

## Microbial evaluation of some kinds of canned milk available in the markets of Al-Diwaniya city

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### Abstract

This study aimed to compare bacterial contamination indicators such as (total bacterial count, total coliform count and faecal coliform count) for some canned milk belonging to different origins (Iraq, Syria, Jordan, Kuwait, and Saudi) available in the markets of Diwaniya city, in comparison with standards parameters and determine the validity of these products for human consumption. Through the results of the current study observed that Kuwaiti canned milk was a high bacterial count ( $62 \times 10^4$  CFU/ml), followed by Syrian canned milk ( $54 \times 10^4$  CFU/ml) and Jordan milk ( $52 \times 10^4$  CFU/ml) and Saudi milk with bacterial content ( $53 \times 10^4$  CFU/ml), ( $51 \times 10^4$  CFU/ml) and ( $50 \times 10^4$  CFU/ml), respectively, to three types of Saudi canned milk, as for the Iraqi local milk has the amount of bacterial count ( $42 \times 10^4$  CFU/ml). Isolation and Identification of contaminated bacteria include (*Staphylococcus aureus*, *Bacillus spp.*, *Klebsiella pneumonia*, *Escherichia coli*, *Enterobacter spp.*, *Pseudomonas aeruginosa*). Through these indicators, the samples of imported milk was above the standard level of contamination and therefore out the standard of health, either the local milk it contains a less proportion of contamination from the importer, this was due to being produced locally and thus the short period of storage and quick access to the consumer.

**Key words:** canned milk, bacteria, CFU/ml, contamination, local milk, imported milk

## التقييم الميكروبي لبعض انواع الحليب المعلب المتوفر في اسواق مدينة الديوانية

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### الخلاصة

هدفت هذه الدراسة الى مقارنة مؤشرات التلوث البكتيري ( العدد البكتيري الكلي , بكتريا القولون الكلية والبكتريا البرازية ) لبعض نماذج الحليب المعلبة من مناشئ مختلفة والمتوفرة في اسواق مدينة الديوانية وهي ( العراقي , السوري , الاردني , الكويتي والسعودي ) ومقارنتها مع المعايير القياسية وتحديد مدى صلاحية هذه المنتجات للاستهلاك البشري , ومن خلال نتائج الدراسة الحالية لوحظ ان الحليب المعلب الكويتي كان ذو محتوى بكتيري عالي ( $62 \times 10^4$ ) وحدة خلية \ مل , يليه الحليب المعلب السوري ( $54 \times 10^4$ ) وحدة خلية \ مل والحليب الاردني ( $52 \times 10^4$ ) وحدة خلية \ مل والحليب السعودي ذو المحتوى البكتيري ( $53 \times 10^4$ ) وحدة خلية \ مل , ( $51 \times 10^4$ ) وحدة خلية \ مل و ( $50 \times 10^4$ ) وحدة خلية \ مل على التوالي لثلاثة انواع حليب معلبة سعودية المنشأ , اما الحليب المحلي العراقي فقد كان مقدار المحتوى البكتيري ( $42 \times 10^4$ ) وحدة خلية \ مل. كما تضمنت الدراسة ايضا عزل وتشخيص البكتريا الملوثة له والتي شملت:

*Staphylococcus aureus*, *Bacillus sp.*, *Klebsiella pneumonia*, *Escherichia coli*, *Enterobacter sp.*, *Pseudomonas aeruginosa*

ومن خلال هذه المؤشرات فان نماذج الحليب المستوردة كانت فوق مستوى التلوث القياسي وبالتالي فهي خارج المواصفات القياسية الصحية , اما الحليب المحلي فانه يحتوي على نسبة تلوث اقل من المستورد وهذا يعزى لكونها تنتج محليا وبالتالي قصر فترة التخزين وسرعة الوصول الى المستهلك .

**الكلمات المفتاحية :** الحليب المعلب , البكتيريا , وحدة خلية/مل , التلوث , الحليب المحلي , الحليب المستورد.

### Introduction

Milk plays a very important role in human life, primarily as a source of perfect food. Owing to their high availability and buffer properties and have nearly occupied a

significant position in the feeding style, but is also an efficient vehicle for transmission of diseases to humans. Pathogenic bacteria pose a serious threat to human health, and constitute about 90% of all dairy-related

diseases (1). Milk is nearly complete food because it contains most of the essential nutrients and almost ideal quantities needed by the human body, and milk is characterized by containing milk sugar Lactose is the only source of mono sugar (galactose) Gelatos which is one of the most important components of nerve tissue. And better benefit the body is milk product in the same environment in which they live rights. The milk exposure to microbes contaminations from the cows until reach to consumers whether a raw milk or its products, and the natural contents of proteolytic, lipolytic and toxic produced bacteria, such as *Pseudomonas*, *Alcaligenes*, *Micrococcus*, *Salmonella*, *Bacillus* and *Staphylococcus* (2). The components of milk and its physical and chemical properties provide a very favorable milieu for the multiplication of microorganisms (3). The warm and rather humid climatic conditions that prevail in most tropical countries) would tend to support the survival and growth of many microorganisms in milk (4), and Iraq is one of them. Recent studies have been established the emergence of new milk-borne bacterial pathogens such as *Escherichia coli* with more serious challenges for public health and the dairy industry. *E. coli* is responsible for several outbreaks of diarrhea in children and adults after ingestion of contaminated milk and dairy products (5). Different studies show that 1-5% of food-borne infections were related to consumption of milk and dairy products, that 53% of cases of food-borne infections caused by contaminated cheese and that enteropathogenic *E. coli* is the causative agent of 18.33% of these cases (6). The *Staphylococcus spp.* was the predominant organism isolated with the majority of them being *Staph. aureus*, the contamination presumably coming from the hands of the cheese-sellers. However, cows may excrete *Staph. aureus* from the udder, often without clinical evidence of mastitis (8). In Iraq, milk, cheese and cream were two of the important dairy products, but little percentage (10%), were make in a hygienic conditions in large dairy factory, when the large percentage were make in unhygienic

conditions whether in a dairy factory or houses or shops (9). Yoghurt defects due to microbial contamination and the most frequent contaminants are yeasts and moulds (10). The aim of this study was to determine bacterial contaminated of canned milk from different origins that circulation in AL-Diwaniya markets and investigation from its validity to consumption.

### Materials and methods

A total of 70 canned samples of milk were collected randomly from the Markets, from different origins (Iraqi, Jordan, Syrian, Saudi and Kuwaiti), during the period of the mid of October 2012 to the mid of February 2013. The samples were transported to the laboratory for microbiological analysis. Samples of milk were processed as follows: - In a 10 ml marked tube, 1ml of canned milk, were added to 9ml of sterile water by pipette and then repeat the process to take 1 ml of a sample of milk.

-Take from the first tube 1 ml and added to the second tube and so we get dilutions 1\100, 1\1000, 1\10000, 1\100000.

-Take 1ml of all dilutions in Petri dishes and pour the nutrient agar media on it, then incubated at 22°C and 35 °C for 24 hrs.

-Total and fecal coliform count determined by pour plate count by taking 1ml of all dilutions in Petri dishes and pour the then inoculated on violet red bile agar, later the first incubated at 37°C for 24 hrs and the second incubated at 44.5°C for 48hrs (11).

-The growth colonies were counted by colonies counter, numbers of bacteria exist by multiply of colonies number by dilution reverse and all microbiological tests were performed in triplicate.

-The growth bacteria was isolated, then examined and diagnosed according to biochemical, morphological characterizations as well as standard methylene blue reduction and resozarin tests were done (12, 13, 14, and 15).

### Results

In present study, the results revealed that the total aerobic bacterial count obtained from Kuwaiti canned milk accomplished ( $62 \times 10^4$ ) cfu/ml, whereas quite empty from any faecal coliform bacteria. The total aerobic bacterial count obtained from Syrian

canned milk accomplished ( $54 \times 10^4$ ) cfu/ml, whereas the rates of total coliform bacteria count ( $11 \times 10^2$ ) cfu/ml, and also the Faecal coliform bacteria from it in rate ( $7 \times 10^2$ ) cfu/ml. The total aerobic bacterial count obtained from Saudi canned milk accomplished ( $53 \times 10^4$ ) cfu/ml, ( $51 \times 10^4$ ) cfu/ml and ( $50 \times 10^4$ ) cfu/ml respectively and quite empty from any faecal coliform bacteria, The total aerobic bacterial count

obtained from Jordan canned milk accomplished ( $52 \times 10^4$ ) cfu/ml, whereas the rates of total coliform bacteria count ( $14 \times 10^2$ ) cfu/ml, and also the Faecal coliform bacteria from it in rate ( $9 \times 10^2$ ) cfu/ml. The total aerobic bacterial count obtained from Iraqi canned milk accomplished ( $42 \times 10^4$ ) cfu/ml, whereas the rates of total coliform bacteria count ( $2 \times 10^2$ ) cfu/ml., Table, 1.

**Table (1): Total bacterial count in canned milk from different origins which circulation in AL-Diwaniya markets.**

Sample	Origin	Total bacteria count CFU/ml	Total coliform bacteria CFU/ml	Fecal coliform bacteria CFU/ml
Canned milk	Iraqi	$42 \times 10^4$	$2 \times 10^2$	-
	Jordan	$52 \times 10^4$	$14 \times 10^2$	$9 \times 10^2$
	Syrian	$54 \times 10^4$	$11 \times 10^2$	$7 \times 10^2$
	Saudi -1	$51 \times 10^4$	-	-
	Saudi -2	$50 \times 10^4$	-	-
	Saudi -3	$53 \times 10^4$	-	-
	Kuwaiti	$62 \times 10^4$	-	-

On the other hand, this study included the detection of some genus and species of bacteria in canned milk (Table 2). *Staphylococcus aureus* was isolated and identified from all origin of canned milk, and *Bacillus spp.* was isolated and identified from the canned milk of Jordan and Syrian origin only, *Klebsiella pneumonia* was isolated and

identified from the Jordan canned milk only, *E. coli* was isolated and identified from all origin of canned milk except Kuwaiti (KDD) wasn't isolate this bacteria from it, *Enterobacter sp.* And *Ps. aeruginosa* was isolated and identified from canned milk of Jordan and Syrian origin only.

**Table (2): Some of isolated bacteria from canned milk from different origins circulation in AL-Diwaniya markets.**

Sample	Origin	Staphylococcus aureus	Bacillus sp.	K. pneumonia	E. coli	Enterobacter sp.	Ps. aeruginosa
Milk	Iraqi	+	-	-	+	-	-
	Jordan	+	+	+	+	+	+
	Syrian	+	+	-	+	+	+
	Saudi	+	-	-	+	-	-
	Kuwaiti	+	-	-	-	-	-

## Discussion

All kinds of imported milk that have been studied were more than the standard specifications of hygienic parameters and which provides for the microbial load does not exceed up to ( $5 \times 10^5$ ) cfu/ml of pasteurized milk and not to exceed coliform bacteria up to 10/ml of milk (New York State milk standards) (16). (17).. This results were agreement with study (18) that indicate to

increase total aerobic bacterial count in milk, The total aerobic bacterial count obtained from Iraqi canned milk accomplished ( $42 \times 10^4$ ) cfu/ml, whereas the rates of total coliform bacteria count ( $2 \times 10^2$ ) cfu/ml., therefore it was not agreement with standard specifications but it contains a less proportion of contamination from the importer this was due to being produced locally and thus the short period of storage

and quick access to the consumer.. This result was agreement with study that indicate to increase total aerobic bacterial count in canned milk (19) Table, 1. The results found are manifested in the (Table, 1) revealed an increase in faecal coliform bacterial count with rates  $(14 \times 10^2)$  cfu/ml and  $(11 \times 10^2)$  cfu/ml in canned milk samples for Jordan and Iraqi milk respectively, the presence of this bacteria may refers to faecal contamination. The cause of high bacterial contamination of canned samples of milk may be return to absence of hygienic conditions during Trading and processing, they are also associated to storage temperature of milk without refrigeration, un pasteurization of milk, circulation and transportation (20). Coliform have significance in milk because they are easily killed during pasteurization and because they are generally regarded to originate from the intestinal tract of warm-blooded animals. Hence, the presence of coliform bacteria in canned milk products is suggest of unsanitary conditions or practices during processing; In the past, Coliforms have been used as an indicator for pathogens, but they are no longer recommended for this purpose due to the fact that coliform organisms are present as normal inhabitants of soil and water, not just specifically from faecal contamination. Some people may wonder if there is co-relationship between the presence of pathogenic bacteria from faecal source, especially *Salmonella* and *Shigella* species, and the presence of Coliforms. As mentioned before, Coliforms are not specific enough for that purpose and it is important to note that these two bacterial species are not Coliforms. In the milk sample concerned, coliform organisms were detected, but it does not necessarily mean that there were pathogenic bacteria. Presence of Coliforms means there may have been problems in the efficiency of heat treatment or re-contamination after heat treatment. In

these cases, the food manufacturer is required to check for process failure and ensure product safety (19). Coliforms, which are often used to monitor the quality of milk, are not a single species of organism. They are a group of gram negative rod-shaped bacteria that have similar biochemical characteristics – being able to ferment lactose with the production of acid and gas within 48 hours at 35°C and grow with or without oxygen. They are usually present in small number in raw milk, meat, poultry or other raw foods. Coliforms count is simple and easy to conduct; hence it can be used as a hygienic indicator to reflect the general microbiological quality in routine test. As coliform organisms can be easily killed by heat, these bacteria can also be used as an indicator of heat treatment failure as well as post heat treatment contamination (19). *Staphylococcus aureus* was isolated and identified from all origin of canned milk, and *Bacillus spp.*, *Enterobacter sp.* and *Ps. aeruginosa* isolated from Syrian and Jordan canned milk, probably these bacteria may be responsible for cases of acute gastrointestinal infections, due to Enterotoxin (21), Thus, *Bacillus spp.* is able to produce spores, which can survive pasteurization( 8). *Klebsiella pneumonia* was isolated from milk, this contamination attributed to internal and external sources because of it was resistance to dryness on skin and equipments so, its regard one of causatives cross-infection (22). The results showed that the canned milk was contaminated with *E. coli* bacteria. The occurrence of a high proportion of *E. coli* in milk samples may be due to lack of proper sanitation and absence of pasteurization of milk. Therefore, stringent hygienic measures must be followed and pasteurization of milk should be imposed to prevent contamination of milk with Coliforms. Otherwise, this traditional milk should be collected from the market(20).

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