Review article

Antibiotic Resistance in *Pseudomonas aeruginosa* and Treatment Strategies for Infections Caused by this Bacterium

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Abstract

The emergence pf antibiotic resistant bacteria in hospitals is a very serious global health concern. Recent studies have shown that ICUs are major sources for microbial diversity and antibiotic resistance. Although *Pseudomonas aeruginosa* is normal flora of the intestine, it accounts for a wide variety of nosocomial infections in individuals, especially in immune-compromised or immune-suppressed patients. This bacterium is not only intrinsically resistant to several antibiotics, including betalactams and penems, but also can acquire resistance to betalactams, aminoglycosides, fluoroquinolones, and polymixins. In this review, we will present an overview of the intrinsic and acquired mechanisms of antibiotic resistance in *P. aeruginosa* strains and therapeutic strategies for infections caused by drug resistant *P. aeruginosa*.

Keywords: *Pseudomonas aeruginosa*, Antibiotic resistance, Resistance mechanism, Multidrug resistance

Antibacterial Activity of Lactoferrin Chimera and its Synergistic Effect with Gentamicin, Cefazolin, and Ceftazidime against Pathogenic Ggram- Negative Bacteria

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Abstract

Background and objectives It is essential to introduce new antimicrobials or to evaluate the synergistic effect of existing compounds as a therapeutic strategy against microbial strains resistant to one or more antibiotics. The aim of this study was to evaluate the antimicrobial activity and synergistic effect of lactoferrin chimera (cLF) in interaction with some common therapeutic antibiotics.

Materials and methods The antimicrobial activity of cLF and the antibiotics including gentamicin, cefazolin, and ceftazidime were determined by the minimum inhibitory concentration (MIC) method and subsequently, the synergistic effect of this peptide with each of the mentioned antibiotics was checked against E coli, P. aeruginosa and S. typhi were investigated and the minimum fraction inhibitory concentration (FIC) was reported. Release of cytoplasmic materials, plotting of survival curves, and activity of peptides alone and in combination with antibiotics were evaluated, and bacterial cell morphology investigating was performed using scanning electron microscopy at MIC and FIC concentrations.

Results The synergistic effect was observed in the combination of cLF with all antibiotics. The results showed that at FIC concentrations, material release from the cytoplasm and the number of surviving cells were significantly higher and lower than when peptides or antibiotics were used alone, respectively. The activity of peptides and antibiotics at FIC concentration was increasing and SEM images at this concentration showed severe membrane damage of bacterial cells.

Conclusions The use of cLF and antibiotics at FIC concentrations reduces the dose of both substances.

Keywords: Antimicrobial activity, Synergetic Effect, Antimicrobial peptides, Antibiotics

Estimation of Population Size of COVID-19 Patients Using Network Scale up in Jahrom, Spring 2020

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Abstract

Background and objective: The COVID-19 epidemic is currently the most important global health challenge. The aim of this study was to estimate the population size of COVID-19 patients in Jahrom, Iran, in the spring of 2020 using network scale up method.

Materials and methods: 2753 people from Jahrom were included in the study by electronic questionnaire. People were asked if they knew anyone with COVID-19 on their social network (probability method)? If yes, how many people do they know (frequency method)?

Results: Sixty percent (1592 people) of the subjects were women and the majority 76% (2028 people) resided in Jahrom. Seven percent (182 people) were from Khafr district. The estimated overall prevalence of COVID-19 by network scale up method was estimated to be 14.3(95% CI: 17.5, 11.2). The prevalence of COVID-19 was estimated to be 17% (95% CI: 19.9, 14.1) based on clinical signs. Among the covered sections, Jahrom city had the highest prevalence related to Khafr district with a prevalence of 42.9% (95% CI: 45.5, 13.5). According to calculations, the prevalence of COVID-19 was estimated at 14.7% in urban areas and 11.7% in rural areas.

Conclusion: The actual prevalence of COVID-19 in Jahrom county in the spring of 2020 was calculated several times as many as reported. Therefore, active diagnostics using extensive testing and diagnosis and isolation of asymptomatic patients can be useful for controlling the epidemic.

Keywords: COVID-19, estimation, network scale up, Jahrom

Resistance to Quinolones Family among Biofilm Producing *Escherichia coli* Strains Isolated from Patients with Urinary Tract Infection in Zahedan during 2017

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Abstract

Background and objective: Urinary tract infection (UTI) is one of the most common and serious bacterial infections in humans and uropathogenic *Escherichia coli* (UPEC) strains are responsible for more than 75% of all UTI worldwide. UPEC strains are able to form biofilm which enable them to show resistance to variety of antibiotics such as quinolones which enable them to persist within the urinary tract and serve as a reservoir for recurrent infections. In this study the patterns of quinolone resistance among UPEC strains isolated from patients with UTI in a hospital in Zahedan was determined.
Materials and methods: In this study, a total of 81 *E. coli* isolates were collected from patients with UTI in a referral hospital in Zahedan. Isolates were cultured on MacConkey agar and eosin methylene blue (EMB) agar plates and identified using PCR assay by specific primers of *tuf*A gene. The ability of *E. coli* strains to form biofilm was measured using qualitative Congo red agar (CRA) assay and susceptibility of strains to 5 antibiotics was determined by disk diffusion method according to the guideline of Clinical and Laboratory Standards Institute (CLSI).
Results: All isolates were positive for *tuf*A gene and confirmed as *E. coli* strains. Using qualitative CRA agar assay 7, 87 and 6% of strains were able to form rdar, bdar and pdar morphotypes, respectively and were selected as biofilm positive strains. In addition, 18 isolates showed susceptibility to all antibiotics, and 64% were resistant to ciprofloxacin. Moreover, 56, 50, 50 and 48% of strains showed resistance to nalidixic acid, levofloxacin, ofloxacin and norfloxacin, respectively. Moreover, 6 resistance patterns were identified among the strains in which pattern 6 (resistant to all antibiotics tested) was selected as the most prevalent type type in this study.
Conclusion: Results of this study revealed the high prevalence of quinolone resistant and biofilm producing UPEC strains among patients with UTI in the studied hospital in Zahedan.
Keywords: *Uropathogenic E. coli*, urinary infection, quinolones, biofilm, congo red agar, Zahedan

Frequency of Resistance to Methicillin among *Staphylococcus aureus* Strains Isolated from Patients with Urinary Tract Infection in Tehran and Isfahan during 2016-2019

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Abstract

Background and objective: Methicillin-resistant *Staphylococcus aureus* (MRSA) is one of the most frequent agents of urinary tract infection (UTI) and infections with this pathogen become a prevalent problem worldwide. The aim of this study was to determine the frequency of resistance to methicillin among *S. aureus* strains isolated from patients with UTI in Tehran and Isfahan.

Material and methods: In this study, during 2016-2019 a total of 4089 *S. aureus* isolated from patients with UTI collected from two referral hospitals in Tehran and Isfahan and confirmed using specific primers for *nuc*A gene. Strains were cultured on Mueller-Hinton agar plates supplemented with 8 µg/ml oxacillin and MRSA strains were confirmed using disk diffusion method (cefoxitin 30 µg) by the guidelines of Clinical & Laboratory Standards Institute (CLSI) and also PCR by the specific primers of *mec*A gene. Prophage typing and SCC*mec* typing methods were employed using separate multiplex-PCR assays to type the MRSA strains.

Results: According to the results of different methods, a total of 1489 *S. aureus* strains (36%) which showed resistance to cefoxitin and harbored *mec*A gene were confirmed as MRSA. Six prophage types and also 4 prophage patterns were also detected among the strains, in which SGF, SGFa and SGFb were present among all strains and prophage pattern 3 was the dominant one. Also, a total of 4 SCC*mec* types (II, III, IV and V) were identified among the MRSA strains and SCC*mec* type III was the most prevalent type in both cities. Furthermore, 18% of MRSA strains also harbored SGA prophage type and were positive for SCC*mec* types IV or V.

Conclusion: The results of this study revealed the relatively high prevalence of MRSA strains among patients with UTI in Tehran and Isfahan. These strains, which almost originated from hospitals, harbored different prophage types which enable them to produce high variety of virulence factors and also different infections among patients.

Keywords: Methicillin resistant *Staphylococcus aureus*, urinary infection, prophage typing, SCC*mec* typing, Tehran, Isfahan

Effect of Myricitrin on Sperm Parameters and Serum Sex Hormons Level in Male Rat under Restraint Stress

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Abstract:

Background and objective: Since stress is a destructive factoer on reproduction system in rats and myricitrin is a flavonoid which used for Improvement of many sicknesses and infertility, the aime of this experiment was to evaluate the myricitrin on male reproduction pararameters and sex hormnes in male rats which esposed to immobility stress.

Materials and methods: This experiment was perfomed on 50 male Wistar rats which were devided into five groups:Control groups (A), Sham control (B) and test groups (C), (D) and (E), (n=10) randomly. Tests groups received immobility stress (restriner) for 60 days daily. Group C did not recieeved any agent during trial stress but group D received normal saline intraperitoneally in the last 14 days during trial course every other day of the trial, but group E received 2.5 mg/kg Myricitrin intraperitoneally in the last 14 days every other day of the trial.

Results: Testosteron, LH, FSH, and the weight of testis epididymis and vas deference, sperm count, velocity and motility were significantly decreased in testes group C and D compared to grou A and B. But these values in group E were significantly increasde compared to other testes group. Sperm morphology did not showe any differences among all groups.

Conclusion: This survey reaveled that chronic immobility stress leads to decrease serum level of Gonadotropins, sex hormone and sex parameters in male rats, but Myricitrin improved all values exept of sperm morphology.

Keywords: immobility stress, Myricitrin, sperm parameters, testestron