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Antibacterial evaluation of azithromycin nanoparticles

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Background and Aims: Researches have proved that suspensions containing nanoparticle formulations of antibiotics have better antibacterial effect. Azithromycin is a new macrolide antibiotic which posses activity against gram negative bacteria in comparison with Erythromycin. The purpose of this research was to prepare Azithromycin nanoparticles using Poly (lactic-co-glycolic acid) polymer or Eudragit RS 100 and to compare the effectiveness of nanoparticle in comparison with drug solutions.
Methods: Azithromycin nanoparticles were prepared by Modified quasi emulsion solvent diffusion (MQESD) method. Drug and polymer were dissolved in a water miscible solvent such as aceton. The resulting solution was added to aqueous phase containing two percent of PVA 95000 as a stabilizer agent, under homogenization. To compare the effectiveness of nanoparticles in comparison with drug solution, the microbial culture method was used. Staphylococcus aureus (ATCC 6538), Escherichia coli (ATCC 8739) and Streptococcus pneumonia (ATCC 33400) were used in this study. The MIC values of Azithromycin were determined using dilution method in nutrient broth media. Inhibition zone diameter was determined by diffusion method in agar media. The obtained MIC values and inhibition zone diameters for nanoparticles were compared to those of azithromycin solution.
Results: Mean inhibition zone diameter for indicator bacteria for azithromycin nanoparticles were significantly more than that of untreated azithromycin solution ($P<0.01$). The MIC values of nanoparticles in comparison to those of drug solution were reduced up to 16 times. The increased potency of formulated nanoparticles is perhaps related to some physicochemical properties of nanoparticles like modified surface characteristics, increased drug adsorption and uptake as well as lower drug degradation.
Conclusions: These results indicate that the potency of azithromycin nanoparticles is much more than solution with the same drug concentration.

Keywords: Azithromycin; Poly (lactic-co-glycolic acid); Modified quasi emulsion solvent diffusion method; Minimum inhibitory concentration