INFECTIOUS BOVINE KERATOCONJUNCTIVITIS CAUSED BY *MORAXELLA BOVIS* IN WATER BUFFALOES

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ABSTRACT

The present paper reports some clinical and therapeutic observations in natural infection of bovine keratoconjunctivitis caused by *Moraxella bovis* in water buffaloes (n = 15). The disease has been sparsely reported in water buffaloes. Varying degree of conjunctival or corneal oedema, hyperemia, blepharospasm, serous to mucopurulent ocular discharge, whitish opacity of cornea and partial to complete blindness were common clinical presentations in the affected animals. The infection was confirmed by culture and isolation of the samples collected from middle canthus of the affected eyes. Therapeutic management of the disease with two different antimicrobial protocols *viz.* parenteral administration of long acting oxytetracycline or topical administration of triple antibiotic (neomycin, polymyxin and bacitracin zinc) ophthalmic ointment resulted in little success. There was uveitis or secondary glaucoma and resultant blindness in the unresponsive eyes.

Keywords: *Bubalus bubalis*, buffalo, pink eye, IBK, moraxellosis, tonometery

INTRODUCTION

Infectious bovine keratoconjunctivitis (pinkeye, moraxellosis, IBK) is an economically important highly contagious ocular disease of cattle caused by gram negative bacilli *Moraxella bovis* (*M. bovis*). Although, many bacteria including *Staphylococcus aureus* and *Escherichia coli* had been isolated from the adult buffaloes affected with infectious bovine keratoconjunctivitis, however, among all these bacteria associated with IBK only *M. bovis* fulfill the Koch's postulates for infectious bovine keratoconjunctivitis (Henson and Grumbles, 1960). Authors could find only one report of infectious bovine keratoconjunctivitis caused by *M. bovis* in water buffaloes by Sinha *et al.* (1979). Many bacterial pathogens like *Mycoplasma* sp., *Branhamella* sp., *Chlamydia* sp., *Staphylococcus aureus*, *E. coli* and *Streptococcus pyogenes* have been reported to aggravate the *M. bovis* infection.

The disease is a major cause of blindness in cattle and economic losses occur due to inappetance and poor weight gain in affected animals suffering from ocular pain and visual impairment. The disease occurs worldwide and spread of the disease is rapid with factors such as environment, season, concurrent pathogens, *M. bovis* strain and host immune system affecting its occurrence and

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clinical severity (Rajesh *et al*., 2009, Anyanwu *et al*., 2013). As per an estimate, IBK affected 50% of herds with 5% of animals in a herd suffering from the disease (Slatter *et al*., 1982), with an annual loss of US $170 million in USA in 1976 (Anon, 1976). Spread of the disease within a ruminant herd is by direct contact with infected materials or by indirect transmission of conjunctival exudates by flies (Ojo *et al*., 2009). Light coloured cattle and calves especially Hereford have been described to have higher incidence of the disease (Snowder *et al*., 2005) and there is a resistance in Brahamans and cattle with more pigmentation at ocular margin (Frisch, 1975). There is sufficient literature on moraxellosis in cattle, but the disease has been sparsely reported in water buffaloes. The present paper describes clinical and therapeutic aspects of the natural infection of the disease in water buffaloes.

MATERIALS AND METHODS

Case history and clinical observations

Two outbreaks of the disease were observed in two different dairy herds. In the first herd, 9 adult water buffaloes of Murrah breed (out of total 290 buffaloes and 180 cows of all ages kept in 10 sheds under semi-loose conditions) were reported with the history of epiphora, photophobia and loss of vision over a period of 5 to 7 days. Clinical examination revealed varying conjunctival or corneal oedema, hyperemia, blepharospasm, serous to mucopurulent ocular discharge, whitish opacity of cornea and partial to complete blindness in all the affected animals (Figure 1 to 5). There was involvement of both eyes in five buffaloes and of only one in four. Fifteen healthy and five affected buffaloes were subjected to the measurement of intraocular pressure (IOP) by indentation tonometry using tonopen. The second herd consisted of 56 buffaloes including adults, heifers and calves of all ages. Six buffaloes from this herd were reported with clinical signs of mild epiphora, conjunctival oedema and varying degree of corneal opacity. Three more buffaloes had complete corneal opacity in one eye and one in both eyes, and were the first to be affected during start of the outbreak around 40 days back. There was microphthalmia and complete loss of vision in the affected eyes in these four animals (Figure 6). The rectal temperature, heart rate, respiration rate, appetite, defecation and urination were normal in the affected animals of both the herds. For culture and isolation, the samples were collected using sterile swabs from the individual eyes targeting inner middle canthus and serous discharges. The samples were immediately subjected to isolation on blood agar (5%) and further biochemical analysis for confirmation of bacterium. Blood samples were collected by jugular venupuncture in EDTA and without anticoagulant for haemato-biochemical analysis. The affected buffaloes were randomly divided into two groups. Eleven buffaloes (Group I) were treated with the intramuscular administration of long acting oxytetracycline 20 mg/kg BW, deep IM, 2 injections at 48 to 72 h. interval and five buffaloes (Group II) were treated with the topical administration of triple antibiotic ointment containing 3.5 mg neomycin base, 10,000 IU polymyxin B units and 400 bacitracin units (qid for 7 days).

RESULTS AND DISCUSSION

Microbiological examination: After 2 days of incubation, pure growth of small white colonies were seen on the blood agar. The colonies were haemolytic as observed by clear zone of hemolysis. The colonies were subjected to gram staining and the bacteria were gram negative rods (paired). The bacterium was later inoculated onto McConkey's lactose agar but it didn't grow on it. Various biochemical tests for confirmation of the bacterium yielded oxidase and catalase positive but negative to nitrate reduction and urease test, and did not ferment carbohydrates (glucose, sucrose and lactose). Thus the bacterium was confirmed as *Moraxella bovis*. Several researchers had isolated *Staphylococcus* spp in sheep, *Staphylococcus aureus* and *Escherichia coli* in cattle calves and adult buffaloes affected with infectious bovine keratoconjunctivitis (Akerstedt and Hofshagem, 2004; Rajesh *et al*., 2009). However, among all these bacteria associated with IBK only *M. bovis* fulfill the Koch's postulates for infectious bovine keratoconjunctivitis (Henson and Grumbles, 1960). Authors could find only one report of infectious bovine keratoconjunctivitis caused by *M. bovis* in water buffaloes by Sinha *et al.* (1979).

The present outbreaks of the disease were reported in the summer month which was associated with increased ultraviolet (UV) radiation and increased fly population. Ultraviolet (UV) light is especially a problem for animals lacking pigmentation around their eyes. This lack of pigmentation allows increased UV radiation to sensitize the eye resulting in inflammation and subsequent infection. But in the dark pigmented water buffaloes in the present study, increased population of flies in summer seemed the major reason of spread of the disease. Flies not only serve as irritants as they feed on secretions from the eye but they also serve as a mean of transmitting microorganism from infected to non-infected animals (Alsaad *et al*., 2012).

The mean intraocular pressure measured in 15 healthy adult Murrah buffaloes was 18.0±4.2 mm Hg in left eye and 20.0±3.7 mm Hg in right eye. Among the five affected buffaloes studied for intraocular pressure (IOP), one buffalo was having the normal IOP (16.0 mm Hg in right eye and 27.0 mm Hg in the left eye). In two buffaloes, the IOP was increased in both the eyes (62.0 and 68.0 mm Hg in right eye, and 82.0 and 74.0 mm Hg in left eye) and two buffaloes were suffering from hypotony i.e. decreased IOP (12.0 and 11.0 mm Hg in right eye, and 6.0 and 8.0 mm Hg in left eye). Pamuk *et al.* (2011) studied IOP in healthy buffaloes and observed that the average IOP for the left eye was 22.1±2.7 mm Hg (16.5 to 27.3 mm Hg) and it was 22.1±2.7 mm Hg (16.1 to 27.0 mm Hg) for the right eye. Haemato-biochemical analysis revealed mild neutrophillic leucocytosis and increased activity of aspartate amino transferase. The concentrations of Hb, PCV, serum total bilirubin, alkaline phosphatase, total proteins, albumin, blood urea nitrogen and creatinine were normal in the affected animals.

Four buffaloes in Group I showed mild improvement with slight reduction in corneal opacity and partial restoration of vision. There was no recovery resulting in permanent blindness in other buffaloes from Group I and all the buffaloes in Group II, suggesting little effect of parentral long acting oxytetracycline but no effect of topical ophthalmic administration of triple antibiotics ointment for the cure of moraxellosis in water buffaloes. Treatment with two doses of long-acting oxytetracycline (20 mg/kg, IM 72 h apart) had been shown to ameliorate clinical signs of naturally occurring IBK through a reduction in *M. bovis* ocular infection. However, treatment failure may occur because of delayed therapeutic intervention or inappropriate route or frequency of antimicrobial

Figure 1. Scleral congestion in an acute pink eye caused by *M. bovis* in a water buffalo.

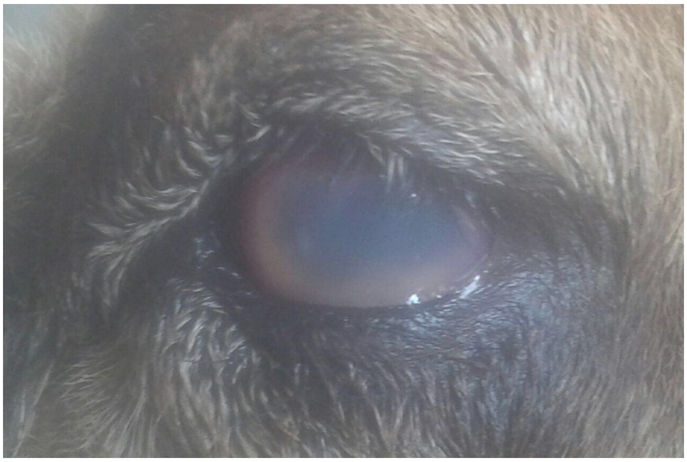

Figure 2. Cloudiness in cornea and conjunctiva in a water buffalo affected with pink eye caused by *M. bovis*.

Figure 3. Corneal opacity in a water buffalo affected with pink eye caused by *M. bovis*.

Figure 4. Corneal neovascularisation, opacity and ulceration in a water buffalo affected with pink eye caused by *M. bovis*.

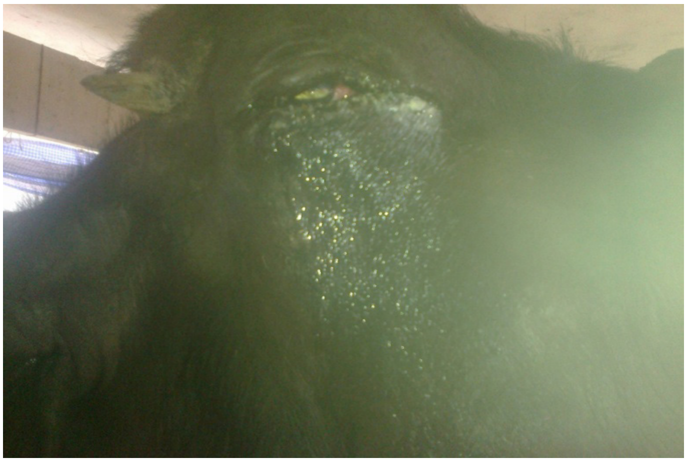

Figure 5. Epiphora, anophthalmia and uveitis in an unresponsive case of pink eye caused by *M. bovis* in a water buffalo.

Figure 6. Bilateral anophthalmia and blindness in an unresponsive case of pink eye caused by *M. bovis* in a water buffalo.

therapy (McConnel *et al*., 2007). Subconjunctival injection of penicillin or tetracyclines was reported to be effective in IBK but later causes necrosis at the injection site (Brown *et al*., 1998). A third eyelid prolapsed or partial tarsorrhaphy together with subconjunctival injection of antibiotics have been recommended in severely affected animals. But in these buffaloes the disease progressed to involve whole of eyes causing panophthalmitis and retraction of globe and hence unfavorable prognosis. The animals in which only cornea was involved however, responded to treatment to some extent with restoration of vision. Bovine cornea is known to possess amazing healing ability and affected animals retain some vision despite common sequel of IBK such as central nebula, macula or leukoma in recovered eyes (Divers and Peek, 2008). Frequent (four time) application of triple antibiotic was also ineffective. Topically applied aqueous antimicrobial suspensions have a short tear half-life and systemic antimicrobial therapy has been recommended as a means of targeting *M. bovis* located within lacrimal glands and nasal passages.

So, the infectious bovine keratoconjuctivitis is a serious ocular disease of water buffaloes similar to cattle. It starts as unilateral or bilateral inflammation of the cornea with moderate to severe hyperemia, epiphora, blepharospasm and photophobia. In advance stage, there is mucopurulent ocular discharge, corneal opacity, and panophthalmitis leading to uveitis or secondary glaucoma to permanent blindness. Therapeutic management of the advance disease cases with parenteral long acting oxyteteracycline has little success but the topical administration of triple antibiotics consisting of neomycin, polymyxin and bacitracin zinc ophthalmic ointment is an ineffective treatment of the disease.

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