



## Frequency of Resistance to $\beta$ -Lactam Antibiotics and the Presence of $\beta$ -Lactamase-Producing Genes *bla<sub>SHV</sub>* and *bla<sub>TEM</sub>* in *Escherichia coli* Isolates from Bovine Clinical Mastitis in Tabriz City, Iran

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### Abstract

**BACKGROUND:** Mastitis is known as the most economic important disease in the dairy industry in the world. *Escherichia coli* (*E. coli*) is one of the major causes of mastitis, which is treated with antibiotics, especially  $\beta$ -lactams. The emergence and spread of resistance to these antibiotics in livestock and the potential transfer of this resistance to human communities is a serious threat to public health in different countries.

**OBJECTIVES:** This study aimed to determine the resistance to  $\beta$ -lactams in *E. coli* isolates from the milk samples of bovine clinical mastitis in Tabriz City, Iran. Also, the presence of the extended-spectrum  $\beta$ -Lactamase (ESBL)-encoding genes (*bla<sub>TEM-1</sub>* and *bla<sub>SHV-1</sub>*) was investigated in the isolates.

**METHODS:** In this descriptive cross-sectional study, 240 milk samples were collected from cattle with clinical mastitis in Tabriz. None of the cattle were under antibiotic therapy before sampling. The samples were evaluated according to the standard microbiological methods. The antibiotic susceptibility of *E. coli* isolates was investigated using the disk diffusion method. Also, the isolates were evaluated for the production of ESBL using the combined disk test. Finally, the presence of *bla<sub>TEM</sub>* and *bla<sub>SHV</sub>* in  $\beta$ -lactamase producing strains was confirmed using the PCR method.

**RESULTS:** Out of 240 samples, *E. coli* was isolated from 50 samples (20.83%), of which 22 isolates (44%) were detected as  $\beta$ -lactamase producers. The results of the PCR test showed that seven isolates (31.81 %) carried the *bla<sub>TEM</sub>* and four (18.18 %) the *bla<sub>SHV</sub>*.

**CONCLUSIONS:** Considering the abundance of  $\beta$ -lactamase-producing *E. coli* in this study, there is a possibility of the spread of antibiotic resistance among the livestock population due to improper use of antibiotics and transferring resistance genes to human communities. Therefore, accurate identification, proper treatment of infected animals, and compliance with the withdrawal period of animal products treated with antibiotics are recommended.

**Keywords:** Bovine mastitis, *Escherichia coli*, Extended-spectrum  $\beta$ -lactamases, *bla<sub>TEM</sub>*, *bla<sub>SHV</sub>*

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### Figure Legends and Table Captions

**Table 1.** Sequence of primers used for *bla<sub>TEM</sub>* and *bla<sub>SHV</sub>* genes amplification.

**Figure 1.** Phenotypic examination of the presence of  $\beta$ -lactamases. The left disks contain clavulanic acid, and the right disks contain the same antibiotics as those without clavulanic acid.

**Figure 2.** Results of *bla<sub>TEM</sub>* electrophoresis in the studied isolates. The first well: 1500 pb marker, second well: negative control, third well: positive control, fourth to seventh wells: positive samples (1119 bp).

**Figure 3.** The results of *bla<sub>SHV</sub>* gene electrophoresis in the studied isolates. The first well: 1500 bp marker, second well: negative control, third well 3:, positive control, fourth to seventh wells: positive samples (865 bp).