

## Treatment Trial of Bovine Bacterial Mastitis in Khartoum State, Sudan

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### ABSTRACT

Mastitis is an inflammatory reaction of the udder tissue which is commonly caused by the microbial infection. Bovine mastitis is one of the devastating diseases causing huge loss to the dairy industry worldwide. The present study investigated the current status of clinical mastitis among dairy cattle in Khartoum state, Sudan. The prevalence of mastitis was assessed by measuring of milk pH and also based on the result of bacteriological evaluation of milk samples. A total of 100 isolates were recovered from 500 milk samples. The major pathogens isolated from the milk samples were : 31% *Bacillus coagulans*, 11% *B. cereus*, 9% *B. subtilis*, 9% *B. licheniformis*, 4% *B. circulans*, 2% *B. lentus*, 3% *B. mycoides*, 3% *B. amyloliquefaciens*, 2% *B. megaterium*, 16% *Staphylococcus aureus*, 8% *Staphylococcus hyicus*, 1% *Corynebacterium* spp. and 1% *Klebsiella* spp. Antibiogram studies were also conducted for the isolates by using twelve antibiotics including Chloramphenicol, Ciprofloxacin, Gentamycin, Tetracycline, Piperacillin/Tazobactam, Pefloxacin, Ofloxacin, Co-Trimoxazole, Ceftizoxime, Cefotaxime and Ampicillin/ Sulbactam, which were used frequently in this area for the treatment of mastitis and Chloramphenicol and Ciprofloxacin were found to be more effective antibiotics among all the tested antibiotics. The effectiveness of different antibiotics in different isolates were as follows: Hundred percent of isolates were sensitive for Chloramphenicol and Ciprofloxacin, 91.6% for Gentamycin and Piperacillin/ Tazobactam, 83.3% for Pefloxacin and Tetracycline, 75.0% for Amikacin and Ofloxacin, 66.6% for Ceftizoxime, 33.3% for Co-Trimoxazole and Cefotaxime and 16.6% for Ampicillin/ Sulbactam.

**Keyword:** Mastitis, cattle, bacterial infection, Milk, antibiotics

### INTRODUCTION

Mastitis is an inflammation of the mammary gland of the cattle accompanied by physical, chemical and bacteriological changes in milk and glandular tissue. The costs associated with mastitis are innumerable and include antibiotic treatment, reduced milk quality, reduced milk yield, increased culling rate and the public health is affected due to infections caused by consumption of mastitis afflicted milk. Bacteria have long been recognized as an important causal agent in bovine mastitis and also can transmit to humans through horizontal infection. Milk drawn from an infected cow can transmit pathogenic bacteria to humans through food chain which is dangerous to the public health earlier it was discovered that milk can transmit tuberculosis, brucellosis, diphtheria, scarlet fever and Q fever to humans Gilmour and Harvey (1990). However, these diseases can be controlled by a pasteurization technique, but a variety of bacteria still contribute to illness and diseases outbreak Gilmour and Harvey (1990). The milk from an infected animal is the main source of pathogenic bacteria Gilmour and Harvey (1990).

The most commonly used antibiotics on conventional dairies were Penicillin Cephalosporin and Tetracyclines. For mastitis, Penicillin, Ampicillin and Tetracyclines were commonly used. Ninety-eight percent of the conventional dairy herds used intramammary dry cow antibiotic treatment while only 6.3% of the organic herds used intramammary dry cow therapy. The organic herds used non-antibiotics products for dry cow therapy (Zwald *et al.*, 2004; Moore *et al.*, 2004).

The objectives of this study to detect the specific antibiotics which are use to treatment bovine mastitis cause by bacterial infection.

## MATERIALS AND METHODS

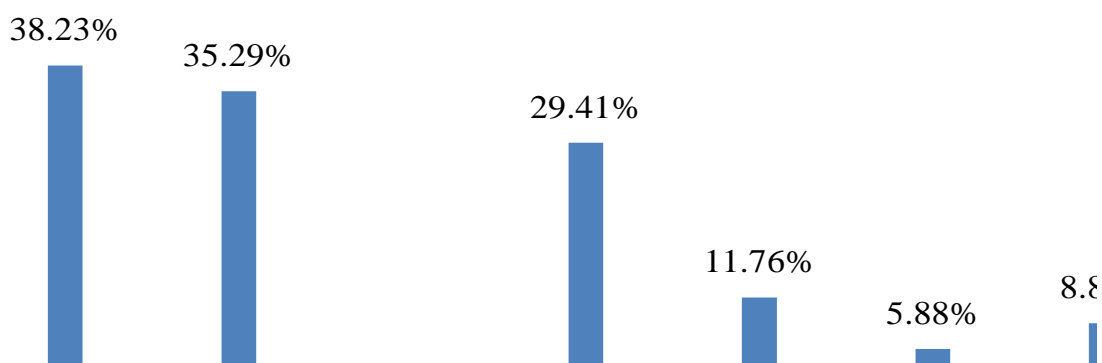
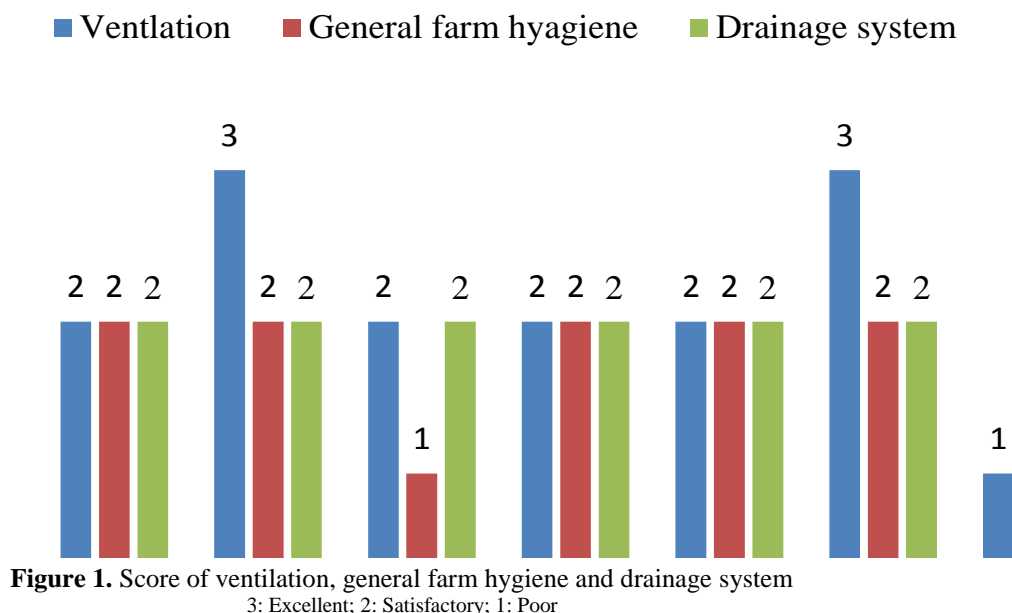
A total of 500 suspected mastitic cows were clinically examined for the presence of mastitis. Mastitis was diagnosed when there were visible or palpable signs of udder, inflammatory changes in milk secretions, or through bacteriological examination of milk. During the study 100 milk samples were encountered from 41 cows suffering from clinical mastitis. Examination of each cow was carried out according to the clinical signs of mastitis and milk changes (Radostitis *et al.*, 2000).

Milk samples were taken under critical aseptic condition for bacteriological studies by collection in sterile Bijou bottles after cleaning the outer surface of the udder and teat with potassium permanganate and with cotton wool soaked in 70% alcohol. The fore milk was stripped off and about 5 ml of milk were drawn in sterile Bijou bottle. All samples collected were immediately placed on ice in a thermoflask after collection. The two media used in culture were Blood agar and MacConkey's agar. After culturing the plates were incubated for 24 hours at 37°C. Purification was achieved by further sub culturing on nutrient agar and incubated at 37°C for 24 hours. After purification the plates were examined for cultural characteristics and biochemical reactions according to standard keys (Barrow and Feltham, 2003).

After isolation and identification isolated bacteria the sensitivity test was applied by multidiscs of different antibiotics, put the culture in incubation for 24-48 hours at 37°C aerobically. The effectiveness read by diameter of growth inhibition around different antibiotics multi-discs (Barrow and Feltham, 2003).

## RESULTS

Figure 1 shows the ventilation, general farm hygiene and drainage system mainly the farm management was satisfactory in visited farms. Figure 2 shows the percentage of practicing before milking in farm, wash of hands before milking was (38.23%) in farms but apply teat lubricant and use dry cow therapy were (5.88%) in visited farms. Figure 3 shows the percentage of isolated bacteria from different farms were as follows: *Bacillus* spp, *Staph* spp, *Klebsiella* spp and *Corynebacterium* spp.



**Figure 2.** Percentage of practicing before milking in farm

**Table 1.** Name, concentration of antibiotics and degree of effectiveness of antibiotics and which type of bacteria could effect by its

Isolated bacteria	Name, concentration and effectiveness of antibiotics											
	AS 20mcg	BA 25mcg	CF 30mcg	TZP 100/10mcg	CH 30mcg	CP 5mcg	CI 30mcg	TE 30mcg	OF 5mcg	GM 10mcg	AK 30mcg	PF 5mcg
<i>B. coagulans</i>	-	+++	-	-	+++	+++	+++	-	-	+++	-	-
<i>B. cereus</i>	-	-	-	+++	+++	+++	-	+++	+++	+++	+++	+++
<i>B. circulans</i>	-	-	-	+++	+++	+++	-	+++	+++	++	++	++
<i>B. mycoides</i>	-	-	-	+	+++	+++	-	++	-	-	-	-
<i>B. licheniformis</i>	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	-	+++
<i>B. megaterium</i>	-	-	+++	+++	+++	+++	+	++	-	+++	+++	+++
<i>B. lentus</i>	-	++	+++	+++	+++	+++	-	-	++	++	+++	+++
<i>B. subtilis</i>	-	-	-	+++	+++	+++	+	+++	+++	+++	+++	+++
<i>B. amyloliquefaciens</i>	-	-	-	+++	+++	+++	+	+++	+++	+++	+++	+++
<i>Staph .aureus</i>	-	-	-	+++	+++	+++	+++	+++	+++	+++	+++	+++
<i>Staph. hyicus</i>	-	-	-	++	++	+++	+++	+++	+++	+++	+++	+++
<i>Klebsiella spp.</i>	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++

(+++): Excellent. (++) Good. (+): Poor. (-): No effect.

AS: Ampicillin/Sulbactam; CI: Cefprozime;

BA: Co-Trimoxazole; TE: Tetracycline; CF: Cefotaxime; OF: Ofloxacin; TZP: Piperacillin/Tazobactam,

GM: Gentamycin; CH: Chloramphenicol; AK: Amikacin; CP:

Ciprofloxacin; PF: Pefloxacin.

Figure 4 shows the number of isolated bacteria which were affected by different antibiotics and the effectiveness of these antibiotic by percentage were as follows: Susceptibility to Gentamycin (GM) and Piperacillin/Tazobactam (TZP) were about (91.6%), (83.3%) from isolated bacteria were susceptible to Pefloxacin (PF) and Tetracycline (TE), (75%) were susceptible to Amikacin (AK) and Ofloxacin (OF), (66.6%) were susceptible to Ceftizoxime (CI), (33.3%) were susceptible to Co-Trimoxazole (BA) and Cefotaxime (CF), (16.6%) were susceptible to Ampicillin/Sulbactam (AS) but the best antibiotics in all this are Chloramphenicol (CH) and Ciprofloxacin (CP) because the percentage of the effectiveness was 100% that mean all isolated organisms are susceptible to these two drugs. Table 1 shows the name, concentration of antibiotics and degree of effectiveness of antibiotics and which type of bacteria could effect by its.

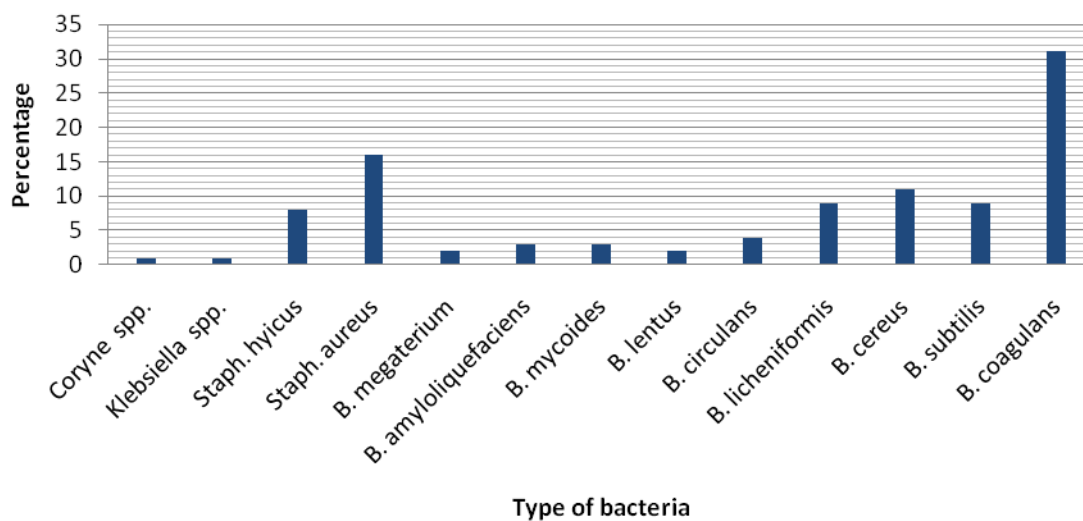


Figure 3. Percentage of isolated bacteria from different farms

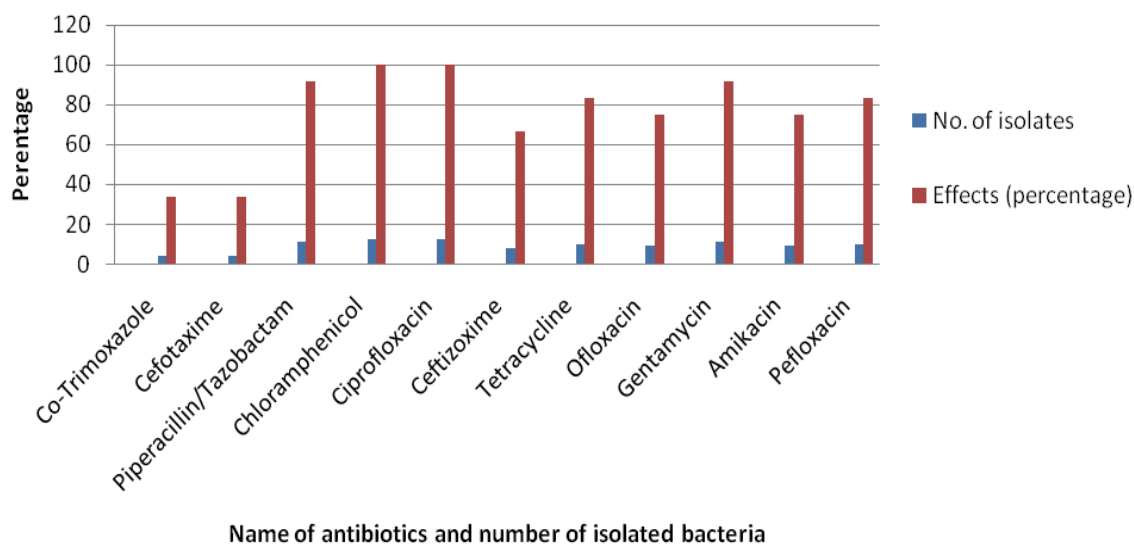


Figure 4. Percentage of effectiveness for different antibiotics and the number of samples.

\* Number of isolated bacteria which were affected by specific antibiotic

## DISCUSSION

In the present study 100 milk samples were shown positive for mastitis. The high prevalence *Bacillus spp* followed by *Staph spp* then *Corynebacterium spp* and *Klebsiella spp.* were relatively similar to the previous reports (Mahantes and Basappa, 2011, waage *et al.*, 1999 and Junaidu, 2011). Mastitis is a result of interaction between three elements like bacteria, cow and environment. In the present study the prevalence of staphylococcus species may be due to the incomplete milking and especially when it is associated with the painful lesions or any wounds on the outer surface of the udder. Staphylococcus is an opportunistic pathogenic bacteria which survive on the skin of the udder and can infect the udder via teat canal or any wound (Junaidu, 2011). Further, the prevalence of enterobacteria species in the present study may be due to the poor hygienic condition in the herds and this infection is becoming more and more frequent which tends to follow the infection of staphylococcus species. The prevalence of streptococcal species may be

due to poor dairy practicing methods, it is the contagious organism which infects other healthy animals in the herds (Junaidu , 2011).

The prevalence of bacillus species in the present study may be due to the environmental factors like soil water and manure, these are the main source of bacteria and when animals are exposed to water, soil and manure these bacteria infect animals via teat canals. Similar findings showed that higher incidence of *Klebsiella* spp. may be due to poor hygienic conditions as reported by Sudhakar *et al.* (2009). Therefore, the above findings indicate that mastitis can be controlled by hygienic conditions in the herds like keeping the animals away from the stagnant water, cleaning manure, use of germicidal solution for washing udder before milking and culling of infected animals Sudhakar *et al.* (2009). In the present studies were also conducted for the isolates by using twelve antibiotics which were used frequently Khartoum state for the treatment of mastitis and Chloramphenicol and Ciprofloxacin were found to be more effective antibiotic among all tested antibiotics against all bacteria isolated in the present study followed Gentamicin, Piperacillin/Tazobactam, Pefloxacin, Tetracycline, Amikacin, Ofloxacin, Ceftizoxime, Ampicillin/Sulbactam and Cefotaxime. The finding is accord to Mahantesh (2011).

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