

ABSTRACT**The Development of Freeze-Dried Liposomal Ovalbumin Formulation using Maltodextrin as Lyoprotectant and HPMC Matrix**

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Background: The present study aims to design formulation of ovalbumin-containing liposomes that are well-preserved during freeze-drying. The combination of Hydroxy Propyl Methyl Cellulose (HPMC) as matrix and lyoprotectants maltodextrin. The obtained dry products were investigated in terms of their physical characteristics and ovalbumin integrity.

Methods: Liposomes were prepared using thin film method and hydrated with the lyoprotectant solution. The formed liposomes were mixed with HPMC gel and freeze-dried. The obtained solid products were characterized using Differential Scanning Calorimetry (DSC), X-Ray Diffraction (XRD), and Scanning Electron Microscopy (SEM). Ovalbumin integrity was quantified using Bradford Assay.

Results: The DSC thermograms of formulations with maltodextrin were relatively homogenous, yet exhibiting meta-stable properties. These results were confirmed by XRD data, in which formulations with maltodextrin showed no intensive peaks, indicating amorphous solid. The SEM images show the morphology of spherical liposomes trapped in the matrices. The SEM images also corresponded to the DSC and XRD data. The SEM data were supported by the TEM data in which showed spherical liposome after re-hydration. Ovalbumin was proved to be well preserved during freeze-drying using this systems since the highest recovery was FM1 with $(99.89 \pm 5.1)\%$, while the lowest was FM2 $(80.25 \pm 4.4)\%$. Maltodextrin concentration played important role in determining ovalbumin recovery ($p=0,343$). The higher maltodextrin concentration the lower ovalbumin recovery.

Conclusion: The developed liposomes formulation using combination of HPMC matrix and maltodextrin showed potential in preserving liposomes structure and ovalbumin integrity.

Keywords: Liposomes, Lyoprotectant, Freeze-Drying, Maltodextrin, HPMC, Ovalbumin