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FORMULATION AND ANTIBACTERIAL ACTIVITY OF SILVER NANOPARTICLE HYDROGELS

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تفويض

أنا الطالبة **اماني عادل عمر العرود**، كلية الصيدلة ، افوض جامعة الإسراء بتزويد نسخ من رسالتي ورقياً وإلكترونياً للمكتبات أو المنظمات أو الهيئات والمؤسسات المعنية بالأبحاث والدراسات العلمية عند طلبها .

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COMMITTEE DECISION

This Thesis/Dissertation (FORMULATION AND ANTIBACTERIAL ACTIVITY OF SILVER NANOPARTICLE HYDROGELS) was Successfully Defended and Approved on the 9th of May, 2018.

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DEDICATION

This thesis is dedicated to the soul of my father Brigadier General Adel Al-Aroud, to my beloved family, my mother and mother in law who have never failed to give reasons to be proud being their daughter, and also to my husband for his constant unconditional support, to my children Tareq and Joury whom I owe every bit of success I have ever achieved. My sisters and brothers, to my friend Suhad for her understanding and help all the way, to Fahmi, Mai and Nariman for the funny times we spent when we felt tired of working. I also dedicate this thesis to my friends all over the place for the happy and hard times we went through together during master's journey.

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LIST OF ABBREVIATIONS OR SYMBOLS

AgNPs	Silver Nanoparticles.
UV-vis	Ultra violet –visible spectroscopy
XRD	X-ray diffractometry
FTIR	Fourier transform infrared spectroscopy
XPS	spectroscopy of photoelectron emitted by X-ray
DLS	dynamic light scattering
SEM	scanning electron microscopy
TEM	transmission electron microscopy
AFM	atomic force microscopy
SPR	Surface Plasmon Resonance
LSPR	localized Surface Plasmon Resonance peaks
ATCC	American Type Culture Collection
TSA	Tryptic soy agar
TSB	Tryptic soy broth
HPMC	hydroxypropyl methyl cellulose
PDI	Polydispersity Index
Z- average	average hydrodynamic size
PVP	Polyvinylpyrrolidone
BSA	Bovine serum albumin
PH	Potency of hydrogen
HPMC	Hydroxyl propyl methyl cellulose polymer
SD	Standard deviation
NP	Nanoparticles
MDR	Multidrug resistant
E. coli	*Escherichia coli*
P. aeruginosa	*Pseudomonas aeruginosa*
S. aureus	*Staphylococcus aureus*
S. epidermidis	*Staphylococcus epidermidis*

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ABSTRACT

The antibacterial activity of silver nanoparticles (AgNPs) is well documented. AgNPs have a broad spectrum activity against gram negative and gram positive bacteria. Most reports evaluated the antibacterial activity of AgNPs in suspensions and not in clinically relevant vehicles such as hydrogels. In this work we prepared a library of monodispersed AgNPs with various sizes and we described the successful incorporation of these nanoparticles into two type of hydrogels: Carbopol (represented anionic polymer) and Pluronic (represented nonionic polymer). AgNPs exhibit excellent colloidal stability in both hydrogels upon storage. However, aggregation occurred upon contact with Tryptic soy agar (bacterial growth media) for carbopol hydrogels but not for pluronic hydrogels.

AgNPs showed different antibacterial activity in both hydrogels, with a common trend supported higher activity for AgNPs with smaller size. This work highlighted the importance of considering nanoparticles size and the type of gelling agent when formulations AgNPs hydrogel which affect their colloidal stability and antibacterial activity.