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Delivery of beclometasone dipropionate to twin impinger via Vibrating mesh and Air jet nebuliser using proliposomes and prosurfactosomes.

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Introduction: Conventional liposomes being more rigid and tends to leak the entrapped or encapsulated beclometasone dipropionate during nebulisation (1). Novel elastic vesicles were formulated and known as surfactosome. These vesicles are composed of surfactant (i.e. Tween 80), in addition to liposomal content, and are more resistant to break up during the shear forces in nebulization. Liposomes and surfactosomes are less stable in aqueous solution; therefore a particulate-based proliposome were introduced by Payne et al., (1965). Proliposomes are free flowing granular product which is composed of phospholipids, cholesterol, active pharmaceutical ingredient and carbohydrate carrier. On hydration in aqueous solution proliposome are converted into an isotonic dispersion of vesicles (2). Similarly, prosurfactosomes are prepared with the addition of Tween 80 in the proliposomal formulation. This study was conducted to compare a hydrophobic drug delivery (i.e. Beclometasone dipropionate) formulated in proliposomes and prosurfactosomes into a twin stage impinger to an *in vitro* lung model. Air jet nebuliser (PARI LC sprint) and vibrating mesh nebuliser (Aeroneb Pro) were utilized as drug delivery devices. This research was conducted in order to study the efficiency of novel 'prosurfactosomes' in comparison with conventional proliposomes.

Method: Proliposomes and protransferosomes were hydrated with Deuterium oxide (D_2O) to form liposomes and surfactosomes. These dispersions were centrifuged to separate entrapped and unentrapped BDP. The separated liposomes and surfactosomes with entrapped BDP were re-dispersed in fresh isotonic water. These liposomes and surfactosomes were delivered via Air jet and Aeroneb pro nebulisers to twin stage impinger. These two nebulisers were utilised to deliver 20 ml of sample dispersion. HPLC was used to quantify the concentration of drug delivered by both nebulisers to the first and the second stage of twin impinger.

Results: It was observed that using Air jet nebuliser surfactosomes delivered significantly ($p<0.05$) more BDP than liposomes to both the stages of impinger. Additionally, it was also observed that using Aeroneb Pro, however, surfactosomes delivered comparatively more BDP than liposomes to both the stages. Therefore, surfactosome was found better formulation for BDP delivery than liposomes.

Nebuliser	Formulation	Stage 1	Stage 2
PARI LC sprint	Liposome	7.52 ± 0.2	20.3 ± 0.8
	Surfactosome	17.87 ± 2.9	44.97 ± 1.9
Aeroneb Pro	Liposome	10.87±0.41	18.1 ± 1.15
	Surfactosome	15.1 ± 4.1	25.3 ± 4.7

Conclusion: Surfactosomes delivered significantly more hydrophobic drug than liposomes to both the stages of impinger using Air Jet nebulizer; whereas they delivered slightly but not significantly more drug than liposomes to both the stages using vibrating mesh nebulizer. The elastic nature of surfactosome made it pass through the nebuliser with much leakage to both the stage of twin impinger.

References:

(1) Saari, m., Vidgren *et al*. 1999. Pulmonary distribution and clearance of two beclomethasone liposome formulations in healthy volunteers. *Int J Pharm*, 181**,** 1-9

(2) Payne, N. I., *et al.* 1986b. Proliposomes: a novel solution to an old problem. *J Pharm Sci*, 75**,** 325-9.