UNIVERSITY OF NAIROBI

COLLEGE OF AGRICULTURE AND VETERINARY SCIENCES

FACULTY OF VETERINARY MEDICINE

DEPARTMENT OF CLINICAL STUDIES

Project Report

CAUSES OF OCULAR INFECTIONS AT THE VETERINARY SCHOOL FARM-KANYARIRI

A project report submitted in partial fulfillment of requirements for the award of a Bachelor of Veterinary Medicine degree of The University of Nairobi.

INVESTIGATOR;

KIBIWOT GODFREY- J30/2030/2010

DECLARATION

I hereby declare that this project is my original work and has not been presented for award of Bachelor's degree in any university.

KIBIWOT GODFREY- J30/2030/2010

Bachelor of Veterinary Medicine

University of Nairobi

SIGN_________________________ DATE____________________________

This project has been presented with my approval as the supervisor.

DR. T.O. ABUOM. (Clinical Studies Department, Faculty of Veterinary Medicine: The University of Nairobi).

SIGN_________________________ DATE____________________________

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DEDICATION

To my mother Mary Biwott and my brother Patrick for their overwhelming support throughout my University studies.

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ABSTRACT

A cross sectional study was done to determine the causes of eye infections in a dairy cattle herd. Any cattle showing signs of eye disease (lacrimation, photophobia and corneal opacity) were recruited into the study. They were identified by their ear tag numbers, ages, breed and season when they were affected (Appendix 1). The individual case histories were also collected. Selected animals were manually restrained in a crush and a sisal rope halter used to restrain the head for proper examination of the affected eyes. Information on the findings on the eyelids, conjuctivae, and cornea were recorded on a record sheet (Appendix 1).Ocular swabs for bacteriology were taken to confirm the diagnosis. The swabs were taken from the cornea and conjunctiva (preferably from early untreated cases) by gently rolling a sterile swab under the lower eyelid to recover the lacrimal fluid, 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 tube which were labeled with the ear tag number of the animal and submitted to the laboratory for analysis. Thirty samples were taken, 28 from clinically ill animals and 2 from the apparently healthy animals.

Each sample was cultured by streaking on standard media ie. blood agar and MacConkey agar at 37^{O}C for 24 hours. Caution was observed to avoid contamination. The colonial morphology was examined, and subculture on selective media was done where necessary. Gram staining was done to identify the organisms microscopically (Carter et al, 1995). Biochemical tests such as urea, citrate, glucose, catalase and gelatin digestion were also carried out (Carter et al, 1995).

Following the laboratory results *Moraxella bovis* was confirmed to be the causative agent of the ocular infections at the farm with prevalence of 53%. The high prevalence rate was attributed to the high number of flies and the dry season when the study was conducted.

1.0 INTRODUCTION

Ocular infections in cattle are usually acute and tend to spread rapidly, young animals are affected frequently with one or both eyes affected (Smith,2002). 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, costs of treatment and labor, decreased value of calves and reduced value of purebred cattle as result of disfigurement of eyes or losses in the slaughter of culled cattle (Smith, 2002). Ocular infections are common during the dry months because of the dust, presence of vectors and other mechanical irritants (Smith, 2002).

Clinically healthy carrier animals harbor the organisms in the eyes and play an important role in maintaining the infection. They may also be responsible in introducing the disease into previously clean herds (Coetzer *et al* 2004) Transmission may either be direct, by means of droplet infection from oculonasal secretion or indirect by insect carriers e.g. house flies (*Musca domestica*), face fly(*Musca autumnalis*) and stable fly (*Stomoxys calcitrans*) and *Arcyophora longivalvis*, a moth that feeds on the ocular secretions of cattle (Carter *et al*.,1995). The earliest clinical signs of ocular infections in cattle are photophobia, blepharospasms and epiphora; later the ocular discharge may become mucopurulent and corneal opacity develops. Chronic cases develop corneal ulcers. Relapse may occur at any stage of recovery (Coetzer *et al*, 2004).

1.1 Justification of the study

Eye infections are a major problem at the farm that has impacted negatively on the production hence the need for this study to determine the specific aetiological agent(s) and the drugs which they are sensitive to.

1.2 Objectives

1.2.1General objective

To determine the causes of ocular infections at the vet farm

1.2.2Specific objectives

1. To determine the etiological agent of ocular infections at the vet farm
2. To establish the predisposing factors

1.3 Problem statement

There is an increased case of eye infections at the veterinary faculty farm which is highly contagious. This has impacted negatively in the farm productivity due to the cost of treatment and reduced weight gain in the young animals.

2.0 LITERATURE REVIEW

Ocular infections in cattle are usually acute and tend to spread rapidly. Young animals are affected frequently with one or both eyes affected (Radostits *et al*, 2000). Several aetiological agents are known to cause ocular infections, they include: *Listeria monocytogenes,* Infectious bovine rhinotracheitis virus, *Mycoplasma bovoculi, Moraxella bovis, Ureaplasma spp, Haemophilus somnus,* Bovine viral diarrhea virus, *Chlamydophila pecorum, Thelazia lacrymalis,* Parainfluenza virus and adenoviruses (Smith, 2002)

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 (Carter *et al.*, 1995). 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).

Clinically healthy carrier animals harbor the organisms in the ocular structures and play an important role in maintaining the infection. They may be responsible in introducing the disease into previously clean herds (Smith, 2002). The 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)

Several studies have shown that the economic impact of ocular infections can be significant because of decreased weight gain in young animals, reduced milk yield, costs of treatment and labor, decreased value of calves and reduced value of purebred cattle as result of disfigurement of eyes or losses in the slaughter of cattle (Smith, 2002)

2.1 Infectious bovine keratoconjuctivitis/pink eye (*Moraxella bovis*)

Pinkeye is a highly contagious, infectious bacterial disease of the eye of cattle caused by *Moraxella bovis* (*M. bovis*). It has a worldwide distribution. Although pinkeye is non-fatal, it has a marked economic impact on the cattle industry. Costs resulting from decreased weight gain, milk production, and treatment were estimated to be $150 million in the U.S. alone, according to a 1993 study (NAHMS, 1993) . Pinkeye (1.1 percent infection rate) was second to scours and diarrhea (1.7 percent infection rate) as the most prevalent condition affecting 1996 born unweaned calves over three weeks old (NAHMS, 1993)

2.1.1 Aetiology

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*. Other predisposing factors are excessive ultraviolet light (sunlight), the face fly (*Musca autumnalis*), the house fly (*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).

Flies not only serve as irritants as they feed on secretions from the eye, but they also serve as a means of transmitting *M. bovis* from infected to non-infected animals. Face flies can remain infected with *M. bovis* up to three days following feeding on infected material. Under experimental conditions, disease transmission is uncommon without the presence of face flies and is common with flies present. (Coetzer and Tustin, 2004)

Cool and warm season grasses, hybrid Sudan grass, and other forage sorghums, weeds, and brush produce air-borne irritants, pollen, and chaff, as well as serve as mechanical irritants. When animals eat out the middle of round bales, leaving a hay shelf over their heads, the incidence of foreign body irritation is greatly increased. The same situation occurs when hay is fed in overhead feeders. This is especially true with wheat hay or hay containing cheat grass (Scott, 2011).

Dust is more of a problem in confined feeding operations and is of minimal importance compared to UV radiation, flies, and plant material.

2.1.2 Transmission

Transmission of *M. bovis* occurs through direct contact, flies, and inanimate objects. The organism is located in the eyes and nasal cavities of infected cattle. Infected secretions from these areas are a source of infection for other cattle (Radostis *et* al., 2000). Infected, asymptomatic cattle may serve as carriers, and will harbor *M. bovis* in their nasal cavities for a period that may exceed one year. These carrier animals allow for the persistence of pinkeye at a particular site from year to year (Smith, 2002). Ultraviolet radiation, face flies, growing plants, and pollen production are at their peak in the dry months, and account for the high incidence of pinkeye during this period. (Coetzer and Tustin, 2004)

2.1.3 Clinical signs

Pinkeye most commonly occurs in the dry months and younger cattle are more susceptible to the disease because older animals have most likely developed acquired surface immunity (protective antibodies on the eye surface) as a result of previous exposure (Coetzer and Tustin, 2004). The prevalence and severity of pinkeye on a particular site may vary from year to year and, this is dependent on multiple factors. Infection rates can range from a few cases up to 80 percent of the herd at the peak of infection rate, usually the third or fourth week of an outbreak. The incubation period is usually two to three days, and in experimental trials has extended to three weeks. Swelling and redness of the conjunctiva, excessive tearing, and squinting are the initial clinical signs. Cattle have a decreased appetite due to the excessive pain, and a moderate body temperature elevation. A small center of the cornea 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. Severe ulceration and corneal rupture with loss of eye contents, cone-shaped bulging of the eye and blindness are infrequent outcomes of pinkeye. More often, complete recovery occurs in three to five weeks, with only a few affected eyes having a persistent white scar on the cornea (Coetzer and Tustin, 2004).

2.1.4 Treatment

According to antimicrobial sensitivity studies, *M. bovis* is most often susceptible to oxytetracycline, ceftiofur, penicillin, and sulfonamides. It must be remembered these sensitivity patterns can and do change, making it necessary to sample a representative number of infected cattle in the herd to determine proper drug usage (Smith, 2002).

Long-acting oxytetracycline has shown to be an effective treatment in calves when used early in the disease process. Long-acting oxytetracycline has been shown to clear *M. bovis* from the infected eye within 24 hours of the first injection, thereby eliminating the treated animal as a source of infection for other non-infected animals. Penicillin injected subconjunctivally has had similar healing rates as long-acting oxytetracycline injected intramuscularly, but is more labor intensive.

A combination of intramuscular long-acting oxytetracycline, followed by feeding two grams per head per day oxytetracycline in alfalfa pellets, was reported effective in reducing the severity of naturally occurring outbreaks of pinkeye in six-month-old Hereford calves (NAHMS, 1993) In addition, calves receiving the oxytetracycline combination required fewer additional treatments than did calves treated with only subconjunctival procaine penicillin. Other microbial products are used topically in the eye, but due to excessive tearing; their effectiveness is short lived and requires repeated treatments (Smith, 2002). When severe corneal ulceration exists, it is important to protect the eye from UV light, flies, and other irritants through the use of eye patches, suturing the eyelids, or creating a third eyelid flap (NAHMS, 1993).

2.1.5 Prevention

Like many diseases, management is often the most effective and economical method of disease control. When environmental conditions, animal nutrition, and herd immunity are properly managed, animal health increases and disease frequency decreases. A decline in disease frequency results in a decrease in concentration of infective organisms on the premises; thus, a further decrease in disease frequency occurs (Scott, 2011). Fly control through insecticide fly tags, sprays, charged backrubbers, and dusts bags are products that can provide chemical control. Manure, weed, and brush management are necessary for total fly control. Grass, weed, and brush control by proper grazing management, brush beating, mowing, and spraying, minimize pollen and mechanical irritation (Scott, 2011).

Hay and/or feed bunk management by lowering overhead hay feeders, spread hay out, and not feeding hay containing mature seed heads or cheat grass in overhead feeders or in round bales, increase bunk space to decrease direct contact. The effect of ultraviolet light (sun light) can be controlled breed selection for eyelid pigmentation and providing shade or tree rows with ample room to prevent overcrowding (Coetzer and Tustin, 2004)

Proper immunization against pink eye and viral diseases (IBR and BVD) as well as isolation infected animals, and decreasing environmental and nutritional distress can help to reduce the occurrence of the disease (Smith, 2002).

2.1 Bovine mycoplasmal conjuctivitis

Mycoplasma bovocoli and *Ureaplasma* spp have been isolated from cattle which have conjunctivitis and infectious bovine keratoconjunctivitis (Smith, 2002). Innoculation of normal calves with *Mycoplasma bovocoli* or *Ureaplasma* spp isolates produced conjunctivitis characterized by serous discharge and localized to diffuse conjunctival hyperemia (Smith, 2002) experimentally induced conjunctivitis ran a course of one month. Suspected cases should be cultured using swabs moistened with *Mycoplasma* broth. *Mycoplasma* may also predispose animals to *Moraxella* infections. Although treatment of mycoplasmal conjunctivitis per se may not be warranted it may be advisable in areas where infectious keratoconjuctivitis is endemic. Topical oxytetracycline ointment is applied three times daily or intramuscular injection of long acting oxytetraxycline is recommended (Smith, 2002).

3.0 MATERIALS AND METHODS

3.1 Area of study

This research was done at Kanyariri veterinary farm which is located on a 375 acre piece of land in Kanyariri village. It is 4km to the west of Upper Kabete campus and 19km from Nairobi city astride the Fort Smith road. It is within the outskirts of Nairobi city Kenya, 1.23◦S, 36.7◦E, in Kiambu County. The time of sunshine is at 0612H and sunset at 1823h and latitude 1.23◦, longitude 36.7◦, temperature of 23◦.The farm keeps a herd of dairy cattle, a flock of dorper sheep, a piggery unit and a layer poultry unit. The farm is used as a teaching farm

3.2 Data collection

Any cattle showing signs of eye disease (lacrimation, photophobia and corneal opacity) were recruited into the study. They were identified by their ages, breed and season when they were affected (Appendix 1). The individual case histories were also collected. Selected animals were manually restrained in a crush and a sisal rope halter used to restrain the head for proper examination of the affected eyes. Information on the findings on the eyelids, conjuctivae, and cornea were recorded on a record sheet (Appendix 1).

3.3 Sample collection and culture

Ocular swabs for bacteriology were taken to confirm the diagnosis. Ocular swabs were taken from the cornea and conjunctiva (preferably from early untreated cases) by gently rolling a sterile swab under the lower eyelid to recover the lacrimal fluid, 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 tube which were labeled with the ear tag number of the animal and submitted to the laboratory for analysis. Thirty samples were taken, 28 from clinically ill animals and 2 from the apparently healthy animals.

Each sample was cultured by streaking on standard media ie. blood agar and MacConkey agar at $37^{O}C$ for 24 hours. Caution was observed to avoid contamination. The colonial morphology was examined, and subculture on selective media such as was done where necessary. Gram staining was done to identify the organisms microscopically (Carter et al, 1995). Biochemical tests such as urea, citrate, glucose, catalase and gelatin were also carried out (Carter et al, 1995).

3.4 Data entry and analysis

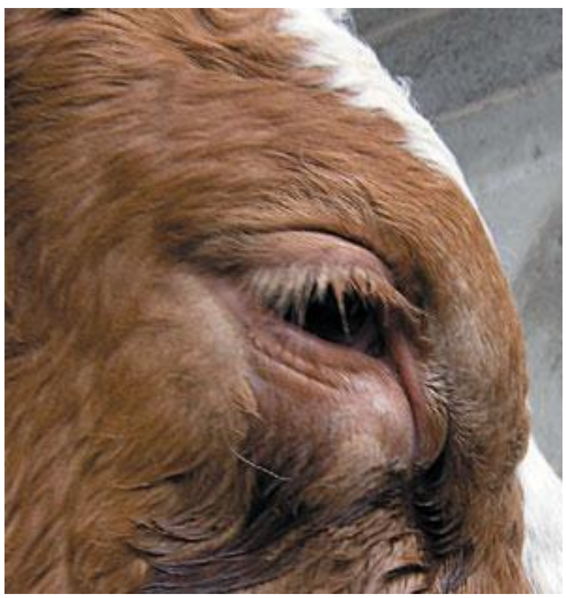
Descriptive statistics was calculated was done using Microsoft Office Excel ® 2010 (Microsoft corporation, NC, USA) to get the percentage prevalence rate.

4.0 RESULTS

4.1 Clinical findings

A high percentage 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. 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)

Figure 1. Photo of an Ayrshire yearling heifer with signs of lacrimation and swelling of the eyelids.



4.2 Microbiological findings

Out of the 30 samples collected 16 (53%) were positive for *Moraxella bovis*. *Staphylococcus aureus* accounted for 12 samples (40%) while 2 samples (7%) had no growth.

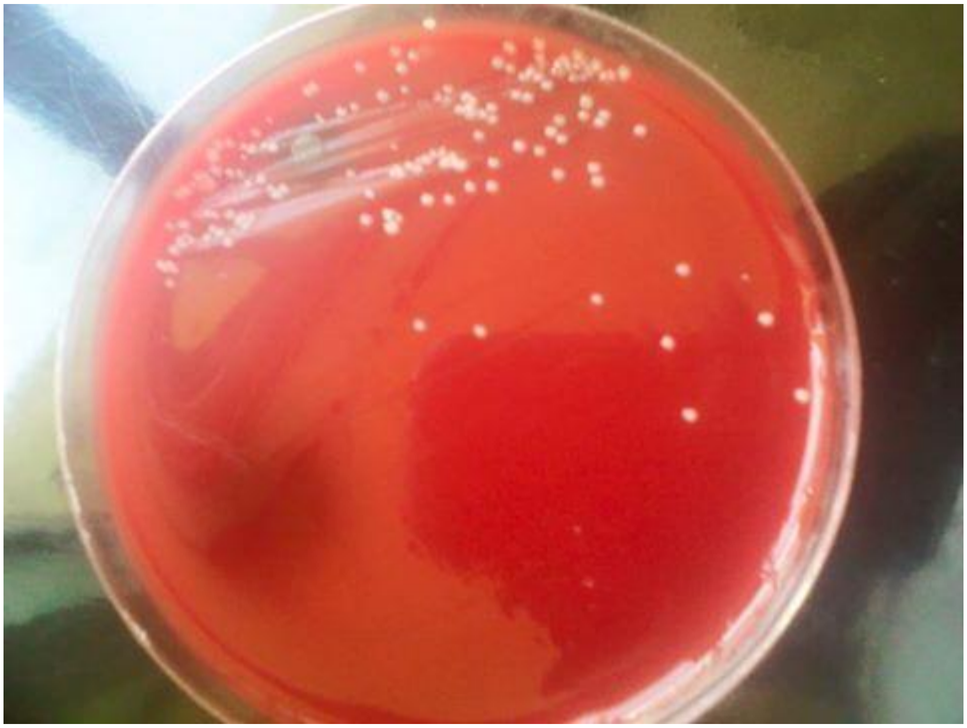


Figure 2: colonial morphology of *Moraxella bovis.*

5.0 DISCUSSION

Eye infections are important in cattle because they lead to losses associated with decreased weight gain in young animals, reduced milk yield, costs of treatment and labor, decreased value of calves and reduced value of purebred cattle as result of disfigurement of eyes or losses in the slaughter of culled cattle (Smith, 2002). Similar losses were reported in this study. The common clinical findings in cases of ocular infections are; photophobia, blepharospasms and epiphora; later the ocular discharge may becomse mucopurulent, opaque areas in thecenter 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. Severe ulceration and corneal rupture with loss of eye contents, cone-shaped bulging of the eye, and blindness are infrequent outcomes of pinkeye. More often, complete recovery occurs in three to five weeks, with only a few affected eyes having a persistent white scar on the cornea.(Coetzer and Tustin, 2004)This study has reported similar findings however none developed the severe forms of the disease.this may be due to the prompt treatment of most cases due the prescence of veterinarians and experienced herdsmen who reported most cases early.

Most cases of eye infections have been reported in younger cattle (Smith, 2002) **.** In this study, most cases of eye infections were in yearling heifers which is in agreement with the previous reports on this condition. This may be due to the low immunity in younger cattle since they are naïve (Smith, 2002).

Infectious agents commonly isolated from eye infections in cattle include, *Moraxella bovis Listeria monocytogenes,* Infectious bovine rhinotracheitis virus, *Mycoplasma bovoculi,Ureaplasma spp, Haemophilus somnus,* Bovine viral diarrhea virus, *Chlamydophila pecorum, Thelazia lacrymalis,* Parainfluenza virus and adenoviruses (Smith, 2002). *Moraxella bovis* was the most common organism isolated from clinical cases at the Vet. Farm accounting for 53% of the cases.

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

The following conclusions can be drawn from this study;

- The causative agent of the ocular infections at The University Of Nairobi veterinary faculty farm-Kanyariri is the bacteria *Moraxella bovis*
- The prevalence of the disease is higher in the young animals compared to the adults
- That the prevalence is high during the dry periods i.e. between December and February
- That the economic impact of ocular infections can be significant because of decreased weight gain in young animals, reduced milk yield, costs of treatment and labor

6.2 RECOMMENDATIONS

From this study, the following are recommended control measures that can be used to minimize the economic losses of dairy production at the University of Nairobi veterinary farm-Kanyariri;

- Maximize herd immune status through optimum nutrition and decrease the distresses of weaning, shipping, and handling of the animals. Like many diseases, management is often the most effective and economical method of disease control. When environmental conditions, animal nutrition, and herd immunity are properly managed, animal health increases and disease frequency decreases. A decline in disease frequency results in a decrease in concentration of infective organisms on the premises; thus, a further decrease in disease frequency occurs

- Control of the face flies(*Musca autumnalis*) – by using insecticide fly tags, sprays, charged backrubbers, and dusts bags are products that can provide chemical control. Manure, weed, and brush management are necessary for total fly control.

- Maintain an optimum irritant-free environment-Grass, weed, and brush control - Grazing management, brush beating, mowing, and spraying, minimize pollen and mechanical irritation.

- Hay and/or feed bunk management - lower overhead hay feeders, spread hay out, do not feed hay containing mature seed heads or cheat grass in overhead feeders or in round bales, increase bunk space to decrease direct contact.
- Ultraviolet light (sun light) - breed for eyelid pigmentation, provide shade or tree rows with ample room to prevent overcrowding.
- Disease management – provide proper immunization against viral diseases (IBR and BVD), isolate infected animals, and decrease environmental and nutritional distress

7.0 REFERENCES

- Blood D.C, Radostits O.M, Gay C.C and Hinchcliff K.W, (2000). Veterinary Medicine, A Textbook of Diseases of Cattle,Sheep,Pigs,Goats and Horses-9th edition . Harcourt Publishers Ltd
- CarterG.R., Chengappa M.M. and Roberts A.W. (1995), Essentials of veterinary microbiology-5th edition. Williams and Wilkins. North Providence Rd. 196-197
- Coetzer J.A.Ws AND Tustin R.C. (2004). Infectious diseases of livestock-2nd edition volume 3, Oxford University Press, Cape Town.1487-1490
- National Animal Health Monitoring System (NAHMS) of the USDA: APHIS-1993
- Scott P.R, Collin D.P, Alastair M (2011)-Cattle Medicine. Manson Publishing Ltd. 73 Corringham Rd, London. 211
- Smith B. P. (2002). Large animal internal medicine, 3rd edition. Mosby Publisher. St. Louis Missouri USA. 1164-1173

8.0 APPENDICES

Appendix1: Data record sheet

EAR TAG	BREED	AGE	SEX	SEASON	CLINICAL FINDINGS