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tes latitudes. *S. dublin* a été isolé chez un de ces troupeaux à chaque occasion.

Dans le foyer décrit ici, la phase aiguë s'est manifestée par un syndrome entéritique contagieux classique. La nécrose sèche a commencé à apparaître environ 6 semaines après le début des troubles digestifs.

Les moutons, même maintenus en contact étroit avec les bovins atteints, n'ont jamais été cliniquement affectés.

Aucune lésion de gangrène n'a été observée chez les veaux ; seuls les adultes ont développé cette forme chronique de salmonellose.

Parmi les lésions, la nécrose de l'extrémité de la queue a été observée chez tous les animaux présentant des lésions nécrotiques chroniques. La nécrose des couronnes n'apparaissait que dans 2 cas (13 p. 100) et un seul bovin présentait une ischémie généralisée de la peau.

Il est surprenant que, pour la première fois, ce soit *S. typhimurium* et non *S. dublin* qui ait été associé à l'apparition de ce syndrome particulier.

Le syndrome de gangrène terminale des extrémités, jusqu'ici décrit sporadiquement, a affecté un grand nombre d'animaux au Ghana. Du point de vue de l'âge, le fait que seuls des adultes ont présenté des lésions de gangrène sèche est peut-être dû aux nombreuses pertes qui furent enregistrées parmi les veaux au cours de la phase aiguë.

Malgré l'absence d'information sur l'origine de cette *Salmonella*, le syndrome décrit ici est une preuve supplémentaire de la propagation de cette maladie en Afrique. Les pertes économiques entraînées par cette affection semblent considérables et un système de contrôle doit être mis en place pour éviter sa dissémination, lorsque cela s'impose.

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MARCHOT (P.), KAECKENBEECK (A.), LEROY (P.), AMANFU (W). Note on the first observation of terminal dry gangrene in cattle due to *Salmonella typhimurium* in Ghana. *Revue Élev. Méd. vét. Pays trop.*, 1989, 42 (4) : 510-512.

Ischaemia and terminal tissue dry gangrene are among the sequels of *Salmonella* infection. Up to now, these lesions had been described in Europe and in Chile, on calf exclusively. This time, the syndrome was observed on adult cattle reared in the Accra Plains (Ghana) and infected by *S. typhimurium*. This case give evidence of the spreading of salmonellosis on the African continent and should foster the search of adequate control measures. *Key words*: Cattle - Gangrene - Salmonellosis - *Salmonella typhimurium* - Ghana.

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Prevalence of mastitis in imported Friesian cows in Sudan

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ABDELRAHIM (A. I.), SHOMMEIN (A. M.), SULIMAN (H. B.), SHADDAD (S. A. I.). Prévalence des mammites chez des vaches Frisonnes importées au Soudan. *Revue Élev. Méd. vét. Pays trop.*, 1989, 42 (4) : 512-514.

Des mammites ont été dépistées par différentes techniques de diagnostic chez trois cent vingt-deux vaches Frisonnes en lactation. Les germes prédominants rencontrés ont été des staphylocoques, des streptocoques, *Corynebacterium* et *Escherichia coli* spp. *Mots clés* : Bovin Frison - Vache - Mammité - Diagnostic - Soudan.

Bovine mastitis has been and continues to be one of the major problems of the dairy industry with great economic losses resulting from decreased milk production, discarded milk, drug costs, veterinary fees and extra labour. Evidence of the prevalence of subclinical mastitis in Sudan is largely based on results from a number of local surveys carried out in various areas of the country (1, 9). However, mastitis has not been investigated in Friesian cows, which

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numbers are continuously increasing with the expanding dairy industry in the country.

The main objective of this study was to establish the prevalence of mastitis in this exotic breed and to identify the predominant pathogens involved. It was also designed to determine the relationship between the California mastitis test, direct cell count and the bacteria present.

Three hundred twenty-two lactating Friesian cows, imported in Sudan from West Germany (1985-1986) were examined in seven herds designated as A, B, C, D, E, F and G. Each herd consisted of 42-50 cows. The cows were kept under open lot, free-stall system. They were fed Sudan grass, hay and concentrates *ad lib*. Water is provided through automatic troughs. The milking is done in a parlor using Stranko Milkers (automatic system). The standard hygiene was high, no overmilking occurred. Lodophor teat dip was applied.

Milk samples were drawn from each quarter from cows that calved more than one week previously. Clinical cases of mastitis under treatment were not sampled. Foremilk was discarded, then about 10 ml of milk were collected in clean sterile universal containers. They were received at the laboratory on the day of collection, counted for total somatic cells and cultured.

Milk samples from each quarter were tested using California mastitis test (CMT) (8). The results of the test were assessed according to the degree of precipitation or gel formation.

One milliliter of each quarter milk sample was spread on an area of one square centimeter of microscope slide.

The milk film was then fixed by gentle heating, stained with methylene blue, washed in running tap water, dried and examined under oil immersion lense for counting of somatic cells according to the method of CARTER (4). Magnification used was 400,000. Cells counts of 500,000 and above were considered positive for mastitis.

A loopfull drop of milk from each sample was plated on blood agar (Oxoid code M55) and Macconky agar (Oxoid code CM7). The plates were then incubated aerobically and anaerobically at 37 °C for 24-48 hours. Bacteriological colonies were purified for the purpose of identification by reculturing on nutrient agar (Oxoid CM3). All bacteriological procedures were done according to other workers (5, 6).

Prevalence of infection using different diagnostic methods are shown in table I. The organisms isolated and their distribution in infected cows and quarters

is presented in table II; 55.6 % of the tested quarters were free of pathogens. The distribution of cell count ranges in quarters is shown in table III.

This is the first attempt to investigate the prevalence of mastitis in imported Friesian cows in the Sudan. The present study showed that there was a high prevalence of mastitis in these imported Friesian cows although these animals were kept under modern dairy system of management and nutrition.

It is obvious that bacterial culture method used was the most reliable one, though it is tedious and expensive. It uncovered more subclinical cases of mastitis than CMT and DCC tests. Furthermore the culture of milk samples showed that 70.3 per cent of cows and 44.1 per cent of the quarters had been invaded with pathogenic organisms. Whereas CMT revealed 31.7 per cent of the cows and 38.8 per cent of quarters were positive to the test. DCC showed that 45.8 per cent of cows and 37.1 per cent of quarters had inflammatory changes. Despite that some quarters were negative to CMT and had cell count less than 500,000 cell/ml but still pathogenic organisms were isolated from them. This could be due to the invasion of the quarters with the pathogenic organism without causing tissue damage yet. Such cases usually pass unnoticed and can only be detected by bacteriological culture. *Staphylococcus aureus* and *epidermidis* were found to be the predominant infective species of pathogens. This was followed by mixed infection. The *Streptococcus* species isolated were mainly *agalactiae* and *disagalactiae*. The *E. coli* and *Corynebacterium* infection accounted for 4.8 per cent and 3.3 per cent respectively. These findings are in agreement with results already reported (2), and with those of WAKEEM and EL TAYEB (10) and ADLAN *et al.* (1) in indigenous and cross bred cows in Sudan.

It is clear that there is a correlation between cell count and infection rate. Higher cell counts are accompanied by higher rate infection. *Staphylococcus* spp. seems to be predominant pathogen in all higher cell count ranges followed by *Corynebacterium* spp., infection where the cell count range increased from 300,000 to over a million. This observation was noticed before by WILSON and RICHARD (11). Weak association was detected between *E. coli* and cell count. Whenever there was high cell count, it is more likely not to isolate *E. coli* from the milk culture. This may indicate that *E. coli* is more vulnerable to elimination by local inflammatory cells or by the locally developed immune reaction (3).

No significant differences in the infection rate due to the position of quarters (front or hind) were observed in this study. However, PEARSON and MACKIE (7) reported that hind quarters were much more prone to infection than the front ones.

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TABLE I Prevalence of infection by different diagnostic methods.

Method	Total No. of cows tested	Total No. of positive cows	Positive cows per cent	Total No. of quarters tested	Total No. of positive quarters	Per cent of positive quarters
CMT	322	102	31.7	1,264	490	38.8
DCC	310	142	45.8	1,168	433	37.1
Cultural Method	239	168	70.3	934	412	44.1

Positive cases have cell counts above 500,000 cells/ml of milk according to IDF ; CMT : California mastitis test ; DCC : Direct cell count ; IDF : International Dairy Federation.

TABLE II Prevalence of infection by pathogens.

Pathogen	No. of cows tested	No. of infected cows	Per cent of infected cows	No. of qtr tested	No. of infected qtr	Per cent of infected quarters
<i>Staph. species</i>	239	73	30.5	934	203	21.7
<i>Strept. species</i>	239	11	4.6	934	44	4.7
<i>E. coli</i>	239	8	3.4	934	45	4.8
<i>Corynebacterium</i>	239	8	3.4	934	31	3.3
<i>Bacillus species</i>	239	1	0.4	934	1	0.11
Mixed infection	239	71	29.7	934	91	9.7
Total	239	172	71.9	934	415	44.4

TABLE III Distribution of cell counts in quarters infected with major pathogens.

Qtr with cell count range thousands/ml	Total No. of qtr	No. of infected qtr	Per cent of qtr infected	<i>Staph. spp.</i> (per cent)	<i>Strept. spp.</i> (per cent)	<i>Bacillus spp.</i> (per cent)	<i>E. coli</i> (per cent)	<i>Coryneb. spp.</i> (per cent)	Mixed infection (per cent)
00-300	465	108	23.2	44.4	9.3	0.9	29.6	0.9	14.8
301-500	92	86	93.5	58.6	9.3	—	8.0	3.4	20.7
501-750	73	63	86.3	54.0	12.7	—	4.8	9.5	19.0
751-1,000	46	46	100	59.6	2.1	—	2.1	12.8	23.4
Over 1,000	98	87	88.8	44.8	11.5	—	1.1	18.4	24.1

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ABDELRAHIM (A. I.), SHOMMEIN (A. M.), SULIMAN (H. B.), SHADDAD (S. A. I.). Prevalence of mastitis in imported Friesian cows in Sudan. *Revue Élev. Méd. vét. Pays trop.*, 1989, 42 (4) : 512-514.

Three hundred twenty-two lactating Friesian cows were examined for mastitis by different diagnostic techniques. The predominant pathogens encountered were Staphylococci, Streptococci, *Corynebacterium* and *Escherichia coli* spp. **Key words**: Friesian Cattle - Cow-Mastitis - Diagnosis - Sudan.

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