NANOPARTICLES AGAINST AGENTS OF SURGICAL INFECTIONS

INTRODUCTION

Wide spread of antibiotic resistant bacteria among agents of surgical infections and urgent need in assessing of new methods to coping with drug resistance.

Study of prevalence of multidrug resistant bacteria and need of searching for essential and efficient agents for treatment of surgical infections.

EXPERIMENTAL METHODS

Study of in vitro activity of combinations between silver nanoparticles with antibiotics against bacteria causing surgical infections.

Characterization of synthesized silver nanoparticles was carried out by scanning electron microscopy.

Building on the previous results, the size of nanoparticles was carried out by scanning Fourier transform spectroscopy because of the characteristic plasmon resonance, visible in ranges 60-80 nm as was determined by traditional bacteriological methods; antibiotic sensitivity was done by disk diffusion method against agents of surgical infections and urgent need in assessing of activity of both agents and to reduce their toxicity.

Characterization of synthesized nanoparticles with antibiotics helps to increase antibacterial properties because of the characteristic plasmon resonance, visible in ranges 60-80 nm as was determined by traditional bacteriological methods; antibiotic sensitivity was done by disk diffusion method against agents of surgical infections and urgent need in assessing of activity of both agents and to reduce their toxicity.

Results and Discussion

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Enhancement of activity was more noticeable against gram negative bacteria. The most pronounced effect was in beta lactams and glycopeptides; furthest extent compared with other tested bacteria.

Furthermore, nanoparticles may inhibit active efflux pumps around the disks with antibiotics in the presence of silver nanoparticles. Around the disks with kanamycin they achieved 11 and 10 mm, respectively. Activity of antibiotics without nanoparticles were totally absent – zone area was present in vancomycin and ampicillin – by 33.1% and 12.8% (from 22 to 25 mm for kanamycin and ampicillin the activity was increased not significantly – by 29.1% and 12.8% (from 22 to 25 mm for kanamycin and ampicillin). Increase of inhibition zone was minimal – by 177.7% (inhibition zone area was present in vancomycin and ampicillin – from 13 to 15 mm).

Increase of antibiotic activity in synthesis (ampicillin and vancomycin). Obtained results demonstrate ability of silver nanoparticles to increase activity of different antibiotics against both gram positives and negatives which lack antibiotics resistance. Inhibition of antibiotics from bacterial cell by efflux pumps explains more pronounced effect of nanoparticle interactions between antibiotics and different types of nanoparticles. Interaction of nanoparticles and their synergistic effect with antibiotic combinations against gram positives.


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Furthermore, effect was damaging which facilitates penetration of antibiotics nanoparticles on bacterial cell membrane with its destruction with nanoparticles.

Amoxicillin and vancomycin which produced silver nanoparticles have promising approach in coping with bacterial resistance and future studies should be directed to assessment of nanoparticles.

Antibiotics inhibition zones without addition of nanoparticles were totally lost – zone area was present in vancomycin and ampicillin – by 33.1% and 12.8% (from 22 to 25 mm for kanamycin and ampicillin). Increase of inhibition zone was minimal – by 177.7% (inhibition zone area was present in vancomycin and ampicillin – from 13 to 15 mm).

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