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PREVALENCE OF THERMODURIC BACTERIA IN DRIED MILK

(With 3 Tables)

By

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مدى تواجد البكتريا المتحملة للحرارة في اللبن الجاف

على بروتين ، حمض منطوق

أجرى البحث على عدد ٤٤ عينة من اللبن الجاف (٢٧ من كل من المحلي والمستورد) جمعت من أماكن مختلفة بمدينة الزقازيق لتحديد مدى تواجد البكتريا المتحملة للحرارة . وقد دلت النتائج على أن متوسط العدد الكلي للبكتريا المتحملة للحرارة في العينات المحلية والمستوردة هو $10 \times 10^6 \pm 10^5$ ، $10 \times 10^6 \pm 10^5$ ، $10 \times 10^6 \pm 10^5$ في الجرام الواحد على التوالي . وقد تم عزل عترات مختلفة من ميكروبات ميكروكوكس لوتيس ، باسيلس سيرس ، باسيلس ساتلس ، باسيلس سيركيولانس ، باسيلس كواجيولانس ، باسيلس ليكنيفيورمس ، المكور السبحي فيشيوم ، المكور السبحي ليكوفيشينز ، المكور السبحي ديورانس ، المكور السبحي زيمو جينز ، المكور السبحي سيرموفيلس من العينات المحلية والمستوردة بنسب مختلفة تراوحت بين ٧٧٪ إلى ٤٨٪ .

وقد تم مناقشة الأهمية الصحية والاقتصادية للمعزولات والاقتراحات الواجب اتباعها لسلامة المنتج .

MATERIALS and METHODS

Fifty-four samples of dried milk (25 each from locally manufactured and imported ones) were collected randomly from supermarkets and pharmacies in Zagazig city and examined

SUMMARY

Fifty-four samples of dried milk (27 each from locally manufactured and imported cans) were collected from supermarkets and pharmacies in Zagazig city. The mean thermoduric count was $1.5 \times 10^3 \pm 0.6 \times 10^3$ ($2 \times 10^2 - 1.4 \times 10^4$) in Locally manufactured samples while the count ranged from 70 to 9.2×10^2 ($3.7 \times 10^2 \pm 0.4 \times 10^2$) in imported samples. *Micrococcus luteus*; *Bacillus cereus*, *B. Subtilis*, *B. circulans*, *B. coagulans*, *B. Lichnifurmis*; *Streptococcus faecium*, *Strept. Liquefaciens*, *Strept. durans*, *Strept. zymogenes* and *Strept. thermophilus* could be isolated at varying percentages. The economic and public health significance of isolates as well as suggestive control measures were discussed.

INTRODUCTION

The quality of dairy products as they reach the consumers depends not only on the condition of the raw material but also on the changes which may take place during the manufacture, storage and distribution.

The wide distribution of the thermoduric organisms which commonly found in soil; dust, waste; water; plants; animal hides; raw milk and on dairy equipment and their resistance to pasteurization temperatures (CHALMERS, 1962 and ICMSF, 1978) underlines the importance of combatting their occurrence in dairy products.

The predominant kinds of thermoduric organisms in dry milk are Streptococci, Micrococci and Sporeformers which are responsible for spoilage and sometimes food poisoning outbreaks traced to consumption of dried milks (ICMSF, 1978 and FRAIZER and WESTHOFF, 1984).

The thermoduric count is used as an indicator of the thoroughness of drying milk plants and equipment sanitation (CHALMERS, 1962 and AL-ASHMAWY, 1992).

The present investigation was designed to detect the prevalence of thermoduric bacteria in dried milk.

MATERIALS and METHODS

Fifty-four samples of dried milk (27 each from locally manufactured and imported cans) were collected randomly from supermarkets and pharmacies in Zagazig city and examined

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bacteriologically for prevalence of thermophilic organisms by applying the following technique:-

Eleven grams from each prepared samples were homogenized in 99 ml of 0.1% peptone water. Ten fold serial dilutions were prepared from the original dilution after application of laboratory pasteurization at 63.5 °C for 30 minutes. The technique recommended by A.P.H.A. (1985) was used for enumeration of thermophilic bacteria. The suspected colonies were picked up and streaked onto nutrient agar slopes and incubated. The pure cultures were purified and identified according to KRIEG and HOLT (1984).

RESULTS

The obtained results are presented in tables 1, 2 and 3.

DISCUSSION

From the results given in Tables 1 & 2, it is evident that the thermophilic count/g. of locally manufactured dried milk samples ranged from 2×10^2 to 1.4×10^4 , with a mean value of $1.5 \times 10^3 \pm 0.6 \times 10^3$. The highest frequency distribution (88.9%) lies within the range 10^2 - 10^3 . While in imported samples such counts varied from 70 to 9.2×10^2 , with a mean value of $3.7 \times 10^2 \pm 0.4 \times 10^2$.

From the aforementioned results, it is evident that the thermophilic count was relatively high in locally manufactured dried milk samples than that of imported cans which may be attributed to the more adequate hygienic measures during milking; collection of raw milk; manufacturing process of such milk products as well as cleaning and sanitization of dairy farm and plant equipment abroad.

The results presented in table (3) indicate that the thermophilic bacteria could be isolated from locally manufactured dried milk were *Micrococcus luteus* (48.1%), *Streptococcus faecium* (22.2%), *Strept. thermophilus* (11.1%), *Bacillus cereus*, *B. circulans*, *Strept. liquefaciens* (7.4 % each), *B. subtilis*, *B. coagulans*, *Strept. durans* and *strept. Zymogenes* (3.7% each). While those isolated from imported dried milk were *Micrococcus luteus*; *Bacillus cereus*, *B. subtilis*, *B. circulans*, *B. coagulans*, *B. Lichnifurmis*, *Strept. Liquefaciens*, *Strept. Zymogenes* and *Streptococcus thermophilus* in varying percentages from 3.7% to 40.7%.

The obtained results substantiate what has been reported by BECKER et al. (1984), FRAZIER and WESTHOFF (1984); MUIR et al. (1986); JARCHOVSKA (1987) and MOLSKA (1989).

Bacillus spp. are among the main spoilage organisms in food due to their versatile metabolism and heat resistant spores (INGRAM, 1969 and WALKER, 1976).

The technological important properties of enterococous spp. are proteolytic rather than lipolytic (WESSELS et al.; 1990).

The temperature tolerance of the thermophilic bacteria could have serious implications on the acceptable levels of heat treatment used in food preservation.

Yet it can be used as an indicator of equipment sanitation and monitoring the good manufacturing practice.

From the public health point view, *Bacillus cereus* has a potential role in food poisoning (ICMSF, 1978). While *Enterococcus* spp. constitute a health hazard to man since BATISH et al. (1985) who isolated an enterotoxigenic strain from infant food. Consequently it has been well established that the destruction and elimination of thermophiles in dried milk could be achieved by using of high temperature for preheating milk for drying; proper cleaning and sanitization of utensils and equipment and, avoid holding the product at high temperature.

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RESULTS

Table (1): Statistical analytical results of thermoduric count/g of dried milk

Samples	No of samples	Positive samples NC. %	Min.	Max.	Mean	S.E.M ±
Local Samples	27	27 100	2×10^2	1.4×10^4	1.5×10^3	0.6×10^3
Imported samples	27	27 77.7	70	9.2×10^2	3.7×10^2	0.4×10^2

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Table (2) : Frequency distribution of examined samples based on their thermoduric count /g.

Intervals	Locally manufactured		Imported	
	NO.	%	NO.	%
10 ————— 10 ²	-	-	3	14.3
10 ² ————— 10 ³	24	88.9	18	85.7
10 ³ ————— 10 ⁴	1	3.7	-	-
10 ⁴ ————— 10 ⁵	2	7.4	-	-
Total	27	100	21	100

Table (3) : Incidence of thermoduric bacteria isolated from the examined samples.

Isolates	Locally manufactured		Imported Samples	
	NO.	%	NO	%
<i>Micrococcus luteus</i>	13	48.1	11	40.7
<i>Bacillus cereus</i>	2	7.4	2	7.4
<i>B. Subtilis</i>	1	3.7	2	7.4
<i>B. circulans</i>	2	7.4	2	7.4
<i>B. coagulans</i>	1	3.7	1	3.7
<i>B. lichnifurmis</i>	-	-	3	11.1
<i>Streptococcus faecium</i>	6	22.2	-	-
<i>Strept. liquefaciens</i>	2	7.4	1	3.7
<i>Strept. durans</i>	1	3.7	-	-
<i>Strept. Zymogenes</i>	1	3.7	1	3.7
<i>Strept. thermophilus</i>	3	11.1	2	7.4