**Designing a Smart Antiseptic Carrier: Povidone-Iodine Encapsulated in Optimized Niosomes**

**Huynh Truc Thanh Ngoc 1**, Lam Ngoc Bich1, Nguyen Lam Dong, Pham Dinh Duy1, Nguyen Thien Hai1

Department of Pharmaceutics, Faculty of Pharmacy, University of Medicine and Pharmacy at Ho Chi Minh city1, Ho Chi Minh city, Viet Nam.

**Background and aims.** Povidone-iodine (PVP-I) is a widely used antiseptic with broad-spectrum antimicrobial activity, though its clinical use is limited by poor stability and susceptibility to degradation. Niosomes, non-ionic surfactant-based vesicular carriers, offer a promising strategy to enhance the stability and controlled delivery of labile compounds like PVP-I. This study aimed to develop and optimize a stable, effective PVP-I-loaded niosomal formulation using the thin film hydration method and to characterize its physicochemical and antibacterial properties.

**Methods.** Niosomal formulations were prepared via the thin film hydration technique. A D-optimal experimental design evaluated the effects of hydrophilic−lipophilic balance (HLB), surfactant-to-cholesterol ratio, and hydration time on entrapment efficiency (%EE), particle size, and polydispersity index (PDI). The optimized formulation was characterized for particle size, zeta potential, morphology, %EE, bacterial killing rate and was tested for stability at 30 ± 2 °C.

**Results.** A methanol:chloroform (3:2, v/v) solvent system produced a uniform lipid film. A combination of Span 60 and Tween 20 with an HLB range of 9.69–11.3 enabled efficient vesicle formation and enhanced entrapment. A 1:1 molar ratio of PVP-I to cholesterol resulted in structurally stable niosomes. The optimized formulation included 100 mg PVP-I, 105.9 mg cholesterol, 188.8 mg Span 60, and 134.6 mg Tween 20, hydrated at 55 °C for 30 minutes. This yielded niosomes with a mean particle size of 440.3 ± 43.15 nm, PDI of 0.651 ± 0.15, %EE of 35.59 ± 2.0%, and zeta potential of −32.0 ± 5.67 mV, indicating good colloidal stability and an antibacterial activity towards *Staphylococcus aures, Pseudomonas aeruginosa, Streptococcus pneumoniae, Streptococcus pyogenes*. Preliminary stability studies showed consistent PVP-I content, particle size, and %EE at 30 ± 2 °C.

**Conclusion/Discussion.** This study successfully developed a PVP-I-loaded niosomal formulation with improved stability and entrapment efficiency, demonstrating potential for enhanced antiseptic delivery applications.

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**References:**

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