
Investigation of the effect of functionalized Zinc Oxide nanoparticle by Thiosemicarbazone on expression pattern of norA gene in Staphylococcus aureus nosocomial pathogenic bacterium

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The existence of efflux pumps such as norA is one the mechanisms of resistance to antibiotics like ciprofloxacin in staphylococcus aureus bacteria. NorA efflux pump and its gene expression and activity in ciprofloxacin resistant S. aureus strains are investigated in this study. In this experimental study, ZnO nanoparticle was synthesis by precipitation method. Amine functionalization of ZNO was carried out by using HOOC-CH (NH₂)-(CH₂)₂-COOH acid (Glutamic acid) via co-condensation reaction. In addition, 50 clinical samples of blood, urine, wound and trachea were collected patients hospitalized in various hospitals of Guilan. S. aureus isolates were detected and thereafter, antibiotic resistance profile, gene expression of norA efflux pump and its existence were investigated using PCR and Real-Time PCR. Of 50 clinical samples, 28 S. aureus isolates were detected and the antibiotic susceptibility test results revealed that 75% of samples (21 samples) were resistant to Penicillin and 25% of samples (7 samples) were susceptible to Penicillin. as, 57% of all samples (16 samples) were resistant to ciprofloxacin and 42% (12 samples) were susceptible to ciprofloxacin. Real-Time PCR test results revealed that each type of strain has a different expression of norA gene and more resistant strains have increased expression of norA gene. Moreover, all ciprofloxacin resistant strains had active efflux pump. The results of the study demonstrated that there is a significant relationship between gene expression of norA efflux pump, its activity and resistance to ciprofloxacin in S. aureus strains. On the other hand, the use of ZnO/TSCs nanoparticles in combination with an antibiotic has an appropriate synergism to

eliminate bacterial to reduce the expression of the norA gene.

Keywords : Staphylococcus aureus, Resistance to Ciprofloxacin, Efflux pump, NorA.

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