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التقييم الميكروبيولوجي لمنتجات اللبسان المجففة بمصنع سخا للألبان

توفيق البسيونى ، فوزى أبو الخير

تم جمع عدد ٥٨ عينة من اللبن المجفف الكامل الدسم واللبن المجفف منزوع الدسم وكذلك مسحوق الالبان كريم المطعم بالبرتقال والفراولة والشوكولاته والفانيليا والمصنعة بمصنع سخا للألبان لفحصها ميكروبيولوجيا لتحديد حالتها الصحية .

وقد تم تحديد العدد الكلى للميكروبات وكذلك عدد الميكروبات السحبية المعدية البكتريا القولون فى الجرام الواحد من هذه المنتجات وكذلك تم عزل العديد من الميكروبات بنسب متفاوتة .

ويعتبر وجود الميكروبات الممرضة وفير الممرضة دليل على اهمال الاشتراطات الصحية الواجبة اثناء تصنيع وتعبئة هذه المنتجات بجانب ما تشكله تلك الميكروبات من خطورة على الصحة العامة .

كما تناول البحث أهمية تطبيق الاشتراطات الصحية السليمة فى تصنيع وتداول هذه المنتجات



BACTERIOLOGICAL EVALUATION OF DRIED MILK PRODUCTS PRODUCED IN SAKHA,  
PROCESSING DAIRY PLANT  
(With 5 Tables)

By  
T.A. EL-BASSIONY and F. ABUL-KHIER  
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SUMMARY

A total of 58 samples of dried milk products (including whole and skim milk powder and ice cream powder with orange, strawberry, chocolate and vanilla) were collected from Sakha processing dairy plant. The mean total colony counts in dried milk products were  $49.09 \times 10^4$ ,  $37.52 \times 10^4$ ,  $32.69 \times 10^4$ ,  $36.09 \times 10^4$ ,  $40.6 \times 10^5$  and  $32.42 \times 10^4$ , respectively.

5 out of 20 strains of coliform bacteria were identified as *E. coli*. Enterococci and anaerobic sporeformers were present in percentage ranged from 0 to 66.7% and 57.1 to 88.9%. *Staph. aureus*, *Staph. epidermidis*, *Micrococcus* species, *Strept. faecalis* and *Strept. faecium* were isolated.

The public health significance of each isolate was discussed.

INTRODUCTION and LITERATURE

Dried milk is produced and sold in this country in large and increasing quantities for use as a basis for the manufacture varieties of infant foods. Its of great benefit to the public and the manufactures, bakers, confectioners and also its used for animal feeding, in the production of patent flours and on shipboard and in the tropics.

In spite of the temperature attained in its preparation, dried milk may, at times, be responsible for transmitting some pathogenic organisms to consumers. Food poisoning outbreaks caused by coagulase positive staphylococci and infections traceable to haemolytic streptococci have been associated with dry and special foods prepared therefrom (ANDERSON and STONE, 1955; ARMIZO *et al.* 1957; ASPERGER, 1971; DELARRAS, 1976 and LUCK *et al.* 1980). The occurrence of salmonellae in dried milk and related products has been reported by MARTH (1969), RAY *et al.* (1972) and TERPLAN (1981).

The presence of coliform organisms in dried milk products provides a useful index in determining the hygienic quality of the products. The presence of coliform bacteria in milk powder has been reported by LEITAO *et al.* (1973), ALEKSIEVA (1974), GHODEKER and NAMBU DRIPAD (1975), JARCHOVSKA and HARTMANOVA (1975), ARUN *et al.* (1980) and LUCK *et al.* (1980).

The enterococci and clostridia organisms have a distinctive role as an indicator of poor factory sanitation, owing to their relatively high resistance to drying (SARASWAT *et al.* 1965 and GUDKOV and DOLIDZE, 1975). Enterococci and clostridium organisms were enumerated and isolated from milk powder by many workers (PUSCH, 1958; HASHIMOTO, 1967; BURBIANKA, 1967; STARK, 1970; LEITAO *et al.* 1973; ALEKSIEVA, 1974 and LUCK *et al.* 1980).

The plate count reported vary from few hundred to several millions per gram milk powder. American Dry Milk Institute (1955) examined 3 types of dried whole milk and reported that the total bacterial count must not exceed 100,000 bacteria per gram to be graded as standard. MLYNARCIK and KELETI (1966) found that the total bacterial count in dried milk ranged from 300 to 14,000 organisms/gm. TAHA *et al.* (1972) examined 50 samples of fresh spray-dried skim milk from the Sakha dairy plant and mentioned that the viable average bacterial count were 13,000,000 at 30°C and 6,800,000 at 37°C, while SALLAM (1979) found that the mean total colony and enterococci counts/gm. milk powder were  $27.05 \times 10^5$  and 430, respectively. KANUNMAL *et al.* (1979) mentioned that the total counts in dried skim milk ranged from  $10^2$  to  $10^6$ /gm.

As the microbial quality of dried milk products reflects the care with which the milk was produced and the sanitary conditions prevailing during its manufacture, therefore, this work was planned to secure informations

regarding the sanitary conditions as well as the existing pathogens in the dried milk and ice cream powders manufactured in Sakha processing dairy plant.

### MATERIAL and METHODS

A total of 58 samples of dried milk products (including whole and skim milk powder and dried ice cream mix with orange, strawberry, chocolate and vanilla) in retail packages as ready for sale were collected from Sakha processing dairy plant. All samples were transferred to the laboratory with a minimum time of delay where they were subjected to the examinations.

Handling and preparation of collected samples were done according to Standard Method for the examination of dairy products (1972).

#### Total colony and coliform counts:

The technique adopted is that recommended by A.P.H.A. (1972).

#### Enterococci count:

Enterococcus Selective Differential agar (E.S.D.) was used for enterococci count as recommended by EFTHYMIU *et al.* (1974).

#### Detection of anaerobic sporeformers (Stormy fermentation test):

The technique adopted is that recommended by CHALMERS (1962).

#### Detection of pathogenic microorganisms:

The procedures used for isolation and identification of pathogenic microorganisms, namely, bacteria of enteric group, staphylococci and streptococci was carried out according to COWAN and STEEL (1970).

### RESULTS

All results obtained from the examined samples of dried milk products are presented in Table (1,2,3,4 & 5).

### DISCUSSION

The results obtained and recorded in table 1, show the maximum, minimum and average total colony counts recovered from all of the products that were tested. Higher counts were reported by TAHA *et al.* (1972) and SALLAM (1977), while lower counts reported by MLYNARCIK and KLETI (1966). It is worth mentioning that 2 out of each 11 examined samples of whole and skim milk powder (18.2%), don't comply with the standard recommended by the American Dry Milk Institute (1955) for "standard" grade product.

Results given in Table 2, point out that lower number of coliform organisms were present in 3 samples (27.3%), 3 samples (27.3%), 5 samples (55.6%), 5 samples (50%) and 4 samples (57.1%) of the samples of whole milk powder, skim milk powder and ice cream powder with orange, strawberry and vanilla, respectively. 5 out of 20 strains (1 of skim milk powder, 2 of ice cream powder with orange and 2 of ice cream powder with strawberry) of coliform bacteria were identified as *E. coli*. *E. coli* could be isolated from dried milk by JARCHOVSKA and HARTMANOVA (1975) and ARUN *et al.* (1980). The presence of *E. coli* in dried milk products is of great public health importance as some established serotypes of *E. coli* may cause gastroenteritis in infant and adults (Costin *et al.* 1964; and ROBERT *et al.* 1977).

Table 3, shows the maximum, minimum and average counts of enterococci recovered from all of the products examined. Enterococci may have a distinctive role as indicator of poor factory sanitation, owing to their relatively high resistance to drying. It could be isolated from milk powder by STARK (1970), LEITAO *et al.* (1973), ALEKSIEVA (1974) and SALLAM, (1979).

The results obtained and recorded in Tables (4&5) show the incidence percentage of isolated *Staph. aureus*, *Staph. epidermidis*, *Micrococcus* species, *Strept. faecalis*, *Strept. faecium*, *E. coli* and anaerobic spore-formers

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from all examined samples. The presence of organisms whether pathogenic or non pathogenic in dried milk products may be due to imperfect sanitation process.

Realizing that Ice cream powder does not receive heat treatment during its preparation at homes, contaminants whether pathogenic or deteriorating organisms may find their way into the product constituting a public health hazard as well as economic losses.

In conclusion, dried milk products, in spite of their moisture content, may, at times, be responsible for transmitting some pathogenic organisms to consumers.

Therefore, strict hygienic measures and suitable regulations should be imposed for production and handling of the products.

## REFERENCES

- Aleksieva, V. (1974): Enterococci in dried milk. Veterinarmeditsinski Nauki, 11,72. Dairy Sci. Abst.37,36(1975).
- American Dry Milk Institute (1955): The grading of dry whole milk and sanitary quality standards including standard methods of analysis. Cited after FOSTER, *et al.* (1958).
- Anderson, P.H.R. and Stone, D.M. (1955): Staphylococcal food poisoning associated with spray-dried milk. J. Hyg. 35: 378-397.
- A.P.H.A. (1972): Standard methods for the examination of dairy products. 13<sup>th</sup> Ed. American Public Health Association, WASHINGTON.
- Armijo, R; Henderson, D.A.; Timothee, R. & Robinson, H.B. (1957): Food poisoning outbreaks associated with spray-dried milk. An epidemiological study. Amer. J. Pub. Health. 47: 1093-1100.
- Arun, A.P.S.; Prasad, C.R., Basant, K.S. and Prasad, B.N. (1980): Occurrence of coliform bacteria in skim milk powder. Ind. J. of Dairy Sci. 33 (1) 119-122.
- Asperger, H. (1971): Coagulase positive staphylococci in dried milk products. Ost Milchw. 26, Wiss. Beil. Nr. 6: 41. Dairy Sci. Abst. 34, 229 (1972).
- Burbianka, M. (1967): Anaerobic spore forming bacteria in dried milk. Dairy Sci. Abst. 30, 214 (1968).
- Chalmers, C.H. (1962): Bacteric in relation to milk supply. 5<sup>th</sup> Ed. London. Arnold, LTD.
- Costin, I.D., Voiculescu, D. & Garcea, V. (1964): Path. Microbiol., 27, 68. Cited after Arun *et al.* (1980).
- Cowan, S.I. & Steel, K.J. (1970): Manual for identification of medical bacteria, Cambridge Univ. Press. London.
- Cruickshank, R.; Duguid, J.P. & Swain, R.H.A. (1969): Medical microbiology. 11<sup>th</sup> Ed., E & S. Livingstone Limited Edinburgh and London.
- Delarras, C. (1976): Detection fo staphylococcal contamination during manufacture of dried milk. Revue laitiere francaise. 339, 95, 99. Dairy Sci. Abst. 38, 611 (1976).
- Efthymio, C.J.; Baccash, P.; Labomardi, V.J. and Epstein, D.S. (1974): Improved isolation and differentiation of Enterococci in cheese. Appl. Microbiol. 28, 417.
- Ghodeker, D.R. and Nambudripad, V.K.N. (1975): Indian J. Dairy Sci. 28, 215. Cited after Arun *et al.* (1980).
- Gadkov, A.B. & Dolidze, G.G. (1975): Microbiological indices of the quality of milk for cheese manufacture. Dairy Sci. Abstr. 37 : 12.
- Hashimoto, H. (1967): Studies on enterococcus group in market milk and dried milk. IV Enterococcus group as predominant flora in dried milk. J. Fd. Hyg. Soc. Japan 8, 21.
- Jarchovska, H. & Hartmanova, J. (1975): Incidence of Gram - negative organisms in dried milk product. Veterinarstvi 25, 399. Dairy Sci. Abst. 38, 693 (1976).
- Konuma, H.; Ninbodee, T.; Takayama, S.; Hashiba, M.; Kawanishi, T. & Suzuki, A. (1979): Microbial flora in skim milk powder imported from Australia, Newzealand and Canada. Bull. of the national Institute of Hygienic Sciences; 97, 44-49.
- Leitao, M.F.D.; Delazari, I. & Mazzone, H. (1973): Microbiology of dehydrated foods. Coletanea do Institute do Tecnologia do Alimentos, 5, 223. Dairy Sci. Abs. 37, 590 (1975).
- Luck, H.; Jordaan, I. & Dunkeld, M. (1980): Incidence of pathogenic and other undesirabel bacteria in milk powder. South African J. of D. Technol. 12, 2, 51-56.

- Marth, E.H. (1969): Salmonellae and salmonellosis associated with milk and milk products. *J. Dairy Sci.* 52: 283-315.
- Mlynarcik, D. & Keleti, J. (1966): Bacteriological study of dried milk formulae. *Farmaceuticky obz.* 35, 140. *Dairy Sci. Abst.* 32, 118 (1970).
- Pusch (1958): Studies on the bacterial content of infants milk powders. *J. Milchwissenschaft*, 13, 124.
- Ray, B.; Jezeski, J.J. and Busta, F.F. (1972): Isolation of Salmonellae from naturally contaminated dried milk products. *J. of milk and food Technol.* 35, 607.
- Robert, W., Shannon, C.W. & Jorge, O. (1977): *J. Infect. Dis.*, 135, 482. Cited after Arun *et al.* (1980).
- Sack, D.A., Merson, M.H., Wells, J.G., Sack, R.B. & Morris, G.K. (1975): *Lancet*, 2, 239. Cited after Arun *et al.* (1980).
- Sallam, S.S. (1979): Microbiological investigation on powdered and condensed milk. M.V.Sc. Thesis. Facul. of Vet. Med. Cairo Univ.
- Saraswat, D.S.; Reinbold, G.M. and Clark, W.S. (1960): The relationship between enterococci, coliform and yeasts and molds counts in butter. *J. Milk and Food Technol.*, 28: 245-248.
- Shore, E.G., Dean, A.G., Holik, K.J. and Davis, B.R. (1974): *J. Infect. Dis.* 129, 577. Cited after Arun *et al.* (1980).
- Stark, E. (1970): Faecal streptococci on barley, malt kernels and instant milk powder, *J. Appl. Microbiol.* 20, 2000.
- Taha, S.M.; Naguib, K. and Abd-El-Ghani, S. (1972): Spray dried milk of Sakha plant. I. quality control studies. *J. milk Fd. Technol.* 35, 35.
- Terplan, G. (1981): Enterobacteriaceae in dried milk products. *Dairy Sci. Abst.* 43, 9 (1981).

Table (1): Total colony counts in dried milk products

Products	Counts/gm	Min.	Max.	Average
Whole milk powder		220	$51 \times 10^5$	$49.09 \times 10^4$
Skim milk powder		600	$298 \times 10^4$	$37.52 \times 10^4$
Ice cream powder with orange		220	$226 \times 10^4$	$32.69 \times 10^4$
Ice cream powder with strawberry		198	$225 \times 10^4$	$36.09 \times 10^4$
Ice cream powder with chocolate		153	$94 \times 10^3$	$40.6 \times 10^3$
Ice cream powder with vanilla		205	$197 \times 10^4$	$32.42 \times 10^4$

Table (2): Coliform counts in dried milk products

Products	Count/gm	No. of samples examined	positive samples		Min.	Max.	Average
			No.	%			
Whole milk powder		11	3	27.3	10	300	116.7
Skim milk powder		11	3	27.3	13	45	29.3
Ice cream powder with orange		9	5	55.6	10	180	58
Ice cream powder with strawberry		10	5	50	30	300	140
Ice cream powder with chocolate		10	0	0	0	0	0
Ice cream powder with vanilla		7	4	57.1	10	150	84.5

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Table (3): Enterococci counts in dried milk products

Product	counts/gm	No. of samples examined	+ ve sample		Min.	Max.	Average
			No	%			
Whole milk powder		11	5	45.5	100	860	383.3
Skim milk powder		11	4	36.4	110	360	258.8
Ice cream powder with orange		9	6	66.7	15	200	147.5
Ice cream powder with strawberry		10	5	50	100	200	156
Ice cream powder with chocolate		10	0	0	0	0	0
Ice cream powder with vanilla		7	4	57.1	25	100	64.8

Table (4): Incidence of clostridial organisms in dried milk products

Product	Total number of samples	Samples + ve to S.F.T.	
		No.	%
Whole milk powder	11	8	72.8
Skim milk powder	11	7	63.6
Ice cream powder with orange	9	8	88.9
Ice cream powder with strawberry	10	8	80
Ice cream powder with chocolate	10	6	60
Ice cream powder with vanilla	7	4	57.1

Table (5)  
Frequency distribution of isolates in dried milk products

Product	Milk powder				Ice cream powder with							
	Whole		Skim		Orange		Strawberry		Chocolate		Vanilla	
	No. of isolates	%	No. of isolates	%	No. of isolates	%	No. of isolates	%	No. of isolates	%	No. of isolates	%
Staph. aureus	1	9.09	-	-	-	-	-	-	-	-	-	-
Staph. epidermidis	2	18.18	2	18.18	-	-	1	10	1	10	1	14.29
Micrococcus sp.	-	-	1	9.09	1	11.11	3	30	2	20	-	-
Strept. faecalis	2	18.18	1	9.09	3	33.33	2	20	-	-	1	14.29
Strrept. faecium	3	27.27	3	27.27	3	33.33	3	30	-	-	3	42.86
Esch. coli	-	-	1	9.09	2	22.22	2	20	-	-	-	-

