بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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جامعة عين شمس

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قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

MONA MAGHRABY

Ain Shams University

Faculty of Science

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Synthesis and characterization of novel nanoparticles for medical purposes

A Thesis

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2020

Abstract

Nanotechnology has proved its significant effect in drug delivery, recently. In this study, a good use of nanotechnology was made. Five drugs were synthesized in lab in order to remedy diabetes of type 1 and type 2 and to decrease the consequent diabetic inflammation. All of them were of a particle size within the nano-range. The drugs are Zinc oxide nanoparticles (ZnONPs), Zinc Oxide-Insulin nanoparticles (ZnONPs-Insulin) of ratio 1:1, Zinc oxide-Insulin nanoparticles of ratio 1:0.5, Zinc oxide-Insulin nanoparticles of ratio 1:0.25, Zinc oxide-Curcumin nanoparticles (ZnONPS-CurcuminNPs) of ratio $1:10,^{-3}$ Zinc oxide-Curcumin nanoparticles (ZnONPS-CurcuminNPs) of ratio $1:10^{-4}$ and Zinc oxide-Curcumin nanoparticles of ratio $1:10^{-5}$. The nanomeric drugs were characterized using XRD, HRTEM, FTIR, EDX and surface area to prove a successful adsorption of the reacting particles and identify the shape and size of the reacting particle. A biological experiment was performed using Albino rats to assess the hypoglycemic effect of five prepared drugs plus Curcumin in the nanorange and comparing it with that of Insulin. An oral glucose tolerance test (OGTT) was performed to the experimental rats on the last day of the experiment in order to check the hypoglycemic effect of the prepared drugs with time. Also, blood samples were withdrawn from the experimental rats for performing glycated hemoglobin (HBA1C) analysis. The whole biochemical analysis revealed the effect of the prepared drug samples and the most potent hypoglycemic drug was found to be ZnONPs-Insulin with the ratio 1:1. After sacrificing of experimental animals, their liver and pancreas specimens were taken to be examined for histopathology. It was found that ZnONPs and ZnONPs-CurcuminNPs has the best effect on pancreas and liver specimens.

Key words: Nanotechnology, drug delivery, diabetes, insulin, Zinc oxide (ZnO), Curcumin, hypoglycemic effect, synthesized, nanoparticles.

Aim of Work

Diabetes is a dangerous disorder unless regular medication was adopted as the subsequent inflammation in all body cells does affect the proper function of body organs. So in this study, the desired targets are

1-prevention of insulin comma

The Insulin comma is resulted from not having a sufficient meal before Insulin injection, because of that the idea of using a suitable drug carrier for Insulin was proposed. The Insulin drug carrier extends the period of time in which Insulin is released and therefore avoid comma.

2-Avoiding the painful Insulin injection.

Insulin cannot be orally administered as Insulin will be digested by means of the digestive system. The subcutaneously injection of Insulin allows Insulin to enter blood directly but is painful to some extent. Therefore, the approach of oral Insulin administration is to be considered by finding out an agent that can protect Insulin against digestion or any surrounding affecting factors till passing to blood.

3-Synthesis of new antidiabetic nanomeric compounds which can act as Insulin competitors which can regulate blood glucose and prevent or cure the inflammation.

Acknowledgement

Praise is to **Allah** for helping me overcome all the difficulties I encountered throughout my research journey.

I would like to thank **Prof. Mohamed Ahmed Mekewei** for the fruitful effort in supervising this work, follow-up, guidance and providing me with fruitful advice.

I am much indebted to **Prof. Mohamed Abd El Hay Ahmed** for his invaluable assistance and advice.

My grateful thanks to **Assoc. Prof. Michael Fahmy Abd El Messih** for his help and encouragement.

Great thanks to **Assoc. Prof. Howaida Abd Elfatah Fadel** for her continuous supervision and kind support throughout all steps of this work.

Contents

Dedication

To the soul of my respectable father who inspired me with ambition and good morals…..

List of abbreviations

ADI	Acceptable daily intake
BET	Brunauer–Emmett–Teller
BW	Body weight
CTAB	cetyltrimethylammonium bromide
CurcuminNPs	Curcumin nanoparticles
Cys	Cysteine (an amino acid)
DM	Diabetic mellitus
EDX	Energy dispersive X-ray spectroscopy
EFSA	The European Food Safety Authority
FAQ	The food and agriculture organization
FT-IR	Fourier-transform infrared spectroscopy
GHB	Glycosylated hemoglobin
GI	Gastrointestinal
Hb	Hemoglobin
HBA1C	Glycosylated hemoglobin
HFD	High fat diet