

## Co-effects of lactic acid and sodium chloride on the antibacterial activity of cumin and dill essential oils under laboratory conditions

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### Abstract

**Background and purpose:** application of essential oils of plants in the food industry is expanding due to its antimicrobial, antioxidant and flavoring properties. In recent years, researchers considered different essential oils due to increasing their antimicrobial activity. The purpose of the present study is to investigate lactic acid and sodium chloride on the antimicrobial activity of cumin and dill essential oils.

**Methodology:** In this research, the constituent compounds of cumin and dill essential oils, as well as their antibacterial agents, were studied separately under different concentrations of sodium chloride and lactic acid (0.5, 1, 2 and 4%) on *Escherichia coli O157* and *Staphylococcus aureus* bacteria. Analyzing the Compositions were performed by GC/MS method, and antimicrobial analysis tests were performed by disk diffusion.

**Results:** our results showed that essential oils of cumin and dill were antibacterial and more effective on *Staphylococcus aureus* (MIC: 5 mg/ml) than *Escherichia coli O157* (MIC: 10 mg/ml). Also, antibacterial properties of dill and cumin essential oils were significantly increased with high concentrations of sodium chloride, especially in amounts equal to or greater than 1%.

**Conclusion:** The essential oils have antimicrobial properties and it exceed dramatically in the percent of  $\geq 1$  of sodium chloride and 0.5 percent of lactic acid.

**Keywords:** chemical compounds, antibacterial effects, dill essential oil, cumin essential oil, sodium chloride, lactic acid.

## Frequency of antibiotic resistance and genes encoding integrons among uropathogenic *Escherichia coli* strains isolated from patients with urinary tract infection in Tehran during 2021

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### Abstract

**Background:** Urinary tract infections (UTIs) are the most common severe bacterial infections seen in clinical settings worldwide. It is known that *Escherichia coli* (*E. coli*) is the most prevalent bacterial pathogen that causes UTIs. Antibiotic resistance leads to higher medical costs, prolonged hospital stay, and increased mortality. UTIs caused by extended spectrum  $\beta$ -lactamase (ESBL) producing *E. coli* account for one of the major therapeutic and epidemiologic challenges. In this study we determined the prevalence of uropathogenic *E. coli* strains isolated from patients with UTI in Tehran, Iran. Moreover, the antibiotic resistance and presence of different classes of integrons among strains was also assessed.

**Materials and Methods:** During 2021, a total of 126 *E. coli* isolated from patients with UI were collected from a referral hospital laboratory in Tehran, and confirmed using phenotypic tests and polymerase chain reaction (PCR) by specific primers for *tufA* gene. Resistance of strains to 17 antibiotics was determined using disk diffusion method according to the guidelines of clinical and laboratory standards institute (CLSI), and ceftazidime and cefotaxime resistant strains were tested for ESBL production by cefotaxime and ceftazidime disks each alone and in combination with clavulanic acid. The presence of classes I-III integrons among strains was determined using separate PCR tests.

**Results:** All 126 tested isolates were confirmed as *E. coli*. All strains (100%) were resistant to ampicillin and the highest rate of resistance was found to ceftriaxone followed by cefpodoxime, ceftazidime and cefotaxime, respectively. Also, low rate of resistance to meropenem, imipenem and kanamycin was observed among strains, respectively. Moreover, 75% of strains were identified as ESBL producing strains, and all 3 classes of integrons were detected among strains, in which integron class I was the dominant one.

**Conclusion:** Results of the present study indicated the high prevalence of UPEC strains with different classes of integrons and resistance to first line antibiotics among patients with UI in Tehran. The emergence and dissemination of antibiotic resistant pathogenic bacteria could be an important threat to human health.

**Key words:** Urinary infections, uropathogenic *Escherichia coli*, antibiotic resistance, extended-spectrum  $\beta$ -lactamase, integrons

## **Characterization of biofilm formation and production of extended spectrum beta lactamase enzymes in *Escherichia coli* strains isolated from patients with urinary infection in Zahedan during 2017**

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### ***Abstract***

**Background:** Biofilm formation is a major determinant factor in the development of urinary tract infections (UTIs) by uropathogenic *Escherichia coli* (UPEC). The ability of UPEC to form biofilm and produce beta-lactamases is linked to persistence and recurrence of UTIs. In this study, we investigated the prevalence of biofilm and beta-lactamase producing UPECs among patients with UTI in Zahedan.

**Materials and Methods:** During 2017, a total of 112 suspected *E. coli* isolates were collected from patients with UTIs in Imam Ali Hospital in Zahedan, and identified using common biochemical tests and also PCR by specific primers. The ability of confirmed strains to produce of curli/cellulose and form biofilm was assessed using qualitative Congo red agar (CRA) and quantitative microtiter plate (MTP) methods, respectively. Extended-spectrum beta-lactamase (ESBL) phenotypic production and antibiotic susceptibility of biofilm producing strains were investigated using disk diffusion method by the guidelines of CLSI.

**Results:** A total of 85 isolates (76%) were identified and confirmed as UPEC strains using standard biochemical and molecular confirmatory diagnostic tests. The prevalence of BFP strains was very high, as 58 strains (68%) produced curli and/or cellulose and were able to produce biofilm. BFP strains showed high resistance (80-99%) to ampicillin, cefotaxime, cefpodoxime, ceftazidime and ceftriaxone. Moreover, 62% of strains were able to produce ESBL, and also a significant association between the strong biofilm and ESBL production was found.

**Conclusion:** The high prevalence of biofilm and ESBL producing UPEC strains isolated from patients with UTI in Zahedan, might be in part due to low socioeconomic status and also warm climate of this city.

**Key words:** Urinary infection, UPEC, biofilm, ESBL, Zahedan

## **Assessment of the risk of farmer's infection to contagious ecthyma in extensive and intensive sheep and goat breeding systems**

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### ***Abstract***

**Background:** Contagious ecthyma is caused by a DNA virus from the group of Parapoxviruses, which is able to cause disease in both humans and animals. Human infection occurs after direct or indirect exposure of a person to an infected animal. The purpose of the present study is to investigate the risk of human infection with Orf in two different methods of small ruminants raising, including extensive and industrial systems.

**Materials and methods:** In this study, the occurrence of contagious ecthyma and human cases of the disease were evaluated in 10 sheep and goat flocks, including 5 flocks raised in an industrial system and 5 flocks raised in an extensive system in Tehran province using PCR method.

**Results:** The results showed similar infection rate in the animals of both extensive and industrial flocks, but human cases in the industrial systems were significantly more than the extensive ones, in a way that there was one human case confirmed by PCR in each industrial flock and only two human cases of Orf were detected in the extensive systems.

**Conclusions and suggestions:** Considering the importance of the virus and its high prevalence in sheep and goat in the country, it is necessary to provide sufficient awareness about ecthyma and the ways of its transmission to animal husbandry workers and other people who are at risk of the infection, especially the workers of industrial units.

**Key words:** Contagious ecthyma, Industrial animal breeding, Orf, zoonosis

## Evaluation the effect of culture supernatant of CT26 tumor cells on lesion caused by *Leishmania major* in BALB/c mice

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### Abstract

**Background:** *Leishmania major* is the agent of cutaneous leishmaniasis, which leads to tissue lesions resistant to treatment and scarring at the site of injury. The use of treatment methods based on chemical compounds is the first line of treatment in patients, despite the side effects, do not lead to complete recovery. The purpose of this study is to evaluate the effect of soluble factors caused by CT26 in regulating the immune response against the cutaneous leishmaniasis.

**Materials and methods:** Female BALB/c mice were infected with the standard strain of *Leishmania major* and after the appearance of lesion, the supernatant of CT26 cells was injected into the mice with cutaneous leishmaniasis in two forms, intravenously and intra-lesion. After 30 days of treatment, tissue samples of the spleen and macrophage cells were removed from the peritoneal cavity to investigate cell proliferation and phagocytosis. The data were statistically analyzed using SPSS (version 20), one-way ANOVA followed by post hoc Tukey's test (*P*values  $\leq 0.05$ ).

**Results:** The lesion size was larger in the groups treated with the supernatant of CT26 cells intravenously and intralesion, but this difference was not significant. The amount of lymphocyte proliferation, phagocytosis and subsequently inflammation of the lesion area in the group treated with cell supernatant was higher than in the control group, but this increase was not significant.

**Conclusion:** The use of soluble factors from CT26 cell culture supernatant can lead to a change in the immune response in the cutaneous leishmaniasis lesion model, which should be further investigated to determine the effective factors in this field.

**Keywords:** Culture supernatant of CT26 cells, cutaneous leishmaniasis, BALB/c mouse