Zag. Vet. J. (ISSN. 1110-1458) Vol. 35, No. 1 (2007) PP. 202-207

Hygienic and Bacteriological Quality of She Camel's Milk

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ABSTRACT

Fifty random samples of she camel's milk, collected from Menofia, Qalubia and Sharkia Governorates (25 samples from camel herds and 25 samples from markets). Samples were analysed chemically and bacteriologically. The chemical examinations revealed that, the mean value of pH and titratable acidity % for samples from herds were 6.65 ± 0.03 and 0.14 ± 0.008 respectively and for samples from markets were 6.89 ± 0.02 and 0.16 ± 0.06 respectively. The bacteriological examination revealed that, the mean values of total colony count, coliforms, enterococci and staphylococci count were 2.6×10^3, 1.6×10^3, 6.0×10^2, and 5.3×10^2, respectively for samples from markets and for samples from markets were 2.6×10^7, 7.0×10^6, 2.9×10^4 and 1.3×10^5, respectively.

Salmonellae failed detection in all the examined samples. Control measures for improving the hygienic quality of she camel's milk and to safe guard the consumers are suggested.

INTRODUCTION

There are about 18 million camels in the world, which support the survival of millions of people in arid and semi-arid areas ***(1)***. Meanwhile, camel milk is considered one of the main components of the human diet in many parts of the world. It contains all essential nutrients as cow milk ***(2)***. Also it has a high biological value due to the higher contents of antimicrobial factors such as Lysozyme, Lactoferrin and immunoglobulins and it has a bacteriostatic effect against Gram-positive strains as well as a bactericidal against Gram-negative cultures ***(2)***. People have strong believe based on their experience that raw camel milk is safe. Camel milk have a therapeutic effect by inhibiting pathogen colonization and infection ***(3)***.

By contrast, camel milk production areas are often located far from market, camel's milk is produced in a traditional way, and is usually handled and transported in poor sanitary conditions. Moreover, camel herds rarely benefit from veterinary care and hence, mastitis are common among lactating females ***(4)***.

Therefore, the milk produced is likely to cause a serious health problem and may contain major pathogen and the natural antimicrobial factors can only provide a limited protection against some pathogens and for a short period. Such risk is higher when the milk is consumed in its raw conditions as is commonly practiced ***(5)***.

The present investigation was aimed to assess the hygienic and bacteriological quality of camel's milk collected from different localities directly from camel herds at Menofia, Qalyobia and Sharkia Governorates and are purchased in the markets at this localities.

MATERIAL AND METHODS

Collection and preparation of samples

Fifty random samples (250 ml each) were collected from Menofia, Qalyobia and Sharkia Governorates, 25 samples directly from the herds and 25 samples from markets. All collected samples were placed in an ice box and transported immediately to the laboratory for analysis. One ml of milk was transferred to a sterile tube containing 9 ml sterile Ringer solution as a diluent from which ten fold serial dilutions were prepared.

Chemical examinations

Determination of pH : by using pH meter.
Determination of titratable acidity: the acidity was expressed as lactic acid and determined ***(6)***.

Bacteriological examination

Preparation of decimal serial dilutions ***(6)***.

1- Total aerobic plate count

Samples were plated onto standard plate count agar ***(6)***.

2- Coliform count

Samples were plated onto violet red bile agar ***(6)***.

3- Enterococci count

Using Enterococci selective media ***(7)***.

4- Staphylococci count

Plating the samples onto Baired parker agar media supplemented with egg yolk and pot. Tullerit ***(8)***.

5- Isolation of salmonellae

Using a selective enrichment media selenite F-broth ***(9)***, then plating on salmonellae –shigella agar plates ***(10)***. The suspected colonies were picked and identified ***(11)***.

RESULTS

Table 1. pH value of the examined raw camel's milk samples.

pH value	Source of samples	
	Herd	Market
Minimum	6.6	6.8
Maximum	6.7	7.1
Mean ± S.E.	6.65 ± 0.03	6.89 ± 0.02

Table 2. Titratable acidity of the examined raw camel's milk samples.

Titratable acidity %	Source of samples	
	Herd	Market
Minimum	0.13	0.14
Maximum	0.15	0.17
Mean ± S.E.	0.14 ± 0.008	0.16 ± 0.006

Table 3. Microbiological examination of she camel milk samples from herds.

Microbial counts	Positive samples		Minimum	Maximum	Mean ± S.E.
	No.	%			
Total aerobic plate count	7	28.0	10	4.0×10^3	$2.6 \times 10^3 \pm 1.1 \times 10^2$
Coliform count	4	16.0	1.4×10	5.8×10^2	$1.6 \times 10^2 \pm 2.5 \times 10^2$
Enterococci count	5	20.0	2.5×10	8.4×10^2	$6.0 \times 10^2 \pm 1.3 \times 10^2$
Staphylococcus count	3	12.0	3.2×10	8.2×10^2	$5.3 \times 10^2 \pm 1.2 \times 10^2$

Table 4. Microbiological examination of she camel milk samples from markets.

Microbial counts	Positive samples		Positive samples	Maximum	Mean ± S.E.
	No.	%			
Total aerobic plate count	15	60	1.5×10^4	3.2×10^8	$6.2 \times 10^7 \pm 1.2 \times 10^8$
Coliform count	8	32	3.4×10^3	9.0×10^6	$7.0 \times 10^6 \pm 1.6 \times 10^6$
Enterococci count	11	44	8.7×10^2	9.5×10^4	$2.9 \times 10^4 \pm 3.9 \times 10^4$
Staphylococcus count	9	36	1.1×10^4	5.5×10^6	$1.3 \times 10^5 \pm 2.0 \times 10^5$

DISCUSSION

From the results given in Table 1, it is clear that the average value of pH for samples from herds was 6.65 ± 0.03 while it was 6.89 ± 0.02 for samples from markets.

These findings agree to a certain extent with previous data ***(12)***. The increase in pH value in samples from markets may be due to bacterial contamination during handling, transportation and storage.

Table 2 showed that the average percent of titratable acidity of the sample from herds was 0.14% ± 0.008 while it was 0.16% ± 0.006 for samples from markets. These in Saudi Arabia similar values were recorded***(12)***. The increase in milk acidity may be due to presence of some bacteria which has the ability of raising milk acidity ***(13)***.

Results reported in Table 3 and 4 showed that, for samples from herds aerobic bacteria were isolated from 28% of examined samples with a mean value of $2.6 \times 10^3 \pm 1.1 \times 10^3$, while for samples from markets it was isolated from 60% of samples with a mean value of $6.2 \times 10^7 \pm 1.2 \times 10^8$, bacteriological investigation of samples collected from Riyadh marked-Saudi Arabia ***(14)*** and from raw dromedary milk ***(15)*** had nearly similar values.

The high bacterial count in samples from market reflects the general poor sanitary conditions under which milk is collected, handled and cooled. Hence the potential hazard associated to its consumption Aerobic bacteria are widely distributed in nature and may gain access to milk through various routes including air, water and utensils ***(16)***.

Coliforms were present in 16% of herd samples with an average count of $1.6 \times 10^2 \pm 2.5 \times 10^2$ while it was present in 32% of samples from markets with an average count of $7 \times 10^6 \pm 1.6 \times 10^6$. In Ethiopia, semereb and molla ***(17)*** recorded nearly similar findings in testing bacterial quality of raw milk of *Camelus dromedarius*. The lower count in samples from herds may be due to the presence of unique biological active agents ***(18)*** and the antimicrobial activity of camel milk against pathogenic strains of some bacteria ***(19)***.

Galton *et al.* *(20)* reported that pre-milking udder preparation play an important role in the contamination of milk during milking. Unsanitary milking practices and absence of cooling facilities could result in an increased number of bacteria. In general, coliform count may be used as an indication of sanitation. The presence of more than 100 coliforms / ml indicate bad hygienic measures during milk production, handling and distribution. Moreover, about 30% of people in industrial countries and hundred of million of people in developing countries suffer from diarrheal disease ***(21)***. Moreover, contamination of milk with coliform might induce many changes leading to economic losses ***(22)***.

Enterococci count in milk from herds were presented in 20% of samples with an average count of $6 \times 10^2 \pm 1.3 \times 10^2$ while it was presented in 44% of samples from markets with average $2.9 \times 10^4 \pm 3.9 \times 10^4$ for milk from markets, the presence of Enterococci in analysed samples suggests a massive faecal contamination during milk production and handling. Enterococci are resistant to heat stress and have a good specific competitiveness in environment with complex microflora, hence, they can easily adapt to the hot climate, these results suggests that Enterococci would be more reliable indicators of faecal contamination than coliform in camel milk ***(23)***. Also, sometimes food poisoning may occur particularly if milk is heavily contaminated ***(24)***.

Staphylococci present in 12% of milk from herds with an average count $5.3 \times 10^2 \pm 1.2 \times 10^2$. Results agreed to a certain extent ***(25)***, it was detected in 36% of market samples with average count $1.3 \times 10^5 \pm 2 \times 10^5$, similar results ***(26)***. The higher staphylococci count indicate the poor hygienic quality of milk and this may be due to the presence of some cases of mastitis in camel herds ***(4)*** and subclinical mastitis ***(27)***.

Camel milk is usually consumed in raw state by nomade, it is therefore of interest to know the activity of natural antimicrobial protein. The ability of camel milk to inhibit the growth of pathogenic bacteria through the high Lysozymes, Lactoperoxidase, Immunoglobulin and N-acetyl glucosminidase (NAGase) have been reported by several authors ***(28,29)***. This may explain why Salmonellae could not recorded in all examined camel milk samples. Also, camel milk has bacteriostatic effect on some food born pathogen ***(30,31)***. The effect of mastitis on the bacteriological quality of milk is well known ***(32)***, therefore, control of mastitis is one of the key elements in the production of good quality milk in addition to hygienic milking techniques.

Some trials to improve the quality of camel milk by heat treatment is applied by some authors ***(33-35)*** but additional research is needed before the conditions of the thermal inactivation of various pathogenic bacteria in camel milk are firmly established.

Moreover, it is strongly recommended to apply appropriate hygienic measures and sanitation on the milkers and utensils in the collection, storage and transportation as is required for any other milk destined to human consumption.

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الحالة الصحية والبكتريولوجية للبن النوق

نهلة أحمد أبو الروس - إيمان محمود شرف

معهد بحوث صحة الحيوان (معمل بيطرى – شبين الكوم)

لبن الجمال مصدر هام للغذاء ويستخدم فى علاج كثير من الأمراض فى مصر والوطن العربى ويتم استهلاكه فى الصورة الخام مما يعرض المستهلك لأضرار جسيمة حين يكون اللبن ملوث ببعض الميكروبات أثناء إنتاجه أو تداوله ولهذا تم فى هذا البحث جمع ٥٠ عينة من لبن الجمال ، ٢٥ عينة من قطعان الجمال فى محافظات المنوفية والقليوبية والشرقية و٢٥ عينة من بعض المحلات التى تبيع اللبن معبأ فى تلك المحافظات.

وقد أسفرت نتائج الفحص الكيميائى عن أن متوسط تركيز أيونات الهيدروجين ومتوسط الحموضة فى العينات من قطعان الجمال ٦,٦٥ ± ٠,٠٣ ، ٠,١٤ ± ٠,٠٠٨% على التوالى وفى العينات من المحلات كانت ٦,٨٩ ± ٠,٠٢ ، ٠,١٦ ± ٠,٠٠٦% على التوالى.

وقد أوضحت نتائج الفحص البكتريولوجى أن :

بالنسبة للعينات من قطعان الجمال كان متوسط العدد الكلى للميكروبات الهوائية والقولونية والسبحية المعوية والعنقودية هو ٢,٦ × ١٠^٣ ، ١,٦ × ١٠^٢ ، ٦ × ١٠^٢ ، ٥,٣ × ١٠^٢ على التوالى. أما فى عينات المحلات فكانت ٦,٢ × ١٠^٧ ، ٧ × ١٠^٦ ، ٢,٩ × ١٠^٤ ، ١,٣ × ١٠^٥ على التوالى ، ولم يتم عزل ميكروب السالمونيلا فى أى من العينات. وقد تم مناقشة أسباب تلوث لبن الجمال وطرق منع هذا التلوث.