



بسم الله الرحمن الرحيم

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Ain Shams University
Faculty of Pharmacy
Microbiology & Immunology Department

Effect of Selected Nanoparticles on Biofilm Formation by Enterococcal Urinary Pathogens

A Thesis

Submitted in Partial Fulfillment of the Requirements
for

Master's Degree
In Pharmaceutical Sciences
(Microbiology and Immunology)

By

Nada Swidan Hassan
Bachelor of Pharmaceutical Sciences,
Faculty of Pharmacy, Ain Shams University, 2014

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

وَقُلْ اعْلَمُوا

فَسِيرَ إِلَهِكُمْ عَلَى كُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ

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List of Abbreviations

Abbreviations	Definitions
ABC	ATP-binding cassette
AgNPs	Silver nanoparticles
AgNO ₃	Silver nitrate
ATR	Attenuated total reflection
CAUTI	Catheter associated urinary tract infection
<i>ddl</i>	D-alanine D-alanine ligase
<i>bee</i>	Biofilm enhancer in enterococci
DLS	Dynamic light scattering
Ebp	Endocarditis and biofilm associated pili
EDX	Energy dispersive X-ray
Esp	Enterococcal surface protein
EPS	Extracellular polymeric substances
FCC	Face centered cubic crystal
Fsr	<i>Enterococcus faecalis</i> sensor regulator
FT-IR	Fourier transform infrared
GelE	Gelatinase
GBAP	Gelatinase biosynthesis-activating pheromone
HSL	Homoserine lactone
ICDD-PDF	International center for diffraction data- Powder diffraction file
MBC	Minimum bactericidal concentration

Abbreviations	Definitions
MIC	Minimum inhibitory concentrations
MW	Molecular weight
OD	Optical density
PBS	Phosphate buffered saline
PCR	Polymerase chain reaction
PGCs	Pilin gene clusters
PdI	Poly dispersive index
PVP	Polyvinylpyrrolidone
QSI	Quorum sensing inhibitor
ROS	Reactive oxygen species
SEM	Scanning electron microscope
SPR	Surface plasmon resonance
SprE	Serine protease
TEM	Transmission electron microscope
<i>tetS</i>	Tetracycline resistance gene
TSBG	Trypticase soy broth with 1% glucose
UTI	Urinary tract infection
UV	Ultra violet
XRD	X-ray Diffraction