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Development and Characterization of Gamma Oryzanol Loaded Niosomes

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ABSTRACT

Over the past several years, treatment of infectious diseases and immunization has undergone a revolutionary shift. Noisome are vesicles composed of non-ionic surfactants, which are biodegradable, relatively nontoxic, more stable and inexpensive, an alternative to liposomes. Noisome are of nonionic multilamellar vesicular structure of surface-active agents, which is similar to liposomes. This article highlights Y-oryzanol (Oz) exert their antioxidant activity and often associated with lowering level of cholesterol, anti-inflammatory, anti-diabetic and anti-cancer effects. All reformulation studies were performed. The thin-film hydration technique was used for encapsulation of OZ in noisome. More than 85 % entrapment of Oz was achieved. Nearly 90 % drug was released within 24 hours. Formulation was found sterilized. Formulation was found stable after 5 weeks.

Key words: Niosomes, Gamma Oryzanol, Liposomes, Antioxidant

1. INTRODUCTION

In the last few years have perceived the discovery & development of a wide spectrum of great scale manufacturing and production of novel materials that invention within the nanometer weighbridge. One of the most significant research and development edges in modern science is nanoscience, the word ‘nano’ means one billionth, and nanometer, expresses the length scale that is used to being studied in Nanoscience. The aim of Controlled drug delivery system (CDDS) is liberating the correct dose of a therapeutic active pharmaceutical ingredient (API) directly in the preferred zone at vital period of time. It allows improving the efficacy of the therapeutic, patient compliance and reducing the probable side effects, frequency of drug administration and fluctuation of drug level in blood.[1]

2. MATERIALS AND METHODS

The medication had a similar appearance to that described in the Indian Pharmacopoeia of 2007 and was discovered to be a white to off-white, odorless, crystalline powder. OZ's melting point was relatively close to the standard value stated in the Indian Pharmacopoeia of 2007. The FTIR technique and spectrum are used to confirm the existence of various groups in OZ. The numerous peaks in the FTIR spectrum are comparable to or match those in the official IR spectrum presentation. Sigma-Aldrich (United States) provided the sorbitan monostearate (Span 60). The source of the cholesterol was Fluka Chemie (GmbH, Japan). We bought ethanol, methanol, and chloroform from RCI Lab scan in Thailand. The study's materials were all of an analytical caliber.

2.1 OZ Niosome Preparation

OZ was encapsulated in niosomes using the thin-film hydration technique.[1,2]

For this procedure, 73 mg of the surface-active substance Span 60 and 65 mg of cholesterol were combined in a 100 ml round-bottom flask and dissolved in 3 ml of a 2:1 v/v solvent mixture of ethanol and chloroform. After utilizing a rotary evaporator (EYEL4, Eyela Tokyo Rikakikai, Japan) to evaporate the organic solvents ethanol and chloroform under vacuum pressure at 70 °C for 1 h, the resulting thin film was produced. The resulting thin film was hydrated for 15 minutes at 50 °C with 1 ml of 0.01 M phosphate-buffered saline that had pH 7.4 and contained medicines (OZ). For additional studies, the finished niosome suspension was kept at 4 °C (Figure 1).

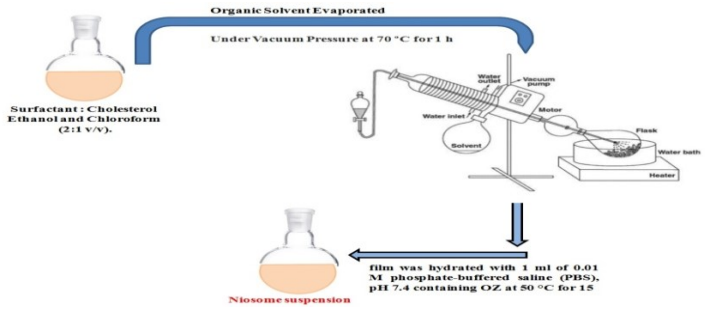

Figure 1: OZ niosome preparation

Solvent: chloroform methanol mixture (2:1v/v), Hydration time: 2-hour, Hydration media: Phosphate buffer saline pH 7.4 (5 ml).

2.2 Removal of Medication from Niosomes that is Unloaded or Unentrapped

By using the centrifugation process, the unentrapped medication was separated from the niosomal formulation. Niosomal suspension was placed in a centrifuge tube and the niosomal formulation was centrifuged at 15,000 rpm for 30 minutes while using a cooling centrifuge and keeping the temperature at 5°c. The produced supernatant was divided. Both the supernatant and the pellet included drug-containing vesicles that had been caught.

2.3 Capture Effectiveness

The extraction conditions for niosomes were modified from the prior study [60] and the encapsulation efficiency (EE) of peptide-encapsulated niosomes was examined. Niosome formulation was centrifuged in 1 ml for 2 hours at 4 °C and 15,000 rpm.

2.4 Scanning Electron Microscopy

A scanning electron microscope (SEM) was used to analyze the surface morphology of the niosomes (Figure 5.2). Niosome suspension in 1 ml was centrifuged at 12,000 rpm for 10 min. Niosomal pellets were centrifuged once more after being rinsed twice with distilled water. Re-suspended in 0.4 cc of distilled water were the pellets. Samples with concentrations ranging from 2 to 5l were put onto a glass slide that was covered before being air dried.

3. RESULTS AND DISCUSSION

3.1 Development of OZ Niosomes

In this experimental investigation, non-ionic surface-active substances as span 20 and cholesterol were used to create OZ-loaded niosomes utilizing the thin film hydration process. As a solvent, a 2:1 v/v combination of chloroform and methanol was utilised.

3.2 Encapsulation Efficiency

Thin film hydration was used to encapsulate the OZ in the niosomes (49, 50). For these method, 73 mg surface active agent (SAA) Span 60, 65 mg cholesterol was accurately dissolved in a 100 ml round bottom flask with solvent (Ethanol) and solvent (Chloroform) in 3 ml at 2:1 vis/v.

3.3 *In vitro* Release Study

In vitro drug release study was conducted using a dialysis membrane with molecular weight 2000 Da (Himedia, India). The drug was released from the formulation in an In vitro drug release study using a phosphate buffer saline at a pH of 7.4. 5 mg of niosomal formulation was placed in the dialysis sac and hermetically sealed and immediately suspended in the aqueous receptor medium.

Table 1: *In vitro* drug release of OZ loaded Niosome

Time (hr)	Amount of Drug Release (mg)	Cumulative amount of drug release (mg)	Cumulative % drug release (%)
1	0.2	0.211	2.11
2	0.4	0.471	4.71
3	1.1	1.136	11.36
4	1.5	1.524	15.24
5	2.1	2.144	21.44
6	2.7	2.673	26.73
7	3.1	3.085	30.85
8	3.6	3.587	35.87
9	3.9	3.921	39.21
10	4.2	4.213	42.13
11	4.7	4.741	47.41
12	4.9	4.923	49.23
13	5.2	5.231	52.31
14	5.7	5.742	57.42
15	6.1	6.124	61.24

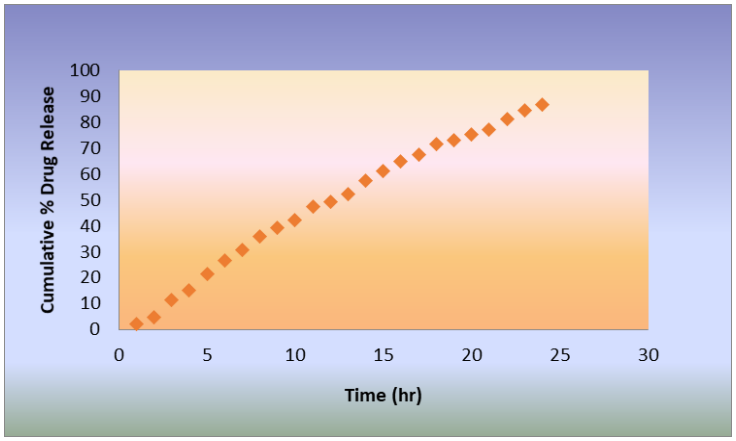

Figure 2: Cumulative % drug release from OZ loaded Niosome (n=3)

4. CONCLUSION

Niosomes are of nonionic multilamellar vesicular structure of surface active agents, which is similar to liposomes. Y-oryzanol (Oz) exert their antioxidant activity and often associated with lowering level of cholesterol, anti-inflammatory, anti-diabetic and anti-cancer effects. All pre-formulation studies was performed. The thin-film hydration technique was used for encapsulation of OZ in niosomes. More than 85 % entrapment of Oz was achieved. Nearly 90 % drug was released within 24 hours. Formulation was found sterilized. Formulation was found stable after 5 weeks. Future studies should be focused on the pharmacological studies using this formulation like anti-oxidant, anti-hyperglycemic and anti-cancer studies. Formulation showed excellent In vitro results.

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