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Commentary

Niosome Optimization and Pharmaceutical Experimental Design

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DESCRIPTION

The possibility exists for new drug delivery methods to deliver medications and other compounds to the targeted areas. Therapeutic compounds are successfully delivered *via* a variety of carriers, including liposomes, niosomes, nano/micro emulsions and polymeric nanoparticles. Non-ionic surfactants and cholesterol are the fundamental building blocks of niosomes, a sort of drug delivery mechanism that forms vesicular structures. In the core or in the space between the double layers of the vesicles, they can encapsulate both hydrophilic and hydrophobic medications. They are biocompatible, biodegradable and have low immunogenicity, among other benefits. Further benefits of niosomes over comparable counterparts include chemical stability, low cost manufacture, greater accessibility, lesser toxicity and easier storage and handling.

Any medication delivery system must carry the active pharmaceutical ingredient to the site of action and release it appropriately during the course of medical treatment in order to be effective and optimal. This objective and delivering the desired therapeutic efficacy can be accomplished in a number of ways. Drug carrier systems have received a lot of attention from researchers in an effort to solve problems associated with treatments using conventional dosage forms. By a decrease in adverse effects and an increase in patient compliance, drug carrier systems have improved therapeutic efficiency. Various approaches have been developed for efficient drug delivery, but vesicular systems have received the most attention. Niosomes have taken a significant step forward among these vesicular systems, leaving others behind. Bilayered, constructed, vesicular systems made of nonionic amphiphiles (surfactants) and cholesterol are nonionic surfactant-based vesicles. Although the niosomes *in vivo* behaviours are comparable to those of liposomes, they have greater chemical stability. Niosome optimisation also depends heavily on their characterisation. Identification of several factors, including niosome size and shape, zeta potential, and drug release profile, are necessary for characterization. These factors are essential for determining how well niosomes will carry drugs.

Prior to introducing Quality by Design (QD), the formulation development process was centred on One Factor at a Time (OFAT) research, which produced laborious processes and inconsistent outcomes. It used to be challenging for formulas created using OFAT techniques to obtain regulatory approvals. A systematic and scientific planning process known as "Design of Experiments" (DOE) is used to organize experiments in order to collect data that will be examined to produce reliable and impartial results. The first step in DOE is to choose the study's process parameters and the experiment's goal.

CONCLUSION

Response surface, 2-factors, 3-level factorial was the experimental design of choice, out of the 13 formulations, 4 were selected to serve as replicates. To guard against the impacts of time-related factors and to fulfill the statistical criterion of independent variables, run order was maintained in the randomized mode. The same programme was used for every statistical analyzes, including Analysis of Variance (ANOVA), in order to choose the best model. The effects of the independent variables were calculated, and response surface and normal plots were drawn.

In conclusion, careful consideration of a number of factors, such as the kind and quantity of surfactant, cholesterol, charge-inducing agent, drug loading, and characterisation, is necessary for the optimisation of niosomes for drug delivery. A potent method for determining the most important variables that affect niosome performance is pharmaceutical experimental design, which may also be used to create a model that forecasts the ideal conditions for niosome manufacture. Niosome-delivered medications can have their bioavailability and therapeutic efficacy increased by adjusting these factors.

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