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Infectious Bovine Keratoconjuctivitis (Pinkeye) Infection in a Dairy Cattle Herd in Kenya

Purity N. Nguhiu
Veterinary Doctor & Lecturer, Department of Animal Sciences, Kenyatta University, Kenya
Obed K. Tum
Undergraduate Student, Department of Animal Sciences, Kenyatta University, Kenya

Abstract:
Infectious bovine keratoconjuctivitis (IBK) or Pinkeye is a highly contagious, non-fatal eye disease of cattle worldwide but has marked economic impact due to production losses, rapid spread of the disease in a herd and treatment costs. A cross sectional study was done to determine the causes of pink eye infections in Ilulla dairy farm in Eldoret of Uasin Gishu County, Kenya from November 2015 to February 2016. Any cattle that showed signs of eye disease (lacrimation, photophobia and corneal opacity) were recruited for this study. A total of thirty heads of cattle that were positive on clinical examination of the affected eyes, were restrained in a crash and conjunctiva swabs were collected for bacteriological evaluation. Bacterial cultures were grown on blood agar media and colonial morphology recorded. Bacteria were identified after staining bacterial smears with Gram's stain. Antibiotic sensitivity tests were done for positive colonies. Moraxella bovis, a gram negative short rod which occurred in pairs or singly was confirmed in 33% of the ocular infections, other bacteria isolated included Staphylococcal aureus at 67% and Escherichia coli at 7% of the infections. Majority of the Moraxella infections were observed in calves 4 out of 8 (50%) and heifers 5 out of 14 (35.7%) while only 1 out of eight (12.5%) adults were infected. The infections were observed in Friesians, Ayrshires and Guernseys. The bacteria were sensitive to wide range of antibiotics tested but were resistant to sulphamethoxazole. Some of the risk factors observed included; high density of face flies, feeding of dry dusty hay and the long dry spell during the time of the study. The infected animals were treated using Ampliclox® and measures to control flies around the milking parlour were instituted.

Keywords*: Dairy Cattle, Kenya, Keratoconjuctivitis, pink eye, treatment*

1. Introduction

Infectious bovine keratoconjuctivitis (IBK) or Pinkeye is a highly contagious, non-fatal eye disease of cattle worldwide but has marked economic impact on the cattle industry. Ocular infections in cattle are usually acute and tend to spread rapidly. Pinkeye in cattle easily costs producers an average of $100 a head due to reduced weight gain, added treatment costs and discounts on sale day. University research has shown that pinkeye can reduce weaning weights in calves as much as 40 to 60 pounds (AG0066, 1998).

Morexiella bovis (*M. bovis)* is the primary infectious agent initiating pinkeye. Other microorganisms initiating pinkeye include *Chlamydia*, *Mycoplasma*, and *Acholeplasma*, or viruses such as the Infectious bovine rhinotracheitis virus (IBRV), which can either add to the severity of the disease process or may serve as predisposing factors permitting a secondary infection with *M. bovis* (Smith, 2002). Other predisposing factors are excessive ultraviolet light (sunlight), the face fly (*Musca autumnalis*), the housefly (*Musca domestica*), the stable fly (*Stomoxys calcitrans*), plant material, and dust (Smith, 2002). Ultraviolet (UV) light is especially a problem for cattle lacking pigmentation around the eye. Lack of pigmentation allows increased UV radiation to sensitize the eye, resulting in inflammation and subsequent infection (Radostits *et al*. 2000).

Most of the ocular infections are transmitted by flies, commonly the face fly (*Musca autumnalis*) but also by the housefly (*Musca domestica*), stable fly (*Stomoxys calcitrans*) and *Arcyophora longivalvis*, a moth that feeds on the ocular secretions of cattle (AG006, 1998) The disease is seen in both young and the adult animals. However, it is more common in beef breeds and is aggravated by grazing in tall grass, by a dry dusty environment and by the presence of the insect vectors (Carter *et al*., 1995). Young animals are affected frequently with one or both eyes affected (Radostits *et al*., 2000).

Several studies have shown that the economic impact of ocular infections can be significant due to decreased weight gain in young animals, reduced milk yield, cost of treatments and labor decreased value of calves as a result of disfigurement of the eyes and losses in slaughter cattle (Smith, 2002).

Disease outbreaks are common during the dry season due to presence of dust and other mechanical irritants. Other predisposing factors for the disease are; prolonged exposure to sunlight (ultra violet rays), concurrent infections, vitamin A deficiency and breed susceptibility has also been reported with *Bos indicus* being least susceptible (Coetzer and Tustin, 2004). Animals having pigmented skin around the eye are more resistant to infection (Coetzer and Tustin, 2004). Young animals are affected frequently with one or both eyes affected (Radostits *et al*, 2000).

Previously before this study, the herdsmen at Illula farm had reported an increase in the number of ocular infections, treated them with cloxacillin eye ointments and tetracycline powder with some success but resurge infections occurred at the onset of the drier period.

2. Materials and Methods

2.1. Area of Study

This study was done at Illula dairy farm, which is a privately-owned farm, in the outskirts of Eldoret town, Uasin Gishu County, Kenya. The farm lies at the coordinated of $0^{0}31^{1}$N, $35^{0}16$ E. It is in the highlands of Kenya at an altitude of 2073 M, average temperatures of low 16.9 ^{0}C and high of 23 ^{0}C. The area receives rainfall throughout the year with annual rainfall of 1100mm, peak months being April/ May and July/ August. The drier months with low rainfall are October to February. The area has 12 days and 12-night hours. The area is prime agricultural land with good soils to support pastures.

The farm is 400 acres and supports 150 adult cattle, 50 calves, mainly Friesians, Ayrshire and a few Guernsey and 100 Dorper sheep. The main economic activity is dairy production.

2.2. Study Animals

All the cattle that showed signs of eye disease (lacrimation, photophobia and corneal opacity) were recruited into the study and they totaled 25. They comprised of nineteen Friesians (4 adults, 8 heifers, 7 calves), three Ayrshires (2 adults, 1 heifer) and three Gurnsey (all heifers). The age classes were Adults > 24 months, Heifers >9 < 24 months and calves 1 to 8 months. Five Friesians (2 adults, 2 heifers and 1 calf) which had no clinical symptoms were also included as negative controls as they had no obvious symptoms of ocular infections. The animals had specific ear tag numbers and names. A total of thirty animals comprising of 8 adults, 14 heifers and 8 calves were selected.

2.3. Clinical Examination and Sample Collection

The ear tag number, name, breed and age of each of the study animals were recorded. The study animals were restrained in a crush for close clinical examination and collection of conjunctiva swabs bacteriological evaluation.

Samples from the conjunctiva of both eyes of each study animal were taken with sterile cotton swabs. Each swab was rolled in the eye for about 30 seconds for each of the eyes. Care was exercised to avoid injury to the animal's eye during sampling, and also contamination of the sample by the animal's skin. It was done carefully to avoid touching the eyeball and any other part of the animal with the swab. The swabs were placed into a sterile labeled tube corresponding to the ear tag numbers and transported with an hour to the laboratory for bacteriological analysis. A total of thirty samples were collected and submitted to the laboratory for microbial evaluation.

2.4. Bacteria Culture and Sensitivity Tests

Each sample was streaked onto plates with blood agar and incubated aerobically at 37°C for 24 hours. The colonial morphology was examined and described. Bacteria smears were made from individual colonies, stained with Gram stain for microscopic examination and identification of the bacterial organisms. Isolation and identification of *Morexiella bovis* were carried out according to previously described protocols [Holt, 1994].

Antibiotic sensitivity tests were done using Himedia KGL 2/4 octodisc impregnated with Ampicillin, Tetracycline, Streptomycin, Cotrimazole, Sulphamethazole, Kanamycin, Gentamycin, and Chloramphenicol and incubated at 37^{0}C for 24 hours.

3. Results

The study animals comprised of 8 calves, 14 heifers and 8 adults while the breeds represented were 23 Friesians, 4 Aryshires and 3 Guernsey.

The cattle with signs of ocular infection were in poor body condition, and were mostly yearling heifers. Most cases were unilateral, but bilateral eye infection was observed in one Ayrshire heifer. The signs noted were excessive lacrimation with matting of the facial hair, photophobia, with animals presenting with closing the affected eyes to avoid exposure to sunlight, reddening and swelling of the eyelids including the third eyelid (Figure 1).

Out of the 30 samples collected 10 (33%) were positive for *Moraxella bovis*, *Staphylococcus aureus* accounted for 18 samples (60%) while 2 samples (7%) were positive for *Escherichia coli*. Among the cases that were positive for *Moraxella*

bovis, 6 were heifers, 3 calves and 1 adult, and on breed distribution the infections were observed in 8 Friesians, 1 Ayrshire and 1 Guernsey. The prevalence of *Moraxella bovis* infections was recorded at 6% of the herd with majority of the infections occurring in heifers. No eye infections were observed in the dorper sheep in this farm.

The colonial characteristic of *Moraxella bovis* showed scanty growth on blood agar of small round whitish colonies (Figure 2).

Figure 1: Ayrshire cow swollen eyelids, lacrimation and matting of facial hairs

Figure 2: Colonial characteristics of Moraxella bovis on blood agar from eye infections of dairy cattle in Eldoret, Kenya

On microscopic evaluation, the organisms occurred in pairs and were gram negative bacteria.

The isolated organisms were sensitive to most of the antibiotics used, with largest zone of inhibition with ampicillin and Sulphamethazole having no effect (Figure 3).

Figure 3: Antimicrobial sensitivity test for the Moraxella bovis eye infections of dairy cattle in Eldoret, Kenya

High percentages of the cattle with signs of ocular infection were in poor body condition, and were mostly yearling heifers. Most cases were unilateral, but few animals with bilateral eye infections were present and were walking by making careful steps to avoid hitting objects this was witnessed mainly in heifer Ayrshire. Other signs noted were lacrimation leading to matting of the facial hair, many flies were seen around the eyes and the entire face feeding on the tears, photophobia presenting with animals were seen closing the affected eyes to avoid exposure to sunlight and corneal ulceration in some animals (Figure 1).

The common clinical findings in cases of ocular infections were; photophobia, blepharospasms and epiphora; later the ocular discharge which may become mucopurulent, opaque areas in the center of the cornea appears in about two days, and by day six the entire cornea will have a gray-white to yellow color with deep central ulceration of the cornea. Some of the animals were blind either unilateral or bilaterally.

4.Discussion

Most of the animals affected were heifers (46%) followed by calves (26%) a few adults were affected. Other findings included low weight gain in young animals and reduced milk yield in adults which has leads to high economic loss as well as treatment cost. These findings are similar to studies in Australia in beef cattle (Champness, 2008; Snowden *et al*., 2005).

The high prevalence of face flies (*Musca autumnalis*) suggested them as the main predisposing factors of this disease which is in agreement with the work of authors (Cheng, 1967). Other predisposing factors that are also found in this study included tall grasses which could cause irritation of the eyes and feeding of dry hay.

Ocular infections in Illula Dairy farm Eldoret lead to losses associated with decreased weight gain in young animals, reduced milk yield, costs of treatment and labor, with culling of most of the cattle. The treated animals recovered within three to five weeks, with only a few affected eyes having a persistent white scar on the cornea as reported by other authors (Coetzer and Tustin, 2004). In this study, though similar findings were reported, none of the cases developed the severe forms of the disease. This may be attributed to the prompt treatment of most cases due the presence of veterinarians and experienced herdsmen who reported most cases early. Most cases of eye infections have been reported in younger cattle**.** In this study, most cases of eye infections were in yearling heifers which were in agreement with the previous reports on this condition (Champness, 2008). This may be due to the low immunity in younger cattle since they are naïve.

The Staphylococcus aureus and *Escherichia coli* that are identified in this study were considered as commensal hence not cause of the eye infections observed.

In conclusion, *Moraxella bovis* were the only infectious agents isolated from eye infections in these cattle therefore it was the cause of this disease and occurrence of face flies was the main predisposing factor. The authors recommended prompt treatment of eye infections and control of flies particularly in the calf pens and milking parlour.

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