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**PHARMACOLOGICAL EVALUATION OF
MICROEMULSION
CONTAINING BUTYLATED CHITOSAN AS
PROTEIN DELIVERY SYSTEM IN ANIMALS**

BY

DANA M. ASAD

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A thesis submitted in
Partial Fulfillment of the
Requirement for the Degree of
Master of Science
in Pharmaceutical Sciences
At
Petra University
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Amman, Jordan



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Abstract

Over years, many ongoing investigations have been done to improve the oral bioavailability of peptide and protein formulations. For insulin, many physical, chemical and other barriers have been faced that needs to be overcome to deliver insulin orally and increase its bioavailability and absorption. Low molecular weight chitosan has been shown to be a potential carrier in delivering insulin; moreover, the mucoadhesive and permeation enhancing properties of such polymer have been implanted to help in crossing the biological barriers. Further modifications of the low molecular weight chitosan have been studied over the last few years in order to produce more chitosan derivatives. In this study the butylation process of different low molecular weight chitosans (1.3, 13 and 30kDa) and their effect on the enhancement of the molecule characteristics have been investigated.

It was found that the low molecular weight butylated chitosans have interesting characteristics over that of the chitosan such as the solubility enhancement and the surface activity of the molecule and above all, the size of the nanoparticles obtained. In vivo studies revealed that the molecular weight as well as the particle size of the insulin-butylated chitosan affected the insulin bioavailability and pharmacological effect. The low molecular weight and particle size of insulin butylated chitosan demonstrated significant enhancement of the hypoglycemic effect of oral insulin when studied on streptozotocin diabetic rat's model.

In conclusion, this study illustrated the effect of butylated chitosan as a chitosan derivative on enhancing oral protein delivery using insulin as a protein model. This study also highlights the importance of optimizing the molecular weight of the investigated polymer along with determining the optimum particle size of the prepared formulation intended to be administered orally.

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