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Formulation and characterization of propranolol hydrochloride-loaded liposomes

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Liposomes are employed as carrier systems, thereby safeguarding active pharmaceutical agents (APIs). They facilitate the incorporation of both lipophilic and hydrophilic drug molecules, ensuring targeted drug delivery. The properties of the liposomes are influenced by their lipid composition, surface charge, size, and method of preparation [1]. The modification of the charge of the phospholipid bilayer was achieved through the incorporation of stearylamine (SA) or dicetyl phosphate (DCP) membrane additives. The objective of this study was to successfully incorporate propranolol hydrochloride and to enhance encapsulation efficiency (EE%).

The synthesis of liposomes was conducted by using the thin-film hydration method. The molar ratios of the samples, as determined in a previous study [2], were found to be 8.5:4.5:6.5 for PC: CH: DCP, 12:5:5 for PC:CH:SA, 2.53:0.63:4.06:2.64 for DPPC:DSPC:CH:SA, and 2.53:0.63:1.53:3.96 for DPPC:DSPC:CH:DCP. Trehalose was present at a concentration of 5 w/w%, while propranolol hydrochloride was present at concentrations of 10, 20, or 50 w/w%, as indicated in the composition. The DLS technique was employed for the purpose of size, PDI and zeta potential measurements. Furthermore, the in vitro release was sustained. The structure was examined via FT-IR and Raman spectroscopy.

Several factors support the appropriateness of the 20% propranolol hydrochloride concentration. Firstly, the size of the samples (100-261 nanometers), and the zeta potential was 14-30 mV for the SA samples and -26 to -36 mV for the DCP samples. Thirdly, the PDI was found to be approximately 0.3. The parameters demonstrate stability. The FT-IR and Raman spectra indicated the incorporation of propranolol hydrochloride into the liposomes. Moreover, SA and DCP samples demonstrating comparable outcomes. The drug release (60-100%) comprised reference samples (API without liposomes) and propranolol hydrochloride containing liposomes in varying concentrations. In the majority of cases, the API containing liposomes demonstrated higher levels of release in comparison to the reference samples. Following extensive analysis, the incorporation process was deemed to have been successful, with the resultant material exhibiting the expected physical and chemical properties.

References

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