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and Scientific Research
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College of Medicine**



***Insilico* bactericidal potential Synthesized silver
nanoparticles of clinical *Staphylococcus aureus* and
Escherichia coli Isolated**

A Thesis

**Submitted to Council College of Medicine - University of
Diyala in Partial Fulfillment of the Requirements for the
master's degree of Sciences in Medical Microbiology**

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

﴿ رَبِّ قَدْ آتَيْتَنِي مِنَ الْمُلْكِ وَعَلَّمْتَنِي مِنْ تَأْوِيلِ

الْأَحَادِيثِ فَاطِرَ السَّمَاوَاتِ وَالْأَرْضِ أَنْتَ

وَكِيِّ فِي الدُّنْيَا وَالْآخِرَةِ تَوَفَّنِي مُسْلِمًا وَالْحَقِيقِي

بِالصَّالِحِينَ ﴿

صَبْرًا وَاللَّيْلِ الْعَظِيمِ

يوسف (101)

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To the unknown fighter who helped me and stood next to me and took my hand to the highest ranks to Mr. Mounir

Sarah

Dedication

To whoever illuminated with his knowledge a mind of jealousy.. To whom God has bestowed upon the great creation before the messeng) (Prophet Muhammad, peace be upon him)

From you we learned that success has value and meaning ... and from you we learned how dedication and sincerity in work can be ... and from you we believe that there is no impossible in the way of creativity and advancement ... "my honorable teacher Prof. Dr.Aliaa Saad

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To the gentle smile that splashed the beauty of its light in the darkness of my heart, wiping all of my worries ... To that tender touch that blew in my heart a fountain of hope in this cruel life ... "My brothers"

To you for the splendor of your morals, your remarkable distinction, your upscale presence and the everlasting smile ... "my colleagues"

Sarah

Supervisor Certification

We, certify that this thesis entitled (**Insilico bactericidal potential Synthesized silver nanoparticles of clinical *Staphylococcus aureus* and *Escherichia coli* Isolated**), has been conducted under our supervision at College of Medicine, University of Diyala, as a partial fulfillment of the requirements for the Master Degree of Science in Medical Microbiology.

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SUMMARY

The study included collecting 100 samples of UTI for women, including 20 samples of Escherichia coli bacteria and 10 samples of staphylococcus bacteria in Al-Batoul Hospital for the period from 1/7/2020 to 1/9/2020

The results showed positive growth in appropriate culture media. Macconkey agar, blood agar, and Eosin blue methyl solid. Isolates were diagnosed using bacteriological and chemical tests. It was found that Escherichia coli bacteria were among the main causes of inflammation..Urinary tract and vaginal infections. The diagnosis was confirmed and a sensitivity tested.

Silver nitrate nanoparticles are manufactured in laboratories Department of Physics at the Faculty of Science, Diyala University, the minute sizes were at 45. The inhibitory activity of metal nitrate nanoparticles Ag was detected alone. The inhibitory activity of silver nanoparticles was estimated by the Agar well diffusion method, wherein the silver nanoparticles with a concentration of 3 μ g / ml recorded the highest inhibition diameters. While the silver nanoparticles were recorded at a concentration 200 μ g / ml, the lowest rate inhibition

The molecular docking approach can be used to model the interaction between a small molecule and a protein at the atomic level, which allow us to characterize the behavior of small molecules in the binding site of target proteins as well as to elucidate fundamental biochemical processes. The docking process involves two basic steps: prediction of the ligand conformation as well as its position and orientation within these sites (usually referred to as pose) and assessment of the binding affinity. These two steps are related to sampling methods and scoring schemes, respectively, which will be discussed in the theory section.

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List of Abbreviations

Abbreviate	Key
DEC	Diarrheagenic
NPs	Nanoparticles
EMB	Eosin Methylene Blue
TSI	Triple Sugar iron
GUD	Glucoronidase
LT	Heat-labile toxin
ST	Heat-stable toxin
LPS	Lipopolysaccharides
UTI	Urinary tract infection
OMPs	Outer-membrane proteins
EAST	Enteroaggregative heat-stable toxin
EAEC	Heat-stable enterotoxin
ETEC	Heat-labile enterotoxin
Pet	Plasmid-encoded toxin
VAT	Vacuolating autotransporter toxin
MDR	Multi-drug resistant
PDR	Pan-Drug Resistant
DNA	Deoxyribonucleic acid
CF	cystic fibrosis
ROS	Reactive oxygen species
AFM	Atomic force microscope
AgNO₃	Silver nitrate
H₂O₂	Hydrogen peroxide reagent
<i>Dnase</i>	A deoxyribonuclease
DEG	Database of Essential Genes
PBPS	Penicillin Binding Proteins
KEGG	The Kyoto Encyclopedia of Genes and Genomes
SHV	Extended-spectrum of hydrolyzing activity

Chapter One

Introduction

1.1 Introduction

Escherichia coli is a Gram-negative, facultative anaerobic, rod-shaped, coliform bacterium of the genus *Escherichia* that is commonly found in the lower intestine of warm-blooded organisms (endotherms) Most *E.coli* strains are harmless, but some serotypes (Tenaillon *et al* , 2010).

Some strains of this bacterium acquire virulence genes that give it the ability to cause disease. These pathogenic strains are classified as dangerous inside and outside the intestine. These pathogenic strains are classified as pathogenic *Escherichia coli* For the intestines that cause diarrhea (DEC) Diarrheagenic *E. coli*, and pathogenic *Escherichia coli* ExPEC (Kaper *et al.*, 2014).

Extraintestinal pathogenic *E. coli*. Each group includes strains of diseases that share similar virulence factors and cause similar diseases. UpEC belongs to ExPEC and is characterized by its ability to be present in the gut without causing disease, but when it is available. Adequate conditions infect other parts of the host's body, including the blood and nervous system Central and urinary tract, causing a number of serious diseases, UPEC bacteria is the main cause For community-acquired urinary tract infections (90-80%) (Foxman, 2014).

It is Staphylococci, considered a coexisting bacterium in a large percentage of people and is dangerous as it has the ability to infect any tissue of the human body and among these diseases, the most important of which are sepsis, osteitis, carditis and pneumonia, and constitute 22% of the bacteria that cause bloodstream infections and 23% of the bacteria Which causes pneumonia, while infections of the skin and soft tissues.

Constitute 39%. Bacteria infect most sites of the human body, and the front openings are the main environmental places for them. Within a healthy adult population, 20% are persistent nasal carriers intermittent carriers, and 50% noncarriers 20% Persistent nasal carriers have an increased risk of *S. aureus* infection compared with intermittent carriers and noncarriers Higher levels of some antistaphylococcal antibodies were observed in persistent carriers than in others, and recently (Basak *et al*, 2016).

It grows anaerobically compulsively or anaerobically in certain conditions, it grows in all agricultural areas, its colonies are colorless in the middle of the component, and are not fermented carbohydrates, especially lactose sugar, they are colored with bluish green, yellowish green and reddish brown pigments in other agricultural media. (Forbes *et al*, 2002)

It grows at a temperature of 37 and resists drought and heat at 50 degrees for 30 minutes. It is considered one of the types of natural flora of the skin and the digestive system as it appears naturally on the skin and mucous membranes of the human being (Jawetz *et al*, 2004).

The technique of large-scale particles demonstrated Due to their wide physical and chemical properties, realistically studies have shown that nanoparticles are You face a problem you are facing a problem facing challenges Go back to the use of nanomaterials For new satisfying drinks, beverages, beverages, beverages, beverages, beverages, beverages, beverages, beverages, beverages, beverages, beverages and beverages Difficult cells, continuous delivery and inhibition of intracellular pathogens and their sterilizing capabilities, Antimicrobial mechanisms NPs include destruction of cell membranes Enzyme pathways, induction

of events in microbial cell wall fabrication, and operation of manufacturing pathways Microbial DNA (Galdiero *et al.*,2011).

Silver nanoparticles are one of the most good antibacterials as nanomaterials Inorganic, which makes it included in the composition of medicines for treating bacterial diseases and that these Particulate matter is one of the factors used for effective treatment of microbes in general, and they have both an internal and an external effect, And according to the preparation methods used, the size and shape of the silver nanoparticles depend on the time, the temperature of the reaction and the concentration of the reactants.(Moghimi *et al* ,2001).

1.2. Aim of study

This study aims to bactericidal Potential of silver nanoparticles synthesized of *S.aureus* and *E.coli*