Proceedings of the Third Annual Meeting for Animal Production Under Arid Conditions, Vol. 2: 138-144

A study on Antimicrobial Susceptibility of Bacteria Isolated from the Mastitic Milk of Rural Camels in India

S. K. Mody, P. R. Patel and C. B. Prajapati

Department of Medicine, College of Veterinary Science and Animal Husbandry, Gujarat Agricultural University, Sardar Krushinagar-385 506, Gujarat Staste, India

ABSTRACT

The prevalence of mastitis was investigated in a total of 146 adult female camels using California Mastitis Test (CMT). 30 sub-clinical cases of mastitis found, were subjected to cultural isolation, identification of isolates and their antimicrobial sensitivity. Out of the total 30 milk samples processed for cultural isolation, 28 milk samples were positive for bacterial organisms. Out of the 28 milk samples, 23 milk samples had Gram-positive organisms, which include Staphylococcus (11 samples), Streptococcus (7 samples), Anthracoids (3 samples), Corynebacterium (1 sample) and a mixed infection of Staphylococcus and Streptococcus (1 sample). The remaining 5 milk samples had Gram-negative organisms.

The isolates were subjected to a standard antimicrobial sensitivity test. Antimicrobial drugs against which the bacterial isolates have shown good senseivity, were Gentamycin (14 samples) and Chloramphenicol (10 samples). Cotrimoxazole (2 samples), Sulfafurazole and Streptomycin (1 sample each) were also found highly sensitive to some bacterial isolates. Antimicrobial drugs, against which bacterial isolates have shown moderate susceptibility, were Oxytetracycline (10 samples), Cotrimoxazole and Chloramphenicol (8 samples each), Gentamycin and Streptomycin (4 samples each), Erythormycin (3 samples) and Sulfafurazole (1 sample). All the bacterial isolates were found resistant to Nitrofurantoin, Furazolidone and Penicillin.

It can be concluded that the preference of antimicrobial drugs for the treatment of mastitis in camels, should be first for Gentamycin discendingly followed by Chloramphenicol, Cotrimoxazole, Streptomycin and Sulfafurazole.

Key words: Milk, Bacteria, Mastitis, Antibiotics, Camel.

INTRODUCTION

Mastitis, also called 'Dairyman's grief', in either the acute or the chronic form, remains a major cause of economic loss throughout the world. More exact definition of the type of mastitis depends on the identification of the causative agent whether it be physical or infectious. In the diagnosis and control of mastitis, laboratory procedures are of value in the examination of milk samples for cells, bacteria and chemical changes, and for testing the sensitivity of bacteria to specific drugs. Culturing of milk samples is a standard method of examination for mastitis. In mastitis control, the costs of bacteriological culture can be greatly reduced by screening the cows with an indirect (CMT) test first and then culturing the positive reactors (Blood and Radostits, 1989). The chemotherapeutic usefulness of antimicrobial drugs in treating infectious mastitis of domestic animals has been well documented (Blood and Radostits, 1989; Einstein *et al.,* 1994).

The disease occurs in the cow, buffalo, ewe, doe, sow and also rarely in the mare (Verma, 1994). Prevalence of mastitis has also been reported in she camels. Among the other animals of semi-arid regions of Gujarat and Rajasthan states of India, the camel, one of the pack animals, constitutes the main source of transportation and it also provides livelihood to the poor rural communities in this area. In camel population, India stands third after Somalia and Sudan. Indian camel population is mostly confined to the northwestern (mostly Gujarat and Rajasthan states) part of the country (Khanna, 1997). Recently a number of studies have been carried out to isolate and identify pathogenic organisms from mastitis milk of she camels (Kapur *et al.,* 1982; Arush *et al.,* 1984; Quandil and Qudar, 1984; Barbour *et al.,* 1985; Hafez *et al.,* 1987; Mostafa *et al.,* 1987; Ramadan *et al.,* 1987; Yousssef, 1992). However, studies on antimicrobial susceptibility of veterinary pathogens isolated from mastitis milk of she camels are absolutely lacking in camels of northwest India.

MATERIALS AND METHODS

This study was undertaken from May 1992 to April 1993. A total of 146 dry and milking camels of Rabbari and Raval communities of eleven villages of north Gujarat State of India were randomly selected for the experiment. Each animal of the study was clinically thoroughly examined for a minimum of three times in the whole study period and at the same time milk samples of sufficient quantity were drawn from animals and were stored in sterilized screw capped clean glass vials for analysis.

California Mastitis Test (CMT) was performed by using mastitis detection reagent (BAIF, India) for detection of sub-clinical mastitis (Kelly, 1984). Isolation of organisms for CMT positive milk samples were carried out as per the method of Cruickshank *et al.,* (1975). Organisms were identified by colony morphology and by using Gram staining of culture smears. The isolates were subjected to antibiotic sensitivity test, (Bauer *et al.,* 1966). Standard antibiotic discs and zone size interpretative tables were used, and were supplied by HiMedia Laboratories Pvt. Ltd., Mumbai, India. The isolates were tested against 10 different types of antimicrobial drugs; Cotrimoxazole (25 µg), Chloramphenicol (30 µg), Erythromycin (15 µg), Furazolidone (50 µg), Gentamicin (10 µg), Nitrofurantoin (300 µg), Oxytetracycline (30 µg), Penicillin (10 units), Streptomycin (10 µg) and Sulfafurazole (300 µg).

RESULTS AND DISCUSSION

The prevalence of mastitis was investigated in a total of 146 camels using CMT. The test revealed 30 (21%) sub clinical cases of mastitis, which were subsequently subjected to cultural isolation, identification of isolates and their antibiotic sensitivity. Out of the total, 30 positive milk samples processed for cultural isolation, 28 (93%) milk samples showed the presence of bacteria, whereas the remaining two samples were sterile. Among the 28 samples found positive for bacterial isolates, 23 (82%) milk samples revealed Gram-positive organisms, comprising of Staphylococcus in 11 (39%), Streptococcus in 7 (25%) and Anthracoids in 3 (11%) samples whereas, Corynebacterium and a mixed infection of Staphylococcus and Streptococcus were found in 1 (4%) sample each. The remaining 5 (18%) samples had Gram-negative bacteria.

Arush *et al.,* (1984) isolated Staphylococci, Corynebacterium and Streptocci from 19 CMT positive milk samples of total 140 milk samples of camels (*Camelus dromedarius*) studied in Central Somalia. Quandil and Qudar (1984) reported 23 acute and 6 sub-clinical cases of mastitis in total of 94 lactating dromedaries in the U.A.E. They isolated different bacterial organisms from 28 milk samples as *Bacillus cereus* (7), *Streptococcus uberis* (5), *Streptococcus agalactiae* (4), *Diplococcus pneumoniae* (4), *Staphylococcus aureus* (3), *Escherichia coli* (3) *and* also *Candida albicans* (1). Various studies had been conducted worldwide on the isolation and identification of bacterial organisms in mastitic camel milk. From these studies it can be assumed that *Staphlococcus aureus, Streptococcus agalactiae, Klebsiella pneumoniae* might be responsible for mastitis in camels. The result of the present study corroborates these findings.

The ideal properties of a drug selected for the treatment of mastitis include a low MIC value, good tissue penetration, a low degree of protein binding, low irritancy and a short milk withholding time. 25 out of 28 isolates identified were subjected to antibiotic sensitivity test and the antibiotic sensitivity spectrum thus obtained is presented in Table 1. Among the antibiotics tested, all the bacteria isolated were resistant to Nitrofurantoin, Furazolidone and Penicillin. Based on the sensitivity of the bacteria, the selection of appropriate antibiotics in Streptococcal and Staphylococcal mastitis would be Gentamycin and Chloramphenicol as a first choice or secondarily Oxytetracycline or Cotrimoxazole. The cultivated Gram-negative bacteria Gentamycin or Chloramphenicol would be the drug of choice.

In bovine mastitis tylosin, Cotrimoxazole or Oxytetracycline have been recommended for Staphylococcal mastitis and Cotrimoxazole and Oxytetracycline have been shown as drug of choice for mastitis caused by Gram-negative bacteria (Einstein *et al.,* 1994). From the results of this study, it can be concluded that the preference of antimicrobial drugs for the treatment of mastitis in camels should be first Gentamycin descendingly followed by Chloramphenicol, Cotrimoxazole, Streptomycin and Sulfafurazole.

Proceedings of the Third Annual Meeting for Animal Production Under Arid Conditions, Vol. 2: 138-144

Table 1: Efficacy of various antibiotics on bacterial isolates of milk samples of rural camels in India.

Bacterial Isolates	No. of samples (n=25)	Sensitivity	Antibiotics									
			O	Sf	Nf	Co	Fr	C	G	E	St	P
Streptococcus	5	S	0	0	0	0	0	3	3	0	0	0
		M	2	1	0	3	0	1	1	1	1	0
		R	3	4	5	2	5	1	1	4	4	5
Staphylococcus	10	S	0	1	0	1	0	4	5	0	1	0
		M	4	0	0	2	0	3	1	1	0	0
		R	6	9	10	7	10	3	4	9	9	10
Corynebacterium	1	S	0	0	0	0	0	1	1	0	0	0
		M	0	0	0	0	0	0	0	0	1	0
		R	1	1	1	1	1	0	0	1	0	1
Anthracoids	3	S	0	0	0	1	0	0	2	0	0	0
		M	2	0	0	1	0	2	0	0	1	0
		R	1	3	3	1	3	1	1	3	2	3
Streptococcus &	1	S	0	0	0	0	0	0	0	0	0	0
Staphylococcus		M	0	0	0	1	0	1	1	0	0	0
Mixed infection		R	1	1	1	0	1	0	0	1	1	1
Gram negative		S	0	0	0	0	0	2	3	0	0	0
Organisms		M	2	0	0	1	0	1	1	1	1	0
		R	3	5	5	4	5	2	1	4	4	5

S=Sensitive; M=Moderately Sensitive; R=Resistant; O=Oxytetracycline (30 µg); Sf=Sulfafurazole (300 µg); Nf=Nitrofurantoin (300 µg); Co=Cotrimoxazole (25 µg); Fr=Furazolidone (50 µg); C=Chloramphenicol (30 µg); G=Gentamicin (10 µg); E=Erythromycin (15 µg); 100 µg); P=Penicillin (10 units).

Proceedings of the Third Annual Meeting for Animal Production Under Arid Conditions, Vol. 2: 138-144

REFERENCES

Arush, M. A., C. Valente, M. Compagnucci and H. Hussein. 1984. Studies on the prevalence of mastitis in the dromedary (*Camelus dromedarius*) in Somalia. Bullettino Scientifica della Facolta di Zootecniue Veterinaria, Universita Nazionale Somalia. 4: 99.

Barbour, E. K., N. H. Nabbut, W. M. Freriens, H. M. Al-Nakli and A. A. Al-Mukayal. 1985. Mastitis in *Camelus dromedarius* in Saudi Arabia. Trop. Anim. Hlth. Prod. 317 (3): 173.

Bauer, A. W., W. M. M. Kirby, J. C. Sherria, and M. A. M. Turk. 1966. Antibiotic susceptibility testing using a standard single disc method. Am. J. Clin. Path. 45: 493.

Blood, D. C. and O. M. Radostits. 1989. Veterinary Medicine. 7th ed. ELBS. Bailliere & Tindall, London.

Cruickshank, R., J. P. Duguid, B. P. Marmion, and R .H. A. Swain. 1975. Medical microbiology. ELBS. (ed.) Churchill Livingstone, London.

Einstein, R., R. S. Jones, A. Knifton and G. A. Starmer. 1994. Principles of veterinary therapeutics. 1st ed. p. 439. Longman Scientific and Technical Publication. Essex, CM20 2JE, England.

Hafez, A. M., S. A. Razing, S. El-Amrousi and R. O. Ramadan. 1987. Studies on mastitis in farm animals in Al-Husa. I. Analytical studies. Assiut. Vet. Med. J. 19 (37): 139.

Kapur, M. P., B. M. Khanna and R. P. Singh. 1982. A per-acute case of mastitis in a she camel associated with *Klebsiella pneumoniae* and *E. coli*. Indian Vet. J. 59 (8): 650.

Kelly, W. R. 1984. Veterinary clinical diagnosis. 3rd ed. Bailliere & Tindall, London.

Khanna, N. D. 1997. Camel production and breeding in Indian drylands. A lead paper: In First National Seminar on improved use of pack animals and its related aspects. Sardar Krushinager, 385 506, Gujarat, India. P. 25.

Mostafa, A. S., A. M. Ragab, E. E. Safwat, S. El-Sayed, M. Adb-El-Rahman, N. A. El-Danaf and M. T. Shouman. 1987. Examination of raw she-camel milk for detection of sub-clinical mastitis. J. Egyptian Vet. Med. Assoc. 47 (1-2): 117.

Quandil, S. S. and J. Qudar. 1984. Bacteriological study of some cases of mastitis in the dromedary (*Camelus dromedarius*) in the United Arab Emirates (Preliminary report). Revue-de-Medicine Veterinaire. 135 (11): 705.

Ramadan, R. O., A. M. Hassa, R. El-Abdin Bey, Y. A. Algasnawi, E. S. M. Abdulla A.A. and Fayed. 1987. Chronic obstructive mastitis in the camel: A clinico-pathological study. Cor. Vet. 77 (2): 132.

Verma, M. P. 1994. Drugs and animal diseases. 1st ed. P. 286. Kas Publishers, Vallabh Vidyanagar-388 120 India.

Youssef, S. A. H. 1992. The use of antibiotics. Proceedings of The First International Camel Conference, 383-387. Dubai, UAE.