Development of novel delivery system for nanoencapsulation of catalase: Formulation, characterization and in vivo evaluation using oxidative skin injury model.

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Abstract

One of the main challenges for successful pharmaceutical application of Catalase (CAT) is maintaining its stability. Physical immobilization of CAT through nano-encapsulation was proposed to resolve this challenge. CAT encapsulating niosomes (e-CAT) were prepared using Brij® 30, 52, 76, 92, and 97 in presence of cholesterol (Ch) by thin film hydration method. Niosomes were characterized for encapsulation efficiency % (EE), size, poly-dispersity index (PI) and morphology. Kinetic parameters, pH optimum, thermal stability and reusability of CAT were determined. The influence of optimized e-CAT dispersion onto thermally injured rat skin was evaluated. Results revealed that encapsulation enhanced CAT catalytic efficiency (Vmax/ Km). Free CAT and e-CAT had pH optimum at 7.0. e-CAT exhibited improved thermal stability where it retained 50% residual activity at 60 ◦C. Free CAT lost its activity after 3 consecutive operational cycles however, e-CAT retained 60% of its initial activity following 12 cycles. After 24 hr of topical application on thermal injury, a significant difference in lesion size was observed with e-CAT compared to control group. Based on these encouraging results, CAT immobilization demonstrated a promising novel delivery system that enhances its operational stability. In addition, nano-encapsulated CAT can be anticipated to be beneficial in skin oxidative injury.

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