

قسم : المراقبة الصحية على الأغذية .  
كلية : الطب البيطرى - جامعة أسيوط .  
رئيس القسم : أ. د. / على يوسف لطفي .

## البكتريا المحبة للبرودة في اللبن الخام والمبستر

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تسبب البكتريا المحبة للبرودة مشكلة كبيرة لصناعة الالبان منذ سنوات طويلة وسوف تظل مشكلة واجبة الحل في السنوات القادمة . لذلك تم جمع عدد ٤٠ عينة من اللبن الخام من أسواق أسيوط بعد التأكد من عدم معيشتها حراريا . وقد تم فحص هذه العينات لمعرفة مدى وجود البكتريا المحبة للبرودة ( Psychrotrophs ) ، وكذلك البكتريا المحبة للبرودة والمقاومة للحرارة ( Thermotrophic Psychrotrophs ) .

وقد وجد أن ١٥ ٪ من العينات تحتوى على البكتريا المحبة للبرودة والمقاومة للحرارة مباشرة بعد اجراء بستره معمله ، بينما وجد أن ٦٧.٥ ٪ من العينات المبستره احتوت على هذه البكتريا بعد حفظها لمدة ٧ أيام عند درجة حرارة ٧ درجات مئوية ، بالإضافة الى ذلك وجد أن استخدام درجة حرارة ٢١ درجة مئوية لمدة ٢٥ ساعة تعتبر طريقه سريعه لعد البكتريا المحبة للبرودة في الحليب الخام والمبستر .

وكذلك تم مناقشة تأثير هذه الأنواع من البكتريا على صناعة الالبان والصحة العامة للمستهلك .



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**PSYCHROTROPHIC BACTERIA IN RAW AND PASTEURIZED MILK**  
(With 4 Tables)

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(Received at 26/2/1984)

**SUMMARY**

40 random samples of market milk sold in Assiut City were collected for enumeration and isolation of psychrotrophs and thermophilic psychrotrophs. 15% of laboratory pasteurized milk samples contained thermophilic psychrotrophs immediately after pasteurization, while 67.5% of the samples had thermophilic psychrotrophs after storage at 7°C for 7 days.

Incubation at 21°C for 25 h method was a very reliable and rapid method to enumerate psychrotrophs in raw and pasteurized milk.

Psychrotrophic bacteria are the cause of major problems to the dairy industry for many years and will continue to be a problem in the future.

**INTRODUCTION**

Cooling or refrigerating milk to prolong its storage life on the farm, in the dairy plant, during marketing or at home draw the attention to cold-enduring bacteria which can grow at low temperature.

Recently, considerable importance has been given to psychrotrophic types that survive pasteurization (WASHAM *et al.* 1977). Thermophilic psychrotrophs in milk have been reported by several researchers in recent years (THOMAS, 1974; STADHOUDERS, 1975; TINUOYE & HARMON, 1975; THOMAS & THOMAS, 1976, 1977, 1978; MIKOLAJCIK & SIMON, 1978 and BODYFELT, 1980). MIKOLAJCIK & SIMON (1978) examined 109 raw milk samples and noted that only 13% of the milk samples heated to 80°C for 12 min contained psychrotrophic spore counts of 10 or more per milliliter and an average of 340 psychrotrophic spores/ml. In another study, no psychrotrophs were recovered from any milk immediately after pasteurization; however, after storage at 7 to 7.2°C for 7 to 10 days psychrotrophic counts were between 1 and 100,000/ml (PATEL & BLANKENAGEL, 1972).

Numerous incubation periods as well as various suitable temperatures for psychrotrophic counts were mentioned in the literatures. Presently, Standard Methods for the Examination of Dairy Products recommend incubating plates at 7°C for 10 days (A.P.H.A., 1978). OLIVERIA & PARMELEE (1976) concluded that incubation at 21°C for 25 h was a very reliable and rapid method to determine psychrotrophs in raw and pasteurized milk.

This work was planned to assess the enumeration and identification of psychrotrophic bacteria in raw and pasteurized milk.



## MATERIAL and METHODS

40 random samples of market milk sold in Assiut Governorate, were collected from different sources. The samples were dispatched to the laboratory without delay and examined as soon as possible after their arrival. All samples were examined for detection of heat treatment (LAMPERT, 1975).

### Preparation of samples:

Each sample was thoroughly mixed, then divided under sterile conditions into two sub-samples. The first was used for psychrotrophic count, while the second for laboratory pasteurization.

### Laboratory pasteurization:

Samples of milk were pasteurized in the laboratory according to A.P.H.A. (1978) by heating in a water-bath at 63°C for 30 minutes. Immediately following the heat treatment, the milk samples were cooled rapidly in ice water. Samples from this pasteurized milk were directly examined for thermotrophic psychrotrophic counts. The remaining amount of pasteurized milk were stored at 7°C for 7 days and reexamined for thermotrophic psychrotrophic counts.

### Psychrotrophic counts in raw and pasteurized milk:

The samples to be analyzed for psychrotrophic bacteria were plated in duplicate. One set of plates was used to determine the psychrotrophic bacterial counts by standard procedure (A.P.H.A., 1978), while the other was used for incubation at 21°C for 25 h (OLIVERIA & PARMELEE, 1976). All plates were counted in exactly the same manner with the aid of colony counter.

### Identification of isolates:

Representative colonies were picked up for purification and the isolates were identified to the generic level using standard taxonomic tests and key in Bergey's Manual of Determinative Bacteriology (BUCHANAN & GIBBON, 1974).

## RESULTS and DISCUSSION

All results obtained from the examined samples of raw and pasteurized milk are presented in Tables (1-4).

Results given in Table 1 shows the maximum, minimum and average psychrotrophic and thermotrophic psychrotrophic counts after incubation at 7 C for 10 days and 21 C for 25 h. From the results obtained, it is evident that incubation at 21 C for 25 h recovered slightly more counts than incubation at 7 C for 10 days. These results suggest that incubation at 21 C for 25 h method to determine psychrotrophs in raw and pasteurized milk. These findings were in agreement with those reported by OLIVERIA & PARMELEE (1976).

Results obtained and recorded in Table 2 evident that only 6 (15%) of laboratory pasteurized milk samples contained thermotrophic psychrotrophs immediately after pasteurization. Four samples contained less than 30/mi, while the other two samples contained 95 and  $1.3 \times 10^2$ /mi. Of the pasteurized milk samples stored at 7 C for 7 days, 27 samples (67.5%) had thermotrophic psychrotrophs. Nearly similar results were obtained by MIKOLAJCIK & SIMON (1978).

Tables 3 & 4 show the incidence percentage of isolated psychrotrophs and thermotrophic psychrotrophs from raw and pasteurized milk. Such organisms played a role in determining the manufactured products of milk through production of proteolytic or lipolytic enzymes during growth. Some



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of these enzymes are heat stable and can withstand milk processing temperatures leading to decrease the keeping quality of milk and milk products. Furthermore, individual members of psychrotrophic bacteria have been implicated from time to time as causal agents of food poisoning (HOBBS, 1975). Bitter, fruity, rancid, sour, yeasty, putrid and unclean off-flavors have been attributed to growth of thermophilic psychrotrophs in milk (SHEHATA & COLLINS, 1971; BHADSAVLE *et al.* 1972; WASHAM *et al.* 1977; MIKOLAJCIK, 1978 and BODYFELT, 1980).

Psychrotrophic bacteria are the cause of major problems to the dairy industry for many years and will continue to be a problem in the future.

There is no doubt that good sanitation and strict hygienic measures during production, handling and distribution of milk are fundamentals.

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Table (1): Psychrotrophic and thermoduric psychrotrophic counts/ml in raw and pasteurized milk at different incubation temperatures

	Psychrotrophic count		Thermoduric psychrotrophic count*	
	at 7°C for 10 days	at 21°C for 25 h	at 7°C for 10 days	at 21°C for 25 h
Maximum	$85.0 \times 10^5$	$24.0 \times 10^6$	$81.0 \times 10^2$	$49.0 \times 10^3$
Minimum	$30.0 \times 10^3$	$42.0 \times 10^5$	$4.2 \times 10^1$	$6.7 \times 10^1$
Average	$78.65 \times 10^4$	$9.52 \times 10^5$	$8.2 \times 10^2$	$9.8 \times 10^2$

\* After storage at 7°C for 7 days.

Table (2): Incidence of thermoduric psychrotrophs in laboratory pasteurized milk

No. of samples examined	+ve sample immediately after pasteurization		+ve samples after after storage at 7°C for 7 days	
	No.	%	No.	%
40	6	15	27	67.5

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Table (3): Frequency distribution of isolated psychrotrophs in raw milk

Isolates	No. of isolates	Percentage
Pseudomonas	25	27.78
Alcaligenes	12	13.33
Flavobacterium	5	5.56
Coliforms	20	22.22
Proteus species	13	14.44
Micrococcus	3	3.33
Bacillus species	10	11.11
Streptococcus	2	2.22
Total	90	100.00

Table (4): Frequency distribution of isolated thermotrophic psychrotrophs in pasteurized milk

Isolates	No. of isolates	Percentage
Bacillus species	26	81.25
Micrococcus	4	12.50
Streptococcus	2	6.25
Total	32	100.00



