

Chloroform-injection (CI) and spontaneous-phase-transition (SPT) are novel methods; Simplifying the fabrication liposomes with versatile solution to cholesterol contents and size distribution

Muhammad Ijaz Khan^{1, 2*}, Naveed Ahmad¹, Muhammad Farooq Umer¹, Amina Riaz¹, Nasir Mehmood Ahmad³ and Gul Majid Khan^{1*},

¹Quaid-i-Azam University, Pakistan

²University of Swabi, Pakistan

³National University of Sciences and Technology, Islamabad

Statement of the Problem: Intricate formulation methods and/or use of sophisticated equipment limit the prevalence of liposomal dosage-forms. Simple techniques are developed to assemble amphiphiles into globular lamellae while transiting from immiscible organic to the aqueous phase.

Methodology & Theoretical Orientation: Various parameters are optimized by injecting chloroform solution of amphiphiles into the aqueous phase and subsequent removal of the organic phase. Further simplification is achieved by reorienting amphiphiles through a spontaneous phase transition in a swirling biphasic system during evaporation of the organic phase under vacuum.

Findings: Although the chloroform injection yields smaller size and PDI yet spontaneous phase transition method overrides simplicity and productivity. The size distribution of liposomes and solid/solvent ratio in both or any phases of formulation show direct relation. Surface charge dependant large unilamellar vesicles with a narrow distribution have PDI <0.4 in 10 µM saline. As small and monodisperse liposomes are prerequisites in targeted drug delivery strategies. Hence the desired size distribution <200 nm and PDI <0.15 is obtained through serial membrane-filtration method. Phosphatidylcholine/water 4 µmol/ml is achieved at a temperature of 10°C below the phase-transition temperature of phospholipids ensuing suitability for thermo labile entities and high entrapment efficiency. Both methods furnish the de-novo rearrangement of amphiphiles into globular lamellae aiding in the larger entrapped volume. The immiscible organic phase facilitates faster and complete removal of the organic phase. High cholesterol content (55.6 mol%) imparts stability in primary hydration medium at 5+3°C for 6 months in light-protected type-1 glass vial.

Conclusion & Significance: Collectively the reported methods are novel, scalable, time-efficient yielding high productivity in simple equipment.

Received: March 14, 2022; **Accepted:** March 16, 2022; **Published:** March 21, 2022