Occurrence of Fecal Coliforms and Enteropathogenic
Escherichia coli (EEC) in Egyptian Soft Cheese

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ABSTRACT

One-hundred samples of Egyptian soft cheese (Damietta and Kareish) were examined for fecal coliforms and enteropathogenic Escherichia coli (EEC). Fecal coliforms and E. coli were more than 10³/g in 2% and less than 10/g in 6% of the Damietta cheese samples. Fecal coliforms and E. coli existed in 84% of Kareish cheese samples with a level of contamination that ranged from 10-442. Fifteen of 46 E. coli strains isolated from Damietta and Kareish cheese were serotypes of EEC. They were serotyped as 0125/B15, 025/K11, 0128/B12, 0126/B16 and 0111/B4.

Coliforms may exist in cheeses in large numbers; they have been used as indicators of unsanitary manufacturing practices. Little attention was given to the public health hazards of these microorganisms, which may include enteropathogenic Escherichia coli (EEC) serotypes (6,19). However, presence of coliforms has become of worldwide interest, since the implication of EEC in an outbreak of foodborne disease due to consumption of soft ripened cheese (16). There appears to be a relationship between pathogenicity and serotypes of E. coli (9), and their pathogenicity has been well documented (8,21). Several investigators have surveyed dairy products for serotypes of E. coli associated with enteropathogenicity (15,18,22,24). Reports on occurrence of EEC serotypes in Egyptian soft cheese are not available; however, there have been many research works that dealt with fecal coliforms and E. coli in Damietta and Kareish cheese (2,3,10,11).

Therefore, this work was planned to estimate the fecal coliforms and enteropathogenic E. coli in Damietta and Kareish cheese available at retail outlets in Assiut city.

MATERIALS AND METHODS

Collection and preparation of samples

One hundred random samples of Damietta and Kareish cheese (50 each) were collected from different groceries and farmers' markets in Assiut city. Each sample was handled and prepared for examination according to standard methods (17).

Analysis for fecal coliforms and E. coli

Numbers of fecal coliforms were estimated by a 3-tube Most Probable Number (MPN) technique as described by Fishbein et al. (13) in the Compendium of Methods for Microbiological Examination of Foods. Numbers of E. coli were determined according to A.O.A.C. (5).

Analysis for enteropathogenic E. coli (EEC)

Selection of E. coli for serological analysis was carried out according to the methods described by Fishbein et al. (13). Ten representative colonies were selected from each plate of EMB and MacConkey agar previously streaked from positive LST and EE enrichment broths, and were incubated at 35°C for 24 h for recovery of lactose and non-lactose fermenting organisms. These colonies were grown on Blood agar base (Difco) and screened serologically. A slide agglutination technique and Coli Anti-0/B serum, polyvalent I (26-119) and Coli Anti-0/B serum, polyvalent II (124-128) were used. These antisera were obtained commercially from Behringwerke AG, Marburg, West Germany.

RESULTS AND DISCUSSION

Occurrence of fecal coliforms and E. coli

According to data summarized in Table 1, fecal coliforms and E. coli were detected in 8 and 84% of Damietta and Kareish cheese samples, respectively. The level of contamination by fecal coliforms and E. coli in the positive samples of Damietta cheese was less than 10/g in 3 samples (6%) and more than 1000/g in one sample (2%). The number of fecal coliforms in 44% of Kareish samples varied among 10, 100 and up to 2.4 x 10³/g. The same levels of contamination by E. coli were detected in 58% of Kareish cheese samples. Fecal coliforms and E. coli of more than 1000/g and up to 2.4 x 10³/g were recovered from 40 and 26% of examined Kareish cheese samples. A higher incidence of fecal coliforms, 45%, than we found in Damietta cheese was recorded by Shelaih (23), whereas lower findings, 2.1% of soft cheese contained over 1600 fecal coliforms/g, were recorded by Collins-Thompson (7). Abdel-Rahman (2) recorded a higher incidence (15%) of E. coli than we found in Damietta cheese. The results of Abdel-Hakiem (1) that 85% of Kareish cheese were contaminated by fecal coliforms, are nearly similar to our findings, although he recorded higher levels of fecal coliforms, and lower incidence of E. coli (75%) in Kareish cheese. El-Bassiony (10) obtained a lower incidence, 28%, of E. coli than we found in Kareish cheese.

The variation in results obtained by different investigators may depend on the difference in manufacturing practices, handling from producers to consumers and the effec-
TABLE 1. Counts and distribution of fecal coliforms and E. coli in Damietta and Kareish cheese samples.

<table>
<thead>
<tr>
<th>Counts/g</th>
<th>Fecal coliforms</th>
<th>E. coli</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Damietta cheese</td>
<td>Kareish cheese</td>
</tr>
<tr>
<td>&lt;10</td>
<td>3 No.</td>
<td>3 %</td>
</tr>
<tr>
<td>10-100</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>100-1000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>&gt;1000</td>
<td>1 No.</td>
<td>2 %</td>
</tr>
<tr>
<td>Total</td>
<td>4 No.</td>
<td>8 %</td>
</tr>
</tbody>
</table>

TABLE 2. Occurrence of E. coli in Damietta and Kareish cheese samples.

<table>
<thead>
<tr>
<th>Samples</th>
<th>No. of isolated strains</th>
<th>Untypable E. coli</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damietta</td>
<td>4 No.</td>
<td>8 %</td>
</tr>
<tr>
<td>Kareish</td>
<td>42 No.</td>
<td>84 %</td>
</tr>
</tbody>
</table>

TABLE 3. Enteropathogenic Escherichia coli (EEC) recovered from Damietta and Kareish cheese.

<table>
<thead>
<tr>
<th>Samples</th>
<th>No. of EEC strains isolated</th>
<th>Types of EEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damietta cheese</td>
<td>1</td>
<td>0125/B15</td>
</tr>
<tr>
<td>Kareish cheese</td>
<td>4</td>
<td>0125/B15</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>025/K11</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>026/B6</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0128/B12</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>0126/B16</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>0111/B4</td>
</tr>
</tbody>
</table>

Occurrence of Enteropathogenic E. coli (EEC)

It is evident from results recorded in Tables 2 and 3, that one out of four E. coli strains recovered from Damietta cheese, was enteropathogenic (EEC) serotype 0125/B15, whereas 14 (33.3%) out of 42 E. coli strains isolated from Kareish cheese were enteropathogenic. They were serotyped as 0125/B15 and 025/K11 (4 strains each), 026/B6 (2 strains), 0128/B12 (2 strains), 0126/B16 (one strain) and 0111/B4 (one strain). Similar serotypes of EEC were recovered from Kareish and Damietta cheese examined by Ahmed (4), who isolated 26 and 6 EEC strains from the cheeses, respectively. Nenkov (19) obtained a lower incidence of EEC in samples of fresh cheese than we found in our cheese samples. Also, a lower incidence of EEC, 10%, was detected by Fantasia et al. (12) in samples of soft ripened cheese associated with diarrheal disease. No EEC were detected in cheese samples examined by Frank and Marth (14) and Nootigat and Hartog (20).

The occurrence of a high proportion of EEC in our cheese samples may be due to lack of proper sanitation and absence of pasteurization of milks used for cheesemaking. Therefore, stringent hygienic measures must be followed and pasteurization of milk should be imposed to prevent contamination of cheese with coliforms and thus to avoid additional outbreaks of foodborne illness caused by EEC.

REFERENCES