

### ALCOHOL-FREE TOPICAL LIPOSOME AND LIPOSOMAL GEL FORMULATIONS OF SOME HORMONES

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**Introduction:** Liposomes are microscopic vesicles composed of membrane like lipid layers surrounding aqueous compartments. The lipid layers are made up mainly of phospholipids. Phospholipids are amphiphilic; they have a hydrophilic head and a lipophilic tail. In aqueous solutions they are arranged in bilayers, which form closed vesicles like artificial cells. Liposomes are composed of small vesicles of a bilayer of phospholipids encapsulating an aqueous space ranging from about 0.03 to 10 micron diameter. Physical chemists, liposomes being well defined are one of the systems of choice to study amphiphiles. Biophysicists, liposomes serve as the best model for biological membranes. Biologists, liposomes serve as model to understand organelles and their function and mechanism of action of complex systems. Liposomes serve for medical and non-medical applications. Both are based on the above. The success of liposomes for medical application is demonstrated by 12 approved drugs including 2 vaccines. (Ambisome, Doxil, Daunoxome so on). Gels are an excellent formulations for several routes of administration. They are useful as liquid formulations in oral, topical, vaginal, and rectal administration. There are many gelling agents. Some of the common ones are Poloxamers and Carbopol derivatives. Testosterone is a steroid hormone from the androgen group and is found in mammals, reptiles, birds, and other vertebrates. In men, testosterone plays a key role in the development of male reproductive tissues such as the testis and prostate as well as promoting secondary sexual characteristics such as increased muscle and the growth of body-hair. Appropriate testosterone therapy can prevent or reduce the likelihood of osteoporosis, type 2 diabetes, cardio-vascular disease (CVD), obesity, depression and anxiety and the statistical risk of early mortality. Low testosterone also brings with it an increased risk for the development of Alzheimer's disease.

**Aim of the study:** The purpose of this study was the formulation of liposomal gel formulations containing some hormones and hormone combinations and determination particle size, zeta potential, FT-IR analysis, PLM, SEM using different methods and to evaluate on studies. Herewith, we purposed to overcome of problems some of the topical preparations containing alcohol by preparing liposomal gel delivery systems.

**Materials & Methods:** Testosterone (TT) containing eight different liposome formulations were prepared by using thin film, sonication and reverse phase

evaporation methods, respectively. Briefly, liposome was prepared by dissolving the 40  $\mu\text{mol mL}^{-1}$  of phospholipids in 30 mL chloroform in a round-bottom flask. The chloroform was removed using a rotary evaporator under reduced pressure to form a thin film over the wall of the flask. The dried film was then hydrated over a water bath with distilled water. Free TT was removed by centrifugation three times at 17,500 rpm for 45 min for each of them. Then liposomes were prepared by sonication process. The liposomes were characterized by mean particle size and size distribution, zeta potential. SEM and PLM technique were employed for obtaining size distribution and surface appearance and lamellarity.

**Results:** During the study, mean particle size and zeta potential of liposomes were analysed. According to results, particle size of liposomes were found as  $676 \text{ nm} \pm 5.73$ ,  $908 \text{ nm} \pm 24.40$ ,  $1146 \text{ nm} \pm 12.30$  and  $674 \text{ nm} \pm 30.48$ , respectively. According to SEM images, liquid state liposomes were clearly showed not intact and having gaps on the surface of bilayer structure. But, gel state liposomes were obviously observed intact in bilayer structure.

**Conclusion:** Generally, liposomes topical drug applications are safer and less strict than the intravenous applications. Liposomes are used as a carrier for creams, gels (lipogelosome) containing various herbal complexes or essential oils, moisturizing agents, antibiotics, and complex products containing recombinant proteins for wound healing. These results obtained in this study confirm that alcohol free liposomal gel containing testosterone formulations are relatively safe than the other commercial testosterone products. Preliminary studies supported that liposome gel delivery system is suitable for topical applications.

### BIOGRAPHY

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