

## Short Communication

# Quality assessment of imported powder milk at Mansoura city, Egypt

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## ABSTRACT

**Objectives:** The objective of this study was to assess the keeping quality of powder milk sold at local markets in Mansoura City, Egypt, and to isolate the contaminated bacteria particularly *Salmonella* spp., *E. coli* and *Staphylococcus aureus* from these milk samples.

**Materials and methods:** A total of 50 powder milk samples were collected from different sources at Mansoura, Egypt. The samples were subjected for physical examination to determine their pH and acidity. Microbiological assessment of the samples were done by Total Bacterial Count (TBC), Total Coliform Count (TCC), True fecal *E. coli* count, and Most Probable Number (MPN), and Total mold and yeast count.

**Results:** Minimum and maximum values of TBC were  $0.45 \times 10^2$  cfu/gm and  $5.11 \times 10^3$  cfu/gm milk powder, respectively. On the other hand, minimum and maximum values of fungal count were  $0.08 \times 10^2$ /gm and  $2 \times 10^2$ /gm samples, respectively. No *E. coli* and *Salmonella* spp. could be isolated from the samples. However, 18% (n=9/50) samples were found to be contaminated with *Staph. aureus*.

**Conclusion:** Based on the Egyptian Standards, the samples were satisfactory in terms of the association of *Salmonella* spp., *E. coli*, and fungi. Contamination with *Staph. aureus* warrants the public health. Thus, appropriate care and preventive measures are suggested.

## KEYWORDS

Coliform, Keeping quality, Microbiological status, Milk powder, *Staphylococcus aureus*

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## INTRODUCTION

Milk is a highly nutritious food that serves as an excellent growth medium for a wide range of microorganisms (Rajagopal et al., 2005). Dried milk powder must exhibit high quality in sensory, nutritional and microbiological attributes at the time of purchase (Hough et al., 2002). In many developing countries like Egypt, due to shortage of liquid milk supply for human consumption, use of imported milk powder is increasing day by day. The consumer uses the milk powder in hot beverages, frozen desserts, cheese, yoghurt, bakery products, soaps and baby food items (Lioud et al., 2005).

Microbiological quality of milk and dairy products is influenced by the initial flora of raw milk, the processing conditions, and post-heat treatment contamination. Poor sanitary practices in processing and may cause public health hazard due to the presence of pathogenic bacteria, mold and yeast. Undesirable microbes that can cause spoilage of dairy products include Gram-negative psychrotrophs, coliforms, lactic acid bacteria, yeasts, and molds in the foods. Moreover, various bacteria of public health concern such as *Salmonella* spp., *Listeria monocytogenes*, *Campylobacter jejuni*, *Yersinia enterocolitica*, pathogenic strains of *Escherichia coli* and enterotoxigenic strains of *Staphylococcus aureus* may also be found in milk and dairy products (Tatini and Kauppi, 2003). For this reason, emphasis should be given on the quality and microbiological assessment of milk powder, which is crucial for the assessment of quality and safety, conformation with standards and specifications, and regulatory compliance. However, few reports are available in Egypt Egypt, particularly, no report has been published from Mansoura region. Thus, this study was undertaken to assess the keeping quality of powder milk sold at local markets in Mansoura City, Egypt, and to isolate *Salmonella* spp., *E. coli* and *Staph. aureus* from powder milk.

## MATERIALS AND METHODS

Milk powder samples (n=50) of different commercial brands were randomly collected from different local markets at Mansoura city. All the samples were tight and free from any damage or leakage during collection. The samples were examined physically for the determination of pH and acidity according to the method described by Marshall (1992). Then, the samples were subjected for microbiological analyses; for this, Total Viable Count (TVC), Most Probable Number (MPN), Total Coliform Count (TCC), and molds and yeasts counts were performed according to the methods described by

Richter et al. (1992), Masud et al. (2012), Nazir et al. (2005a) and Nasrin et al. (2007). *Staphylococcus* spp. count was determined following the method of Sneath et al. (1986), Begum et al. (2007), Islam et al. (2007a, b) and Jahan et al. (2015). Detection of *Salmonella* spp. was done according to the method described by Robinson (1983) and Khan et al. (2005).

## RESULTS AND DISCUSSION

**Table 1** represents the assessment of keeping quality of the milk powders. Results showed an acidity ranging between 1.30%-1.70%, whereas, the pH ranged between 6.50-6.80. These results are in coincidence with the standards of USA and Egypt.

The TBC ranged from  $0.45 \times 10^2$  to  $5.11 \times 10^3$  with the mean value of  $2.1 \times 10^3 \pm 0.12 \times 10^3$  cfu/gm. These results clearly indicated that all samples contain less than the upper limit (10,000/gm) set by the Egyptian Standard (ES; 2005) (**Table 2**).

**Table 1.** Statistical analyses of total bacterial count/gm of some imported milk powder samples.

Test	Minimum	Maximum	Average
Acidity (%)	1.3	1.7	1.5
pH	6.5	6.8	6.6

**Table 2.** Egyptian standards (ES: 1648/2005) of microbiological examination of imported powder milk products.

Parameters	Egyptian Standard (ES)
TBC Count	$10^4$ /gm
<i>S. aureus</i>	Nil
<i>E. coli</i>	Nil
<i>Salmonella</i> spp.	Nil
Yeast & mold counts	10/gm
Acidity %	1.2-1.5%

Milk powder is generally considered as good microbiological quality (Fernandez de Oliveira et al., 2000), considering that it was made from good quality milk and containing low microbial count and the moisture content is kept low (USDEC, 2001).

The TCC of the samples ranged 12-55 MPN/gm. Four (8%) samples were unacceptable while 46 (92%) of milk powder samples complied with the ES. Mold and yeast count in the milk samples were ranged from  $0.08 \times 10^2$ /gm to  $2 \times 10^2$ /gm of milk sample, with mean value of  $1.3 \times 10^2 \pm 0.67 \times 10^2$ /gm indicated that molds and

yeasts counts in the dried milk samples were few as compared with ES (Table 2).

**Table 3.** Total bacterial count/gm and total mold and yeast count/gm of the imported milk powder samples.

Samples Examined	Positive samples		Total Bacterial Count (TBC/gm)			Mold and Yeast count/gm		
	No	%	Min	Max	Mean±SE	Min	Max	Mean±SE
N=50	50	100	$0.45 \times 10^2$	$5.11 \times 10^3$	$2.1 \times 10^3 \pm 0.12 \times 10^3$	$0.08 \times 10^2$	$2 \times 10^2$	$1.3 \times 10^2 \pm 0.67 \times 10^2$

**Table 4.** Detection of bacterial pathogens of examined milk powder samples.

Samples Examined	<i>Salmonella</i> spp.		<i>Staph. aureus</i>		<i>E. coli</i>	
	Positive	%	Positive	%	Positive	%
N=50	0	0	9	18	0	0

It is known that coliforms are destroyed by pasteurization and by successive heat treatment during processing. Therefore, the presence of these bacteria in dried milk powder might be attributed to contamination after heating caused by improper cleaning and sterilization at the manufacturing plants. If the milk gets contaminated with few numbers of coliforms as do some serotypes of *E. coli*, they would be able to proliferate and produce millions of cells during holding at warmer temperatures which may exert health hazard to the consumers (Chodeker et al., 1980; Arun et al., 1980). The public health importance of mold has been emphasized because certain species can produce mycotoxins which may produce neoplastic diseases like leukemia and other cancers (Bullerman, 1980), while some species of yeasts may constitute a public health hazard such as gastrointestinal disturbances (Jaquet and Teheran, 1976). Presence of coliforms is considered as an index of unsatisfactory sanitation and possible presence of enteric pathogens (Nazir et al., 2015b; Rehman et al., 2015).

Association of bacteria in the milk powder samples are presented in Table 4 revealing that *Staph. aureus*, *Salmonella* spp. and *E. coli* are contaminated in 18%, 0% and 0% samples, respectively. This indicated that all the parameters complied with Egyptian Standards (2005) except the presence of *Staph. aureus* in the powder milk samples (Table 2). No *Salmonella* spp. could be isolated from the samples, which is in agreement with ADMI (2003).

## CONCLUSION

It can be concluded that the keeping quality and the microbiological quality of most of the powder milk samples collected from different areas of Mansoura city are satisfactory. However, *Staphylococcus aureus* has been detected from the milk samples, which is not acceptable as per Egyptian Standard. Presence of *Staph. aureus* in the

powder milk samples indicates improper hygienic measures has been followed during production.

## COMPETING INTEREST

The authors do not declare any competing interest.

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