Gentamicin is the best antibiotic in treatment all types of bovine mastitis caused by bacteria

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ABSTRACT
In this study milk samples collected from fifty cows were examined clinically by visually and by use of pH paper to check availability of mastitis, types, causative agent and effective specific antibiotic for treatment. The results of visual and pH paper check reveal positive samples which changed in colour from yellow to green or bluish green indicating mastitis availability in milk samples. Three types of mastitis were found namely Acute (27%), chronic (22%) and gangrenous (1%). Milk samples were sent to microbiology laboratory to detect the causative agent and made a sensitivity test for choice the specific antibiotic for treatment. The results indicated four isolated bacteria as causative agent which were Staphylococcus spp (24%), Bacillus spp (7%), Corynebacterium spp (1%) and Klebsiella spp (1%). From the three types of antibiotics used in treatment of mastitic cases (Ciprofloxacin, Chloramphenicol and Gentamicin) Gentamicin by injected the quarter with intrammary was the best antibiotic in treatment of mastitis cases completely within 1-3 day after application compared to Gentamicin only with any agonist. Further study with intensive sampling is needed to complete the picture for safe and sustainable milk production and industry.

1. Introduction
Mastitis is an inflammation of the mammary gland of the cattle’s 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 (Basappa, 2011). Dairy industry has recently grown as a very important economic national source of income especially among indigenous types in Sudan, Butana and Kenana which are consider a big for milk sales and distribution to other towns (Safa et al., 2014). However, the national milk production in the Sudan is estimated to be 2.5 million ton per year of which 50% is used for direct human consumption and the remaining for bakeries and for feeding young stock (Hussein, 2008). In Sudan, many dairy owners introduced cross breed this might result in a progeny of mixed blood cows with lowered resistance to endogenous and locally prevailing diseases such as mastitis. Mastitis is considered the main disease in dairy herds (Kaneen and Bandhard, 1990). Mastitis is the inflammation of the mammary gland due to the injury of any type. However, the udder disease of major concern is that associated with microbial infection (Blood et al. 1983). Hilerton et al. (1987) reported the most cases of mastitis were found to affect usually only the single front quarters.

The apparent increase of Staphylococcus aureus, for which no established control measures exist, is interesting in light of the observation that the labour resource on some dairy farms may have dropped below a critical threshold, because of low milk prices, possibly resulting in less attention to detail in cow management (Anon, 2002). In 1972 Shommein was report that the diagnosis of clinical mastitis in cattle does not present difficulty in visible inflammatory changes in the mammary gland tissue and of the physical and chemical changes of quality of milk. Mastitis affects other domestic animals such as sheep, goats, pigs, camels, horses as well as wild life like deer (Blood et al., 1983).

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 and Moore et al. 2005). Systemic administration for treatment of mastitis was first used in the 70's Ziv (1980a). In acute cases, the intramammary administration often fails due to poor and uneven distribution of the drug, either by the growth of breast parenchyma or blockage caused by the products of inflammation. In these circumstances, parenteral therapy is preferred (Mestorino, 1993a). From the clinical point of view, the success of parenteral therapy depends mainly on the ATM passage from blood to milk (Ziv, 1980a). The ATM
concentrations in highly vascularized tissues are equivalent to those determined in blood plasma. By contrast, in places where the irrigation is poor or those which are separated from the central compartment by biological membranes, drug levels are not equivalent (Kruth, 2006).

The time during which concentrations in the mammary gland are effective depends largely on the drug characteristics, the dose, the bioavailability of the molecule, the ability to penetrate the mammary gland and the microorganism susceptibility (Ziv, 1980b and Mestorino, 1993a). The situation has been compounded by the continued indiscriminate use of antibiotics, defying the rational approach of selection of suitable antibiotics after culture and sensitivity test of milk. This may be attributed to callous approach of the dairy farmers, who instead of consulting qualified veterinarian, prefer to take over the counter supply of medicine by the drug retailers. Veterinarians who do not capitalize on the available diagnostic tests are no less responsible for increase in the incidence of mastitis. Apart from antibiotic sensitivity testing, other parameters, which affect the efficacy of drugs in mastitis such as pH of milk, presence of lipid vacuole or reticulin fibres, are also important (Rajeev, 2010).

The objectives of this study to detect the best antibiotics for treatment of bovine mastitis cause by bacteria.

2. Materials and Methods

2.1. Animals
A total of 50 suspected mastitic cows were examined clinically for presence of mastitis. Hundred milk samples from mastitic cows were collected from Khartoum, Bahry and Omdurman (Sudan). Mastitis was diagnosed by palpation of the udder to examined the texture, local temperature, pain and consolidation in the udder and also examined the supramammary lymph node, and examined the milk visually by changes in colour, find of flakes and shreds, viscosity and odour.

2.2. Sampling
Hundred 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.

2.3. Chemical tests
- pH examination
This test was done to determine milk pH by using of a special paper (manufactured by Kruse Company in Denmark). Positive sample revealed change in colour from yellow to green or bluish green, while negative sample revealed no change of the yellow spots or change to light green. The test was applied by adding one drop of milk on yellow spot, where in a few seconds the colour was change in positive cases.

- Culture
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 subculturing on nutrient agar and incubated at 37°C for 24 hours. After purification, a full loop from purified culture was taken and a smear was made and stained with Gram’s stain to differentiate between Gram’s positive and Gram’s negative bacteria and to see the shape of bacteria. Plates were examined for cultural characteristics and biochemical reactions according to standard keys Barrow and Feltham (2003). Staphylococci were studied in particular for haemolysis and coagulase production using human plasma. A positive coagulase test was judged as any degree of clotting from a loose clot suspended in plasma to a solid clot. Barrow and Feltham (2003).

- Purification of cultures
Purification of culture was made by subculturing a part of a typical and well isolated colony on nutrient agar. This process was repeated twice. The resulting of growth was checked for purity by examining smears stained with Gram’s stain method.

- Identification of bacteria
The purified isolated bacteria were identified according to criteria outlined by Barrow and Feltham (2003) which included of: Reaction of Gram’s stain, shape of the bacterial colonies, presence or absence of spores, motility, the colonial characteristics on different media, haemolysis of blood agar and biochemical tests. All biochemical tests for identification of isolated bacteria were performed according to Barrow and Feltham (2003). They included: Catalase test, Fermentation of sugars, Oxidase test, Urease test, Coagulase test, Indole test, Oxidation Fermentation Medium and Methyl Red test.
3. Result

3.1. pH examination
A total of 100 milk samples gave a positive reaction to pH paper. The color of the paper was changed from yellow to green or bluish green when the cow was infected with mastitis because the pH of milk will increase to alkaline (Fig. 1).

![Figure 1. Shows pH paper test for detection of mastitis in studied milk samples.](image)

3.2. Bacteriological examinations
Four genera of bacteria were isolated from the milk samples. The isolated bacteria were as follows: *Bacillus* spp 74%, *Staphylococcus* spp 24%, *Corynebacterium* spp 1% and *Klebsiella* spp 1%.

3.3. Sensitivity test
The three types of antibiotics which were used in this study were effected in all isolated bacteria.

3.4. Treatment of individual cases:
We used the three antibiotics in mastitic cows Ciprofloxacin, Chloramphenicol and Gentamicin, the best one was Gentamicin. It was experimented in all types of mastitis even due to trauma till appered the blood in milk, all cases were treated within 1-3 days completely.

3.5. Types of mastitis
The type of mastitis in this study were as follows: the highest percentage was acute mastitis 27% then chronic mastitis 22% and the last one was gangrenous mastitis 1% (Fig. 2).

![Figure 2. Shows the percentage of types of mastitis in studied milk samples.](image)

4. Discussion
In this study found three types of mastitis, acute, chronic and gangrenous and this is in agreement with Atyabi et al. (2006). The isolates bacteria in this study were as follows: *Staphylococcus* spp. and this is an agreement with Lakew et al. (2009). *Bacillus* spp and *Corynebacteria* spp. were isolated in this study as one of bacteria which can cause mastitis and this is in agreement with findings by Redeat (2014). Also *Klebsiella* spp was isolated from infected milk and this is in agreement with findings by Atyabi et al. (2006). All isolates obtained were subjected to antibiogram assay and all affected with antibiotics which were selected in this study. The best antibiotic in treatment of mastitis was Gentamicin and this is in agreement with findings by Zig (1980c); Jones and Ward (1990); Rajeev et al. (2010); Joseph and Katherine (2011); Redeat (2014) and Thamires et al. (2016) were
examined different antibiotics in treatment of mastitis and one of the best antibiotics in all these study was Gentamicin.

References