSOMES- NOVEL DRUG DELIVERY SYSTEMS A REVIEW

Amaragonda Ramadevi
MPharmacy(pharmaceutical department)
G pulla reddy college of pharmacy
Hyderabad, mehadipatnam, 500028

Abstract

Target-specific drug-delivery systems for the administration of pharmaceutical compounds enable the localization of medicine to diseased sites. The vesicular system of niosomes, with their bi-layer structure assembled by non-ionic surfactants, is able to enhance the bioavailability of a drug to a predetermined area for a period. The formulation of vesicles as a way of improving the delivery of drugs over the past several years has generated a lot of concern among scientists working in the field of drug delivery systems. The amphiphilic nature of niosomes promotes its efficiency in encapsulating lipophilic or hydrophilic drugs. Other additives, like cholesterol, are often wont to maintain the rigidity of the niosomes' structure. Niosomes are contrasted with liposomes when the high chemical stability and efficacy of the substitute are considered. For medicines and therapeutic purposes, the implementation of vesicular (lipid vesicles and non-ionic surfactant vesicles) devices can give many benefits. They strengthen drug molecules' clinical efficiency by delaying clearance from circulation, safeguarding the drug from the genetic atmosphere, and limiting target cell impacts. This study focused on recent developments in the distribution for niosomal medicines, possible benefits above other delivery systems, methods of construction, characterization methods, and current noisome studies. Niosomes often have tremendous potential for nanotechnology to realize focused non-cancer, non-infective agents. Niosome's potential for drug delivery are often improved using new ideas like proniosomes, discomes, and aspasome. Niosomes also are useful for diagnostic testing and as a lively ingredient to the vaccine. Such areas, therefore, need additional study and development to products available within the market niosomal preparations.

Keywords: - Niosomes, Compositions, Methods of Preparation, Surfactants, Vesicles.

INTRODUCTION

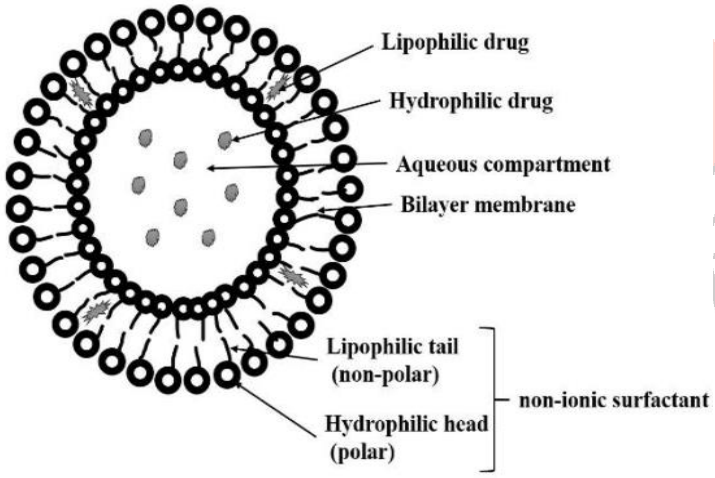
The concept of a drug-delivery system refers to a process of administering pharmaceutical compounds at a predetermined rate to achieve a therapeutic effect in humans or animals at a diseased site, and at the same time, reducing the concentration of the medication in surrounding tissues. Localized drug action enhances the efficacy of the drug and reduces systemic toxic effects on tissues. Niosomes are non-ionic surfactant vesicles obtained on the hydration of synthetic non-ionic surfactants, with or without incorporation of cholesterol or other lipids. This class of vesicles was introduced by Handjani – Vila et.al. They are vesicular systems almost like liposomes which will be used as carriers of amphiphilic and lipophilic drugs. One of the explanations for preparing niosomes is that the assumed higher chemical stability of the surfactants than that of phospholipids, which are utilized in the preparation of liposomes. Due to the presence of the ester bond, phospholipids are easily hydrolyzed. Novel drug development is both time-consuming and expensive. The development of a new drug costs an estimated $120 million, and the journey from discovery, clinical testing, and development to regulatory approval takes decades. Specific drug-delivery systems alleviate the urgency for bringing new drugs into the market by increasing drug selectivity and the therapeutic index while lowering the effective dose. This narrative review discusses the role of niosomes as a drug-delivery system and details of their structure, preparation, properties, and applications.

Advantages of niosomes	Disadvantages of niosomes
1.The characteristics like size, lamellarity etc. of the vesicle are often varied counting on the need.	1. Fusion
2. The vesicles can act as a depot to release the drug slowly and offer a controlled release	2. Aggregation
3. Since the structure of the niosome offers place to accommodate hydrophilic, lipophilic also as amphiphilic drug moieties, they will be used for a spread of medicine .	3. Leaking of entrapped drug
4. The vesicle suspension being water based offers greater patient compliance over oil based systems	4. Physical instability
5. They're osmotically active and stable.	5. Hydrolysis of encapsulated drugs which limiting the time period of the dispersion.
6.They increase the steadiness of the entrapped drug	
7.Can enhance the skin penetration of medicine	

.

STRUCTURE OF NIOSOME

A typical niosome vesicle would consist of a vesicle forming amphiphilic i.e. a non-ionic surfactant such as Span-60, which is usually stabilized by the addition of cholesterol and a small amount of anionic surfactant such as dicetyl phosphate, which also helps in stabilizing the vesicle



The two major components used for the preparation of niosomes are,

1.Cholesterol 2.Non-ionic surfactants

1.Cholesterol

Cholesterol may be a steroid derivative, which is employed to supply rigidity and proper shape, conformation to the niosomes preparations.

2.Non-ionic surfactants

The following non-ionic surfactants are generally used for the preparation of niosomes.

e.g.Spans (span 60, 40, 20, 85, 80)

Tweens (tween 20, 40, 60, 80)

Brijs (brij 30, 35, 52, 58, 72, 76)

The non ionic surfactants possess a hydrophilic head and a hydrophobic tail.

Type of Niosomes

Niosomes are defined as either a variable of bilayer number (e.g. MLV, SUV) or size function. (LUV, SUV, for example) or as a component of the preparing technique (REV, DRV, for example).

1.Multilamellar vesicles (mlv)

It consists of the many bilayers, which correspond to the aqueous lipid compartment separately. Such vesicles are approximately 0.5-10 µm in size. Multilamellar vesicles were the foremost commonly used niosomes. All such vesicles are suitable for lipophilic substances as a drug transporter.

2.Unilamellar Vesicles (LUV)

The sort of niosomes features a high percentage of the aqueous / lipid container, and perhaps during a somewhat economical got to have membrane lipids, larger quantities of bioactive substances could be obtained.

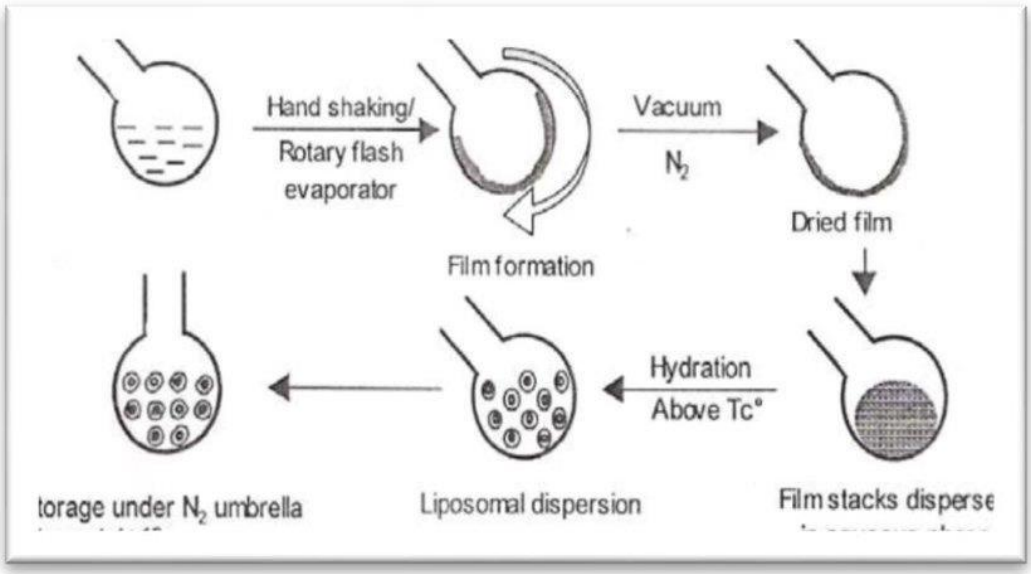
3.Small Unilamellar Vesicles (SUV)

Such Small Unilamellar Vesicles are often formed by sonication approach through multilamellar vesicles. At an equivalent time, the electrostatic stabilisation of French press deformation is that the inclusion of dicetyl phosphate in 5(6)-carboxyfluorescein (CF) charged niosomes supported Span 60.

METHODS OF PREPARATION

1. Handshaking method:-

(Thin film hydration technique) Another round bottom flask dissolves during a volatile organic solvent the mixture of vesicles that shape ingredients including surfactant and cholesterol. At room temp (20 ◦C), the organic solvent is collected and use a rotary evaporator that leaves a surface layer of solid mixture accumulated on the flask rim. To gentle agitation, its dried surfactant film might be rehydrated at 0-60 ◦C to the aqueous phase. Standard multilamellar niosomes form this technique.

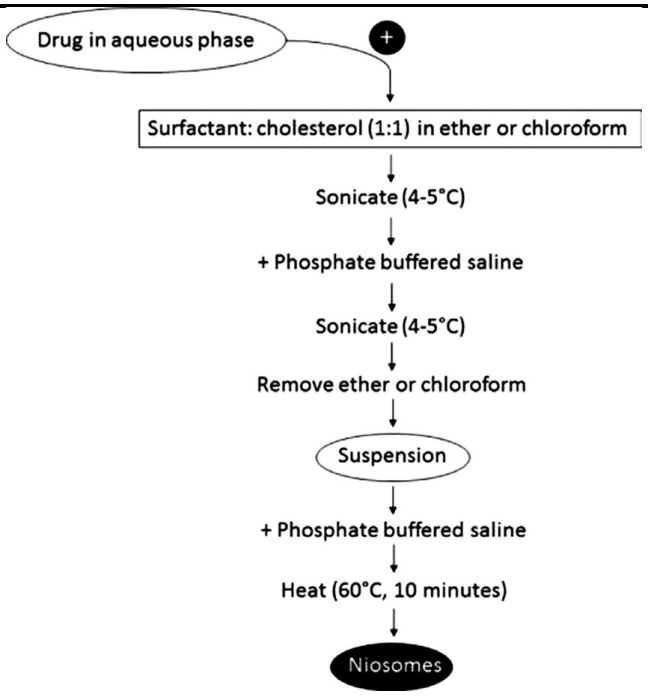


2. Micro fluidisation:-

Micro fluidisation may be a current strategy used only to form specified size production unilamellar vesicles. This approach is predicated on the concept of the submerged jet where two fluidised streams communicate at ultra-high velocities inside the interaction chamber in discrete micro channels. The impingement on a well-liked full view thin liquid layer is configured during a very way that perhaps the energy delivered to the device persists inside the niosome formulation region.

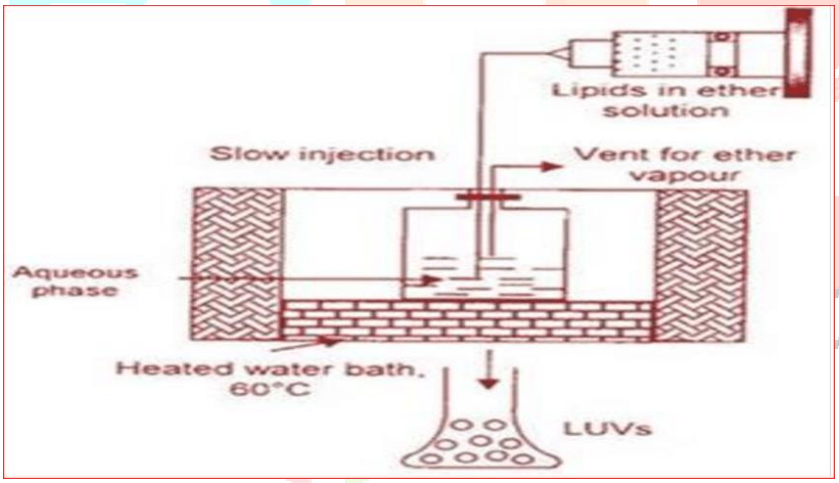
3. Reverse Phase Evaporation Technique (REV)

during a combination of ether and chloroform, cholesterol and surfactant (1:1) are diluted. additionally thereto , an aqueous phase comprising a drug is sonicated at 4-5◦C. The aqueous phase forms into two phases. With the introduction of a coffee amount of phosphate-buffered saline (PBS), the clear gel produced will further be sonicated. The organic phase is extracted at 40 ◦ C at lower pressure. The resulting vicious niosome suspension is mixed with PBS and raised for 10 minutes during a water bath to develop niosomes at 60 ◦C. the assembly of Diclofenac Sodiumniosomes using Tween 85 was recorded by using this process.



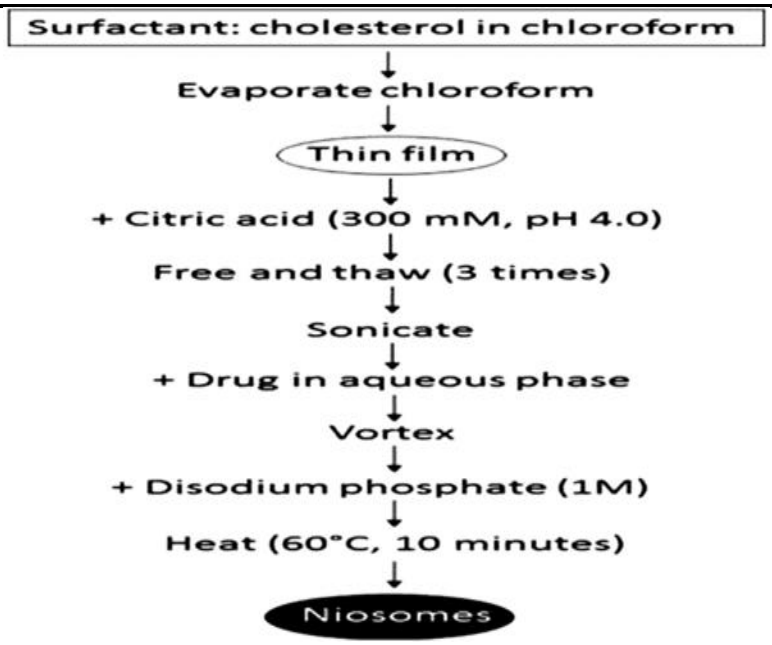
4. Ether injection method

This approach offers the likelihood of manufacturing niosomes by progressively introducing a compound of the surfactant submerged in ether at 60 ◦ C in warm water. This surfactant mixture in ether is injected via a 14-gage needle into an aqueous substance solution. Ether vaporisation contributes to single-layered vesicles being formed. The vesicle's size ranges between 50 to 1000 nm, supported the circumstances utilised.



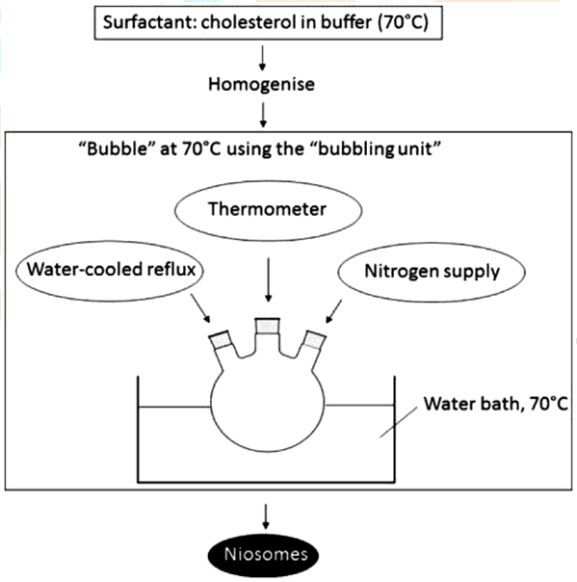
5. Trans-membrane pH gradient (inside acidic) Drug Uptake Process (remote Loading)

Through chloroform, surfactant and cholesterol are consumed. Under lower pressure, the solvent will then dissolve and establish a skinny layer on the bottom of the round bottom Flask. an influence mixing acid (pH 4.0) moisturises the film. The MLV is frozen and reheated 3 times then sonicated. Aq. Sol. of 10 mg/ml of drugs is added to the present niosomal suspension and vortexed thereto . The sample pH would then be doubled to 7.0-7.2 including 1 M of disodium phosphate.



6. The "Bubble" Method

This "Bubble" Method is an innovative strategy to organize liposomes and niosomes in one phase through the utilization of organic solvents. A bubbling machine comprises of a round-bottomed flask and a number of other necks to live temperature within the water bath. Water-cooled reflux and thermometer are inserted via the 3rd neck of the first and second neck and nitrogen supply. Throughout this buffer (pH 7.4) cholesterol and surfactant are spread at 70 ◦ C, the dispersion combined with a better shear homogeniser for 15 seconds then instantly "bubbled" with nitrogen gas at 70◦C.



7. Sonication

A standard technique of vesicle development is by solution sonication as described in Cable. during this technique, a substance solution aliquot within the buffer is introduced during a 10-ml glass vial to the surfactant / choleste mixture. the answer is sonicised for 3 minutes at 600C, using just a sonicator with a titanium sample to get niosomes.

Application of Niosomes

1. Niosomes for haemoglobin as a transporter.
2. It'll be used because the source of peptide products.
3. Niosomes could also be used as a haemoglobin carrier.
4. it's utilized in immune reaction research.
5. Transdermal niosome delivery methods.
6. It utilized in the delivery of ophthalmic medicines.
7. Use of the niosomal method as diagnostic agents

CONCLUSION

Niosome tends to become a system of choice of drug delivery over liposome as secure and economical is clear. Niosomes even have significant drug discovery ability for targeted delivery of non-cancer, no infective agents. Niosomal drug delivery ability are often enhanced by the utilization of latest techniques like proniosomes, discomfort and aspasome. Niosomes also represent a more substantial clinical aid and as an adjuvant to the vaccine. These regions, therefore, need more research and exploration to supply commonly available niosomal preparedness. Scientists and academics widely understand the notion of integrating the drug into liposomes or niosomes to good target the drugs at the right tissue location. These display a liposome-like design and may , therefore, reflect alternate vesicular mechanisms concerning liposomes combined with the power of the niosome to encompass various sorts of drugs throughout their non-environmental structure. Niosomes are ideas for better drug delivery candidates, particularly as compared to liposomes thanks to different variables like price, stability, etc. Niosomes like focusing, ophthalmology, oral, parenteral are often wont to distribute differing types of medicine.

REFERANCE:-

Allen, T. M. 1998. Liposomal drug formulations: Rationale for development and what we will expect for the longer term . Drugs, 56(5):747–756.

Arunothayanun, P., Bernard, M. S., Craig, D. Q. M., Uchegbu, I. F., Florence, A. T. 2000. The effect of processing variables on the physical characteristics of non-ionic surfactant vesicles (niosomes) formed from a hexadecyl diglycerol ether. International Journal of Pharmaceutics, 201(1):7–14.

Azmin, M. N., Florence, A. T., Handjani-Vila, R. M., Stuart, J. F. B., Vanlerberghe, G., Whittaker, J. S. 1985. The effect of non-ionic surfactant vesicle (niosome) entrapment on the absorption and distribution of methotrexate in mice. Journal of Pharmacy and Pharmacology, 37(4):237–242.

Baillie, A. J., Coombs, G. H., Dolan, T. F., Laurie, J. 1986. Non-ionic surfactant vesicles, niosomes, as a delivery system for the anti-leishmanial drug, sodium stibogluconate. Journal of Pharmacy and Pharmacology, 38(7):502–505.

Baillie, A. J., Florence, A. T., Hume, L. R., Muirhead, G. T., Rogerson, A. 1985. The preparation and properties of niosomes-non-ionic surfactant vesicles. Journal of Pharmacy and Pharmacology, 37(12):863–868.

Balasubramaniam, A., Kumar, V. A., Pillai, K. S. 2002. Formulation and in vivo Evaluation of Niosome-Encapsulated Daunorubicin Hydrochloride. Drug Development and Industrial Pharmacy, 28(10):1181–1193.

Bhaskaran, S., Panigrahi, L. 2002. Formulation and Evaluation of Niosomes using Different Nonionic Surfactant. Ind J Pharm Sci, 64(1):63.

Blazek, W. A. I., Rhodes, D. G. 2001. SEM Imaging Predicts Quality of Niosomes from MaltodextrinBased Proniosomes. Pharm Res, 18:656–661.

Buckton, G., Harwood 1995. Interfacial phenomena in Drug Delivery and Targeting. Switzerland. Harwood Academic Publishers. Gadhiya, P., Shukla, S. 2012. Niosomes in targeted drug delivery. A review. . International journal of pharmaceutical research scholars, 1(2):59–72.

Gandhi, M., Paralkar, S., Sonule, M., Dabhade, D., Pagar, S. 2014. Niosomes: Novel Drug Delivery System. International Journal of Pure & Applied Bioscience, 2(2):267–274.

Handjani-Vila, R. M., Ribier, A., Rondot, B., Vanlerberghie, G. 1979. Dispersions of lamellar phases of non-ionic lipids in cosmetic products. International Journal of Cosmetic Science, 1(5):303–314.

Hunter, C. A., Dolan, T. F., Coombs, G. H., Baillie, A. J. 1988.Vesicular Systems (Niosomes and Liposomes) for Delivery of Sodium Stibogluconate in Experimental Murine Visceral Leishma niasis. Journal of Pharmacy and Pharmacology, 40(3):161–165.

Khan, A., Sharma, P. K., Visht, S. 2011. Niosomse as colloidal drug delivey system: A review. International journal of chronotherapy and drug delivery, 2(1):15–21.

Khandare, J. N., Madhavi, G., Tamhankar, B. M. 1994. Niosomes Novel Drug Delivery System. The Eastern Pharmacist, 37:61–61.

Lohumi, A. 2012. a completely unique Drug Delivery System: Niosomes Review. Journal of Drug Delivery and Therapeutics, 2(5):129–135.

Madhav, N. V. S., Saini 2011. Niosomes: a completely unique Drug Delivery System. International Journal of Research in Pharmacy and Chemistry. IJRPC, 2011(3):498– 499.

Manosroi, A., Wongtrakul, P., Manosroi, J., Sakai, H., Sugawara, F., Yuasa, M., Abe, M. 2003. Characterization of vesicles prepared with various non-ionic surfactants mixed with cholesterol. Colloids and Surfaces B: Biointerfaces, 30(1-2):129–138.

Ozer, A. Y. 1991. a completely unique Drug Delivery System Nonionic Surfactant Vesicles. Euro J Pharm Biopharm, 37(2):75–79.

Priyanka, B., Rahul, J., Swapnali, Z., Shobha, H. 2019. Niosomes: As novel drug delivery system. International Journal of Research in Pharmacy and Pharmaceutical Sciences, 4(2):73–78.

RajaNaresh, R. A., Chandrashekhar, G., Pillai, G. K., Udupa, N. 1994. Anti-inflammatory Activity of Niosome Encapsulated Voltaren in Arthitic rats. Ind J Pharmacol, 26(1):46–48.

Rogerson, A. 1987. Adriamycin-Loaded Ni osomes - Drug Entrapment, Stability and Release. J Microencap, 4(4):321–328.

Rogerson, A., Cummings, J., Willmott, N., Florence, A. T. 1988. The Distribution of Doxorubicin in Mice Following Administration in Niosomes. Journal of Pharmacy and Pharmacology, 40(5):337–342.

Shahiwala, A., Misra, A. 2002. Studies in Application of Niosomally Entrapped Nimesulide. J Pharma Sci, 5(3):220–225.

Uchegbu, I. F., Florence, A. T. 1995. Non-ionic surfactant vesicles (niosomes): Physical and pharmaceutical chemistry. Advances in Colloid and Interface Science, 58(1):1–55.

Weissmann, G., Bloomgarden, D., Kaplan, R., Cohen, C., Hoffstein, S., Collins, T., Gotlieb, A., Nagle, D. 1975. A general method for the introduction of enzymes, by means of immunoglobulincoated liposomes, into lysosomes of deficient cells. Proceedings of the National Academy of Sciences, 72(1):88–92. Yasam, V. R., Jakki, S. L., Natarajan, J., Kuppusamy, G. 2014. A review on novel vesicular drug delivery: proniosomes. Drug Delivery, 21(4):243–249.