قسم: المراقبة الصحية على الأغذية
كلية: الطب البيطري - جامعة أسوان.
رئيس القسم: أ.د. توفيق علي الرحمن البيضوني.

التقييم الميكروبيولوجي لل لبن المركز والمحلى

أحمد عبد الحميد، توفيق البسيوني، مصطفى خليل

تم جمع عدد 42 علبة من لبن اللبن المركز والمحلى من أسواق مدينة أسوان لفحصها ميكروبيولوجياً وتحديد الحالة الصحية لانتاجها.

وقد تبين من الفحص أن متوسط العدد الكلي للميكروبات وكذلك عدد الميكروبات الكروية الكروية المعموياً وعدد الطحالب والفطريات في الجزء الواحد على التوالي 10^2، 10^3، 10^4، 10^5 و10^6.

بما أن عزل ميكروب السالمونيلا، الميكروب المكور العنقودي، الذهبي والميكروبات السحيحة القولونية.

وقد تم مناقشة الأهمية الصحية لوجود بعض الأنواع من البكتيريا والفطريات، والطحالب على الصحة العامة وكذلك تأثيرها على جودة هذه المواد من منتجات الألبان.
MICOBIIOLOGICAL EVALUATION OF CONDENSED MILK
(With Two Tables)

By
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(Received at 16/2/1988)

SUMMARY

32 random samples of full cream sweetened condensed milk (Carnation and Alaka) were collected from Assiut City markets for microbiological evaluation. The mean value of total colony, enterococci and yeast and mold counts were $128.4 \times 10^5$, $45.1 \times 10^7$ and $66.3 \text{g}$, respectively. Only four of the examined samples (12.5%) do not comply with the standards recommended by A.P.H.A. for the total bacterial counts. Enterococci, Micrococcus, Anaerobes, Aspergillus, Cladosporium, Penicillium, Mucor and Alternaria could be isolated in different percentages, while salmonellae, Staph. aureus, Bacillus cereus and coliforms could not be detected. The public health hazard of each isolate was discussed.

INTRODUCTION

Dairy products of reduced moisture content may be produced because of savings in transportation and merchandising costs related to reduced volume and weight. These products with their greater concentration of milk solids, are useful in manufacture of ice-cream, candies and other food items. Sweetened condensed milk may be made either from whole milk or from skim milk by concentrating milk to about one-third volume by the removal of water and addition of sugar.

Viable microorganisms are commonly found in the final product, and their numbers may vary between few microorganisms to 100,000/g (ROBINSON, 1981). The various methods of heat treatment used are not adequate to kill spore-forming bacteria, and further processing and handling usually contribute a variety of microorganisms; the sugar levels employed permit some types to grow if other conditions are favourable. Enough oxygen may be present in the head space of an incompletely filled, or poorly sealed, container to permit the growth of organisms able to tolerate the high osmotic pressure of the product.

Several outbreaks of acute gastrointestinal disturbance have been reported due to consumption of condensed milk (COCKBURAN and VERNON, 1956). Torulopsis, Aspergillus, Penicillium, Micrococcii, Coliforms and spore-forming may be associated with defects in condensed milk, especially if the canned products are held for longer times (ROBINSON, 1981). JARHOVSKA et al. (1970) found that the total bacterial count ranged from 100/g to 50,000/g. They also isolated staphylococci, micrococcii, enterococci, enterobacter and Alkaligenes faecalis; while, SLUZEWSKI (1977) stated that micrococcii can grow and resist the high osmotic pressure of sweetened condensed milk. In another study conducted by SALLAM (1979), the mean value of total colony, enterococci and yeast and mould counts were found to be $10.24 \times 10^3$, 105.33 and 17.83/g respectively.

This work was planned to secure the microbiological evaluation of condensed milk.
MATERIAL and METHODS

32 random samples of full cream sweetened condensed milk cans (Carnation and Alaska) were collected from Assiut City markets for microbiological evaluation. Preparation and handling of collected samples were done according to standard Methods (A.P.H.A., 1978). The prepared samples were examined for the following:

- Total colony count: \( \text{A.P.H.A., 1978} \).
- Total yeast & mould count: \( \text{A.P.H.A., 1978} \).
- Enterococci count: Enterococcus selective differential agar was used as recommended by EFTHIMIOU et al. (1974).
- Coliform count: MPN technique was carried out as described in FAO (1979).
- Staph. aureus count: MPN technique was employed as described by VAN DOORNE et al. (1981).
- B. cereus count: MPN technique was used as described by LANCETTE and HARMON (1980).
- Detection of anaerobic spore-formers: The technique used is that recommended by CHALMERS (1962).
- Isolation and identification of other pathogenic microorganisms was carried out according to RIPPON (1974) and FINEGOLD and MARTIN (1978).

RESULTS

The results obtained are recorded in Tables (1 & 2).

**Table (1): Total colony, Enterococci and yeasts & moulds counts/g of the examined condensed milk.**

<table>
<thead>
<tr>
<th>Positive Samples</th>
<th>No/32</th>
<th>%</th>
<th>Min.</th>
<th>Max</th>
<th>Counts/g.</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total colony</td>
<td>32</td>
<td>100</td>
<td>300</td>
<td>(110 \times 10^3)</td>
<td>(128.4 \times 10^2)</td>
<td></td>
</tr>
<tr>
<td>Enterococci</td>
<td>15</td>
<td>46.9</td>
<td>100</td>
<td>(32.6 \times 10^3)</td>
<td>(45.1 \times 10^2)</td>
<td></td>
</tr>
<tr>
<td>Yeasts &amp; moulds</td>
<td>10</td>
<td>31.3</td>
<td>10</td>
<td>120</td>
<td>66.3</td>
<td></td>
</tr>
</tbody>
</table>

DISCUSSION

Table (1) shows the maximum, minimum and average of total colony counts in the examined samples of condensed milk. According to the standard specified by the American Public Health Association, the total bacterial count/g. of sweetened condensed milk should not exceed 10,000, consequently, 12.5% of the examined samples do not comply with such standard. Similar findings were obtained by SALLAM (1979). Also, the results recorded in Table (1) revealed that 46.9% of the samples contained enterococci with varying numbers. Lower incidence of enterococci was reported by SALLAM (1979). These organisms may have a distinctive role as indicative of poor factory sanitation, owing to their relatively high resistance to drying or disinfectants (FAO, 1979). Furthermore, they constitute a public health hazard.
QUALITY OF CONDENSED MILK

(SEDOVA, 1970 and ERWA, 1972). Yeasts and moulds were found in 10 samples (31.3%) with an average count of 65.3/g. of condensed milk (Table 1). these organisms could be isolated from condensed milk examined by RAO and RANGANATHAN (1970) and SALLAM (1979) who obtained a lower findings than that present in this investigation.

The results recorded in Table 2, show the incidence percentages of isolated microorganisms recovered from the examined condensed milk samples. The isolated organisms whether pathogenic or non-pathogenic thrive well in the product constituting a public health hazard as well as economic losses. The main source of contamination of condensed milk by these microorganisms may be from imperfectly cleaned machinery and incompletely sterilized tins (GARCIA, 1959). On the otherhand, Salmonella, Staph. aureus, Bacillus cereus and coliforms could not be detected in all of examined samples. ROBINSON (1961) stated that coliforms, may die off with holding, but micrococci yeast, moulds may proliferate.

Table (2): Frequency distribution of isolated strains recovered from the examined condensed milk samples.

<table>
<thead>
<tr>
<th>Isolates</th>
<th>Frequency No. of isolates</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bacteria</strong></td>
<td></td>
</tr>
<tr>
<td>Strept. faecalis</td>
<td>15</td>
</tr>
<tr>
<td>Strept. faecium</td>
<td>5</td>
</tr>
<tr>
<td>Micrococcus</td>
<td>4</td>
</tr>
<tr>
<td>Anaerobes</td>
<td>3</td>
</tr>
<tr>
<td><strong>Moulds</strong></td>
<td></td>
</tr>
<tr>
<td>Aspergillus sp.</td>
<td>7</td>
</tr>
<tr>
<td>Cladosporum sp.</td>
<td>5</td>
</tr>
<tr>
<td>Penicillium sp.</td>
<td>4</td>
</tr>
<tr>
<td>Mucor sp.</td>
<td>3</td>
</tr>
<tr>
<td>Alternaria</td>
<td>3</td>
</tr>
</tbody>
</table>

REFERENCES


