

Dept. of Food Hygiene,  
Faculty of Vet. Med., Cairo University,  
Head of Dept. Prof. Dr. A.W. Moursy.

## INCIDENCE OF COLIFORM ORGANISMS IN CREAM AND ICE-CREAM WITH SPECIAL REFERENCE TO ENTEROPATHOGENIC STRAINS OF ESCHERICHIA COLI

(With 3 Tables)

By

H.A. EL-ESSAWY and A.A.M. RIAD

(Received at 28/2/1990)

مدى تواجد ميكروبات القولون في القشدة والاييس كريم وخاصة عترات  
الايشريشياكولاي المرضية

حمدي المعصوي ، عائشة رياض

تعد ميكروبات القولون مسؤولة عن كثير من التغييرات الغير مرغوب فيها في الألبان ومنتجاتها فضلا عما تسببه من خطورة على صحة المستهلك ، لهذا فقد تم فحص مائة عينة من القشدة والمثلج اللبني (الاييس كريم) جمعت من مصادر مختلفة من القاهرة والجيزة . وقد اشتملت هذه الدراسة على عد تلك الميكروبات بالاضافة الى عزلها وتصنيفها ولقد أسفرت الدراسة عن النتائج التالية: تواجد ميكروبات القولون في جميع عينات القشدة و ٩٨% من عينات الاييس كريم بمتوسط قدره  $6.39 \times 10^1$  و  $3.67 \times 10^1$  على التوالي، كما أسفرت تصنيف العترات المعزولة عن تواجد ميكروب الايشريشياكولاي في ٣٠% ، ١٦% في كل من عينات القشدة والاييس كريم على التوالي. كذلك تم عزل ميكروبات انيتروباكتريكوكا، انيتيروباكتري أجلوميرانس ، انيتيروباكتري ابروجينس، انيتيروباكتري ساكازاكي، ستروباكتري فرونيديا، ستروباكتري دايغوس و ستروباكتري أمالوناتيكيس، كليبيلا اوكستيوكا، كليبيلا اوزني وكذلك كليبيلا وينوسكليرومتس بنسب مختلفة من العينات التي فحصت . كما تم الفحص السيرولوجي لعترات الايشريشياكولاي المعزولة وتبين أن ١٤ عترة منها تنتمي الى خمسة أنواع سيرولوجية ممرضة هي:

$O_{26} : K_{60} : B_6 : O_{128} : K_{67} : B_{12} : O_{125} : K_{20} : B_{15} : O_{112} : K_{66} : B_{11} : O_{111} : K_{58} : B_5$

هذا وقد نوقت الأهمية الصحية والاقتصادية للميكروبات المعزولة وكذلك الاجراءات التي يمكن اتخاذها لتحسين حالة المنتج.

### SUMMARY

One hundred samples of Fresh cream and ice-cream, (50 each), collected from different localities in Cairo and Giza were bacteriologically examined for detection, isolation and identification of coliforms.

All examined samples of fresh cream and 98% of ice-cream samples proved to contain coliform organisms, with a mean value (MPN/ml) of  $6.39 \times 10^1$  and  $3.67 \times 10^1$  respectively. Escherichia coli could be detected in 30% and 8.16% of examined fresh cream and ice-cream samples respectively. Enterobacter cloacae, Ent.agglomerans, Ent.aerogenes, could be detected in examined samples at various rates ranging from

## EL-ESSAWY and RIAD

6% to 40.82%, while *Ent.sakazakii* could be detected only in Fresh cream at lower percentages (4%). *Citrobacter freundii*, *Cit.diversus*, *Cit.amalonaticus*, *Klebsiella oxytoca*, *K.pneumoniae*, *K.ozoenae*, and *K.rhinoscleromatis* could be detected in examined samples at various rates ranging from 2% to 34.69%.

Serological typing of isolated 14 *E.coli* strains proved to belong to five different serotypes:  $O_{26} : K_{60} : B_6$ ,  $O_{111} : K_{58} : B_4$ ,  $O_{112} : K_{66} : B_{11}$ ,  $O_{125} : K_{70} : B_{15}$  and  $O_{128} : K_{67} : B_{12}$ .

The public health importance and economic significance of the isolated organisms as well as suggested control measures for improving the quality of the products have been discussed.

## INTRODUCTION

Milk and its products are liable to contamination from different sources during production, handling and distribution. Members of the family Enterobacteriaceae, especially coliforms stand first among food contaminants as they are widely - spread in nature. Some of these contaminants induce certain objectionable changes in the product, while others play a pathogenic role among consumers.

Although the coliform count in dairy products is used to ascertain the standard of sanitation maintained during production, certain serotypes of *E.coli* are associated with severe diarrhoea in infants and young children, as well as cases of food poisoning and gastroenteritis among consumers. Moreover, the organisms are frequently implicated in different affections among consumers (LOVE, *et al.* 1972; MARIER, *et al.* 1973 and MOSSEL, 1975). The present investigation deals with the rate of contamination of both cream and Ice-cream with coliform organisms.

## MATERIAL and METHODS

One hundred random samples of fresh cream and ice-cream, (Fifty each) collected from different localities in Cairo and Giza were bacteriologically examined for detection of coliforms (MPN/ml) according to the technique recommended by ICMSF, (1982). Isolated coliform colonies were identified according to KRIEG and HOLT (1984). *Escherichia coli* strains were serologically typed according to SOJKA (1965).

## RESULTS

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

## COLIFORM, CREAM AND ICE-CREAM

## DISCUSSION

**Coliform content:**

The results given in Table (1) reveal that coliforms could be detected in all samples of fresh cream and 98% of examined ice-cream samples with a mean count (MPN/ml) of  $6.39 \times 10^4 \pm 2.49 \times 10^4$  and  $3.67 \times 10^5 \pm 2.32 \times 10^5$  respectively. Nearly similar count were reported by Seham and BASHANDY (1983) and HAFEZ (1984). Lower results were reported by KOHNECHAHARI, *et al.* (1972).

**Isolated coliforms:**

Table (2) shows that 30% and 8.16% of examined cream and ice-cream samples respectively contained *E.coli*, while *Enterobacter cloacae*, *Ent.agglomerans*, *Ent.aerogenes*, *Citrobacter freundii*, *Cit.diversus*, *Cit.amalonicus*, *Klebsiella oxytoca*, *K.pneumoniae*, *K.ozoenae* and *K.rhinoscleromatis* could be detected in examined samples at various rates (2-40.82%). *Enterobacter sakazakii* could be isolated only from examined fresh cream samples (4%). These findings substantiate what have been reported by HAFEZ (1979) and HAFEZ (1984).

**Isolated *E.coli* serotypes:**

It is evident from Table (3) that *E.coli* strains isolated from fresh cream and ice-cream samples proved to belong to O<sub>26</sub> : K<sub>60</sub> : B<sub>6</sub>, O<sub>111</sub> : K<sub>58</sub> : B<sub>4</sub>, O<sub>112</sub> : K<sub>66</sub> : B<sub>11</sub>, O<sub>125</sub> : K<sub>70</sub> : B<sub>15</sub> and O<sub>128</sub> : K<sub>67</sub> : B<sub>12</sub>, while 5 strains could not be typed due to lacking of specific antisera.

These findings agree with those reported by SHELAH (1976) and POLO VILLAR, *et al.* (1978).

**Hygienic significance of isolates:**

Contamination of dairy products with coliforms is considered objectionable as they may induce certain undesirable changes in the product rendering it of inferior quality or even unfit for human consumption, thus causing economic losses.

Most of the examined samples proved to be highly contaminated. The public health importance of *E.coli* as well as other members of isolated coliform organisms was emphasized by many authors, as they have been implicated in different affections among consumers (KORNACKI & MARTH, 1982). Realizing that isolated organisms have been implicated in cases of food poisoning, therefore, one may safely conclude that sanitary control measures should be taken during production, handling and storage to improve the quality of the product.

## REFERENCES

- Hafez, R.Sh. (1979): Microbiological studies on market ice-cream. Thesis, Ph.D. Fac. Vet. Med., Cairo Univ.

## EL-ESSAWY and RIAD

- Hafez, N.M. (1984): Incidence and public health importance of coliforms with special reference to enteropathogenic serotypes of E.coli in milk and some dairy products. M.V.Sc. Thesis, Fac. Vet. Med., Cairo Univ.
- International Committee On Microbiological Specifications for foods (ICMSF) (1982): Microorganisms in foods. I. Their significance and methods of enumeration. 2nd Ed. University of Toronto Press. Toronto Buffalo and London.
- Kohnechahari, M.; Meleki, M.; Farkondeh, A. and Ghazvinian, R. (1972): enumeration of total microorganisms and coliform organisms in creams consumed in Teheran. Lait., 52, 355. Dairy Sci. Abst., 34: 699.
- Kornacki, J.L. and Marth, E.H. (1982): Food-borne illness caused by Escherichia coli. A review Journal of food protection. 45: 1051.
- Krieg, N.R. and Holt, J.G. (1984): Bergeys Manual of systematic Bacteriology. Vol. 1, Williams and Wilkins, Baltimore, U.S.A.
- Love, W.C.; Gorden, A.M.; Gross, R.T. and Rowe, B. (1972): Infantile gastro-enteritis due to E.coli O<sub>124</sub>. Lancet, 11: 355.
- Marier, R.; Wells, J.G.; Swanson, R.C.; Callahan, W. and Mehlman, I.J. (1973): An outbreak of enteropathogenic E.coli food borne disease traced to imported French cheese. Lancet, 2: 1376.
- Mossel, A.A. (1975): Microbiology of food and dairy products. Univ. of Utrecht., Fac. Vet. Med.
- Polo Villar, L.M.; Herrera. Marteache, A. and Pozo Lora, R. (1978): Identification of enteropathogenic E.coli and salmonellae in ice-cream by flourescent antibody technique. anales de Bromatologia, 30 (2): 151-156. Dairy Sci. Abst., 41: 444, (1979).
- Seham, M. Mahmoud and Bashandy, E.Y. (1983): Coliforms in ice-cream with special reference to incidence of enteropathogenic E.coli. Vet.Med.J. Vol. 31, No.3.
- Shelaih, M.A. (1976): Studies on coliform organisms in milk and some dairy products. M.V.Sc. Thesis, Fac. Vet. Med., Cairo Univ.
- Sojka, M.J. (1965): Bacteria in domestic animals and poultry. Farnham royal, Common Welth. Agriculture Bureaux.

Table (1): Statistical analytical results of coliform content (MPN/ml) in examined samples

	Positive samples		Min.	Max.	Mean	S.E.M. $\pm$
	No.	%				
Fresh cream	50	100	$15 \times 10^3$	$11 \times 10^{12}$	$6.39 \times 10^{11}$	$2.49 \times 10^{11}$
Ice-cream	49	98	2.3	$90 \times 10^5$	$3.67 \times 10^5$	$2.32 \times 10^5$

## COLIFORM, CREAM AND ICE-CREAM

Table (2): Isolated coliforms from examined samples

Isolates	Fresh cream		Ice-cream	
	No. of samples	%	No. of samples	%
<i>Escherichia coli</i>	15	30	4	8.16
<i>Enterobacter cloacae</i>	11	22	20	40.82
<i>Ent. agglumerans</i>	15	30	17	34.69
<i>Ent. aerogenes</i>	3	6	18	36.73
<i>Ent. sakazakii</i>	2	4	-	-
<i>Citrobacter freundii</i>	12	24	17	34.69
<i>Cit. diversus</i>	4	8	4	8.16
<i>Cit. amalonaticus</i>	7	14	6	12.24
<i>Klebsiella oxytoca</i>	2	4	8	16.33
<i>K. pneumoniae</i>	10	20	4	8.16
<i>K. ozoenae</i>	1	2	5	10.20
<i>K. rhinoscleromatis</i>	1	2	2	4.08

Table (3): Incidence of isolated *Escherichia coli* strains from examined samples

Serotype	Fresh cream		Ice-cream	
	No.	%	No.	%
O <sub>26</sub> : K <sub>60</sub> : B <sub>6</sub>	2	4	1	2.04
O <sub>111</sub> : K <sub>58</sub> : B <sub>4</sub>	4	8	-	-
O <sub>112</sub> : K <sub>66</sub> : B <sub>11</sub>	3	6	-	-
O <sub>125</sub> : K <sub>70</sub> : B <sub>15</sub>	-	-	2	4.08
O <sub>128</sub> : K <sub>67</sub> : B <sub>12</sub>	2	4	-	-
Untyped	4	8	1	2.04