Carbopol 934, 940 and Ultrez 10 as viscosity modifiers of palm olein esters based nano-scaled emulsion containing ibuprofen

ABSTRACT

Micro-emulsions and sometimes nano-emulsions are well known candidates to deliver drugs locally. However, the poor rheological properties are marginally affecting their acceptance pharmaceutically. This work aimed to modify the poor flow properties of a nano-scaled emulsion comprising palm olein esters as the oil phase and ibuprofen as the active ingredient for topical delivery. Three Carbopol ® resins: 934, 940 and Ultrez 10, were utilized in various concentrations to achieve these goals. Moreover, phosphate buffer and triethanolamine solutions pH 7.4 were used as neutralizing agents to assess their effects on the gel-forming and swelling properties of Carbopol ® 940. The addition of these polymers caused the produced nano-scaled emulsion to show a dramatic droplets enlargement of the dispersed globules, increased intrinsic viscosity, consistent zeta potential and transparent-to-opaque change in appearance. These changes were relatively influenced by the type and the concentration of the resin used. Carbopol ® 940 and triethanolamine appeared to be superior in achieving the proposed tasks compared to other materials. The higher the pH of triethanolamine solution, the stronger the flow-modifying properties of Carbopol ® 940. Transmission electron microscopy confirmed the formation of a well-arranged gel network of Carbopol ® 940, which was the major cause for all realized changes. Later in vitro permeation studies showed a significant decrease in the drug penetration, thus further modification using 10% w/w menthol or limonene as permeation promoters was performed. This resulted in in vitro and in vivo pharmacodynamics properties that are comparably higher than the reference chosen for this study.

Keyword: Carbopol; Palm olein esters; Oil phase; Ibuprofen