عنوان مقاله:

An Investigation into Antibacterial Activity of Fluoroquinolone-Derived Compounds on Two Gram-Negative Bacteria: Escherichia coli and Pseudomonas aeruginosa

محل انتشار:

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خلاصه مقاله:

Introduction and objectives: Quinolones are known as a bunch of antibiotics inhibiting two central enzymes involved in DNA replication and transcription; i.e. DNA gyrase and topoisomerase IV. Among them, fluoroquinolones can be developed via substituting fluorine atoms at the sixth position of core quinolone structure, thereby enhancing antibacterial activity. As a result, growth and proliferation of bacteria may be prevented through new compounds derived from fluoroquinolones and somehow strengthen their antibacterial effects. Materials and Methods: The present study was designed and conducted to measure inhibitory concentrations of N-4-methyl (phenyl)-2,2,2-trifluoroacetimidoylciprofloxacin (5a) and N-4-methyl (phenyl)-2,2,2- trifluoroacetimidoylnorfloxacin (5b) as two synthetic derivatives of fluoroquinolones. In addition, real-time PCR (RT-PCR) technique was used to assay the performance of these two derivatives on DNA gyrase gene expression levels in Escherichia coli (E. coli) and Pseudomonas aeruginosa (P. aeruginosa) as gram-negative bacteria. Broth microdilution method and disc diffusion test were also employed to determine minimum inhibitory concentration (MIC) of these synthetic compounds in comparison with conventional antibiotics of gentamicin and ciprofloxacin (a fluoroquinolone). Results: According to the findings; 5a compared with the two antibiotics in gram-negative bacteria showed inadequate efficacy at phenotypic and molecular levels, and it could also have antibacterial effects assumed less than the given antibiotics. In contrast, 5b generated a larger diameter of the zone of inhibition (ZOI) in E. coli and P. aeruginosa compared with the two antibiotics that were reported statistically significant (p=0.00). The results of the broth microdilution method also confirmed findings from disc diffusion test. On the other hand, 5b brought about a significant reduction of DNA gyrase expression levels in both bacteria, while 5a had did not show such a significant effect in this domain. Conclusion: The results of this study suggested that 5b could be used as a new and alternative antibiotic candidate for gentamicin or ciprofloxacin against infections caused by E. coli and P. aeruginosa. However, further research focused on various dimensions, including corresponding complications, as well as clinical trials were required to draw a definite conclusion on these synthetic compounds.

کلمات کلیدی:

Fluoroquinolone, N-4-Methyl (Phenyl)-2,2,2-Trifluoroacetimidoyl Ciprofloxacin (5a), N-4-Methyl (Phenyl)-2,2,2-Trifluoroacetimidoyl Norfloxacin (5b), Escherichia coli, Pseudomonas aeruginosa