

CONCURRENT SARCOPTIC AND PSOROPTIC MANGE COMPLICATED WITH *STAPHYLOCOCCUS AUREUS* IN A MURRAH BUFFALO (*BUBALUS BUBALIS*)

R.L. Rakesh^{1*}, K. Mahendran², K. Karthik³, Priyanka², A.G. Bhanuprakash² and V.K. Gupta²

ABSTRACT

Buffalo mange is a contagious skin disease caused by a variety of parasitic mites burrowing in or living on the skin. A female Murrah buffalo was presented with a history of inappetence, sudden decrease in milk yield, bilateral lameness of forelimbs with local hair loss and pruritis. Skin scrapings examination revealed presence of both *Sarcoptes* and *Psoroptes* mites. A part of the skin scrapings inoculated on various culture media and stained by Gram's staining showed gram positive cocci bacteria in clumps. Further identification of bacteria by various biochemical tests confirmed the presence of *Staphylococcus aureus* as a secondary invader. Antibiotic sensitivity test was performed using eight different commonly used antibiotics. Haematology revealed reduced haemoglobin, PCV and TEC values, leucocytosis, neutrophilia and eosinophilia. The buffalo was treated with 1% Ivermectin at 200 µg/kg body weight, subcutaneously once a week for three weeks, Enrofloxacin at 5 mg/kg body weight, intramuscularly once a day for five days and Meloxicam at 0.5 mg/Kg body weight, once a day, intramuscularly for 5 days. Deltamethrin was also applied to the surrounding environment twice at a two week interval. The buffalo showed significant improvement after the treatment.

Keywords: mange, buffalo, *Sarcoptes*, *Psoroptes*, *Staphylococcus aureus*

INTRODUCTION

Mange is a widespread contagious skin disease and appears to be one of the most important skin diseases of buffalo in tropical and subtropical countries (Jabeen *et al.*, 1998). Water buffaloes (*Bubalus bubalis*) are infected mainly with *Sarcoptes*, *Psoroptes*, and *Chorioptes* species of mange mites (Afzal *et al.*, 1995).

Sarcoptes scabiei, a burrowing mite causes scabies in humans or sarcoptic mange in a number of animals through host-adapted variants. It generally affects sparsely haired parts of the body. *Sarcoptes scabiei* var. *bubalis* is the cause of sarcoptic mange in buffaloes. The disease is sometimes characterized by presence of skin lesions much more severe than other forms of mange and may involve the entire body surface of bovine in a period as short as 6 weeks (Radostits *et al.*, 2007). *Psoroptes* mites are superficial skin parasites which generally live on the skin of parts of the body well covered with hairs. Infestation may be chronic or even subclinical and localized, often in the ear of the host, or it may be acute and more generalized over the entire body, when it is

¹Division of Parasitology, *E-mail: drrakeshrlvet@gmail.com,

²Division of Medicine,

³Division of Bacteriology and Mycology, Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh, India

described as psoroptic mange (Bates, 1999). *P. ovis* and *P. natalensis* have been reported to cause psoroptic mange in buffaloes (Gill *et al.*, 1989; Sreedevi *et al.*, 2010). *Chorioptes bovis* is another non-burrowing mite very occasionally reported to cause chronic mange in buffaloes (El-Khodery *et al.*, 2009).

Buffaloes infested with mange usually suffer from intense pruritus and react by vigorously scratching, biting and rubbing against objects, which can cause injuries that can be infected with secondary bacteria leading to serious complications. Thus buffalo mange can severely affect the profitable buffalo production due to dermatitis, hide damage, decreased milk and meat production, reduced performance and sometimes even mortalities in severe complicated cases (Tikaram and Ruprah, 1986). Diagnosis of mange in domestic animals is based on clinical manifestations and the demonstration of mites or their developmental stages in host skin scrapings (Kettle, 1995).

The present paper describes the clinical manifestations and successful therapeutic management of concurrent sarcoptic and psoroptic mange complicated with secondary invasion by *Staphylococcus aureus* causing cellulitis and resulting in lameness of the affected limbs in a Murrah buffalo (*Bubalus bubalis*).

MATERIALS AND METHODS

History and Clinical Examination: A female Murrah buffalo aged 4 years, housed in the cattle and buffalo farm of Indian Veterinary Research Institute, Izatnagar, Bareilly (India) was presented with a history of inappetence, sudden decrease in milk yield, swollen forelimbs, pruritus

and lameness. Clinical manifestations included marked swelling of the forelimbs especially the right limb with alopecia, crusts and scab formation. In some areas, the affected dermis exuded serum and was covered with granulation tissue (Figure 1). In vital parameters, rectal temperature was increased and heart rate, respiration rate and pulse rate were normal. The animal was dull, weak, unable to stand for long time and gait was altered.

Parasitological examination: Deep skin scrapings from the periphery of the lesions were collected in a test tube containing 3 ml of 10% potassium hydroxide solution. After gentle heating for about 3 minutes, the test tube was centrifuged at 3,000 rpm for 5 minutes. A drop of the sediment was put on a clean glass slide and examined under microscope for the presence of mites. The mites found were identified by morphological characteristics of the species (Soulsby, 1982; Kettle, 1995). The skin scrapings were examined every week for 4 weeks to evaluate efficacy of treatment.

Microbiological examination: A part of the skin scrapings collected aseptically into a sterile container was inoculated on nutrient agar, blood agar and Sabouraud dextrose agar (SDA) separately and incubated at standard conditions. From the pure culture isolated on blood agar which was having hemolysis pattern with golden yellow colonies, it was sub-cultured on to mannitol salt agar. Bacterial colony from the culture was also stained by Gram's staining. Further, for specific identification of bacterial isolates, biochemical tests like catalase test, coagulase test, DNase test and oxidase tests were performed (Cowan and Steel, 1965; Schleifer and Kloos, 1975; Thaker *et al.*, 2013). Isolates were also subjected to in-vitro antibiotic susceptibility test (ABST) using eight different commonly used antibiotics: Ampicillin, Amoxycillin, Tetracyclin,

Gentamicin, Enrofloxacin, Streptomycin, Amikacin and Ciprofloxacin (Himedia, India) (Bauer *et al.*, 1966).

Haematological examination: Blood samples were collected by jugular venipuncture. About 5 ml of blood sample was collected in a clean glass vial using EDTA as anticoagulant for haematological examination. In another vial, 5 ml of blood was collected for harvesting serum sample. A complete haematological examination was carried out as per standard techniques (Jain, 1986). Total protein, albumin and globulin concentration in the serum was determined by using standard biochemical procedures. The blood and serum examination were repeated after 28 days to determine improvement after treatment.

Treatment: The buffalo was treated with 1% Ivermectin at 200 µg/kg body weight, subcutaneously once a week for three weeks, Enrofloxacin at 5 mg/kg body weight, intramuscularly once a day for five days and Meloxicam at 0.5 mg/Kg body weight, once a day, intramuscularly for 5 days. Adjunct to the drugs, Deltamethrin was applied to the surrounding environment twice at a two week interval. Follow up for observation of response to therapy was carried out regularly.

RESULTS AND DISCUSSION

Based on the history and clinical signs, it was diagnosed as a case of buffalo mange. Both *Sarcoptes* and *Psoroptes* mites were identified on parasitological examination of the skin scrapings. The smaller mites were roughly circular and had a finely striated cuticle. All their legs were short and the third and fourth pairs did not project beyond the margin of the body. The tarsi of the first, second

and fourth pair of legs in the male and the first and second pair of legs in the female ended in suckers whereas the remaining pairs ended in bristles. The pedicels which bore these suckers or bristles were unsegmented. Their anus was located terminally. These features indicated them as *Sarcoptes scabiei* var. *bubalis* (Figure 2). The larger mites were oval; all their legs were long and projected beyond the margin of the body. Their pedicels were long, segmented and bore suckers on the first, second, and third pairs of legs in the male and on the first, second, and fourth pairs of legs in the female. Based on these morphological features they were identified as *Psoroptis natalensis* (Figure 3). Thus, the buffalo was confirmed to be suffering from both sarcoptic and psoroptic mange (Randhawa *et al.*, 1997; Ramprabhu *et al.*, 2001).

Microbiological examination revealed that there were similar golden yellow colonies on blood and nutrient agar but no growth on SDA. Colonies on blood agar showed hemolysis. Suspecting for *Staphylococcus*, single colonies were plated on Mannitol salt agar which showed yellow colonies indicating it as *S. aureus* (Figure 4). Mannitol salt agar is selective for *Staphylococcus* and *S. aureus* produce yellow colonies. Further confirmation was done with biochemical tests which showed catalase positive and oxidase negative. There was DNase and coagulase production. These tests confirm that the isolate was a pathogenic *Staphylococcus aureus* which can produce disease. ABST performed showed highest zone of inhibition around discs containing Ampicillin followed by Enrofloxacin.

On Haematology, reduction in PCV, Hb, TEC and lymphocytes and increase in TLC, neutrophils and eosinophils were noticed. This finding is in agreement with many workers (Shanthkumar and Suryanarayana, 1995; Dimri *et al.*, 2007; Vishe *et al.*, 2012). Reduced PCV,



Figure 1. Photograph showing swollen forelimbs, alopecia and moist exudation

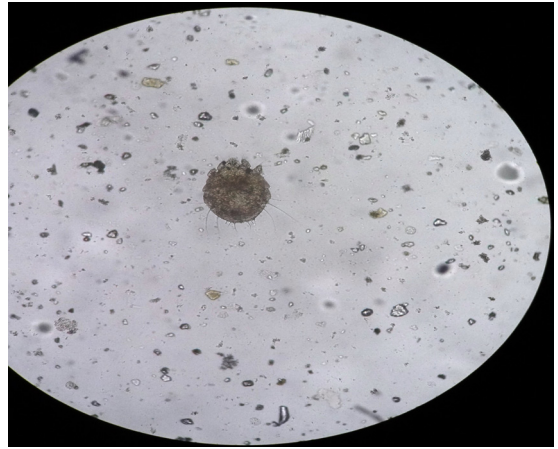


Figure 2. Photograph showing *Sarcoptes scabiei* var. *bubalis* mite

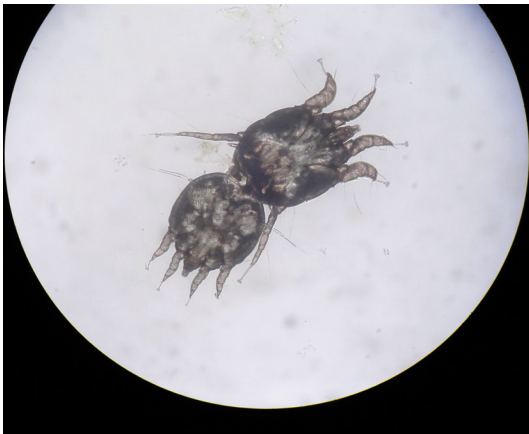


Figure 3. Photograph showing *Psoroptis natalensis* mites (male and female in copulation)

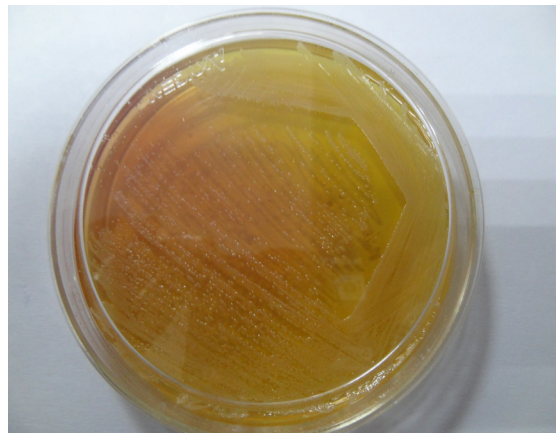


Figure 4. Photograph showing *S. aureus* colonies on Mannitol Salt Agar

Table 1. Haematological parameters before and after treatment.

Blood parameter	Pre-Treatment	Post-Treatment
Packed Cell Volume (%)	26	34
Haemoglobin (g/dl)	9.0	11.0
Total Erythrocyte Count ($10^6/\text{mm}^3$)	5.32	6.54
Total Leukocyte Count ($10^3/\text{mm}^3$)	12.98	9.68
Differential Leukocyte Count:		
a) Lymphocytes (%)	50	64
b) Monocytes (%)	5	4
c) Neutrophils (%)	34	25
d) Eosinophils (%)	10	6
e) Basophils (%)	1	1
Total Protein (g/dl)	6.5	8.0
Albumin (g/dl)	2.5	3.3
Globulin (g/dl)	3.9	4.6
Albumin Globulin Ratio (A:G)	0.64	0.72

TEC and Hb values were probably due to the decreased erythroid elements in blood (Vishe *et al.*, 2012). Lymphopenia was probably due to immunosuppression. Leukocytosis and neutrophilia were due to secondary bacterial infection. Eosinophilia noticed in present case might be linked to antigen-antibody interactions in tissues rich in mast cells, such as skin and as well as to protracted host-parasite reaction (Ramprabhu *et al.*, 2001). Additionally, the affected buffalo showed hypoproteinaemia and decrease in A:G ratio. This correlates with the observations of Randhawa *et al.* (1997) and Ramprabhu *et al.* (2001). Decrease in albumin represents decreased albumin synthesis. A possible cause for this could be the increased rate of acute phase proteins due to skin inflammation. The low level of protein could also be due to loss of serum proteins from the affected dermis (Ramprabhu *et al.*, 2001).

After treatment, the skin scrapings examination showed progressive decrease in the

number of mites found, but a few live mites were still present on day 7 prompting further two doses of Ivermectin. Meanwhile, antibiotic treatment with Enrofloxacin was continued daily for 5 days, as the bacteria were found highly susceptible to it in ABST. This brought about rapid clinical improvement. By day 21, no more live mites were observed in the skin scrapings. By day 28, the lesions had almost completely healed, hair had grown, and the skin became glossy and regained normal colour and texture. The haematological examination carried out on day 28 revealed remarkable improvements in all the parameters tested, almost returning to their normal physiological range. Similar results were obtained by other workers (El-Khodery *et al.*, 2009; Kotb and Abdel-Rady, 2011), who also found treatment of animal's environment with Deltamethrin as an adjunct to administration of Ivermectin to be the best protocol for eradication and prevention of re-infestation with mange mites in buffaloes.

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REFERENCES

- Afzal, M., A. Hussain, M.S. Mian, A. Muneer and A.R. Rizwi. 1995. Incidence of ectoparasites and its chemotherapy. *J. Anim. Health Prod.*, **5**: 146-149.
- Bates, P. 1999. Inter- and intra-specific variation within the genus *Psoroptes* (Acari: Psoroptidae). *Vet. Parasitol.*, **83**: 201-217.
- Bauer, A.W., W.M.M. Kirby, J.C. Sherris and M. Tarek. 1966. Antibiotic susceptibility testing by a standardized single disk method. *Am. J. Clin. Pathol.*, **45**(4): 493-496.
- Cowan, S.T. and K.J. Steel. 1965. *Manual for the Identification of Medical Bacteria*, 1st ed. Cambridge University Press, London. 217p.
- Dimri, U., R. Ranjan, S.K. Singh, M.C. Sharma, D. Swarup, P. Dwivedi, A.K. Sharma and M. Kataria. 2007. Clinico-pathological and haemato-biochemical changes in buffaloes with sarcoptic mange. *Indian J. Vet. Pathol.*, **31**: 160-162.
- El-Khodery, S.A., M. Ishii, S.A. Osman and M.H. Al-Gaabary. 2009. Comparative therapeutic effect of moxidectin, doramectin and ivermectin on psoroptes mites infestation in buffalo (*Bubalus bubalis*). *Trop. Anim. Health Prod.*, **41**(7): 1505-1511.
- Gill, B.S., J. Singh, B.S. Gill, A. Singh, S.S. Khehra, A. Rai and O. Hussain. 1989. Efficacy of ivermectin against mange and gastrointestinal nematodes of buffalo (*Bubalus bubalis*). *Vet. Parasitol.*, **31**: 141-147.
- Jabeen, F., N. Ahmed, M.A. Chaudhry and I. Javed. 1998. Epidemiology and treatment of sarcoptic mange in buffalo calves around Lahore. *Pak. V. J.*, **18**(1): 39-42.
- Jain, N.C. 1986. *Schalm's Veterinary Haematology*, 4th ed. Lea and Febiger, Philadelphia. 1221p.
- Kettle, D.S. 1995. *Medical and Veterinary Entomology*, 2nd ed. Cab International, Wallingford. 725p.
- Kotb, S. and A. Abdel-Rady. 2011. Epidemiological studies of Egyptian buffaloes mange with special reference to efficacy of different therapeutic trials for treatment of mange. *Ass. Univ. Bull. Environ. Res.*, **14**(1): 9-22.
- Radostits, O.M., C.C. Gay, K.W. Hinchcliff and P.D. Constable. 2007. *Veterinary Medicine: a Textbook of the Diseases of Cattle, Horses, Sheep, Pigs and Goats*, 10th ed. Saunders Elsevier, Philadelphia. 2156p.
- Ramprabhu, R.A., M. Subramanian, A.P. Nambi, S. Prathaban and P. Dhanapalan. 2001. Concurrent sarcoptic and psoroptic mange infestation in *Bubalus bubalis*. *Vet. Arhiv.*, **71**: 53-56.
- Randhawa, C.S., R.S. Brar, D.R. Sharma and S.S. Randhawa. 1997. Biochemical responses in mixed chronic psoroptic and sarcoptic mange of buffaloes (*Bubalus bubalis*). *Trop. Anim. Health Prod.*, **4**: 253-254.
- Schleifer, K.H. and W.E. Kloos. 1975. Isolation and characterization of staphylococci from human skin. I. Amended descriptions of *Staphylococcus epidermidis* and *Staphylococcus saprophyticus* and descriptions of three new species: *Staphylococcus cohnii*, *Staphylococcus haemolyticus*, and *Staphylococcus xylosus*.

- Int. J. Syst. Bacteriol.*, **25**: 50-61.
- Shanthkumar, G. and C. Suryanarayana. 1995. Clinicobiochemical and therapeutic studies on mange in buffalo calves. *Indian Vet. J.*, **72**: 77-79.
- Soulsby, E.J.L. 1982. *Helminths, Arthropods and Protozoa of Domesticated Animals*, 7th ed. Bailliere Tindall, London. 809p.
- Sreedevi, C., G.S.N. Murthy and N.L. Rani. 2010. Therapeutic management of *Psoroptes natalensis* in buffaloes (*Bubalus bubalis*). *Buffalo Bull.*, **29**(4): 304-307.
- Thaker, H.C., M.N. Brahmabhatt and J.B. Nayak. 2013. Isolation and identification of *Staphylococcus aureus* from milk and milk products and their drug resistance patterns in Anand, Gujarat. *Vet. World*, **6**(1): 10-13.
- Tikaram, S.M. and N.S. Ruprah. 1986. Incidence of sarcoptic mange in buffaloes in India. *Trop. Anim. Health Prod.*, **18**: 86-90.
- Vishe, H.P., K. Pawar, H.K. Gupta and G.S. Rao. 2012. Prevalence and hemato-biochemical studies in parasitic and non parasitic dermatological disorders in Surti buffalo and buffalo calves. *Vet. World*, **5**(4): 230-235.