

## Causes of calf mortality in Kabete area of Kenya

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### ABSTRACT

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A total of 345 calf carcasses of mainly dairy breeds from the farms around Kabete area were examined at the post-mortem facility in the Department of Veterinary Pathology and Microbiology, University of Nairobi, over a 10-year period (1980–1989). About 46,8% of the total deaths took place within the first 2 months, 31,8% of them in the first month and 13,3% in the first 2 weeks. In 23 cases (6,7%) no specific cause of death was determined. The major causes of death were diseases of the alimentary tract (31,3%)—mainly gastroenteritis (76/108) due to colibacillosis, salmonellosis, coccidiosis and helminthiasis, and bloat (20/108). The other major causes of death were diseases of the respiratory tract (16,8%)—mainly pneumonia (42/58), and tick-borne diseases (13,3%)—mainly east coast fever (ECF) (37/46). The alimentary and respiratory diseases were most common in the 1–30 d age group. The other causes of death occurred in the following frequencies: musculoskeletal system (7,0%), septicaemia (6,7%), malnutrition (6,1%), cardiovascular system (3,7%), nervous system (3,2%), liver (2,6%) and poisoning (2,6%).

**Keywords:** Cause, calf mortality, Kabete area, Kenya

### INTRODUCTION

The main objective of dairy-calf rearing is to produce replacement heifers. Several factors, acting either singly or in combination, may hamper calf rearing. The rate of calf losses in part determines the success or failure of any dairy enterprise since this can severely limit the number of heifers available for selection. Some studies on calf mortalities have been reported in the tropics (Kariuki 1974; Ibeawuchi, Ndiye & Okoro 1983; Jacobsen 1983; Perry, Mwanaumo, Schels, Eicher & Zaman 1984; Shoo, Semvua, Ka-

zwala & Msolla 1992; Gitau, McDermott, Waltner-Toews, Lissemore, Osumo & Muriuki 1994). These have shown that both infectious and non-infectious factors are associated with calf mortalities. In Kenya, few studies have been carried out on the causes of calf mortalities (Kariuki 1974; Gitau *et al.* 1994).

The purpose of this paper is to review the various causes of calf mortality as diagnosed at the post-mortem facility in the Department of Veterinary Pathology and Microbiology, Faculty of Veterinary Medicine, Kabete in Kenya, during a 10-year period (1980–1989).

### MATERIALS AND METHODS

The data used in this investigation were obtained from the records of the Department of Veterinary Pathology and Microbiology, University of Nairobi, Kabete. The climate and geographical location of the area around Kabete has been described previously (Mulei, Rege & Kiptoon 1989). The calf carcasses were

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from the Medicine Unit of the Department of Clinical Studies and various farms in the vicinity of the Faculty of Veterinary Medicine, Kabete. They were representative of the following breeds:

- Friesian 167 (48,4%)
- Ayrshire 91 (26,4%)
- Guernsey 47 (13,6%)
- Jersey 16 (4,6%)
- cross-breeds of various dairy breeds 19 (5,5%)
- others 5 (1,5%)—mainly crosses of dairy and beef breeds

The calves consisted of 183 (53,0%) males and 162 (47,0%) females of ages ranging from 1 day to 10 months. Animals that had died of experimental procedures were excluded from the study. The diagnoses were based on the history and clinical signs (reported), macroscopic post-mortem lesions, and histological and microbial findings. Tissues taken for histopathology were fixed in 10% buffered formalin, processed and embedded in paraffin wax. The sections were cut at a thickness of 5–7 µm, then stained with haematoxylin and eosin and Periodic Acid Schiff (PAS) and examined under the microscope. These were used to confirm diagnoses of conditions such as meningitis, hepatitis and pneumonia. The diagnoses of tick-borne diseases were confirmed by examination of lymph-node smears (ECF) and blood smears (anaplasmosis and babesiosis). Faecal samples were used to confirm helminths and coccidial infestations while bacterial diseases (e.g. salmonellosis, colibacillosis and septicaemia) were confirmed by microbial findings. The samples taken for microbial culture were blood, gastrointestinal contents and organs showing pathological lesions. The methods employed for microbial culture and identification were as described by Buchanan & Gibbon (1974) and Agumbah, Ogaa, Mutiga & Muraguri (1983). History, clinical signs and absence of specific post-mortem lesions were the bases for diagnoses of diseases such as tetanus and poisoning.

As some of the data on farm management, history and clinical signs were not applicable to all cases, correlations between conditions were not analysed statistically.

## RESULTS

The results are summarized in Tables 1 and 2. A total of 345 carcasses of calves were examined at the post-mortem facility during a 10-year period, 1980–1989. The number of calves received, varied from year to year (Table 1). The last 2 years of the investigation had slightly higher numbers than the other years. The number of male and female calves were almost the same and most of them were less than 1 month old (Table 2). In 23 (6,7%) of the 345 cases, no specific diagnosis could be established. Of the remaining 322

(94,3%) calves, 74% died of infectious diseases and the rest of the non-infectious conditions described below.

### Diseases of the alimentary tract

Disease conditions affecting the alimentary tract were encountered in 108/345 (31,3%) cases. Seventy-six of these were due to gastroenteritis caused either by colibacillosis (36/76), salmonellosis (20/76), coccidiosis (10/76) or helminthiasis (20/76). The remaining deaths were due to bloat (20/108), abomasal impaction (5/108), abomasal torsion (3/108) and intussusception (4/108). The conditions involving the alimentary tract were most common in calves during the first 2 months of life (Table 2).

### Diseases of the respiratory tract

The respiratory system was involved in 58 of the 345 (16,8%) cases. Of the latter cases, pneumonia was associated with 42 deaths and, in 12 of the reported pneumonia cases, bronchopneumonia was incriminated, while four were associated with aspiration pneumonia. The other deaths were associated with lung abscesses (6/58), pulmonary oedema (6/58) of unknown cause and pulmonary emphysema (4/58). Most of the deaths occurred in the first month of life (Table 2).

### Tick-borne diseases

Forty-six (13,3%) of the 345 cases were associated with tick-borne diseases. The diseases diagnosed were ECF (37/46), babesiosis (5/46), anaplasmosis (4/46) and heartwater (3/46). Most of the deaths occurred in the older calves over 2 months of age.

### General systemic states

Twenty-three of the 345 (6,7%) calves died of septicaemia due to *Salmonella* spp. (6), *Escherichia coli* (5), *Streptococci* spp. (3) and undifferentiated causes (9) (based on post-mortem findings without microbial culture).

### Diseases of the musculoskeletal system

Problems related to the muscles and the skeleton were diagnosed in 24 of the 345 (7,0%) calves. Ten cases were diagnosed as polyarthritis, seven with bone fractures, mainly of humerus (3), femur (2), and tibia and ulna (2). Four had severe dog bites and three had necrosis of the limb muscles, possibly associated with prolonged recumbency.

### Diseases of the cardiovascular system

Diseases affecting the above system were reported in 13 of the 345 (3,7%) cases. These included pericarditis (7/13), endocarditis (4/13) and patent ductus arteriosus (2/13).

TABLE 1 The common causes of calf mortality as diagnosed at the post-mortem facility in Kabete area of Kenya, according to years

System, organ or condition	Year										Total (%)
	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	
Alimentary tract	7	8	9	15	12	9	8	10	17	13	108 (31,3)
Respiratory tract	6	6	4	6	6	5	4	5	7	9	58 (16,8)
Tick-borne diseases	5	4	5	6	3	2	2	4	7	8	46 (13,3)
Septicaemia	2	1	2	3	1	2	2	3	2	5	23 (6,7)
Musculoskeletal system	3	—	—	3	1	3	1	2	4	7	24 (7,0)
Cardiovascular system	—	—	3	2	—	2	—	1	2	3	13 (3,7)
Liver	1	1	1	1	1	—	—	1	1	2	9 (2,6)
Malnutrition	2	1	—	2	5	2	3	1	4	1	21 (6,1)
Inconclusive	4	5	3	2	1	2	2	2	2	—	23 (6,7)
Nervous system	—	1	2	1	2	—	3	—	1	1	11 (3,2)
Poisoning	—	—	1	1	1	2	2	—	—	2	9 (2,6)
Total (%)	30 8,7	28 8,1	27 7,8	45 13,1	32 9,3	29 8,4	28 8,1	28 8,1	47 13,6	51 14,8	345

TABLE 2 The common causes of calf mortality as diagnosed at the post-mortem facility in Kabete area of Kenya, according to sex and age

System, organ or condition	Sex	Age in months									Total	Grand total (%)
		0,1– 0,5	0,6– 1,0	1,1– 2,0	2,1– 3,0	3,1– 4,0	4,1– 5,0	5,1– 6,0	6,1– 7,0	7,1– 10,0		
Alimentary tract	♂	9	6	9	8	6	5	5	3	4	55	108 (31,3)
	♀	10	11	10	5	2	1	4	5	5	53	
Respiratory system	♂	10	14	2	1	3	—	1	1	1	33	58 (16,8)
	♀	4	6	3	2	2	2	2	3	1	27	
Tick-borne diseases	♂	2	1	3	1	1	4	3	2	3	19	46 (13,3)
	♀	—	6	2	2	1	3	5	7	27		
Septicaemia	♂	4	—	3	—	—	—	2	2	2	13	23 (6,7)
	♀	1	1	1	1	1	1	2	1	1	10	
Musculoskeletal	♂	3	3	1	2	—	1	—	—	1	11	24 (7,0)
	♀	1	1	5	3	—	1	1	1	—	13	
Cardiovascular	♂	1	2	—	—	—	1	—	—	2	6	13 (3,7)
	♀	—	—	1	1	1	2	—	—	2	7	
Liver	♂	—	—	1	—	2	1	1	1	—	6	9 (2,6)
	♀	—	—	1	—	1	—	—	—	1	3	
Malnutrition	♂	—	2	1	2	3	2	2	1	1	14	21 (6,1)
	♀	—	—	1	1	2	1	1	1	—	7	
Inconclusive	♂	1	5	3	3	—	—	—	—	1	13	23 (6,7)
	♀	—	3	1	2	—	1	1	—	2	10	
Nervous system	♂	—	2	1	—	1	—	1	1	—	6	11 (3,2)
	♀	—	1	1	—	—	1	1	1	—	5	
Poisoning	♂	—	—	1	—	1	1	—	—	1	4	9 (2,6)
	♀	—	—	1	—	1	—	—	1	2	5	
Total	♂	30	35	25	17	17	15	14	11	16	183	345
	♀	16	29	27	17	11	10	15	18	19	162	
Grand total (%)		46 13,3	64 18,5	52 15,0	34 9,0	28 9,1	25 7,2	29 8,4	29 8,4	35 10,1	345	

### Diseases of the nervous system

Eleven (11/345) (3,2%) of the cases were related to diseases of the nervous system. The conditions were meningitis (5/11), cerebral abscesses (2/11) and tetanus (4/11).

### Diseases of the liver

Nine (9/345) (2,6%) of the cases were related to liver problems. Five (5/9) were due to hepatitis, two (2/9) due to liver abscesses and the other two (2/9) were attributed to fascioliasis.

## Poisoning

Nine (9/345) (2,6%) were considered to have died of poisoning. The suspected agents were organo-phosphorous(5/9) and plant (4/9) poisoning.

## Malnutrition

Twenty-one (21/345) (6,1%) calves, mostly males (14/21), were considered to have died of malnutrition (starvation). All the carcasses were markedly emaciated and no underlying disease conditions were associated with the cause of death, and the gastrointestinal tract contained little contents.

## DISCUSSION

Of the 345 calf carcasses examined, 322 (93,3%) were associated with a variety of specific causes, while 23 (6,7%) were non-specific. Of the total deaths, 74% were thought to have been caused by infection. About 46,8% of the deaths occurred within the first two months of life, 31,8% within the first month and 13,3% in the first 2 weeks. Other workers (Speicher & Hepp 1973; Oxender, Newman & Marrow 1973; Martin, Schwabe & Franti 1975; Ibeawuchi *et al.* 1983; Tikku 1986) reported high calf mortality during the first month of life, with subsequent decrease with age. Young calves are highly susceptible to infectious diseases as a result of a lower immunity which could be exacerbated by inadequate colostrum intake (Oluokun & David-West 1988; Brenner, Orgad, Burd & Gat 1989). Since potential pathogens have been isolated from clinically healthy calves, stress may be an important contributory factor in clinical infection (Hagstad, Nilcholson, Fulton, Springer & Cox 1984).

The most important causes of death were diseases affecting the alimentary system. This accounted for 31,3% of all the cases. Infectious diseases such as colibacillosis, salmonellosis and coccidiosis were the most prevalent. Bloat was most common in older calves above 3 months, in agreement with earlier studies (Kariuki 1974). Problems associated with the alimentary tract were the most important causes of calf mortalities (Ibeawuchi *et al.* 1983; Tikku 1986; Waltner-Toews, Martin & Meek 1986). The second most encountered group of diseases were those affecting the respiratory tract. Pneumonia was the most prevalent, accounting for 47/58 of the cases. Pneumonia is closely associated with gastroenteritis (Tikku 1986; Waltner-Toews *et al.* 1986), and it has been suggested that some common factors related to either management technique or specific agents, predispose calves to both syndromes (Waltner-Toews *et al.* 1986).

Tick-borne diseases were the third most important cause of death, accounting for 13,3 % of the deaths. ECF was the most important disease, affecting 37/46 of the cases. In the area around Kabete, the

prevalence of ECF was reported to be high and also to be associated with high mortalities in livestock (Mulei & Rege 1989). ECF has also been reported to be a major cause of calf mortality in other parts of Eastern Africa (Jacobsen 1983; Perry *et al.* 1984). The prevalence of the other tick-borne diseases in Kabete is low (Mulei *et al.* 1989) and they are not normally associated with high mortalities in cattle.

Malnutrition (starvation) accounted for 6,7% (23/345) of the deaths. The deaths were most common in the male calves (14/23). In the area around Kabete it is not uncommon to find emaciated and neglected calves. This is particularly common in the smallholder farms or zero-grazing units where feed supply is not always adequate for all the animals. The other disease problems affecting the cardiovascular, musculoskeletal and nervous system, the liver and the general systemic state (septicaemia) have been reported to cause calf mortalities (Kariuki 1974; Ibeawuchi *et al.* 1983; Perry *et al.* 1984; Tikku 1986).

Since calves are reared in confinement, various aspects of management could play an important role in the prevention and control of calf diseases. The majority of the disease conditions described in this paper, could have been avoided by the application of proper management procedures.

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