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Preparation and characterization of liposome containing ovalbumin and silver nanoparticles

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Introduction: Nanoparticulate carrier systems such as liposomes, are promising delivery system that can protect drugs and antigens against degradation while helping them to cross the barrier function imposed by the stratum corneum. Liposomes can encapsulate both hydrophilic and lipophilic compounds, proteins and other macromolecules. To enhance the stability of the liposomes, metal nanoparticles can be added to the formulation to improve physical stability of the vesicles in contact with the skin, as well as the product shelf life. **Objective:** Prepare and characterize liposomes containing ovalbumin in the presence of silver nanoparticles. **Methods:** Liposomes were prepared by lipid film hydration method using the pair of lipids soy phosphatidylcholine and 1,2-dioleoyl-sn-glycero-3-phosphoethanolamine at a ratio of 3:1, respectively. The lipid film was hydrated with 50 mL solution of 5mg/mL ovalbumin dispersed in phosphate buffer 0.01M pH 7,4 containing or not 5 mL of a 8 mM a silver nanoparticle dispersion. The formulations were stirred in ultra turrax® at 15.000 rpm during 10 minutes and homogenized in a homogenizer. In the end formulations were filtered through a 0.45 µm pores membrane. The characterization was performed by using the Zetasizer Nano ZS 90, for particle size distribution, polydispersity index and zeta potential determination. The ovalbumin encapsulation efficiency (EE) was determined using a 50 k Amicon® filter to separate the free drug by centrifugation at 4000 g for 40 minutes. EE was determined by the ratio [(amount of ovalbumin used - amount of free ovalbumin)/ amount of ovalbumin used) x 100]. The liposomes vesicles were visually analyzed by atomic force microscopy in intermittent contact mode (tapping mode), using 3 v5.12b43 NanoScope software for processing the images. **Results:** For both formulations the particle size average was around 60 nm and the polydispersity index was around 0.2. The zeta potential was -27 for the solution with silver and -9 mV for the solution without it while the ovalbumin encapsulation efficiency was around 60% for both formulations. The atomic force microscopy was able to generate high resolution images showing the liposome adhesion on a mica surface without causing particles collapse, allowing good morphological characterization of the system. **Conclusion:** The silver nanoparticle inclusion did alter the zeta potential but not others liposome characteristics. The liposomes prepared will be further used on stability studies in contact with the skin.

Keywords: Liposome, ovalbumin, metallic nanoparticle, size distribution, zeta potential, encapsulation efficiency, atomic force microscopy.

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