THE PREVALENCE AND RISK FACTORS OF PNEUMONIA IN DAIRY CATTLE AT UNIVERSITY OF NAIROBI VETERINARY FARM

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DECLARATION

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

JOHN NJIRU MVUNGU-J30/2088/2010

SIGN…….DATE…….

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

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SIGN……DATE……

DEDICATION

I dedicate this project to my family and especially my father for the financial, moral support and the encouragement they have given me throughout my entire education.

ACKNOWLEDGEMENTS

I am grateful to various individuals who contributed to the success of this study. My special gratitude goes to my supervisor Dr. Muthee who devoted his time to read my work and offered valuable advice. I also wish to express my deepest gratitude to the farm manager Dr.Abuom who granted me the permission to collect data from the farm therefore giving me opportunity to conduct this study. I am greatly indebted to Dr. Cheruiyot, for his assistance during the study. I also wish to acknowledge the support of Dr. Mwaniki Mutuota and cooperation of the other farm employees who provided data and information for this survey. I wish to acknowledge the role played by Mr. Muraithi who gave me motivation during the study. I am also very grateful to the people who shared ideas on how to write a report. I am very grateful to the contribution and assistance received from staff of the Faculty of Veterinary Medicine. Finally, I wish to express my gratitude to the entire veterinary farm management for support and facilitation of this study and I thank God for being my source of strength and guiding me in writing of this project. The data obtained during this study will assist in the development of a workable disease control and improving productivity in the farm.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT.

The occurrence of pneumonia/ bovine respiratory disease complex (BRDC) in the veterinary farm has remained unchanged for years despite the great economic impact implicated with it in terms of both treatment and reduced performance. The aim of this study was to determine the level of pneumonia cases in The University of Nairobi veterinary farm and the various risk factors that were involved. The farm cattle health records spanning 5-yr period (2010 to 2014) were evaluated and disease prevalence was determined. The period prevalence in all cattle in the farm was 20.8%. The calves had a prevalence of 22% while the adult cattle had a prevalence of 20%. There was small difference in prevalence rate between young stock and adult cattle with calves being more affected than adults. The epidemiological pattern incriminated various factors including environment, management, pathogen and animal risk factors. The study will assist in management of disease and therefore production with great efficiency, while lowering the prevalence of pneumonia and improving animal welfare and profitability.

CHAPTER ONE

INTRODUCTION

An important factor that influences dairy herd productivity is the amount and type of disease in herd. The basis of disease control programs includes knowledge of the frequency of disease, information about the risk factors, the biological effect of disease and information on the effectiveness of control procedures. The disease can influence productivity in many ways, it can increase culling rate, reduce milk or protein yield, increase cow mortality and reduce reproductive efficiency, milk production is often profoundly reduced in cows with clinical disease.

The effect of disease on productivity can be direct such as pneumonia and mastitis causing a profound reduction in milk yield and death or indirect such as in lameness leading to reduced feed intake, thus causing reduced milk yield. The effect of disease on longevity has been investigated (walter *et al*.,1988; Thompson *et al*., 2008). A large proportion of cow culling is considered involuntary –driven by disease, injury or death rather than for reason of low production. The premature removal of cow from the herd reduces lifetime milk yield. Disease also reduces the number of offspring for replacements or for sale. The productivity of an individual cow is the sum of the value of milk she produces, the value of her offspring and her individual value when she leaves the herd (The merk veterinary manual).Respiratory disease is

the major cause of financial loss from infectious disease in growing cattle in many countries worldwide. Economic losses result from vaccination costs, antibiotic treatment and veterinary attendance, reduced short-term and lifetime growth rates and mortality (Scott, 2009). However, bovine respiratory disease (BRD) is complex, multi-factorial and despite the available tools continues to represent a threat to cattle health, welfare and farm profitability (Caldow, 2011).

1.1 General objective

To determine the prevalence and risk factors of pneumonia in dairy cattle through a retrospective study.

1.2 Specific objectives

1. To determine the prevalence of pneumonia at the University of Nairobi vet-farm Kanyariri for the past five years (2010-14)
2. To determine factors predisposing dairy cattle at vet farm to pneumonia.
3. To recommend the best control method of pneumonia at vet-farm.

1.3Hypothesis

There is high prevalence of pneumonia in cattle at the University of Nairobi veterinary farm Kanyariri.

1.4 Justification

The livestock sub-sector is important since it contribute to 10% of the country's GDP and creates over 50% of the agricultural sector labour force. The dairy sector is growing and hence contributes to poverty reduction through the sale of milk, milk products and livestock. Dairy farming also contributes to employment creation, food security and improvement of nutrition

status and health of the people. The major challenges facing the dairy industry are various livestock diseases which cause death of livestock and great economic loss because they decrease productivity of livestock. High prevalence of pneumonia has led to diminish in dairy cattle production efficiency and is a major constraint of dairy cattle farming at University-vet Farm.

There is a need to develop a disease control strategy which would assist in the improvement of animal health and thus reduce morbidity and mortality and enhance production of dairy animals. The study establishes prevalence and risk factors of pneumonia in dairy cattle at university of Nairobi vet farm. Lastly, the pneumonia control strategy proposed will facilitate the process of disease control and thus improve productivity and profitability of cattle in the farm.

CHAPTER TWO

LITERATURE REVIEW

Pneumonia is inflammation of the pulmonary parenchyma usually accompanied by inflammation of the bronchioles and often by pleurisy (O.M Radostitis, 2000) it is also commonly referred to as bovine respiratory disease (B.R.D). It is manifested clinically by an increase in respiratory rate, cough, abnormal breath sounds on auscultation and in most bacterial pneumonias by evident of toxemia. Most of the pneumonias in animals are bronchogenic in origin but some originate by hematogenous route.

2.1Classification of pneumonia

Classification is based on pathophysiology and clinical signs. Under this category pneumonia can be classified into three major categories (Pierson *et al.,* 1980)

2.1.1 Bronchial pneumonia

Is characterized pathophysiologically by invasion of pathogenic organisms that gain access to lung through the pulmonary tree; characterized clinically by depression fever and other signs of sepsis such as hyperemic mucous membrane, sclera injection, and anterior ventral distribution of abnormal lung sounds.

2.1.2 Interstitial pneumonia

Are very diverse groups of noninfectious disease and are characterized by interstitial reactions that result from ingestion or inhalation of toxins or allergens. Affected animals tend not to be

depressed and septic, abnormal lung sounds and lesions are diffusely distributed and there is no response to routine therapy such as antibiotic.

2.1.3 Metastatic pneumonia

Is characterized pathophysiologically by septic embolization of the lungs from other foci in the body, classically liver abscess and postcaval thrombi. Clinically, cases of metastatic pneumonia exhibit signs of sepsis as with bronchopneumonia but with widespread pulmonary lesions and abnormal lung sounds and the eventual development of hemoptyasis. Based on the above classification, bronchopneumonia causes greater economic losses and is the most common (Baker *et al.,* 2003).

Other classification includes **duration** can be acute or chronic. **Morphological** -on basis of exudate: catarrhal, fibrinous, suppurative, hemorrhagic, necrotizing, proliferative .**According to location and pattern**; bronchopneumonia, lobar pneumonia and interstitial pneumonia (Pierson *et al.,* 1980)

2.2 Aetiology

Pneumonia may be caused by viruses, bacteria, or a combination of both. In addition other minor causes include fungi, metazoan parasites, physical and chemical agents (Blood *et al.,* 1983)

2.2.1 Bacteria causing pneumonia

Mycoplasma, ureaplasma and chlamydia species are mostly associated with bronchopneumonia of cattle (Steven E. Wikse *et al.,* 1994).Facultative anaerobes; mannheimia (pasteurella) haemolytica, Pasteurella moltocida, Haemophilus somnus, Arcanobacter pyogenes, Pseudomonas aeruginosa, Escherichia coli, Actinobacillus pleuropneumoniae, streptococcus

species, staphylococcus species, Moraxella spp, salmonella spp. The most common bacteria involved in pneumonia outbreak are Mannheimia hemolytica, Pasteurella moltocida (Odendaal *et al*.,1995). Histophilus somni and Mycoplasma bovis. Other common agents; Mycoplasma mycoides and Corynebacterium pyogenes (Nicholas *et al.*,2003).

2.2.2 Viral causes.

Bovine herpes virus type 1(IBR), Bovine parainfluenza virus type 3, bovine viral diarrhea virus, bovine respiratory syncytial virus, bovine adenovirus, bovine rhino virus, bovine reovirus, bovine enterovirus, bovine corona virus, calicivirus, and influenza virus. A multitude of infectious agents, including viruses, bacteria and mycoplasma spp are involved in different combinations on different farms (Caldown et al., 2011; ailing et al.,2004).

2.2.3 Parasitic pneumonia

The cattle lungworm Dictyocaulus viviparus is also responsible for causing pneumonia (Breeze,1985)

2.2.4 Miscellaneous causes

Other agents that may cause pneumonia include; feed toxins plant, fog fever; sudden exposure to lush pasture grass (high in l- tryptophan) schiefer,*et al* 1974. Rape, kale and turnips may also cause interstitial pneumonia, purple mint, crotalaria, and moulds –mouldy sweet potatoes. Toxic gases; nitrogen dioxide and hydrogen sulphide. Allergies; hay mould and milk allergy.

2.3 Factors predisposing cattle to pneumonia

Bovine respiratory disease has a multifactorial aetiology and develops as a result of complex interaction between environmental factors, host factors, and pathogens. Environmental factors (e.g. weaning, transport, commingling, crowding, dust, and inadequate ventilation) serve as

stressors that adversely affect the immune and nonimmune defense mechanisms of the host (Taylor *et al.*,2010). In addition, certain environmental factors (e.g. crowding, dust and inadequate ventilation) can enhance the transmission of infectious agents (e.g. virus) after the animal defense mechanism has been impaired allowing colonization of the lower respiratory tract by bacteria. (The mark veterinary manual-10th edition).

Age is a very important factor; young calves are more susceptible to bovine respiratory disease/pneumonia compared to yearling age and older cattle, this because host defense mechanism is not well developed in young calves. Calf refers to the age group of young cattle from birth to six or nine months of age (west, 1995). The main environmental factor predisposing cattle to respiratory disease is stress; poor ventilation in animal housing (Snowder *et al*., 2006; Timothy, 1998).Cold humid conditions sudden change in air temperature, stress due to different causes and change in environment has also been associated with outbreak of pneumonia in young calves. (Cernicchiaro *et al.*,2012; Scott, 1995).

Inadequate intake of colostrum or poor quality of colostrum will affect the calf's defense against respiratory agent and make them more susceptible to infection (Ohnstad *et al.,2010*). Weaning of calves before five weeks of age has been associated with increased respiratory disease. Rearing systems where calves of different origin are mixed together at a young age suffer from high levels of respiratory disease (miller *et al*.,1987). large , shared air spaces calves from different age groups and poor sanitation between calf batches often make these system even more vulnerable (ostergaard *et al*.,1986;losinger ., 1996).calves that have suffered from diarrhea are also more likely to suffer from respiratory disease. The stress associated with management procedure such as disbudding and castration may also be associated with high respiratory disease incidence.

2.4 Diagnosis

2.4.1 Clinical findings

Clinical signs of bacterial pneumonia are often preceded by signs of viral infection of the respiratory tract, with the onset of bacterial pneumonia, clinical signs increase in severity and are characterized by depression and toxemia. A combination of clinical signs of depression and fever (40-41^{O}C), without any signs attributable to other body systems, are the classic component of a case definition for early case of bovine respiratory disease (Reggiardo.,1989; Henton, 1995). Serous to mucopurulent nasal discharge sometimes bloody and eye discharge; moist cough; and rapid, shallow respiratory rate may be noted.

Coughing. In early BRD cases, the lungs and airways are generally painful, so the animal will try to clear the airway with mild, tentative, soft coughing. Loud, prominent coughing or "honking" indicates far more chronic, advanced cases, at which point treatment is difficult. On auscultation of then cranioventral lung field reveals increased bronchial sounds, crackles, and wheezes. In several cases, pleurisy may develop, characterized by an irregular breathing pattern and grunting on expiration. The animal will become unthrifty in appearance if the pneumonia becomes chronic, which is usually associated with formation of pulmonary abscess (Blood *et al*, 1983)

2.4.2 Necropsy findings.

Necropsy findings depend on the causative agent.M haemolytica causes severe, acute, hemorrhagic pneumonia. Grossly, extensive reddish black to grayish brown on cranioventral regions of consolidation with gelatinous thickening of interlobular septa and fibrinous pleuritis. There are extensive thrombosis, foci of lungs necrosis and limited evidence of bronchitis and bronchiolitis. The acute form involves sero-haemorrhagic-fibrinous pleuritis with abundant

pleural effusion, fibrinous bronchopneumonia with fibrinous or gelatinous exudate, and the parenchyma of lungs appears marbled because of concurrent necrosis and haemorrhages (Bryson DG.,1993: Redondo *et al*., 1994; Suzuki *et al*., 1995; Taylor, 1998)P moltocida is associated with less fulminating fibrinous to fibrinopurulent bronchopneumonia.H somni infection of the lungs results in purulent bronchopneumonia that may be followed by septicemia and infection of multiple organs. Also associated with extensive fibrinous pleuritis in feedlot calves. Serology and bacteria culture are not of major significance because the bacteria involved are normal inhabitant of upper respiratory tract but specificity of culture can be increased by collecting antemortem specimens from lower respiratory tract by tracheal swabs, transtracheal wash, or bronchioalveolar lavage(Schuh *et al*.,1992). Lung specimen can be collected for culture after necropsy.

2.4.3 Clinical pathology

Tentative diagnosis is by clinical observation, but should be confirmed by pathogen isolation. Sampling methods include using nasal swabs (even though M. haemolytica can be commensal in the nasal cavity), tracheo-bronchial lavage or broncho-alveolar lavage, sampling the pulmonary parenchyma, blood, spleen, liver and lymph nodes. Hematological observation usually reveals a leukocytosis and a shift to the left in bacterial pneumonia. A leukopenia and lymphocytopenia occurs in some cases of viral pneumonia (D.C Blood et al., 1989)

2.5 Treatment

Successful therapy depends on early recognition by trained personnel skilled at detecting the early symptoms of disease and treatment with antibiotics (Hjerpe, 1983). Long acting antimicrobials e.g. enrofloxacin and florfenicol have shown success in treating pneumonia and

are commonly used as first or second line treatment options in farms (Murray, 2011). NSAID have been shown to be a beneficial ancillary therapy in controlling fever (Francoz *et al*., 2012; Lockwood *et al*., 2003). If selection for treatment is late and pulmonary abscessation has occurred, it is difficult to achieve resolution with antimicrobials, and the use of a convalescent pen or culling of the animal should be considered. (The Merck veterinary manual).

CHAPTER THREE

MATERIALS AND METHODS

3.1 Area of study

The study was carried out at the University of Nairobi veterinary farm which is used as a teaching facility. The farm is located within the outskirts of Nairobi in Kanyariri village of Kabete subcounty. The farm keeps a herd of dairy cattle, a flock of dorper sheep, a piggery unit and a poultry unit. The dairy unit has Friesians, Guernseys, Ayrshires and Jerseys.

3.2 Study design

A retrospective study was done, it entailed collecting data from the farm dairy health records. The data was collected for a span of five years (from year 2010 – 2014) and was divided into two classes according to the age; the calves (young stocks) up to nine months and adult cattle above nine months.

3.3 Data analysis

The data was entered in Microsoft office excel 2010 and analyzed using graphs, pie charts and tables. Prevalence of pneumonia was determined in all cattle in farm and in both young stock (calves nine months old and below) and adult cattle above nine months old.

CHAPTER FOUR

RESULTS

From the year 2010 to 2014 there were an average of 677 young stock (both female calves and unsold bull calves from nine months of age and below), and an average of 1005 adult cattle above above nine months. The total number of pneumonia cases encountered in the farm for a period of five years were 350 in both young stock and adult cattle. 149 cases were from calves while the rest 201 were from adult cattle above nine months. The table below shows the prevalence in all groups.

Table 1: Herd structure and cases of pneumonia.

Herd structure and pneumonia cases encountered from year 2010-14			
	calves ≤ 9 months	**Adult cattle>9 months**	**Total**
No. of animals	**677**	**1005**	**1682**
No. of cases of pneumonia (old and new)	**149**	**201**	**350**

$$\textbf{period prevalence of pneumonia} = \frac{\textbf{number of cases of pneumonia in five years}}{\textbf{number of the cows over the same period.}} \times \textbf{100}$$

Table 2: prevalence of pneumonia in cattle at vet-farm Kanyariri

	In calves up to nine months	In adult cattle above nine months	In all cattle
Period prevalence of pneumonia for the five years	22%	20%	20.8%

The overall occurrence of pneumonia in all cattle in the farm

Table 3: overall cases of pneumonia in all cattle at vet-farm Kanyariri

		DISTRIBUTION OF PNEUMONIA IN DAIRY CATTLE AT THE UNIVERSITY OF NAIROBI FARM FROM YEAR 2010-2014											
	January	February	March	April	May	June	July	August	Septembe	October	Novembe	Decembe	totals
Year 2010	3	2	6	8	5	5	6	9	5	9	4	6	68
Year 2011	4	3	5	9	2	6	7	7	6	0	2	4	55
Year 2012	1	4	6	5	6	11	13	4	4	4	2	6	66
Year 2013	8	3	3	6	8	12	16	10	4	1	2	7	80
year 2014	12	6	8	16	6	5	5	4	3	4	6	6	81
totals	28	18	28	44	27	39	47	34	22	18	16	29	350

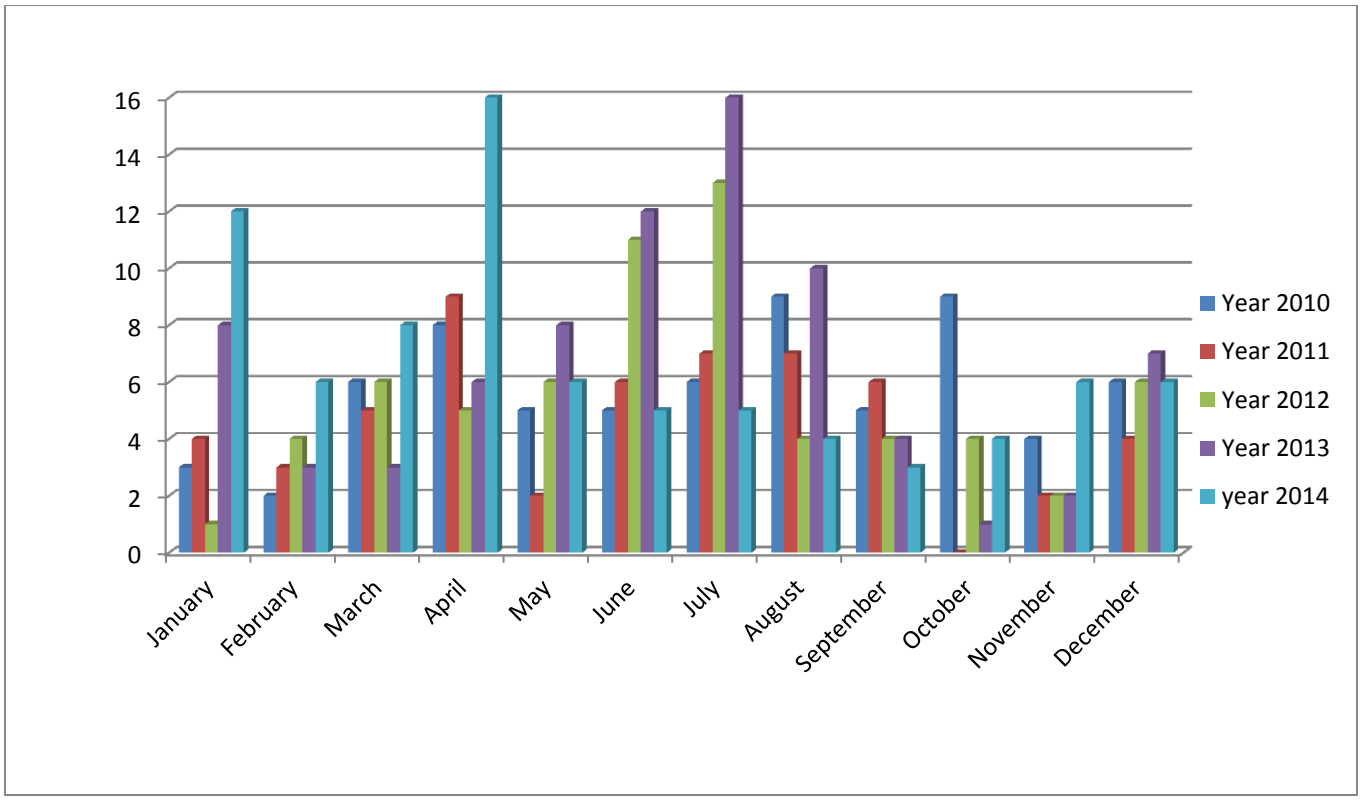

Figure 1 graph representation of overall cases of pneumonia in all cattle at vet-farm.

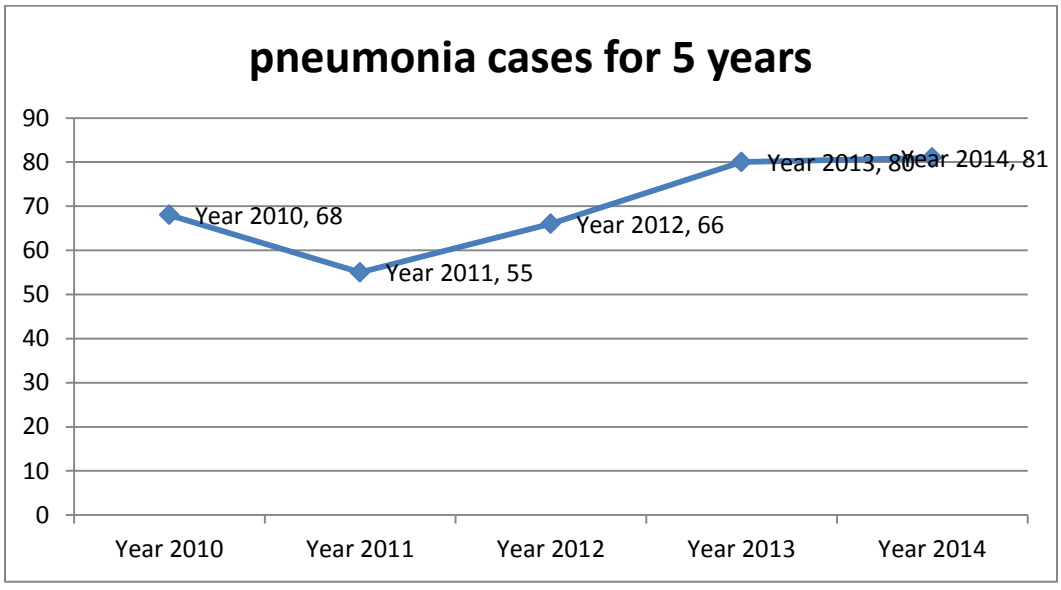

Figure 2: Trend of the occurrence of pneumonia in vet-farm from year 2010-2014.

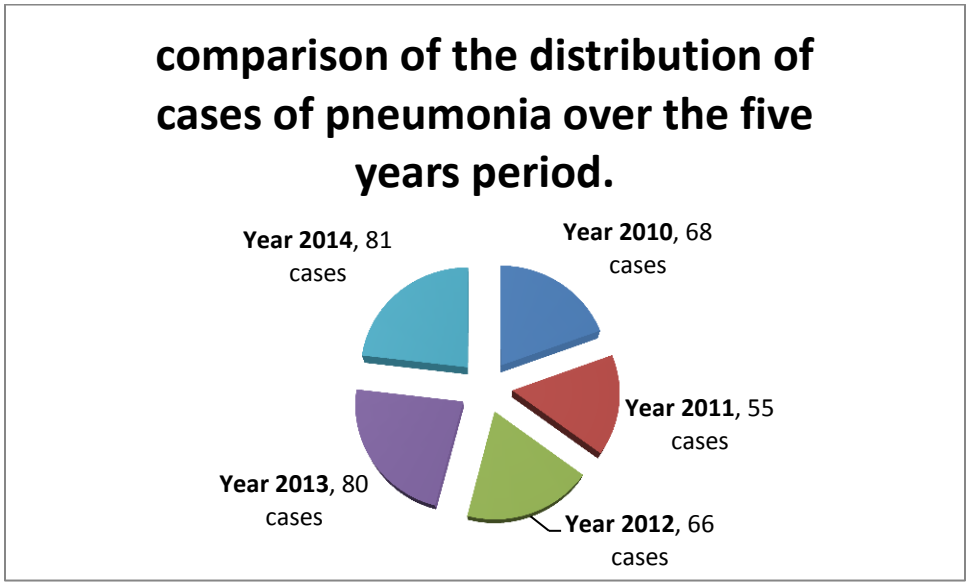

Figure 3 pie chart representation of pneumonia in different years.

PNEUMONIA IN YOUNG STOCK (CALVES BELOW NINE MONTHS OF AGE)

Table 4 distribution of cases of pneumonia in calves of below nine months of age

Data analysis for pneumonia in calves at university of nairobi veterinary farm for the past five years													
	january	february	march	april	may	june	july	august	septembe	october	novembe	decembe	totals
year2010	2	0	4	5	3	1	6	4	2	2	0	2	31
year2011	2	2	2	4	2	2	5	3	1	0	1	2	26
year2012	0	1	3	4	3	4	6	3	2	3	1	2	32
year2013	0	2	2	5	0	3	8	6	3	0	0	0	29
year2014	3	4	4	6	4	2	3	1	1	2	3	3	36
totals	7	4	15	24	12	12	28	17	9	7	5	9	149

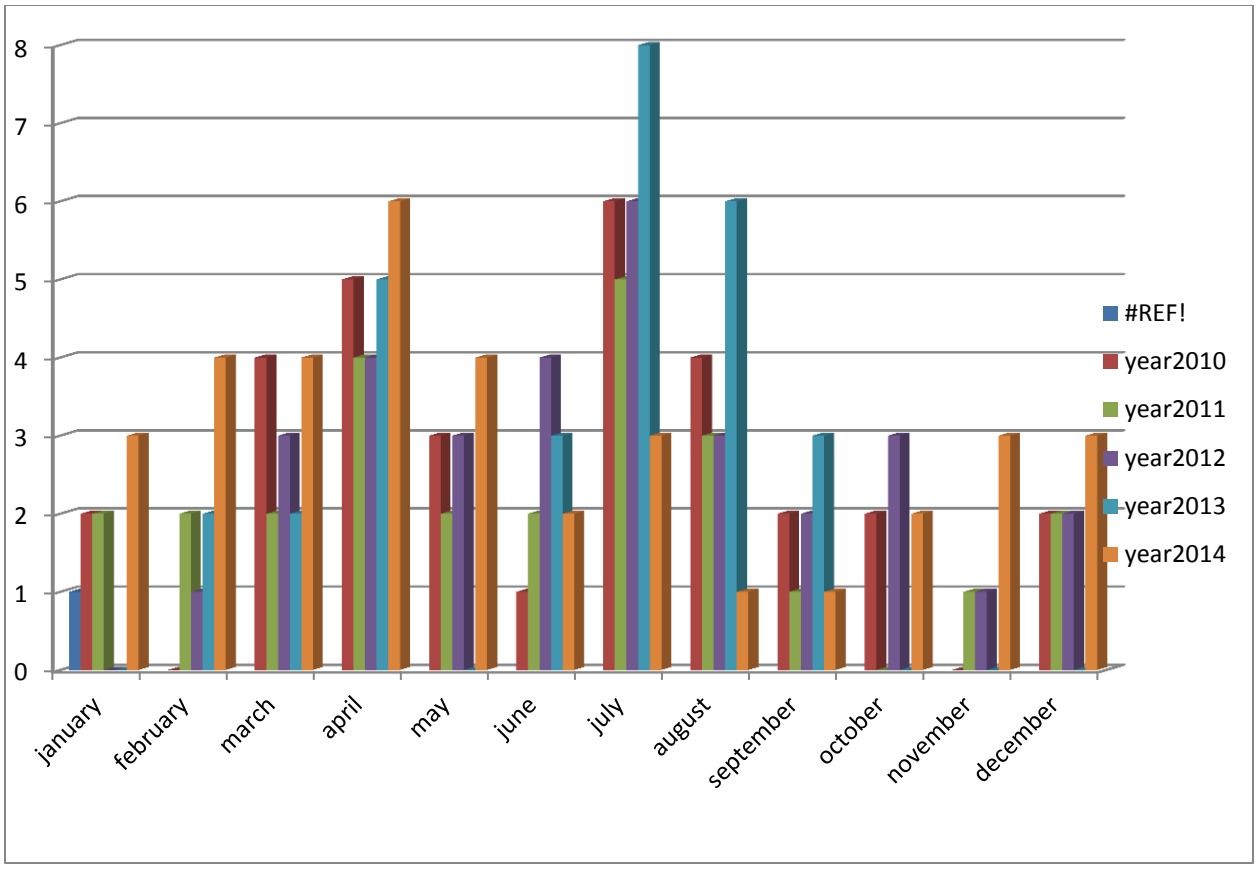

Figure 4 graph representation of distribution of pneumonia across all months in young stocks (age of nine months and below).

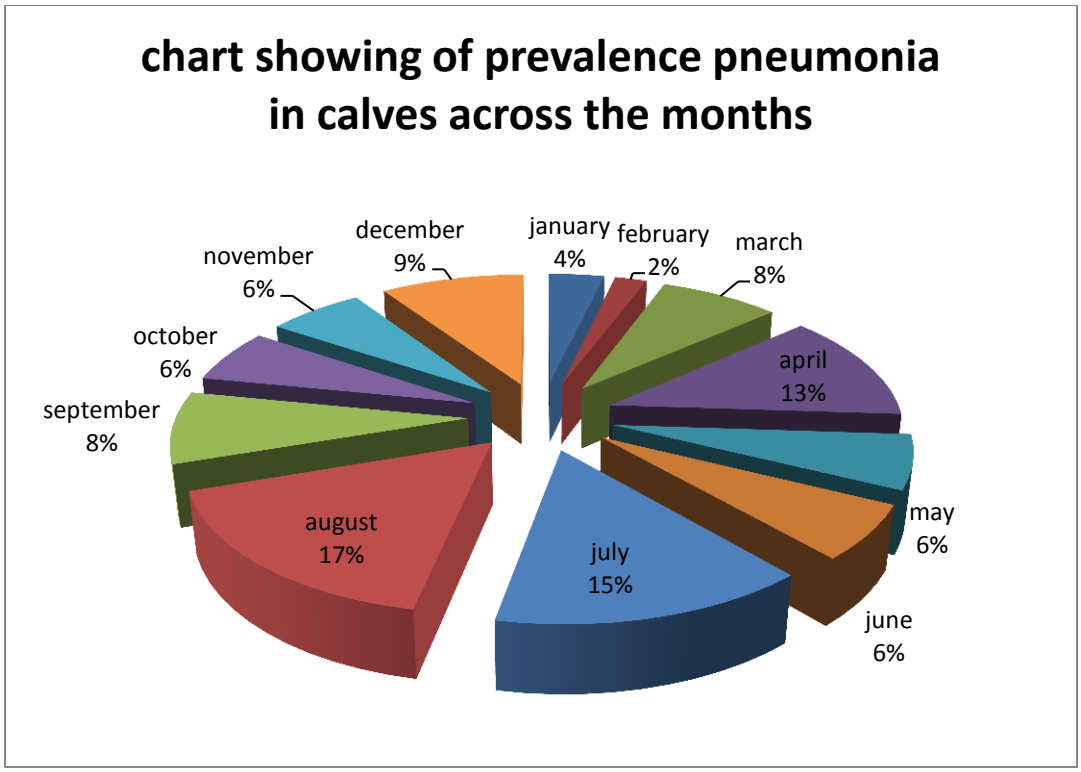

Figure 5 pie chart representation of distribution of pneumonia in months in calves of up to nine months of age.

PNEUMONIA IN ADULT CATTLE ABOVE NINE MONTHS OF AGE

Table 5: Cases of pneumonia in adult cattle above nine months of age

	January	February	March	April	May	June	July	August	eptembe	October	Novembe	Decembe	totals
year 2010	1	2	2	3	2	4	0	5	3	7	4	4	37
Year 2011	2	1	3	5	0	4	2	4	5	0	1	2	29
Year 2012	1	3	3	1	3	7	7	1	2	1	1	4	34
Year 2013	8	1	1	1	8	9	8	4	1	1	2	7	51
Year 2014	9	2	4	10	2	3	2	3	2	2	3	3	45
totals	21	9	13	20	15	27	19	17	13	11	11	20	196

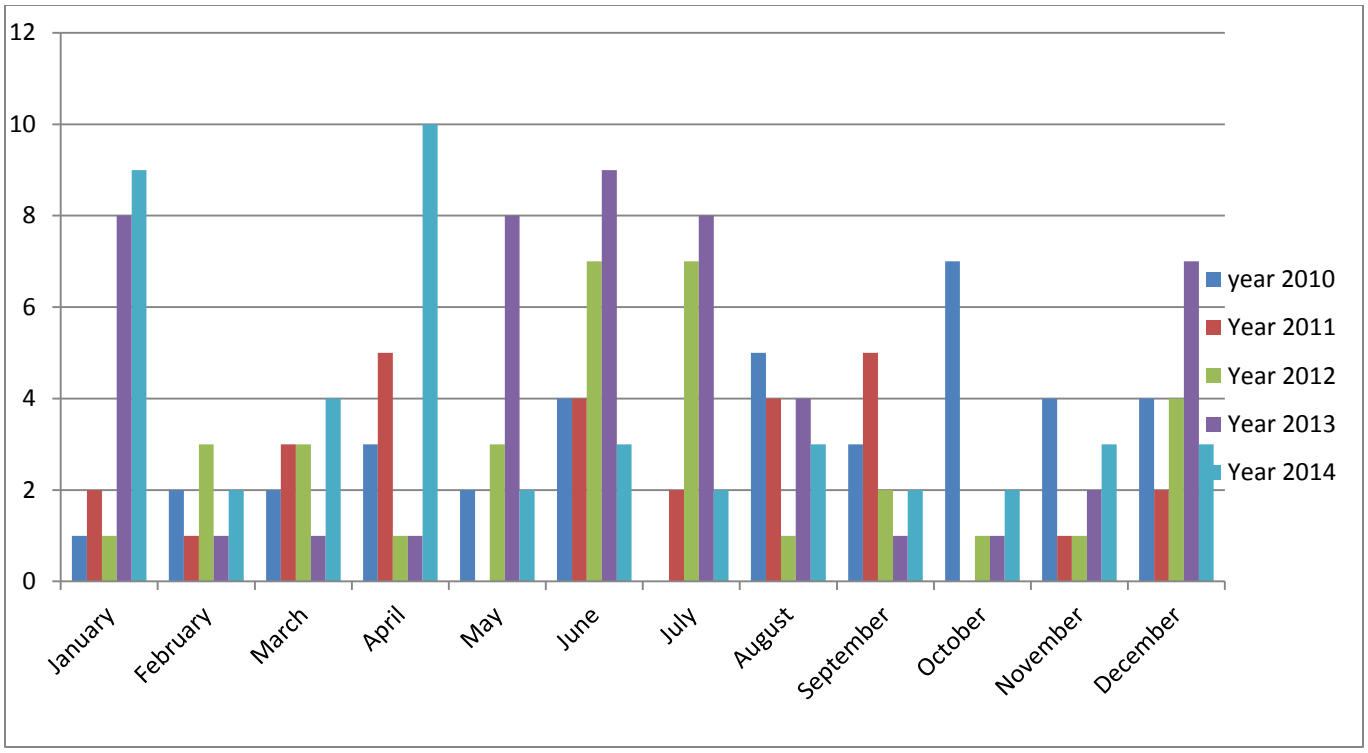

Figure 6 Graph representation of occurrence of pneumonia in adult cattle in months.

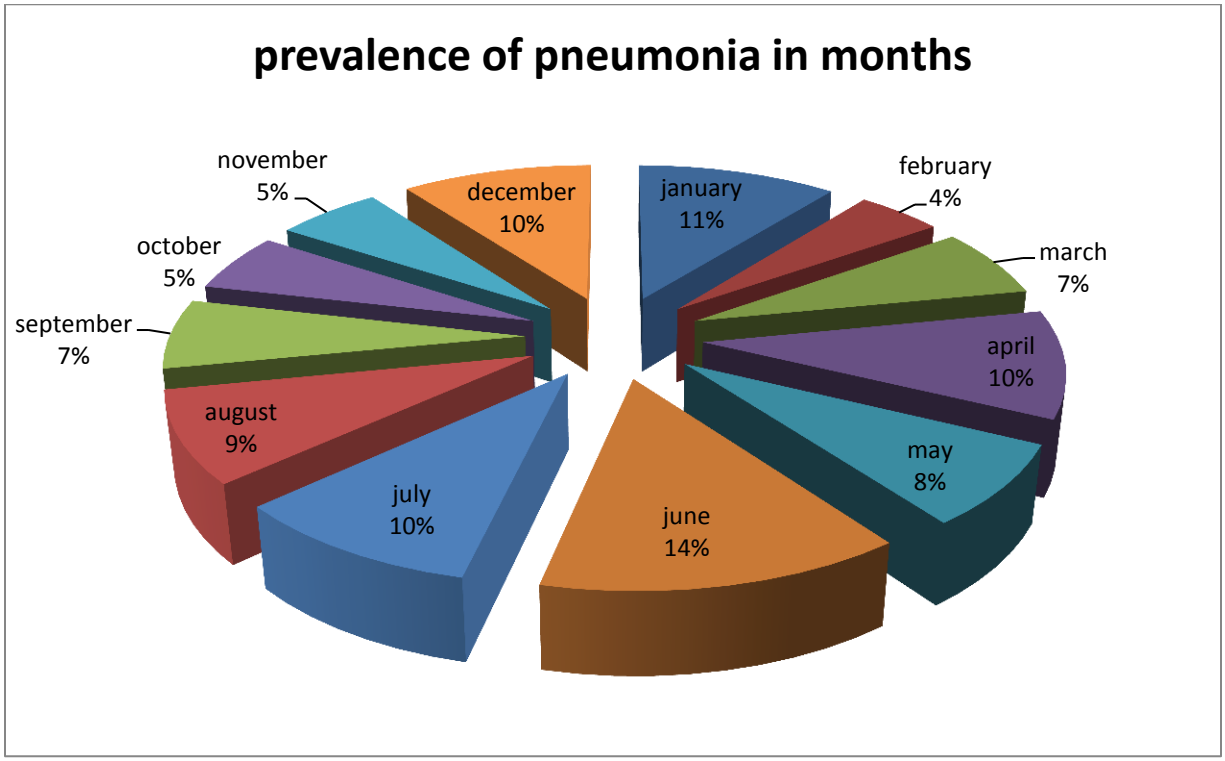

Figure 7 Pie chart representation of the pneumonia prevalence in adults in months

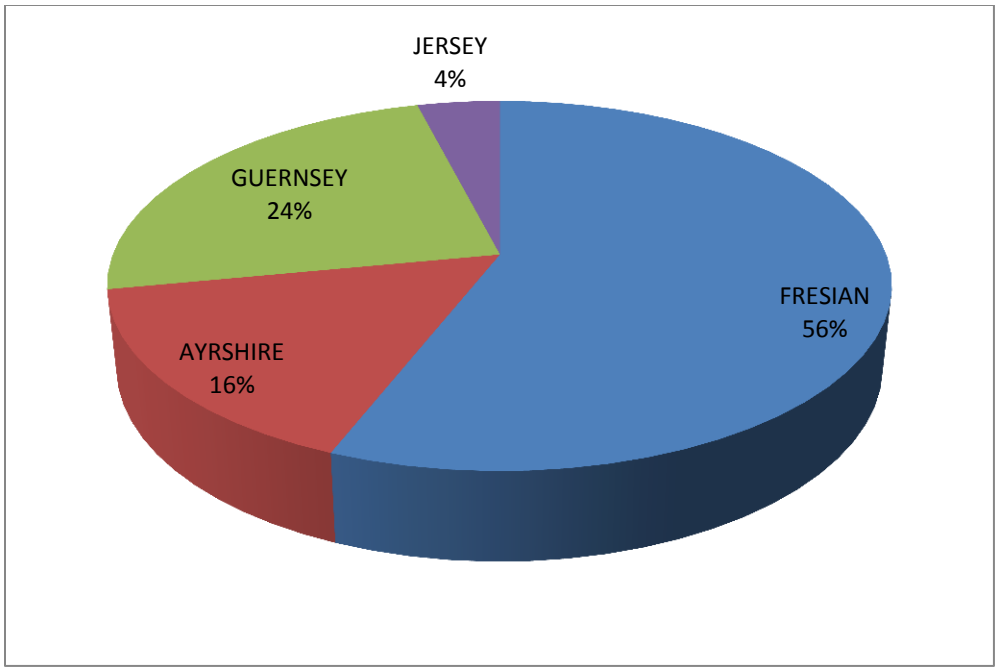

Figure 8 pie chart representation of breed prevalence of pneumonia.

CHAPTER FIVE

DISCUSSION

The overall period prevalence of pneumonia in all cattle over the period study of five years was 20.8%. This agrees with another study done by (Mwangi Alice Wambui 2014) which indicates that respiratory lesions in the lungs were the major cause of the death in veterinary farm Kanyariri resulting in 25.88% of all deaths diagnosed in post mortem between 2003 and 2013. From the study it was noted that the number of new pneumonia cases kept varying with slight decrease in year 2011 followed by increase in other years. The cases of cattle pneumonia in the farm occurred in all five years although they were high in the year 2013 and 2014 as compared to other years, this was due to varying intensity of predisposing factors as discussed in both young stocks and adults below. The prevalence was slightly higher in young stock (22%) than in the adults (20%)

5.1 Risk factors of pneumonia in calves at the university of Nairobi farm

The prevalence rate of pneumonia in calves was high. Several factors were seen to play a key role in contributing to this. These factors included.

5.1.1 Season

The disease occurred throughout the year but some months had a higher prevalence compared to others. Cases were high in the months of long rain starting from March to April and also during the cold months of July and august. The reason for this was lower temperature ($22^{o}C$ and rainfall range 40-125mm in march to May and temperature $16^{o}C$ in July). However there was increase in

prevalence of disease on month of December in some years and could have been attributed to unpredictable weather condition where there was both sunshine and rain favoring respiratory infection and also dusty environment which could have interfered with lung defence mechanism.

5.1.2 Following other infections that weaken the calves (Concurrent disease stress e.g. chronic diarrhea)

Calf scour was common condition among many calves in the farm, seven percent (7%) 0f the calves that had calf scour also had concurrent respiratory disease. Diseases such as Bovine Viral Diarrhea (BVD) and coccidiosis specifically suppress the immune system in the growing calf. Concurrent infection with these diseases represents a large risk for bovine respiratory disease. Any disease such as joint ill also increases susceptibility to respiratory disease.

5.1.3 Poor colostrum intake as a newborn calf

Some calves had lost their mothers to diseases and dystocia complication hence depriving them from getting enough colostrum. Disease conditions like mastitis also contributed to low intake of colostrum other condition that could have contributed to this is agalactiae. Colostrum is very rich in antibodies from the dam. When calf gets this antibodies early enough(4-8 hours after birth) this antibody are able to pass through the intestine and confer immunity which may last for sometimes before the calf can start producing her own antibody. However lack or intake of low amount of colostrum may have resulted to low immunity and hence high susceptibility to pneumonia. The newborn calves have also specialized intestinal epithelium capable of engulfing soluble protein, which disappear within 24 hours after birth (Cunningham, 1992). All these help calves to absorb intact immunoglobulin from colostrum. Providing the newborn calves with

sufficient quantity and good quality of colostrum at the right time is the most important aspect of calf management.

5.1.4 Weaning

Weaning was done at the age of three months irrespective of the weight of the calf and it was abrupt. Weaning is usually stressful condition to a calf. Stress lowers the immunity of a calf and hence the calf became vulnerable to respiratory infection and other type of infection.

5.1.5 Crowding and separation from mothers at young age

Calves were separated from their mothers at two days of age this was a stressful period to them. The calves were also housed together in a common pen at night and this could have worsened the situation. Stress in a calf lowered the immunity. When calves were separated from their mothers for long time their immunity was reduced and this resulted into increased incidences of pneumonia.

5.1.6 Exposure of calves to older cattle shedding high levels of infectious agents (but not necessarily sick themselves).

The calves were confined in a common pen irrespective of their age group difference. Older cattle have a well-developed immunity and they can harbor infectious agent without coming down with disease (carrier state). This older animals also include their mothers especially the ones with mastitis since some bacteria causing mastitis also cause respiratory disease. These cattle transmit disease to calves with poorly developed immunity and the calf come down with disease.

5.1.7 General weakness due to poor nutrition

The type of solid feed fed to calves was hay. This had detrimental effect on nutrition especially to calves below two months of age. The calf is born as a monogastric animal but other compartment develops as the calf grows. Enough amount of colostrum, milk should be given initially and later on introduce soft feeds/grass. Calves have poor digestibility of hay and can lead to malnutrition and low immunity hence high incidence of pneumonia. The immune system of malnourished animals is weak. A calf's defense against disease can be improved by supplying the correct nutrition to meet its requirements at every stage of development

5.1.8 Dusty conditions that interfere with the respiratory tract's normal defense mechanisms

Incidences of pneumonia were also seen during hot and dry seasons. During these time the amount of dust, pollen grain and other light particles are abundant in the air, these large particles interfere with respiratory tract defense mechanism (the T-cells, epithelial cells and alveolar macrophage) and therefore increase susceptibility. The natural defense mechanism such as coughing and depletion of periciliary fluid layer could have further interfere with normal lung function resulting in bacteria and virus colonizing

5.1.9 Housing and Crowding

The calves of the same age group were reared together and were also housed in a single shed, some of the respiratory diseases are contagious and these could have resulted into spread of the disease due to close contact. Calves spent most of their time indoors; calves raised in outdoor hutches are less likely to be treated for pneumonia than those raised in indoor pens (Walter-Tower *et al.,* 1986).

5.1.10 Age

Half of the incidences of pneumonia were seen in weaning calves. A newborn calf has poorly developed defense mechanism. The normal flora is not well established and unlike to newborn of primates, they are born with no circulating antibodies to combat infection. Yet the calf must survive in highly contaminated environment (Bath *et al.*, 1985).

5.1.11 Handling

Handling of the calves during activities like dehorning and ear tagging predisposed them to stress resulting in high incidences. This procedures were common in the farm.

5.2 Risk factors of prevalence of pneumonia in adult cattle in vet-farm

5.2.1Season

The cases of pneumonia were distributed throughout the year this was because Kenya is in the tropics where there is no major variance in climatic change, but unlike in calves high incidences were seen on both the cold season(June and July) and in hot season(December and January). The high case in hot season (summer pneumonia) could have been attributed to dust and other foreign particles interfering with lungs defense mechanism.

5.2.2Concurrent disease

Apart from being diagnosed with bovine respiratory disease complex other diseases were diagnosed alongside, five percent (5%) of the pneumonia cases came about as a complication of other disease like; mastitis, milk fever and diarrhea. Most downer cows also ended up being diagnosed with respiratory disease. These diseases weakened immune system predisposing the cattle to pneumonia. Diseases such as Bovine Viral Diarrhea (BVD) specifically suppress the

immune system. Concurrent infection with these diseases represents a large risk for bovine respiratory disease. BVD specifically targets the lung cells so has a direct respiratory effect and is a major risk factor for pneumonia.

5.2.3 The breed

The major breed affected was Friesian followed by Guernsey, Ayrshire and Jersey was the least affected. Friesian seems to be more susceptible compared to others.

5.2.4 Transport

Three out of eleven cattle which were taken to exhibition over the period of five years came down with respiratory disease. Transport stress could have predisposed cattle to respiratory infection.

5.2.5 Crowding

This occurred during activities like breeding, heat synchronization, milking, housing after grazing pasture, assembling in yards, congregating around feed troughs, etc. this favored virus transmission or compromise the immune system.

5.2.6 Handling

Rough handling of the cattle and stressful activity like pregnancy diagnosis by students (teaching purpose) resulted into immunosuppression and susceptibility to pneumonia.

5.2.7 Mixing

Mixing different groups of cattle, especially of different ages or from different sources .This happened during housing after grazing pasture, assembling in yards, congregating around feed troughs, etc.

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

According to the suggested performance target for dairy cattle the prevalence rate of clinical diseases should be less than 15% (Otto et al., 2000), this was not the case with study findings. Much more remains to be done to control this expensive and persistent disease. Pneumonia is a great challenge in dairy farming in Kanyariri and the farm management should put more effort to reduce the high prevalence. These will be achieved through integrated approach of understanding environmental, management, pathogen and animal risk factors of pneumonia. Strategies to reduce pneumonia should therefore target improving cattle immunity and reducing stress as well as treating any concurrent disease present. Managing the animal-environment-pathogen interaction is the key to preventing and controlling the disease.

Key areas for further investigation and knowledge exchange programmes include:

1. The cattle immune status and the influence of nutrition and vaccination to pneumonia

2. Level of involvement of various pathogens such as pasteurella, histophilus and mycoplasma and awareness stock health risks.

6.2 Recommendations

The key to preventing respiratory diseases entails.

i. Vaccination with biological products targeting the viral and bacterial pathogens.

ii. Appropriate use of antibiotics labeled for control of bovine respiratory disease/pneumonia

iii. Minimize exposure to environmental conditions that contribute to disease, such as dust, crowding, fumes (proper ventilation is a key - especially with dairy facilities).

iv. Provide adequate rest, feed and water (especially after transport).

v. Make sure animals receive adequate levels of essential nutrients such as vitamins and minerals.

vi. Handle animals with care. Use low stress handling techniques.

vii. Avoid overcrowding.

viii. Maintain good housing and ventilation.

ix. Make sure animals receive the right deworming program to control lungworm

x. Avoid overcrowding of calves in the house (best are single calf pens) and pasture

xi. Avoid mixing cattle of different age groups and especially calves from different sources.

xii. Isolate sick calves and cows from the rest if possible

xiii. Calves must receive fresh colostrum at 8-10% of body weight during first 3 hours after birth but not later than 12 hr. after birth.

xiv. Aspiration pneumonia: avoid forced feeding, only experienced people should drench young animals

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