Resistance Pattern of Tetracycline in *Escherichia coli* Isolates from Hospitalized Patients in Gonbad Kavus

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Abstract

Background & Objective: Escherichia coli is the most common cause of urinary tract infection. Unfortunately, excessive use of antibiotics has led to the release of resistant pathogens and enhancement of resistance genes.The aim of this study was to evaluate the resistance pattern of tetracycline in uropathogenic E. coli strains isolated from patients hospitalized in different wards of hospitals in Gonbad e kavus and environs.

Matherials and Methods: In this study, 310 urine samples were collected from hospitalized patients. After performing diagnostic tests, antibiotic susceptibility test was performed using the disk diffusion method (Kirby-Baer method) and broth microdilution. Then they were identified by PCR and specific primers of tetA and tetB resistance genes.

Results: Of 193 isolates, 33.2% showed resistance to tetracycline, and the highest sensitivity was observed to cefepime (81%). Determination of minimum inhibitory concentration of tetracycline showed that 48% of strains showed MIC≤4 μg/mL and the highest growth rates were observed at MIC=2 μg/mL. Of the 64 isolates, 28 isolates (43.8%) had the tetA gene, and 31 isolates (48.4%) had the tetB gene, while only 1 isolate (1.6%) shared both genes.

Conclusion: The results showed that resistance to tetracycline is relatively common in E. coli isolates, but the frequency of tetA and tetB resistance genes are approximately the same in the strains isolated from hospitalized patients.

Keywords: Uropathogenic, E. coli, Tetracycline, PCR

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Antimicrobial Effect of Turmeric essential oil alone and in combination with Therapeutic Antibiotics on some Commercial Pathogenic strains: A study "*in vitro*"

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Abstract

Background and objective: Nowadays application of antimicrobial compounds from plant resources are increasing. Turmeric (Curcuma longa) is a medicinal plant from Ginger family (Zingiberaceae). The aim of this research was to assess antimicrobial activity of Turmeric essential oil (TEO) alone and in combination with therapeutic antibiotic using disk diffusion agar, well diffusion agar, minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) on some standard pathogenic strains "in vitro".

Materials and methods: In this experimental study, TEO extracted in Clevenger apparatus using water distillation method and efficiency calculated based on w/w percentage. Diameter of inhibition zone of TEO on pathogenic bacteria using disk diffusion agar and well diffusion agar. The MIC and MBC were evaluated using microdilution broth and pour plate methods. Interaction of TEO in combination with gentamicin and chloramphenicol was measured by sub-MIC. Data were analyzed using one-way ANOVA and Duncan test.

Results: Extraction efficiency of TEO were 1%. Results showed that the highest antimicrobial effect of TEO belonged to gram positive bacteria, Staphylococcus aureus with inhibition zone of 13.10 mm. in combination state, TEO showed synergistic effect with gentamicin and chloramphenicol on Pseudomonas aeruginosa, Salmonella typhimurium, Staphylococcus aureus and Listeria innocua and antagonistic effect was seen with Escherichia coli. The MIC of TEO for Pseudomonas aeruginosa, Salmonella typhimurium, Escherichia coli, Staphylococcus aureus and Listeria innocua were 50, 50, 200, 25 and 200 mg/ml respectively.

Conclusion: Results showed that TEO alone and in combination with therapeutic antibiotics has antimicrobial effect to pathogenic strains. In combination state TEO antibacterial activity was significantly increased.

Keywords: Curcuma longa, Chloramphenicol, Gentamicin, Synergistic effect.

The Anti-biofilm Efficacy of Colloidal Silver Nanoparticles against Clinical Isolate of *Staphylococcus epidermidis* Biofilm

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Abstract

Background and objectives: The key factor in the pathogenicity of *Staphylococcus epidermidis* is colonization and multilayer biofilms formation. Biofilm creates a barrier against antimicrobial agents and prevents antibiotic function. In addition, increase of resistance to antibiotics is one of the main problems with their usage. Today, the use of nanoparticles has been widely considered due to their antimicrobial properties and low toxicity. The purpose of this study was to evaluate the antimicrobial activity of silver nanoparticles against biofilms caused by *Staphylococcus epidermidis*.

Material and methods: In this study, 90 strains of *Staphylococcus epidermidis* including 50 clinical isolates and 40 strains isolated from the carriers were studied. Biofilm formation experiments were performed by using microtiter plate and stained by crystal violet. Minimum inhibitory concentration (MIC) was achieved by Agar well diffusion method and microplates. The oxacillin resistance was evaluated by disk diffusion method.

Results: The silver nanoparticles had an anti-biofilm activity of 3.9 ppm and increased at a higher concentration of 7.8 ppm. At the concentration of 15.62 ppm, the biofilm was destroyed. A total of 24 isolates were resistant to oxacillin.

Conclusion: The results of this study indicated that colloidal nanoparticles against *Staphylococcus epidermidis* have a bactericidal effect, and in concentrations below the MIC, it can inhibit biofilm formation caused by this organism.

Keywords: *Staphylococcus epidermidis*, biofilm, silver nanoparticle

Frequency of Biofilm Producing *Escherichia coli* Strains Isolated from Patients with Urinary Tract Infection in Isfahan. 2017

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Abstract

Background and objective: Urinary tract infections (UTIs) are some of the most common bacterial infections, and a significant cause of morbidity in all age groups that incur large financial costs to health-care systems. Uropathogenic *Escherichia coli* (UPEC) is the primary cause of UTIs and due to its high resistance to most classes of antibiotics, results in treatment failure. UPEC strains possess various virulence factors such as the ability to form biofilm which plays an important role in UTIs. The formation of biofilms by UPEC on or within bladder epithelial cells and as well as on urinary catheters is responsible for persistent infections which leading to recurrences. In this study we aimed to determine the prevalence of biofilm producing *E. coli* strains isolated from patients with UTI in Isfahan.

Materials and methods: During 2017, a total of 213 *E. coli* isolates were collected from patients with UTI in a reference hospital in Isfahan and were identified using common biochemical and PCR confirmatory diagnostic tests. The ability of *E. coli* strains to form curli and cellulose was measured using qualitative Congo red agar assay and a quantitative microtiter plate assay was employed to test the biofilm forming capacity of the strains.

Results: A total of 166 strains were identified and confirmed as *E. coli* using PCR test. Using qualitative Congo red agar plate assay, 127 strains (77%) exhibited saw morphotype and were not able to produce curli and cellulose. The other 39 strains (23%), produced curli and cellulose and were biofilm positive, in which, 38, 59 and 3% exhibited rdar, bdar and pdar morphotypes, respectively. Also, the results of microtiter plate assay showed that all of 39 curli and cellulose producing strains were biofilm positive in which 18, 26 and 56% of strains were able to form strong, moderate and weak biofilm, respectively.

Conclusion: The results of this study revealed the high prevalence of *E. coli* associated UTIs among different sexes and age groups in Isfahan. Biofilm production is closely related to antibiotic resistance and nowadays, biofilm forming UPEC strains are global public health concern. All strong biofilm producer UPEC strains, were able to form curli and cellulose simultaneously; which indicating the important role of these two compounds in the intensity of biofilm formation. Therefore, providing new therapeutic strategies and powerful compounds for destroying or inhibition of curli and cellulose will play an essential role in solving the clinical problems caused by biofilm of *E. coli*.

Key words: Urinary tract infections, uropathogenic *Escherichia coli*, biofilm, curli, cellulose, morphotype.