



Epidemiological study of clinical and subclinical mastitis in she- camel in Samawah desert / Al Muthanna governorate

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Abstract

She-camel mastitis

is relatively not well studied in camel-rearing areas worldwide. In Iraq, few reports have been done on the camelids in general and on mastitis in particular in compare to other livestock such as cattle, sheep and goat. This study intends to determine the clinical and subclinical mastitis and its etiological agents in she-camels in Samawah desert / Al Muthanna governorate. Thirty

milk samples were collected from apparently clinical normal she-camels from 3 camelids herds during December 2016 to March 2017. The milk samples were aseptically collected from each quarter after stimulation milking process in she-camel. Each milk sample was subjected to physical and bacteriological examination and mastitis screening tests including (somatic cell count) SCC and California mastitis test (CMT). The pH of fresh camel milk was varied from 6.1 to 6.5. All milk samples revealed a bright white color with upper thick creamy layer. No any signs of clinical mastitis were observed in all examined she-camels. Meanwhile, keratosis of the teats and udder due to severe tick infestation was observed in 83.33% percentage (25 out of 30). The subclinical mastitis was determined in 30% percentage (9 out of 30) lactating she-camels using SCC, CMT and revealed various bacterial growth. These bacteria were the *Enterobacterium spp.*, *Staphylococcus spp.* and *Streptococcus spp* moreover, the percentage of isolates was 55.55% (5 out of 9), 33.33% (3 out of 9) and 11.11% (1 out of 9) respectively. In conclusion, this study confirmed the correlation between SCC and CMT in diagnosis of subclinical mastitis in 30% of the examined she-camel. Moreover, it approved the absence of clinical mastitis due to the nature of the milk production. The authors recommend to perform another future studies that including large number of the animals, in addition to study the natural physiological phenomena of milk production in she-camels.

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Key words: Al Muthanna, CMT, Camelids, Iraq, SCC, Subclinical Mastitis, Udder.

Introduction

The mutual name for the long-necked, humped, even-toed ungulates large animal is camel. It is including the mammalian genus *Camelus* of the *Camelidae* family. According to FAO, the whole camel's number internationally is supposed to be 20

million. The majority of these camels (about 15 million) are found in Africa and the rested number is in Asia.

Most of these camels are possessed by Bedouin, who travel around the year season in exploration of grassland, therefore the actual number of camels can only be predictable (http://www.fao.org/ag/againfo/home/en/news_archive/2006_camel.html).

The camel (*Camelus dromedarius*) is considered as an essential existence factor in the arid and semiarid areas of Middle East and Africa (Fo *et al.*, 2012). The camelids are separated from ruminants and located in the order of *Artiodactyla* that are a polygastric animals but not a true ruminant depending on taxonomy, physiology and behavior. Moreover, true ruminants own 4 part stomach, while camel ruminates have 3 part stomach, consequently, it is named a distinct as a pseudo-ruminant (Fowler, 1996). There are variation between the susceptibility of the Camelids and ruminants to infectious diseases. According to Canadian researchers during the outbreaks of bovine spongiform encephalitis that diagnosed in cows in Alberta/ Canada, any of transmissible spongiform encephalopathies haven't ever been investigated in Camelids in the globe (Fowler, 2010). The old world camels place fundamentally into two species, the *Camelus bactrianus* (Bactrian) with two humps and *Camelus dromedarius* (Arabian) with one hump (Wilson, 1998). The dromedary favor desert environments and are used in the transportation of human and also as a source of hair, hides, meat and milk (Al-Salihi, 2016). The Camelids are considered as one of the domesticated animals in Mesopotamia and this fact has been confirmed in the cylinder seals that came from Mesopotamia Middle Bronze Age and showed riders seated upon camels (Al-Salihi, 2016).

According to Iraqi government survey in 1978, there was 70,000 camels. But this number dropped dramatically because of the economic sanctions imposed after the 1991 Gulf war (FAO, 2005). Nowadays, Iraq owned a total of 58,000 camels (Al-Salihi, 2012) and all are one-humped camels and are commonly found in certain parts. The greatest proportion of this population is present in the middle and south and west parts of country. Throughout Iraq various ecozones desert areas are living the "Bedouin" communities who own the camels and consume their milk and meat. Camel is considered as one of the highly mulch animals, although they are living in the harsh desert environmental conditions (Knoess, 1984; Abbas and Tilley, 1990; Schwartz, 1992). The variation of milking frequency is one of the obstacle in the estimation of the camel's daily milk production within the pastoralist circumstances. Management environments, feeding, stage of lactation, breed, species and diseases of the udder are the factors that affected on the milk production of the she-camels. She-camels also show variation in the lactation length from 9 to 18 months.

Inflammation of the udder is called a mastitis. It is a compound disease that occurs in globe between a dairy animals. It causes huge economic losses due to drop of milk production, poor milk quality and extra cost from the treatment and care of infected udder (Maichomo *et al.*, 2011; Sudhan and Sharma, 2010; Eyassu and Bekele, 2010; AL-Ani, 2004). Mastitis has both impact of economic importance and as zoonotic disease that cause of numerous harmful effects on the health of human and animal production (Hegazy *et al.*, 2004 and Al-Majali *et al.*, 2008). Mastitis is caused by different causative agents such as virus, bacteria and fungus, however, bacterial infections are considered as the primary cause of domestic animals mastitis (Eyassu

and Bekele, 2010). She-camels is not commonly affected with mastitis, and if it occurs, it is similar to the forms that seen in dairy cattle, and called clinical and subclinical. It also can lead to loss of function in one or more quarters or even death. There are different predisposing factors that enhance prevalence of mastitis. Anatomically, mammary glands of the she-camels are not pendulous accompanied with relatively short teats that lead to reduce the risk of the trauma. Even so, the possibility of laceration, contusion and abrasion can happen if she- camels attack by dogs or jump on tree or fence. The traumatized teat acts to wane the canal sphincter that in normal animals hinder the accessing of pathogenic microorganisms. Milk itself consider as an exceptional medium for growth of bacteria. If the milk is stagnating in the udder for any reason, this condition act to help the invaded bacteria to grow, settle and develop of mastitis.

Wernery *et al.*, (2008) reported the particular bacteria which cause mastitis in camelids. However, all micoorganisms cause cattle mastitis, they can predicated to be as the cause in she-camels. These micoorganisms have also been investigated from other disease conditions in camelids. *Escherichia coli*, *Klebsiella pneumoniae*, and *Aerobacter enterobacterium*, have been isolated from camelids peracute mastitis.

During decade ago She-camels mastitis has been reported from a number of camel-rearing countries in the world such as Untied Arab Emirate (Al-Juboori *et al.*, 2013; Quandil and Quadar , 1984), Sudan (Mohamed ELMustafa, 2014;Alamin *et al.*, 2013; Obeid, 1983), Egypt (Moustafa *et al.*, 1987; Hassanien *et al.*, 1984); India (Kapur *et al.*, 1983); Saudi Arabia (Al-Dughaym and Fadlelmula, 2015; Abdelgadir,2013; Saleh and Faye 2011; Barbour *et al.*,1995; Hafez *et al.*, 1987) , Somalia (Abdurahman *et al.*, 1991; Arush *et al.*, 1984), Ethiopia (Bekele and Molla, 2001), Kenya (Matofari *et al.*, 2003) and Iraq (AL-Tofaily and Al rodhan, 2011).

Review of literatures revealed few publications that related to camel's mastitis in Iraq. Moreover, little attention on mastitis as a problem was paid at herd level. Al Muthanna governorate is considered as the second highest number of camels population in Iraq, however, for the authors knowledge, there are no previous reports regarding she-camel mastitis. Consequently, this study intends to investigate the clinical and subclinical mastitis and its etiologic agents in she-camels at 3 camel herds in Samawah desert / Al Muthanna governorate using SCC and CMT, in addition to isolate and identified the bacterial causative agents.

Materials and Methods

Study Area

This study was performed by visiting various camel herds in the desert of Samawah / Al Muthanna governorate 280 kilometres (174 mil) southeast of Baghdad and is located midway between Baghdad and Basra, at the northern edge of the governorate. Its area is 51,740 km² and a dry desert climate, in summer temperatures easily exceed 40°C, while rainfall is very limited and limited to the winter months. This area is sandy with ridges, and it is desert, the camel's owners live a nomadic life, migrating from place to another looking for grassland and Water oases. The area is covered with desert plants and periodic pastures of diverse concentrations. The average High

Temperatures are 15°C (January) to 42°C (July), while, the average Low Temperatures are 7°C (January) to 30°C (July) (Figure. 1).

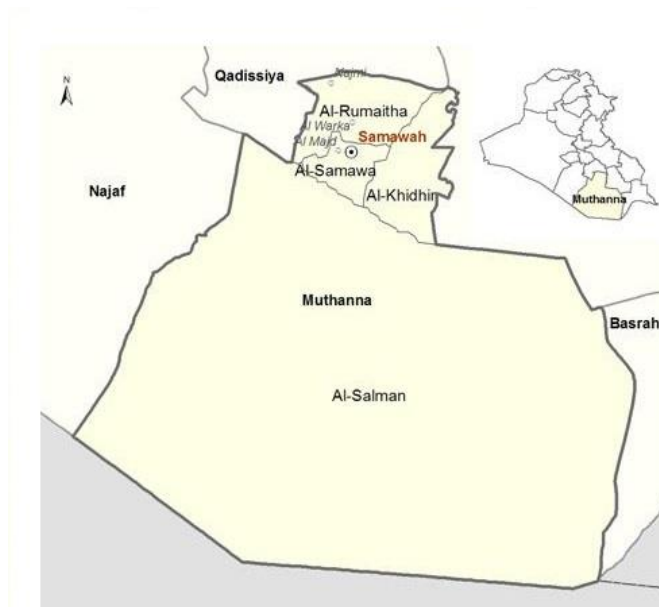


Figure.1: Shows the map of Al Muthanna governorate/ Study Area

Milk Samples Collection

Thirty milk samples were collected from apparently clinical normal she-camels within 3 camelids herds during December 2016 to March 2017. These camels were grazed freely in the desert, but were also supplemented with concentrate feed that prepared as balls. Moreover, age, lactation number, stage of lactation, pregnancy and previous mastitis history were reported for each examined she-camels (Figure. 2). The she-camel does not give the milk without stimulation factors that include feeding with a balls of concentrate (Figure.3), drinking water and allowed her calves to suckle. The milk samples were aseptically collected. The udder and the teats were washed and cleaned with 70% alcohol. The first few strips of milk from each quarter were discarded. About 100ml -200 ml of milk was collected into sterile containers. The samples were kept on ice during transportation to the laboratory and kept in the refrigerator until doing all diagnostic procedures. The milk samples were subjected to physical examination, bacteriological culture and mastitis screening tests.



Figure. 2: Shows one herd of camels that included in this study



Figure.3: Shows the concentrated food that given to the she-camels

Physical examination of milk

All milk samples were examined for physical examination tests including color, pH and consistence (Figure 4).

California Mastitis Test

The test was carried out according to manufacturer's recommendation (Bori-Vet, Denmark). The test scores were as follows: negative: no thickening homogenous; trace: slight thickening that disappears in 10 seconds; 1: distinct thickening, no gel; 2: thickens immediately and begins to gel; 3: clear gel formation with surface elevation. (Figure.5)



Figure.4: Shows laboratory tests for milk samples



Figure. 5: Shows the paddle of California Mastitis Test and the test

Somatic Cell Count

The slide count was done by spreading a fine smear of a fresh milk sample on a slide. The smear was air dried and immersed in xylene for 2 minutes to remove fat globules. Then the slide was stained with methylene blue, washed with distilled water and dried by air. The cells with blue stained nucleus were counted microscopically in 50 fields and the average number of cells per field was multiplied by the microscopic factor (Guliye *et al.*, 2002).

Bacteriological Cultivation

Each specimen was cultured in duplicate onto 5% sheep blood agar, MacConkey's agar (Oxoid), Hayflick modified medium (for isolation of *Mycoplasma spp.*). Presumptive identification of bacterial species was done as described by (Koneman *et al.*, 2005) and confirmed by the API (bioMerieux, Inc. France).

Results

Results of physical examination of the milk samples

The pH of fresh camel milk varied from 6.1 to 6.5. The temperature values were ranged between 38.2 and 38.9 in all the milks. All milk samples revealed bright white color with upper thick creamy layer.

Prevalence of Clinical Mastitis and subclinical mastitis

No any signs of clinical mastitis were observed in all examined she-camels, so the prevalence rate was zero. Meanwhile, keratosis of the teats and udder due to severe tick's infestation were observed in 25 out of 30 she camels with percentages of 83.33% (Figure.6 A&B). The subclinical mastitis in lactating she-camels was determined in 9 out of 30 with a percentage of 30% by using SCC, CMT (Figure 7). The values of CMT and SCC for the specimens from apparently healthy and mastitic she-camels are represented in table. 1.

Negative or trace scores of CMT were measured as healthy and 1, 2 and 3 infected. The average SCC from healthy camels (n = 21) was determined to be 453,275 cells/ml, hence counts from 453,275 to below 499.250 cells/ml, which relate to CMT score 1, was assigned to subclinical infection. From 30 milk specimens, tested by CMT and SCC, 9 specimens were positive for subclinical mastitis giving a prevalence rate of 30%.

Table.1: Represents the values of CMT and SCC for the specimens from apparently healthy and mastitic she-camels

SCC	CMT
453.275	Negative
495.022	Trace
499.250	1
665.500	2
890.500	3



Figure.6: A. Udder keratosis and ticks infestation.
B. Different size of ticks that collected from camel.

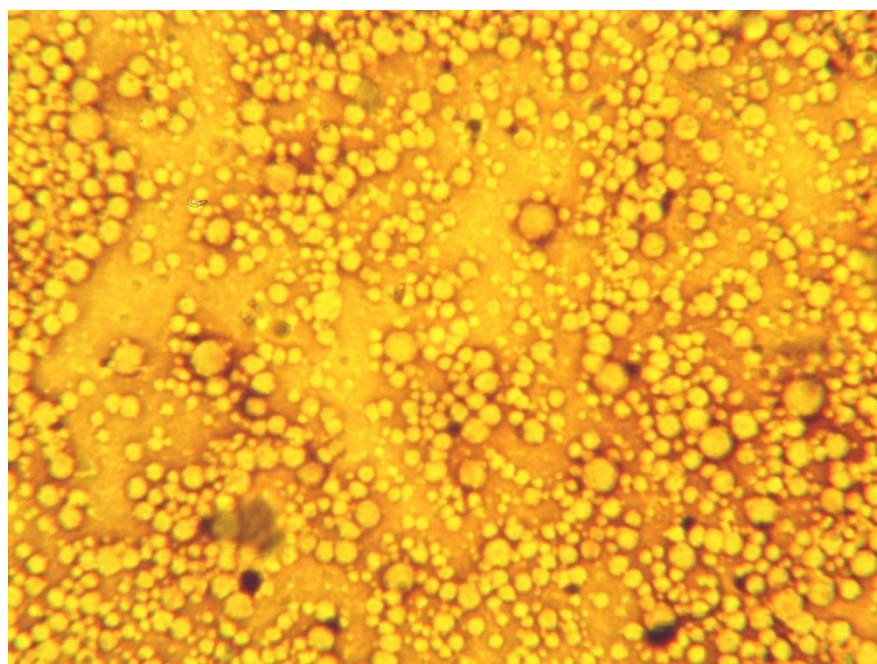


Figure.7: Smear of milk to perform the SCC

Microbiological Investigation

Bacteria were isolated from 9 cases that were revealed positive results in CMT and SCC. The *Enterobacterium spp.*, *Staphylococcus spp.* and *Streptococcus spp* were the most important organism isolated from the subclinical mastitis milk samples and the percentages of isolation were 55.55% (5 out of 9) , 33.33% (3 out of 9) and 11.11% (1 out of 9) respectively.

Discussion

The results of the current study showed that camel's milk revealed a bright white color in all samples. This result is compatible with previous study (Abu-Lehia, 1989). Abu-Lehia, (1989), approved that the fat of dromedary milk contain smaller amounts of short chain fatty acids and a lower content of carotene. The lower carotene content could explain the whiter color of fat camel milk (Stahl *et al.*, 2006). The current study also revealed that the pH of fresh camel milk varied from 6.1 to 6.5. This result is in agreement with previous study (Khaskheli *et al.*, 2005). The physical test of camel milk were linked to several factors such as the ingestion of some salt-tolerant plant that makes it salty and also on the food and water availability (Farah, 1993).

The diagnosis of clinical mastitis is based on a physical examination of the udder; evaluation of the secretion for consistency, color, viscosity, presence of debris, and sediment and also the systematic clinical signs that appear on the infected animal. The prevalence rate of the clinical mastitis was zero in this study. And no she-camels revealed a signs of clinical mastitis. The absence of clinical mastitis may be associated with fact that she-camel is not like other lactating animals that secret and keep the milk available in its mammary glands at any time. The udder of lactating she-camel is empty and need some stimulation factors to secret the milk such as allowing her calve to suckle it. However, the field observation revealed that the milking period was very short and even the Bedouin (nomadic people) believed that she-camel is a stingy and don't give milk. These observation may attribute to absence or decrease of the prevalence of the clinical mastitis in she- camels, because there is no stagnant milk , moreover, the udder is empty of milk that consider as an ideal media for bacterial growth.

CMT and SCC tests were used to diagnose subclinical mastitis among she camels in this study. The CMT scores of negative or trace were considered healthy and 1, 2 and 3 infected. The average SCC from healthy camels was determined to be 453,275 cells/ml, hence counts up to 499.250 cells/ml related to CMT score 1, was allocated to subclinical infection. The prevalence of subclinical infection was 30%, among randomly-selected milk samples from apparently healthy camels, in the present study. Another study from the Saudi Arabia reported a prevalence rate of 33% based on CMT alone (Aljumaah *et al.*, 2011). However, a previous investigation suggested that CMT has about 70% sensitivity and 91% specificity in camel mastitis (Younan *et al.*, 2001). From the findings of the present study, it appears that both SCC and CMT were sensitive in detection of subclinical mastitis. The milk samples with subclinical mastitis that were positive in CMT and SCC (9 specimens) were revealed various bacterial isolates and these results didn't match the physical properties of the milk.

Therefore, more studies are required to correlate the physical tests and microbiological tests in camel subclinical mastitis to draw solid conclusions.

In conclusion, this study confirmed the correlation between SCC and CMT in diagnosis of subclinical mastitis in 30% of examined she-camel. This study also approved the absence of clinical mastitis due to the nature of the milk production. Early detection of subclinical mastitis and interference may aid in disease control. Various mastitis pathogens were identified from subclinical mastitis, with relatively high prevalence of *Enterobacteriaceae*. The authors recommend doing another future studies and including large number of the camels, in addition to study the natural physiological phenomena of milk production in the she- camels.

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