Bacteriological study of raw and unexpired pasteurized cow’s milk collected at the dairy farms and super markets in Sari city in 2011

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Key words
Raw milk • Pasteurized milk • Milk contamination

Introduction
The quality of milk is influenced by different bacteria present in milk. This study was undertaken to investigate the bacterial contamination of raw and pasteurized milk in Sari Township, Iran, 2011.

Methods
In this investigation, 100 pasteurized milk samples were collected randomly from the super markets in the city and 100 raw milk samples from 4 dairy farms from suburb areas and evaluated for the presence of coliforms, Escherichia coli, Staphylococcus aureus and Listeria monocytogenes by culture methods and biochemical tests. Data analysis was performed by SPSS software using X² test and described in percentage.

Results
In the raw milk, contamination with E. coli, coliforms and Staphylococcus aureus was observed in 42 (42%), 36 (36%) and 22 (22%) of samples respectively, and the same for the pasteurized milk samples was 9 (9%), 2 (2%) and 2 (2%), respectively. Listeria monocytogenes was not detected in any sample. Presence of E. coli in the milk could be due to contamination with waste water and fecal materials.

Conclusions
Considering the contamination of raw and pasteurized milk with E. coli and coliforms, sanitary practice during collecting and transporting, particularly in the summer season is recommended.

Materials and methods
In this descriptive study, 100 samples, each in 5 ml were collected during the spring, summer, fall and winter seasons from 4 dairy farms of Sari Township (only 4 dairy farms permitted). Also 100 pasteurized milk samples were collected from the retail dealers (those dealers who had milk at the time of referring). The samples were preserved in ice container and transferred to the Sari Medical Collage laboratory.
In all, 200 pasteurized and raw milk samples were studied and cultured based on the standard methods for the iden-
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The frequency distribution of the organisms in 100 raw and 100 pasteurized milk samples in Sari Township in 2011.

<table>
<thead>
<tr>
<th>Bacteria</th>
<th>Raw milk number (%)</th>
<th>Pasteurized milk number (%)</th>
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</thead>
<tbody>
<tr>
<td><em>Escherichia coli</em></td>
<td>42 (42)</td>
<td>9 (9)</td>
</tr>
<tr>
<td><em>Coliforms</em></td>
<td>36 (36)</td>
<td>2 (2)</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>22 (22)</td>
<td>2 (2)</td>
</tr>
</tbody>
</table>

Results

In this investigation, total of 200 samples (100 pasteurized and 100 raw milk) were studied. In the raw milk samples, contamination with *E. coli*, *coliforms* and *S. aureus* was observed in 42 (42%), 36 (36%) and 22 (22%), respectively. In the pasteurized samples, contamination with *E. coli*, *coliforms* and *S. aureus* was observed in 9 (9%), 2 (2%), and 2 (2%) samples, respectively.

By referring to the grading of raw milk contamination of national standard of Iran which is given in the Table I and considering the total bacterial count, the quality of raw milk was determined as follow: 30% had very good quality, 50% with first and second grades, that is, with good quality and the rest were of poor quality.

Table II shows the highest rate of isolates in the raw and pasteurized milk orderly as follow: *E. coli*, *coliforms* and *S. aureus*. From the statistical point of view, insignificant relationship was observed between the seasons of the year and the isolated organisms (X² = 1.30, df = 6 and P = 0.97). *Listeria* could not be isolated in any of the samples. The highest number of isolates were observed in the raw cow’s milk. Isolated organisms from the pasteurized milk samples collected from the dairy companies indicate the higher rate of *E. coli* (Tab. III).

Table IV indicates the frequency of the isolates from the raw cows milk samples collected from the dairy farms under study, here also presence of *E. coli* and *coliforms* is significant, which is due to unhygienic production of milk. The frequency distribution of the isolates from the pasteurized milk samples based on the seasons of the year is depicted in the Table V.

Discussion

In the present study, 200 (100 pasteurized and 100 raw) milk samples were collected and in the pasteurized milk *E. coli*, *coliforms* and *S. aureus* were observed in 9%, 2% and 2%, respectively and in the raw milk 42%, 36% and 22%, respectively. *L. monocytogenes* was not isolated in any of the samples under study. Data on 739...
pasteurized milk samples in Iran showed contamination of 8.68% with higher than the standard level, in a way that, in 15 samples, *coliforms* count was 20 to 40 per ml of sample [7].

A study in Iran, comparing the concurrent contamination of *E. coli* and *S. aureus* revealed that in milking 19.7%, transporting 49% and in milk selling centers 58.4% of samples were contaminated with 2 organisms [8]. Report on contamination of the raw milk samples in Maayer city of Iran was as follow: *E. coli* 75%, *Enterobacter* 42%, *Klebsiella* 36% and *S. aureus* 52% [9]. Also higher count of *E. coli* followed by *S. aureus* was reported too, which refers to the improper public health measurements, and poor cleaning, in addition to the primitive system of transportation. Report given by Asmahan in Khortoum indicated, 63% of raw cow’s milk samples contaminated with *E. coli* [10]. Fulya revealed that 10% of the raw milk samples under study were contaminated with *E. coli* [11]. Crump et al., studied on 216 raw milk samples and found that 28 (13%) of them were contaminated with *E. coli* [12]. The reason could be due to the animals and their living environment. Another study showed that 1.46% of the milk samples in the milk storage tankers were contaminated with *E. coli* [13]. The reason was expressed as contamination of the milk with animal feces.

Zelalem and Bernard in Ethiopia found higher *Coliform* count in raw milk samples under study which could be due to the initial contamination of the milk samples from the cow’s milk, the milkers, milk containers and the milking environment [14]. Chye et al., stated that the lower counts of bacteria may be due to good cleaning system and good handling from farms to the plant [15]. The higher percentage of *E. coli* could be due to the fact that *E. coli* may grow in raw milk and reaches higher number in tropical countries or in the absence of cooling system. The isolation of *Coliform* and other food pathogens from dairy products poses a serious threat to food safety [16].

High contamination of raw milk to *Escherichia* and *Coliform*, particularly in the summer was reported [17]. Presence of *S. aureus* in milk may originate from mastitic animals [18], or human sources, which is in agreement with our findings. *S. aureus* in milk and milk products is an indicator of the spoilage [19]. Ekici et al., in their study detected *S. aureus* in 75% of the raw cow’s milk but no *E. coli* was isolated [20]. Findings showed that 38% of raw milk and 11% of pasteurized milk contaminated with *S. aureus* [21]. A study on 366 raw milk samples, revealed 25.3% contaminated with to *L. monocytogenes* and 9.2% to *Salmonella typhi* [22].

When the frequency distribution of the detected organisms in the raw and pasteurized milk samples are compared, it is noticed that the number of the isolates are higher in the raw cow’s milk. It is because, during pasteurization process some organisms are killed, as is indicated from our findings which are given in the Table III and IV. When the number of isolates in the raw milk are compared in the different seasons of the year, it is noticed that number of the detected organisms in the summer is higher than the winter season (Tab. V). The reason could be that in the summer the ambient temperature is high and lacking of refrigeration in the situation of long distance milk transportation helps the situation. It agrees with the report documenting difficulty in obtaining high quality milk during summer season [23].
Considering the results of this study and the similar investigations, it could be concluded that the presence of coliforms bacteria may not necessarily indicate a direct fecal contamination of milk, but it is a precise indicator of poor sanitary practices during milking and further handling process. In this condition, awareness about the source of contamination is very important. Considering the rate of raw milk contamination to E. coli and coliforms, in the Sari Township, practice of hygienic condition and also supervision to the milk processing, transportation and preservation, particularly during the summer season is recommended.

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References