BIO_15 - Study of antibody encapsulation for neuroinflamatory disorders therapy

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Introduction: Neuroinflammation is a complex process involving activation of immune cells and release of pro- inflammatory mediators within central nervous system (CNS) in response to injury, infection, or neurodegeneration. Antibody-based therapeutics are now standard for the treatment. Its nanoencapsulation could protect the drug from degradation, improve permeation capacity, and create a specific target of biologicals. Polymeric nanoparticles (PNs) have gained prominence in the area of drug delivery due to its biodegradability, controlled release and increased bioavailability compare to free bioactive.

Objectives: Evaluate different encapsulation methods for polymeric nanoparticles synthesis aiming to antibody encapsulation.

Methodology: A standard monoclonal antibody was characterized prior to encapsulation. It was performed size exclusion chromatography, SDS-page, fluorescence spectroscopy and circular dichroism. PNs were prepared by emulsion solvent evaporation (DE) and nanoprecipitation (NP) techniques. Encapsulation efficiency (EE) for both DE and NP particles was analyzed by spectrophotometry and affinity chromatography, respectively. Size distribution of NPs was determined by Dynamic Light Scattering (DLS). Protein A affinity chromatography was performed for both PNs to evaluate maintenance of antibody activity post formulation.

Results: The initial mAb structure was confirmed by a single peak in the size exclusion chromatographic profile with an estimated molecular mass of 201.8kDa; maximum fluorescence intensity at 336nm; beta-sheet secondary structure profile compatible with the literature. The DLS results for PN synthesized by DE and NP were 1293 nm and 161,9 nm, with PDI of 0.3 and 0,25 and Zeta potential of -7.18 mV and -4.09, respectively. The first method showed an EE of 97.81% and the second one 58%. Both PNs displayed the same chromatography affinity profile.

Conclusion: Both methods successfully encapsulated the mAb in polymeric nanoparticles and could be used as a potential therapeutic strategy to reduce neuroinflammation.

Keywords: Polymeric nanoparticles; Antibody encapsulation; Drug delivery