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Eye infections in farmed Ostriches (*Struthio camelus*) on selected farms in Gaborone and Lobatse districts, Botswana

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ABSTRACT

A study to investigate an outbreak of keratoconjunctivitis among grower ostriches (*Struthio camelus)* was undertaken on two farms in Lobatse and Gaborone districts, Botswana. Thirty ostriches (34.1%) showed signs of unilateral keratoconjunctivitis and yielded 8 different species of bacteria. A preponderance of non-conventional causal species of bacteria was recovered from this condition. The bacterium, *Staphylococcus aureus* accounted for 24.1% of the total number of isolates followed by *Aeromonas hydrophila* and *Staph. hyicus,* each contributing 12. 1 %. Branhamella species, the conventional causal bacterium of ophthalmia or keratitis in the mammalian species accounted for only 3.4%. The left eye was more commonly affected than the right. Most of the cases were in September when it was dusty and windy. Most bacterial isolates were responsive to tetracycline both *in vitro* using antimicrobial impregnated discs and also *in vivo* subsequent to therapeutic intervention. Administration of an oil based topical preparation of tetracycline resulted in amelioration of clinical signs of keratoconjunctivitis among affected ostriches.

Keywords: Eye infections, farmed ostriches, *Staphylococcus aureus,* tetracycline effective

INTRODUCTION

Characteristically, the ostrich *(Struthio camelus)* has long eyelashes and a nictitating membrane or third eyelid, which covers the entire eyeball. The species name "*camelus*" refers to the similarity between the ostrich and camel as exemplified by the brown prominent eyes, eye lids, thick eye lashes, large size body and remarkable tolerance to an arid environment (Hallam, 1992; Huchzermeyer, 1994). The ostrich is endowed with such a keen eyesight that it can see as far as 12 kilometres away (Huchzermeyer, 1994). This indispensable eyesight ensures survivability not only in the wild but also under domestication. The authors noted that keratoconjucitivitis in this species results in loss of appetite and distress, which may result in, reduced growth rate and subsequent depreciation of the market value of affected birds. Reports on eye affections in ostriches namely, congenital anomalies, traumatic injuries, myiasis and infection are scanty. Similarly, there is a dearth of knowledge on therapeutic intervention in cases of keratoconjunctivitis in the ostrich.

The main purpose of this study was to investigate outbreaks of keratoconjunctivitis in grower ostriches on two farms in Lobatse and Gaborone districts. Attempts were made to determine the aetiology, inciting factors,

pathogenesis and epidemiology of these infections using other avian species as models. Antibiograms of the bacterial isolates and their clinical applications was also briefly discussed.

MATERIALS AND METHODS

Between January and September, 2000, 88 farmed grower ostriches (*Struthio camelus)* kept on two ostrich farms in Lobatse and Gaborone districts were subjected to a clinical physical examination. These ostriches weighed between 20-90kg body weight and aged between 3-12 months. Ostriches on both farms were housed in fenced pens, which had been de-stumped and cleared of long stalks, stones and grasses. The grass cover was maintained below eye level. The ostriches were fed *ad libitum* on a commercial feed ration. The feed contained the following constituents: plant protein (cotton seed cake), 15.4% crude fibre, 12.0%, calcium, 1.7%, phosphorus, 1.0% magnesium, 0.48%, manganese, 360mg/kg, zinc, 175mg/kg. The birds were also given finely chopped Lucerne in addition to the concentrates. Water was given *a d libitum.*

Clinical examination of the eyes and the general body condition was done by restraining the younger birds on a table. The heavier birds were restrained in a V-shaped crush prior to swabbing the eyes, encrustations and discharges around the eyes were cleared using a sterile paper towel soaked in sterile physiological saline. Sterile cotton swabs were used in duplicate to swab the affected eyes. Soon after collection, one batch of swabs were inserted into semi-solid transport medium and stored at $+4^0$ C overnight before bacterial culture, while the other batch was each put in a sterile bijou bottle containing sterile phosphate buffered saline (PBS). Dry sterile cotton swabs were used to collect corneal and conjunctival scrapings, which were then smeared, on clean microscope slides. The smears thus prepared were then air-dried and transported to the laboratory in dust free slide boxes.

Thereafter, the eye swabs were cultured both aerobically and anaerobically on blood agar, MacConkey at 37 ^{0}C, for 24 hours. Some material from the swabs was plated on special fungal medium, Sabouraud dextrose agar and *Mycoplasma* isolation medium (PPLO; Oxoid) for about 1 week at 37 ^{0} C. Characterization of the colonies based on morphology and appearance was carried out as described before (Buchanan and Gibbons, 1974).

Analytical profile indices (API) used as an adjunct to bacterial identification was carried out as described by the manufacturer of the kits (Bio-Merieaux, Lyon, France). The coagulase, oxidase and catalase tests were conducted on selected colonies using conventional methods (Quinn et al., 1998). Similarly, antibiotic sensitivity of each bacteria was carried out using standard technique as previously described (Quinn et al., 1998). Staining for Chlamydia species was carried out as described previously using a modified Ziehl-Nielsen technique (Quinn et al., 1998).

RESULTS

Epiphora, photophobia, serous and later mucopurulent discharge obstructing eyes and nostrils were among the most consistent clinical signs manifested by ostriches affected by keratoconjunctivitis. The feathers around the eyes were wet and matted by the discharges. Subsequent encrustation of the discharges and corneal opacity with unthriftness and listlessness were a

common sequelae to inanition in chronic varying degrees of anorexia. However, amaurosis was not a feature. Unilateral keratoconjunctivitis especially in the left eye, was more common than the bilateral form. Whereas 45 left eyes were affected only 10 right eyes were involved and in 3 birds both eyes were affected. Gross ophthalmoscopic examination did not reveal the presence of foreign bodies in the eyes.

Table 1. Bacteria isolated from healthy eyes (normal flora)

Bacteria Isolated	Numberof Swabs	Percent (%)
Micrococcus species	7	23.3
Staphylococcus lentus	6	20.0
S. homonis	3	10.0
S. scuiri	3	10.0
S. capitis	2	6.7
S. simulans	1	3.3
S. epidermidis	1	3.3
S. chromogenes	1	3.3
No growth	6	20.0
Total	30	100

Cases of eye infections occurred during the months of July, August and September. During this time of the year the ground was bare, that is, there was no vegetation covering the ground. At the same time the wind was blowing and dust was blown into the eyes of the ostriches. When eye swabs from normal healthy eyes were cultured from 30 birds, 24 bacteria were isolated. Micrococcus species and *Staphylococcus lentus* were the common isolates accounting for 23.3% and 20.0% respectively (Table 1). These isolates were considered non-pathogenic for they cases. Acutely affected birds showed were coagulase-negative. There was no growth from 6 eye swabs. *Staphylococcus aureus* was the most common bacterium isolated from infected ostrich eyes accounting for 24.1% of cases. Other bacteria isolated from infected eyes included *Aeromonas hydrophilia* and *Staphylococcus hyicus* at 12.1%.

When all the bacteria isolated from normal and infected eyes are considered together Staphylococcus genus was the most common bacteria isolated from ostrich eyes and accounted for 70.75% followed by Micrococcus and Aeromonas species at 8.5%. Eye infections were the only infectious disease observed in the grower ostriches at this time. Neither Chlamydia, nor Mycoplasma organisms could be demonstrated in the ocular secretions and conjunctival scrapings. No pathogenic fungi were cultured from eye swabs using selective medium Sabouraud dextrose agar (SDA). When six antibiotics were tested for antibiotic sensitivity, tetracycline was the most effective antibiotic (Figure 1). Tetracycline was effective against all the isolates tested whereas Erythromycin was sensitive to 61% of the isolates. irritation caused by dust from these feeds and litter appeared to be one of the obvious causes of mechanical conjunctivitis. Exacerbation of this condition by the presence of bacterial pathogens may develop into a keratitis or even abcessation of the cornea. However, none of the ostriches examined in this study were blind.

Other potential inciting factors implicated in the pathogenesis of the keratoconjunctivitis in some species include face flies, ultra violet rays among others

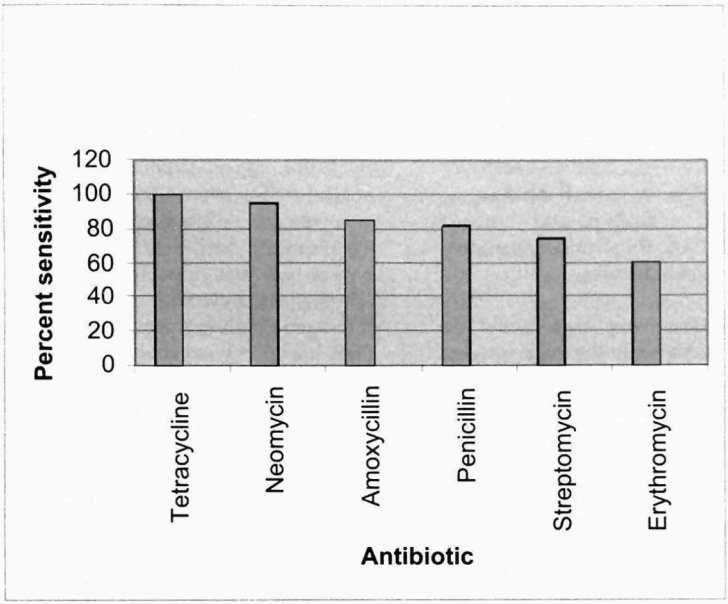

Figure 1 Antibiotic sensitivity of *Staphylococcus aureus* isolates (n=25)

However, there was no conclusive evidence of their involvement in the present study. In the literature, a plethora of bacteria have been associated with avian eye infections resulting in epiphora, half closed oedematous eyes and the third eyelid may be half across the eye (Hallam, 1992). In the present study, there was a possibility of mechanical irritation from dust and plant stalks in the field although the grass was periodically cut to prevent this problem. Powdery feed is a potential eye irritant resulting in epiphora.

The hypothesis of mechanical irritation of the eyes by dust was further supported by the high prevalence of keratoconjunctivitis during the windy and dusty months of the year from July to September before the onset of the summer rains The high morbidity of the condition among these ostriches was suggestive of the contagious nature of the condition. Of the bacterial flora recovered from healthy and apparently inflamed eyes, the commonest was *Staphylococcus aureus*. Isolation of a coagulase positive *Staph. aureus* only from cases of keratoconjunctivitis confirms a causal role. However, absence of *Staph. aureus* from apparently healthy eyes may support the causal aetiology. The rest of the bacterial flora namely *Staph lentus, Staph. hyicus,* Micrococcus spp and *A. hydrophila* were considered to be opportunists or commensals. The more conventional causal organisms of keratoconjuctivitis in birds have been cited to include:

Mycoplasma gallisepticum(Kern et al., 1996., McMartin et al., 1996; Nunoya et al., 1995); *M. sturni*; *Escherichia coli*; Bordetella species (Quinn et al., 1998); and *Chlamydia psittaci* (Dean et al., 1995). In the present study, neither Mycoplasma species nor *C. psittaci* were demonstrated in the ocular discharges, conjunctival scrapings and corneal impression smears from apparently healthy and inflamed eyes.

Other infectious causes of keratoconjunctivitis in the avian species cited in the literature included *Aspergillus fumigatus*, which was traced to contaminated feed (Hallam, 1992). No pathogenic fungus was isolated from the ocular material in the present study. Avian parasitic conjunctivitis has been associated with the eye nematodes *Oxyspirura mansoni* and *Thelazia* species (Kern et al., 1996). In the present investigation, ophthalmological examination revealed neither the presence of parasites nor congenital eye anomalies, which are known to cause blindness in ostriches (Ofri and Horowitz, 1995).

Therapeutic intervention with a topical tetracycline ointment to the affected eyes resulted in ameriolation of the signs of keratoconjunctivitis, which simulated *in vitro* response seen in the antibiogram. This further confirmed the infectious nature of the aetiological agent. Chemoprophylactic tetracycline intervention during the dusty months, thick but short grass cover in the pens to reduce the amount of dust, housing affected ostriches in shaded pens to cut off UV light would be worthwhile recommendations to prevent progression to corneal opacity and eventual blindness.

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