Sjournals
Scientific Journals
Scientific Journal of Animal Science (2012) 1(3) 75-80

Contents lists available at Sjournals
Scientific Journal of Animal Science
Journal homepage: www.Sjournals.com

Original article

Retrospective studies of the trends of occurrence of ruminant mastitis pathogens in a veterinary teaching hospital in Northwest, Nigeria

C.N. Kwanashie*, K. Oputeh, E.O. Ngbede
Department of Veterinary Microbiology, Ahmadu Bello University Zaria, Kaduna State, Nigeria

*Corresponding author; Department of Veterinary Microbiology, Ahmadu Bello University Zaria, Kaduna State, Nigeria.

ARTICLE INFO

Article history:
Received 15 August 2012
Accepted 16 September 2012
Available online 20 September 2012

Keywords:
Cattle
Goats
Isolation
Mastitis
Nigeria
Pathogens
Sheep
Retrospective
Zaria

ABSTRACT

A retrospective study to determine the pattern of isolation of mastitis causing organisms from milk samples of cattle, sheep and goats submitted to the Microbiology laboratory of the Department of Veterinary Pathology and Microbiology Ahmadu Bello University Zaria from 1980-1991 and 1999-2009 was conducted. The samples were subjected to cultural isolation and biochemical characterization. The results of the isolates were assembled, reviewed and summarised. A total of 227 milk samples were submitted from cattle (40), sheep (31) and goats (156) respectively, from the years 1980 to 1991 and 1999 to 2009 and subjected to cultural isolation and biochemical characterization. A total of 18 different organisms were isolated from 158 of the samples submitted. Six of the submitted samples were un-typeable while 63 were culture negative i.e showed no growth. The most commonly isolated mastitis causing organisms from all samples were: *Staphylococcus aureus* (26.51%), *Escherichia coli* (12.20%), *Staphylococcus spp* (10.24%), *Streptococcus spp* (6.63%) and *Corynebacterium spp (7.32%).* Other organisms are, *Micrococcus (1.22%), α-hemolytic Streptococcus (1.83%), β- haemolytic Streptococcus (2.42%), Pseudomonas aeroginosa (4.88%), Enterobacter spp (1.83%), Proteus spp (4.89%), Lactobacillus spp (2.42%), Pasteurella spp (4.27%), Klebsiella spp (3.05%), Citrobacter spp (0.61%), Candida albican (0.61%), Flavobacterium spp (0.61%), Bacillus spp (3.67%), Acinetobacter spp (1.20%) and Sarcina spp (0.61%). Staphylococcus aureus* was the most predominant organism isolated from cattle, sheep and goat milk. There was a significant

reduction in occurrence of mastitis from 201 (88.55%) cases within 1980-1991 and 26 (11.45%) cases within 1999-2009.

1. Introduction

Despite the widespread implementation of mastitis control programs, mastitis remains a threat to the diary industry (Bradley, 2002). Mastitis causes significant loss to dairy farmers (Kossaibati and Esslemont, 1997; Wilson *et al.,* 1997; Arga *et al.,* 2012) as a result of decreased milk production, decreased milk quality, increased culling rate of cows and the substantial cost of treating affected animal.

Mastitis is an inflammation of mammary gland parenchyma caused by infectious or non infectious agents (White and Hinckley, 1999; Kivaria *et al.,* 1999), though the etiology is usually an infectious agent (Seifu and Tafesse, 2010). The pathogens frequently implicated as cause mastitis can be divided into 2 broad categories. The contagious pathogens which can spread from cow to cow during milking include *Streptococcus agalactiae*, *Staphylococcus aureus*, and *Mycoplasma* spp. and the environmental pathogens found throughout the environment of the cows and include organism such as *Streptococcus uberis*, *Streptococcus dysgalactiae* subspp *dysgalactiae* and coliforms such as *Escherichia coli* and *Klebsiella* spp (Zhao and Lacasse, 2008; Oliver and Murinda, 2012).

Bacteriological knowledge of the prevalence and trends of mastitis pathogens in an area is of importance especially to the diary industry and veterinarians (Wilson *et al.,* 1997; Shpigel *et al.,* 1998; Ruegg, 2003) especially with the reports of changes in the frequency of occurrence of mastitis pathogens and emergence of new pathogens (Tenhagen *et al.,* 2006; Suriyasathaporn, 2011). Such data will help in the implementation of preventive measures and also the appropriate selection of antimicrobials which are an important component of the mastitis control program (Persson *et al.,* 2011). Therefore, the purpose of this paper is to report the prevalence of individual mastitis pathogens from cattle, sheep and goats diagnosed of clinical mastitis based upon routine culturing of milk samples by the Microbiology laboratory of the Department of Veterinary Pathology and Microbiology, Faculty of Veterinary Medicine, Ahmadu Bello University Zaria between1980-2009.

2. Materials and methods

This study was based on the microbiological results of isolation and characterization of pathogens from milk samples of animals diagnosed of mastitis by the clinicians of the large animal clinic of the Ahmadu Bello University Veterinary Teaching Hospital (ABUVTH) from 1980 to 2009. The isolation and characterization was carried out in the Microbiology laboratory, Faculty of Veterinary Medicine ABU Zaria using standard laboratory techniques. The milk samples were cultured on blood agar, MacConkey agar at 37°C for up to 24 h and Sabouraud's Dextrose Agar (SDA). Standard laboratory techniques were used for identification of bacterial colonies (NMC, 1987a).

3. Results

A total of 227 milk samples were submitted from 40 cattle, 31 sheep and 156 goats between 1980-1991 and 1999-2009 for cultural isolation. Eighteen organisms were isolated from a total of 158 milk samples while 6 isolates were untypable and 63 samples had negative culture (Table 1 and Table 2). The most common organisms isolated were *Staphylococcus aureus (26.51%), Escherichia coli (12.20%), Streptococcus spp (6.63%), Corynebacterium spp (7.32%).* Other organisms were *Staphylococcus spp (10.24), α- haemolytic Streptococcus (1.83%), β- haemolytic Streptococcus (2.42%), Pseudomonas aeroginosa (4.88%), Enterobacter spp (1.83%), Proteus spp (4.89%), Lactobacillus spp (2.42%), Pasteurella spp (4.27%), Klebsiella spp (3.05%), Citrobacter spp (0.61%), Candida albicans (0.61%), Flavobacterium spp (0.61%), Pseudomonas spp (3.05%), Micrococcus (1.22%), Bacillus spp (3.67%), Acinetobacter spp (1.20%)* and *Sarcina spp (0.61%)* (Table 2). The highest numbers of milk samples submitted were from goats; 156 followed by cattle (40) and sheep (31). Out of these samples growths were recovered from 118 (71.95%), 22 (13.41%) and 24 (14.63%) of the goat, sheep and cattle milks respectively (Table 2 and Figure 1).

Two hundred and one milk samples from mastitic animals were submitted within 1980-1991 out of which 136, 27 and 38 were from goats, sheep and cattle respectively. Twenty six milk samples from mastitic animals were submitted within 1999-2009 out of which 20, 4 and 2 were from goats, sheep and cattle respectively (Table 3).

Table 1
Number of milk samples from goats, sheep and cattle submitted to the Microbiology laboratory Faculty of Veterinary Medicine ABU Zaria for cultural isolation and culture status of the samples from 1980-1991 and 1999-2009.

	Goats	Sheep	Cattle	Total
No. of samples submitted	156	31	40	227
No. of culture positive samples	118	22	24	164
No. of culture negative samples	38	9	16	63
No. of un-typeable isolates	4	0	2	6

Table 2
Distribution of isolates from milk of mastitic cattle, sheep and goat submitted to the Microbiology laboratory, Faculty of Veterinary Medicine ABU Zaria from 1980-1991 and 1999-2009.

Isolates	Goats	Sheep	Cattle	Total (%)
Staphylococcus aureus	27	8	7	42 (26.51)
Staphylococcus spp	16	1	0	17 (10.24)
Micrococcus	2	0	0	2 (1.22)
Streptococcus spp	7	2	2	11 (6.63)
α-haemolytic *Streptococcus*	3	0	0	3 (1.83)
β-haemolytic *Streptococcus*	3	1	0	4 (2.42)
Corynebacterium spp	8	1	3	12 (7.32)
Psuedomonas aeroginosa	5	0	3	8 (4.88)
Escherichia coli	18	1	1	20 (12.20)
Enterobacter	0	0	3	3 (1.83)
Proteus spp	6	1	1	8 (4.89)
Lactobacillus spp	2	0	2	4 (2.42)
Pasteurella spp	5	2	0	7 (4.27)
Klebsiella spp	4	1	0	5 (3.05)
Citrobacter spp	0	1	0	1 (0.61)
Candida albicans	0	1	0	1 (0.61)
Flavobacterium spp	0	1	0	1 (0.61)
Bacillus spp	6	0	0	6 (3.67)
Acinetobacter spp	2	0	0	2 (1.20)
Sarcina spp	0	1	0	1 (0.61)
Untypeable	4	0	2	6 (3.67)
Total	118 (71.95%)	22 (13.41%)	24 (14.63%)	164

4. **Discussion**

The findings of this study is a possible indication that farmers are becoming aware of and able to institute mastitis prevention and control programs on their farms in the 2000s than in the 1980s as shown by the decrease number of mastitis cases reported between 1980-1991 and 1999-2009. This might be due to increased and improved campaign on the best practices for prevention and control of mastitis by veterinarians, dairy groups and animal health workers. Major mastitis pathogens were encountered in cattle, sheep and goats though with a high prevalence of *Staphylococcus aureus* across the three species of animals. This is in agreement with the results of other studies (Persson *et al.,* 2011; Arga *et al.,* 2012) that isolated *Staphylococcus aureus* as a major cause of mastitis in animals. *Staphylococcus aureus* has been reported to be the most pathogenic among the mastitis causing agents (Grabber *et al.,* 2009). It causes chronic, clinical or subclinical mastitis associated with a reduction

of milk yield and difficulty to treat (Sol *et al.,* 2000; Grabber *et al.,* 2009). *Staphylococcus aureus* localizes in microabscesses and scar tissue reducing accessibility of antibiotic to it (Sol *et al.,* 2000; Suriyasathaporn, 2011). The higher prevalence of *Staphylococcus aureus* is an indication of the absence of hygienic milking practices and unhygienic environment and dirty milking utensils. The organism also poses public health threat asides its effect on production because of its contagious nature. Majority of the organisms in this study are contagious and found in the environment of the animals. This suggests poor husbandry, hygiene and milking techniques on the farms which will predispose not just the animals to mastitis but may also result in contamination of the milk. Thus infection of suckling animals and humans consuming such milk without adequate pasteurization may occur. Though environmental mastitis causing pathogens cannot be totally eliminated from a herd (Palaha *et al.,* 2012), its incidence can be reduced to a low level by institution of hygienic and good management practices. The recommended preventive and control measures against mastitis should include application of good sanitary and hygienic measures, such as adequate washing and sanitation of milkers' hands, wash cloths, milking machine and bedding. In addition prompt identification of the mastitis causing agent and institution of appropriate treatment of the animals and treatment of quarters during the drying off period.

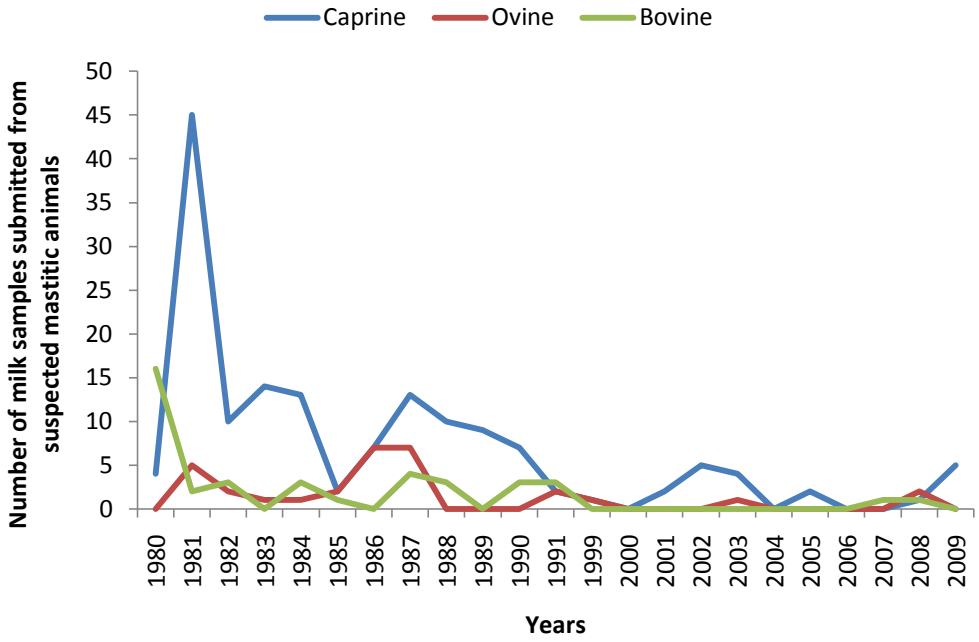

Fig. 1. Pattern of sample submission of milk from mastitic cattle, sheep and goat in the Microbiology laboratory of the Faculty of Veterinary Medicine ABU Zaria from 1980-1991 and 1999-2009.

Table 3
Occurrence of mastitis based on sample submission of milk from mastitic cattle, sheep and goat to the Microbiology laboratory of the Faculty of Veterinary Medicine ABU Zaria from 1980-1991 and 1999-2009.

Years	Goats (%)	Sheep (%)	Cattle (%)	Total (%)
1980 – 1991	136 (87.18)	27 (87.10)	38 (95)	201 (88.55)
1999 – 2009	20 (12.82)	4 (12.90)	2 (5)	26 (11.45)

Goats compared to sheep and cattle had the highest incidence of mastitis. This might be due to the pendulous nature of the mammary gland of the breeds of goats (Red Sokoto and Kano Brown) in this area which predisposes them to trauma and subsequent contamination of infected wounds by mastitis causing pathogens.

The 27.75% (65) of culture negative milk samples is in agreement with the National Mastitis Council reports that 25 to 40% of milk samples of animals with clinical mastitis do not have a bacterial isolate. For a high

probability of bacterial isolation from a sample of milk, there needs to be at least 100 cfu/mL of milk (NMC, 1987b). Any infected quarter with a bacteria concentration below 100 cfu/mL of milk infection is usually modest and bacteria are shed intermittently; white blood cells in milk may also have engulfed and sequestered bacteria, preventing isolation; or poor sample handling and collection have reduced the bacterial concentration (NMC, 1987b; Wellenberg *et al.,* 2002). Some other mastitis pathogens such as fungi and viruses may have accounted for the high number of culture negative samples also.

5. Conclusion

Though the frequency of mastitis cases have declined in the last 10 years compared to the 1980s, major mastitis causing pathogens such as *Staphylococcus aureus, Corynebacterium spp, and Streptococcus* spp were the common isolates encountered. Staphylococcus aureus was the most predominating organism isolated from all three (cattle, sheep and goats) species of animal.

Acknowledgements

The authors wish to acknowledge the staff of the Microbiology laboratory, Department of Veterinary Pathology and Microbiology, Faculty of Veterinary Medicine Ahmadu Bello University Zaria where this research was conducted.

References

Arga, S., Tadesse, G., Tessema, T.S., Zewdu, E., 2012. Bacterial pathogens and udder infection dynamics during the early lactation period in primiparous cows in Ambro Town, Central Ethiopia. Global Veterinaria. 8(4), 403-408.

Bradley, A.J., 2002. Bovine mastitis: An evolving disease. Vet. J. 163, 1-3.

Grabber, H.U., Naskova, J., Studer, E., Kaufmann, T., Kirchhofer, M., Brechbuhl, M., Schaeren, W., Steiner, A. and Fournier, C., 2009. Mastitis-related subtypes of bovine Staphylococcus aureus are characterized by different clinical properties. J. Diary Sci. 92, 1442-1451.

Kivaria, F.M., Noordhuizen, J.P.T.M., Msami, H.M., 2007. Risk factors associated with the incidence rate of clinical mastitis in smallholder dairy cows in the Dar es Salaam region of Tanzania. Vet. J. 173, 623-629.

Kossaibati, M.A., Esslemont, R.J., 1997. The costs of production disease herds in England. Vet. J. 154, 41-51.

National Mastitis Council, 1987a. Laboratory and Field Handbook on Bovine Masitis, National Mastitis Council, Madison, WI, USA.

National Mastitis Council. 1987b. Reasons for negative culture results. Accessed June 10, 2012 at 10.38am from http://www.nmconline.org/articles/nogrowth.htm.

Oliver, S.P., Murinda, S.E., 2012. Antimicrobial resistance of mastitis pathogens. Vet. Clin. North Am. Food An. Pract. 28, 165-185.

Palaha, R., Chaudhary, N. and Kumar, H. (2012). Detection of Escherichia coli from the udder of the diary farm Buffaloes in Phagwara region, Punjab, India. Vet. World, 5(9): 522-525.

Persson, Y., Nyman, A.K.J., Gronlund-Andersson, U., 2011. Etiology and antimicrobial susceptibility of udder pathogens from cases of subclinical mastitis in diary cows in Sweden. Acta Vet. Scand. 53, 36.

Ruegg, P.L.(2003). Investigation of mastitis problems on farms. Vet. Clin. North Am. Food An. Pract., 19, 47–73.

Seifu, E., Tafesse, B. 2010. Prevalence and etiology of mastitis in traditionally managed camels (Camelus dromedarius) in selected pastoral areas in eastern Ethiopia. Ethiopian Vet. J. 14(2), 103-113.

Shpigel, N.Y., Winkler, M., Ziv, G., Saran, A., 1998. Clinical, bacteriological and epidemiology aspect of clinical mastitis in Israeli dairy herds. Prev. Vet. Med. 35, 1-9.

Sol, J., Sampimon, O.C., Barkema, H.W., Schukken, Y.H., 2000. Factors associated with cure after therapy of clinical mastitis caused by Staphylococcus aureus. J. Diary Sci. 83, 278-284.

Suriyasathaporn, W., 2011. Epidemiology of subclinical mastitis and their antibacterial susceptibility in small holder dairy farms, Chiang Mai Provine, Thialand. J. An. Vet. Adv. 10(3), 316-321.

Tenhagen, B.A., Koster, G., Wallmann, J. and Heuwieser, W. (2006). Prevalence of mastitis pathogens and their resistance against antimicrobial agents in dairy cows in Brandenburg, Germany. J. Diary Sci. 89, 2542-2551.

Wellenberg, G.J., van der Poel, W.H.M., van Oirschot, J.T., 2002. Viral infections and bovine mastitis: a review. Vet. Microbiol. 88, 27-45.

White, E.C., Hinckley, L.S., 1999. Prevalence of mastitis pathogens in goat milk. Small Rum. Res. 33, 117-121.

Wilson, D.J., Gonzalez, R.N., Das, H.H., 1997. Bovine mastitis pathogens in New York and Pennsylvania: prevalence and effects on somatic cell count and milk production. J. Diary Sci. 80(10), 2592-2598.

Zhao, X, Lacasse, P., 2008. Mammary tissue damage during bovine mastitis: Causes and control. J. Ani. Sci. 86, 57-65.