ARTICLE TYPE

Antibacterial Activity of Some Nanoparticles Against Some Pathogenic Bacteria That Isolated From Urinary Tract Infections Patient

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ABSTRACT

Nanoparticles include multiple metal oxides such as yttrium, copper, nickel, zinc, iron, and silver that have antimicrobial activity. The present work evaluates the antibacterial activity of some nanoparticles (NPs)against various pathogenic bacterial strains (Escherichia coli, Pseudomonas aeruginosa, Klebsiella pneumonia and Staphylococcus aureus). Antimicrobial activity of NPs was accomplished by the mean of disk diffusion assay using dilutions of (200, 100, 50, 25, and 12.5) and the MIC and MBC of each isolate is determined. NPs shows no antibacterial activity against tested bacteria. It is highly recommended using NPs as an economical alternative antibacterial agent, especially in treating ectopic infections but with high concentration since low concentration gives no result without taking the risk of developing resistant bacterial strains as with antibiotics.

Keywords: Antibacterial activity, Nanoparticles.

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INTRODUCTION

People are frequently infected through microorganisms, which include bacteria, molds, yeasts, and viruses found in their environments. Because of the emergence and boom in the variety of more than one antibiotic-resistant microorganisms and the continuing emphasis on health-care prices, many scientists have developed a new method to get an effective antimicrobial material that triumphs over the resistances of those microorganisms and also are value-effective. Such troubles and needs have brought about a resurgence in the use of nanoparticles such as silver-primarily based antiseptics that can be related to an extensive-spectrum activity and drastically decrease propensity to result in microbial resistance compared with the ones of antibiotics.[1-3]

The recent researches in nanotechnology had introduced numerous types of metal nanoparticles that have antimicrobial activity and numerous metal oxide that comprise oxide like zinc, silver, magnesium, and iron, etc. that had been reported with antimicrobial characters.[5-7] The NPs antimicrobial activity have been detected as a function of surface area in contact with the microbe; therefore, nanoparticles with its large surface area provide a broad range of reactions with the bacterial surface.[8] NPs refer to spherical particles in diameter ranging from1–100 nm 5. They have a high surface to volume ratio in comparison to the particles constituted of the same material but not at the Nanoscale.[9] The confluence of nanotechnology and biology is used to solve many biomedical problems and can be practiced effectively and safely in the field of health as some NPs were extensively investigated, and they showed promising antibacterial activity.[10]

MATERIAL AND METHODS

ZnO (50 nm) FeO3 (20 nm) Ag (80 nm) CuO NPs (50nm) Yttrium (50nm) was purchased from (Zhengzhou Dongyao Nano Materials Co., LTD, China). Standardized media of Blood, MacConkey's, Nutrient, and Muller Hinton agar were purchased from (HIMEDIA, India). Different antibiotic disks Amikacin (AK30), Cefotaxime(CX30), Ciprofloxacin(CPR5), Gentamicin(CN10) were purchased from (Bioanalyses, Turkey).

Antibacterial activity of Nanoparticles

Bacterial samples were collected from patients who visit Mirjan Hospital in Hillah, Babylon Province, Iraq samples were cultured on blood and MacConkey's agar plates for 24-48 hours at 37ºC for isolation and purification. All isolates were confirmed by Viteck 2 compact system (Biomérieux). Antimicrobial activity of nanoparticles was tested against some urinary tract infections bacteria, isolates were including

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three gram-negative bacteria (Escherichia coli, Pseudomonas aeruginosa, and Klebsiella pneumonia)along with two gram-positive bacteria (Staphylococcus aureus and pseudomonas aeruginosa) then the isolates were activated on nutrient agar slants. The antimicrobial activity was carried out as described by the Clinical and Laboratory Standards Institute[11] by using the disk diffusion assay Bacterial sensitivity to antibiotic or nanoparticles was tested. Triplicates of nanoparticles were used in dilutions of (200, 100, 50, 25, and 12.5) in sterile deionized water. The isolates have been incubated for 15min at fourºc then incubated at 37ºc overnight. Final results have been scored when the inhibition zone became observed around disks after the incubation period then the inhibition zone diameter was measured through using of a digital Vernier caliper.[12,13]

Minimum inhibitory concentration(MIC)and Minimum bactericidal concentration(MBC) determination

Bacterial isolates have been incubated at 37ºC overnight, and then used for preparing 0.5 McFarland. A total of 10mL tube nutrient broth medium was prepared, then each sample was inoculated aseptically with 1ml of the respective bacterial suspension(about 108 CFU/mL). Five dilutions of each nanoparticle were prepared (200,100,50,25, and 12.5) in sterile deionized water, and negative control (without NPs) was used. Tests were performed in triplicates for each isolate. The inoculated sets were incubated at 37ºC overnight. After the incubation period, the visible turbidity in each tube was investigated. The lowest concentration with no turbidity is represented as the MIC for the tested strain. Tubes showed no turbidity was cultured on nutrient agar plates and incubated at 37ºC overnight. Bacterial colonies' growth was checked, and the concentration that shows no growth is represented as the MBC.z

RESULTS AND DISCUSSION

Antibacterial activity of both NPs and antibiotics

NBs shows no antibacterial activity against tested bacteria. The effects of different antibiotics on bacterial isolates were compared. The result in Figures 1-5 showed that the selected

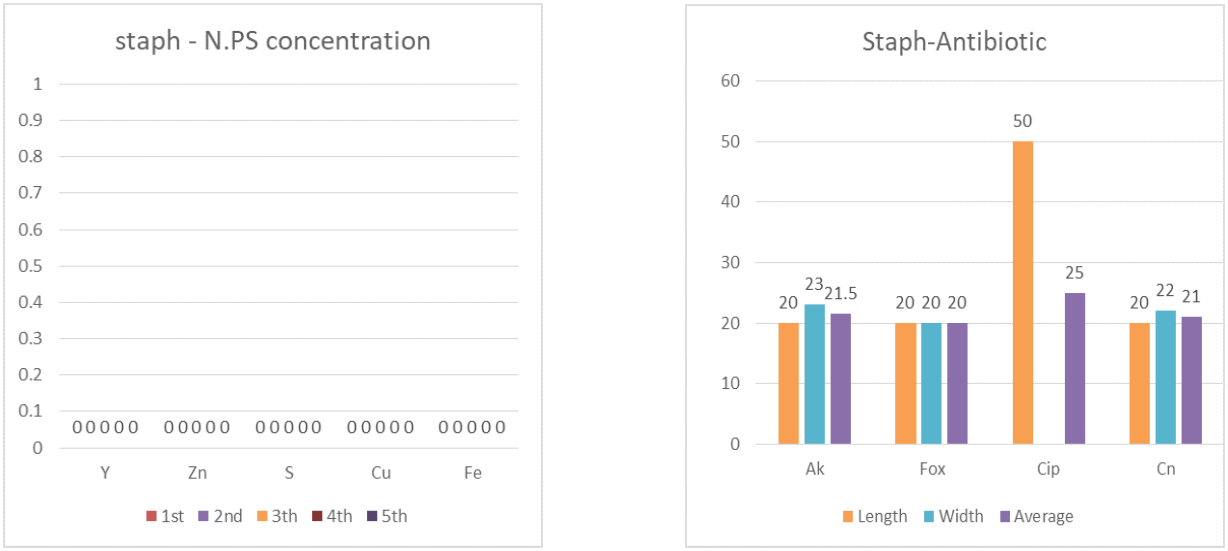


Figure 1: antibacterial activity of both NBs and antibiotics on staphylococcus aurous

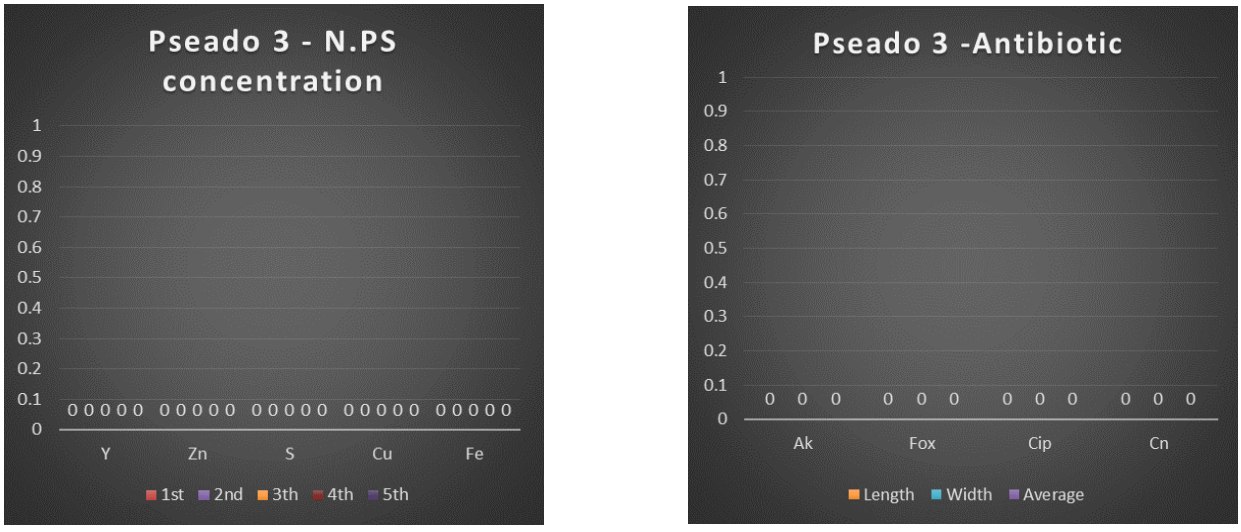
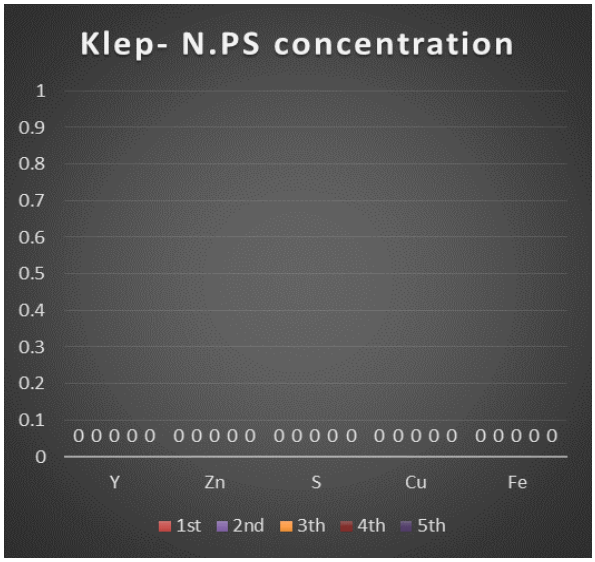


Figure 2: antibacterial activity of both NBs and antibiotics on pseudomonas bacteria



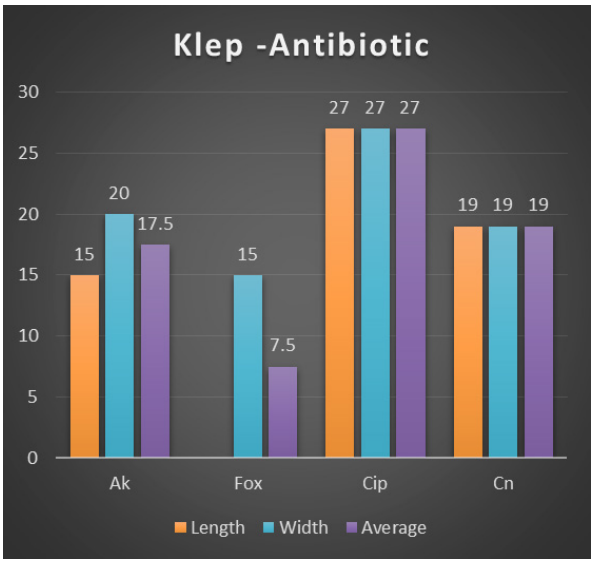
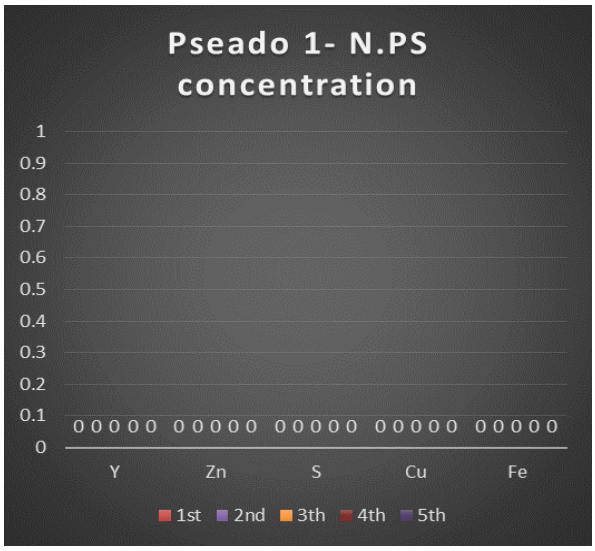


Figure 3: antibacterial activity of both NBs and antibiotics on klebsiella



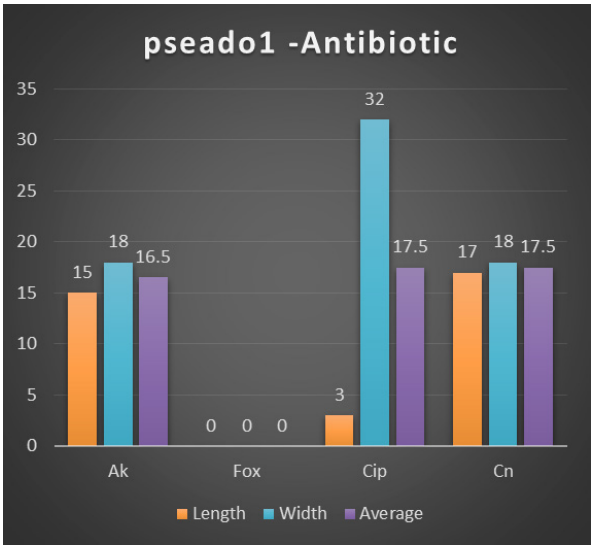
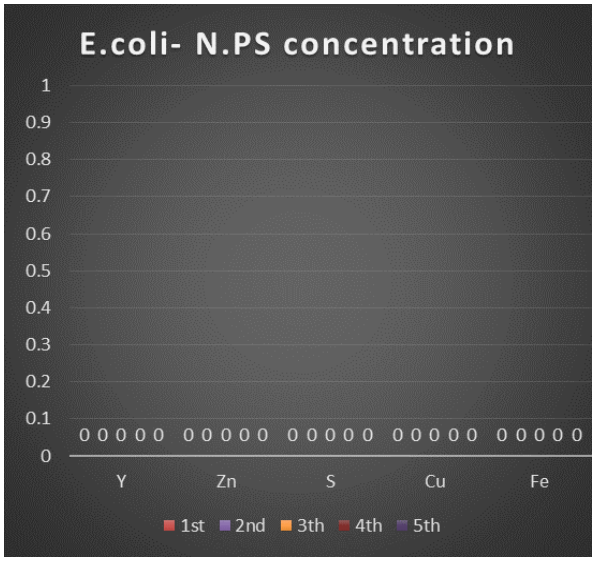


Figure 4: Antibacterial activity of both NBs and antibiotics on pseudomonas 1



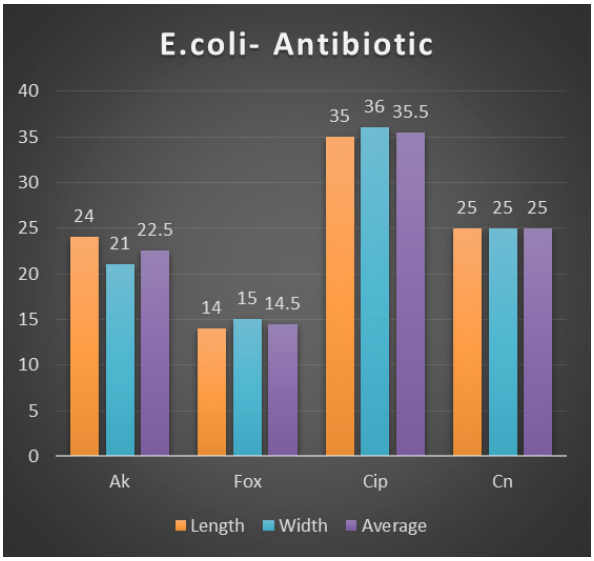


Figure 5: antibacterial activity of both NBs and antibiotics on E-coli

antibiotics were effective against all elected strain except pseudomonas three strain, and the CIP antibiotic appeared with the highest activity while FOX appeared with the least activity.

CONCLUSION

The results of this study have been showed that the NPS has no considerably inhibitory and antibacterial effect on the selected pathogenic bacterial strain that agree with.[14]

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