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MICROBIOLOGICAL QUALITY OF BABY FOODS

(With One Table)

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التقييم الميكروبيولوجي لأغذية الأطفال

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فى هذة الدراسة تم جمع ٣٠ عينة من أغذية الأطفال المصنعة محليا بطريقة عشوائية من العديد من المحلات فى مدينة أسيوط لفحصها ميكروبيولوجيا وتحديد الحالة الصحية لأنتاجها. وقد تم تقييم كل من APC) Aerobic plate count و Coliforms و Faecal coliforms و *E. coli* و Enterococci و Psychrotrophic و Thermotrophic و *Cl. Perfringens* و Yeasts & molds. وقد تبين انخفاض العدد الكلى للميكروبات، حيث كان متوسط عدد APC و Coliforms هو 1.1×10^5 و للجرام، على التوالى. ولم يتم تحديد أي عدد من Faecal coliforms و *E. coli* و *Cl. perfringens* حيث أظهرت كل العينات ($<3\text{MPN/g}$). وقد وجد أن متوسط أعداد كل من Enterococci و Thermotrophic و Psychrotrophic و molds & Yeasts كالتالى 2.9×10^3 و 4.4×10^4 و 3.5×10^2 و للجرام، على الترتيب. ومن النتائج التى تم الحصول عليها يتضح مدى الجودة الصحية والحالة الميكروبيولوجية لأغذية الأطفال المباعه بمدينة أسيوط. وقد تمت مناقشة الأهمية الصحية ومدى خطورة هذة الميكروبات على صحة المستهلك وكذلك الشروط الواجب اتباعها.

SUMMARY

In this study, 30 random samples of locally manufactured dried baby foods with milk base were collected from various retailers in Assiut City for microbiological examinations. The samples were examined for Aerobic plate count (APC), Coliforms, Faecal coliforms, *E. coli*, Enterococci, Psychrotrophic, Thermotrophic, *Cl. perfringens* and Yeasts & molds counts. Total numbers of different types of microorganisms were counted and most of samples contained relatively low numbers of microorganisms, in particular the average counts of APC and coliforms were 1.1×10^5 /g and 5 MPN/g, respectively. Faecal coliforms, *E. coli* and *Cl. perfringens* showed undetectable levels (<3 MPN/g) in all the

examined samples. It was found that the average counts of enterococci, psychrotrophic, thermotrophic and yeasts & molds were 2.9×10^3 /g, 4.4×10^4 /g, 3.5×10^2 /g and 5 /g, respectively. From the present investigation, the public health significance of the examined microorganisms recovered from the examined baby foods sold in Assiut City was discussed.

Key words: *Baby foods – Microbiology - Quality.*

INTRODUCTION

Undoubtedly the ideal food for the human infant is human breast milk, which has the important nutritional advantages. Unfortunately, there are occasions when a substitute for breast milk must be found, and in some cases there is no wish from mothers to feed breast (Schreiber, 2001). Dry milk is still the most important ingredient of breast milk substitute formulation.

The rapid use of baby foods as substitute of / or with mother milk, has made its microbial quality of great concern. Such foods may contain varying numbers of different types of microorganisms due to low quality ingredients and / or unsatisfactory methods of preparation and handling. Therefore, baby foods, may, at times, be responsible for some cases of food poisoning and food-borne diseases in children. Also, baby foods may not receive adequate heat treatment during its preparation at home, so, contaminants whether pathogenic or deteriorating microorganisms can find their way into the products, constituting a public health hazard as well as economic losses. Coliforms, enterococci, proteus species and clostridial organisms could be isolated from baby foods by Singh *et al.* (1980) and Saudi *et al.* (1984).

Because of temperatures attained in baby foods preparations, together with the germicidal effect resulting from desiccation, dried milk should contain few bacteria.

Therefore, this work was accomplished to secure information regarding the sanitary conditions as well as the existing pathogens in baby foods of milk bases and currently available at the retail level in Assiut City.

MATERIAL and METHODS

Collection of samples:

A total of 30 random samples of different varieties of locally manufactured dried baby foods with milk base were collected from

various retailers in Assiut City. All samples were aseptically packaged and dispatched directly to the laboratory with a minimum of delay.

Preparation of samples:

Cartons and cans of baby food samples were cleaned and thoroughly mixed before being aseptically opened. Approximately 10 g of the sample were aseptically weighed and then added to 90 ml of 0.1% sterile peptone water to obtain a dilution of 10^{-1} (APHA, 1992), and then decimal dilutions were prepared and followed by microbiological analysis.

Microbiological examinations:

- 1- APC: (APHA, 1992).
- 2- Coliforms count (MPN/g): (AOAC, 1980).
- 3- Enumeration of faecal coliforms (MPN/g): (AOAC, 1980).
- 4- Enumeration of *E. coli* (MPN/g): (AOAC, 1980).
- 5- Enterococci count: (Efthymiou *et al.*, 1974).
- 6- Psychrotrophic count: (APHA, 1985).
- 7- Thermoturic count: (APHA, 1985).
- 8- Enumeration of *Cl. Perfringens* (MPN/g): (Beerens *et al.*, 1980).
- 9- Yeasts & molds count: (Harrigan and McCance, 1976).

RESULTS

Table 1. Incidence and count of different microorganisms recovered from the examined baby food samples.

	Positive Samples		Count / g		
	No./30	%	Minimum	Maximum	Average
APC	30	100	10^3	2.2×10^7	1.1×10^5
Coliforms	1	3.3	<3	7.3	5
Faecal coliforms	0	0	<3	<3	<3
<i>E. coli</i>	0	0	<3	<3	<3
Enterococci	16	53.3	10	5.8×10^5	2.9×10^3
Psychrotrophic	26	86.6	10^1	8.8×10^6	4.4×10^4
Thermoturic	24	80	10	7×10^4	3.5×10^2
<i>Cl. Perfringens</i>	0	0	<3	<3	<3
Yeasts & molds	7	23.3	0	10	5

DISCUSSION

The APC is considered as index of sanitary quality, organoleptic quality, safety and utility of foods. The APC of perishable foods may reflect conditions such as the microbial content of the raw materials and ingredients, the effectiveness of the processing procedures, the sanitary condition of equipment and utensils, and the time-temperature profile of storage and distribution. However, most foods are regarded as unwholesome when they have a large population of microorganisms, even of these organisms are not known to be pathogenic and do not alter the character of the food (National Academy of Science, 1985). It is accepted that the estimation of bacterial numbers in baby food samples is used as an index of its sanitary quality.

According to the data summarized in Table 1, the mean value of APC of the examined baby food samples is 1.1×10^5 /g. Moustafa *et al.* (1984) and Sabreen (1986) detected much higher levels of APC/g in baby foods. Carneiro *et al.* (2003) detected unacceptable colony counts for the majority of the infant formula samples and the contamination rates were related to inadequate handling.

According to the standards recommended by the ICMSF (1974) for APC, it is evident that all the examined baby food samples lie in the range of marginally accepted quality ($5 \times 10^4 - 5 \times 10^5$ APC/g). Comparing the results obtained, it could be concluded that the average count of APC of the examined baby food samples was in agreement with microbiological standards for dry milk products (1×10^5) (USDA, 1988) and also with the published microbiological criteria for dried milk products that total viable count is $< 2 \times 10^5$ /g (Milner, 1995). With regard to microbiological analyses, most dairies are performing the APC and coliform count for dried milk products (White, 1998).

Out of the 30 examined baby food samples 29 (96.7%) had none detectable levels of coliforms (< 3 MPN/g) whereas one sample only (3.3%) was contaminated with such organisms in level 7.3 MPN/g as shown in Table 1. These findings are similar to those found in surveys done by Jarchovská *et al.* (1980) and Singh *et al.* (1980). Jarchovská *et al.* (1980) found coliforms in only 0.78% of the examined samples of baby foods. The obtained result is lower than that obtained by Moustafa *et al.* (1984) who found that coliforms count were 10.3×10^1 /g. Carneiro *et al.* (2003) detected coliforms in most of the infant formula tested.

Comparing the results obtained, it could be concluded that the mean coliforms count of the examined baby food samples was in agreement with microbiological standards for dry milk products (10 coliforms/g) (USDA, 1988) and also with the published microbiological criteria (<100 coliforms/g) (Milner, 1995).

None of the examined samples was positive for faecal coliforms and *E.coli*. Moustafa *et al.* (1984) found no faecal coliforms in the imported baby food samples. Documented outbreaks of infantile diarrhea due to Enteropathogenic *E.coli* and coliforms have been stated by ICMSF (1980).

The relatively absence of coliforms with failure to detect faecal coliforms and *E.coli* can be considered as an index of satisfactory sanitation. Moreover, from the public health point of view enteropathogenic serotypes of *E.coli* has been implicated in human cases of gastroenteritis, epidemic diarrhea in infants, summer diarrhea in children as well as many cases of food poisoning (Leclercq *et al.*, 2001).

Data presented in Table 1, illustrate the total yeasts & molds count/g in the examined baby food samples. Nikodemusz (1978) and Jarchovská *et al.* (1980) detected also low levels of yeasts and molds. Also, the obtained results of enterococci count are in agreement to a certain extent with those reported by Saudi *et al.* (1984). On the other hand, lower results were recorded by Jarchovská *et al.* (1980). The enterococci may have a distinctive role as indicators of poor factory sanitation, owing to their relatively high resistance to drying, detergents or disinfectants as well as freezing temperature. Moreover, these organisms are also implicated in food spoilage (Angelotti *et al.*, 1963) and food poisoning outbreaks (Erwa, 1972). Aleksieva (1974) suggested that enterococci count might be added to the standard indices of hygienic quality of baby foods.

None of the examined baby food samples showed detectable levels of *Cl. perfringens* (<3 MPN/g). Saad (1995) found *Cl. perfringens* in 14% of dried milk samples using MPN technique with an average count of 50.48 MPN/g. The obtained result is reflecting the good sanitary condition of the examined baby food samples as concluded before with the results of APC, coliforms, faecal coliforms and *E.coli*.

Table 1, showed the average counts of psychrotrophic and thermophilic in the examined baby food samples as 4.4×10^4 /g and 3.5×10^2 /g, respectively. Crossly (1962) reported that the flora of dried milk products are mainly thermophilic micrococci, thermophilic streptococci, corynebacteria, aerobic spore-formers and miscellaneous organisms.

Because of their low water activity, dried products rarely spoil or deteriorate because of microbial growth. Standards specifying Standard Plate Counts and coliforms counts of dried milk products are reflecting quality grades and product processes as established by USDA and the American Dry Milk Institute (ADPI, 1965 and USDA, 1988).

The aforementioned results prove that the good sanitation and strict hygienic measures during production, packaging, preservation and transportation of baby foods is fundamental. Therefore, suggestive recommended measures for control of microorganisms and improvement the keeping quality and sanitary condition in baby foods are to be considered.

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