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Studies on Colibacillosis in Calves in Egypt I. Mortality among Buffalo and Friesian Calves

By

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With 3 tables

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Introduction

The importance of *E. coli* as a cause of death among newly born calves has been recognized in different countries. In England the mortality rate among calves was 5—12 % (LOVELL, 1945; WITHERS, 1952 and 1953); in the USA VAN PELL et al. (1953) found that 43.6 % of losses in calves were due to calf scours. The losses can be very severe and reach 100 % during a season on a given farm (DUNNE et al., 1956). In West Germany MAYR et al. (1964) reported an annual loss of 10 % of calves due to *E. coli* infection; in Italy it varied between 20 and 30 % (PIGNATTELLI et al., 1972).

In Egypt RAGAB and ASKAR (1959) reported a mortality rate of 16.1 % and 31 % in Tahreer Province and Kanater, respectively.

In the present work the mortality rate among buffalo and Friesian suckling calves belonging to the dairy farms of the General Meat Organization was estimated for the years 1965—1973 and the internal organs of 100 dead calves from 9 different farms were examined bacteriologically.

Material and Methods

Data concerning the mortality rate among newborn calves were obtained from the annual reports of the General Meat Organization by the second author (M. S. I.).

For bacteriological examination 100 dead calves were selected from 9 farms; 8 were buffalo farms with problems of diarrhoea, dehydration and septicaemia and one was a Friesian farm with calves dying with symptoms of meningitis and early deaths shortly after birth. The internal organs were cultured on nutrient agar, MacConkey agar and blood agar. Colonies suspected as *E. coli* were purified and examined biochemically and serologically.

Results

1. Mortality among newborn calves

A. Buffalo calves

The mortality rate due to enteritis in 1965/66 represented 24.3 % of suckling buffalo calves, constituting 42.4 % of total deaths. This percentage decreased in subsequent years with a slight variation, attaining 10.2 % in 1971/73, but still constituting more than half of the total deaths (Table 1).

Table 1
Mortality Rate in Buffalo and Friesian Calves

Year	Buffalo suckling calves			Friesian suckling calves		
	Total No.	Total deaths	deaths due to enteritis	Total No.	Total deaths	deaths due to enteritis
1965 / 66	1186	909 (57.3 %)	386 (24.3 %)	723	113 (15.6 %)	38 (5.2 %)
1966 / 67	1158	658 (56.8 %)	269 (23.2 %)	565	140 (24.8 %)	59 (10.4 %)
1967 / 68	3648	895 (24.5 %)	246 (6.7 %)	984	93 (9.5 %)	32 (3.2 %)
1968 / 69	2728	493 (18.1 %)	162 (5.5 %)	1242	59 (4.8 %)	15 (0.9 %)
1969 / 70	3209	576 (17.9 %)	265 (8.2 %)	1295	74 (5.7 %)	29 (2.2 %)
1970 / 71	3732	1031 (27.6 %)	399 (10.6 %)	1258	109 (8.7 %)	24 (1.9 %)
1971 / 72	3342	807 (24.1 %)	428 (12.8 %)	1315	74 (5.6 %)	24 (1.8 %)
1972 / 73	3411	631 (18.5 %)	350 (10.2 %)	2184	129 (5.9 %)	46 (2.1 %)
Total	22814	6000 (26.3 %)	2505 (11 %)	9566	791 (8.3 %)	267 (2.7 %)

B. Friesian calves

In 1965/66 the mortality rate of Friesian calves due to enteritis was much lower (5.2 %) than in buffalo calves in the same year. In the second year it varied between 0.9 % and 3.2 %. Deaths due to enteritis constituted about 22—42 % of the total deaths. In general the total mortality in Friesian calves was much lower than in buffalo calves (Table 1).

Table 2
Incidence of *E. coli* strains isolated from 62 calves dying from colibacillosis

No. and kind of dead animals positive to colibacillosis	Number of <i>E. coli</i> strains isolated from different organs										
	Blood	Liver	Spleen	Kidney	Intestine	Lung	Bone marrow	Muscle	C. S. F.	Total	
Buffalo	54	39	46	34	50	83	28	22	13	-	315
Friesian	8	6	7	7	8	11	5	4	2	3	53
Total	62	45	53	41	58	94	33	26	15	3	368

2. Results of the bacteriological examination

From 62 of 100 dead calves (54 buffalo and 8 Friesian) 492 *E. coli* strains could be isolated from the internal organs. They were most frequently isolated from the intestine, then the kidneys, liver, blood and spleen; less frequently from the lungs, bone marrow and muscles (Table 2).

Of the 8 Friesian calves, 2 animals which died with symptoms of meningitis revealed *E. coli* in the cerebrospinal fluid.

Only 368 of the strains could be typed and the remainder were either rough or could not be typed. In buffalo calves 16 sero-groups were isolated.

Table 3

Number of *E. coli* serogroups

Buffalo farms	groups	8	9	15	26	35	55
Marg		2	2	1	-	5	5
Shouha		7	3	-	-	6	-
Danabeek		-	4	-	2	2	-
Magaz B		2	-	-	-	-	-
Adah		5	-	9	3	17	-
Mootamadia		-	-	-	-	5	7
Hawatka		-	3	-	-	-	-
Kome Ompo		1	3	1	5	-	-
Total		17	15	11	10	35	12
Kanater (Friesian calves)		1	7	-	7	-	-
Total		18	22	11	17	35	12

The 0-group 117 was by far the most common. The *E. coli* strains isolated from Friesian calves were found to belong to 9 0-group. The prevailing groups were 0 78, 0 101 and 0 137 (Table 3).

More than one *E. coli* serogroup was sometimes isolated from different organs of the same animal, thus giving double, triple or quadruple infection. In Friesian calves single and double infections were found in the kidneys, liver and intestine and the smallest in the bone marrow. Triple infection was mostly encountered in the intestines. Quadruple infection was met with only once in blood, liver and spleen and twice in the intestine.

Discussion

The average mortality rates due to enteritis in 8 years on 15 buffalo and 5 Friesian farms were 11 % and 2.7 %, respectively. In Ireland it was 17.1 % (MURPHY, 1954/5;) and in Denmark it reached 22.5 % (OTTOSEN, 1959). From these data and other reports mentioned in the Introduction it can be concluded that the mortality rate shows variation in different countries as well as in the different years and herds in the same country. This was also expressed by PIGNATELLI et al. (1972) concerning Italy, who reported a marked variation depending on whether the calves were native or imported from abroad.

Sixty-two of the calves harboured *E. coli* in different organs. Although 83 cultures were isolated from the intestine, a lesser number of strains were encountered in the different organs. This may explain the fact that not all the strains found in the intestines have the ability to invade and multiply in the tissues. If we take the liver and blood as an index for septicaemia, then 46 of the 54 buffalo calves were septicaemic. *E. coli* was not isolated from the blood in 15 of the calves, from the spleen in 20 and from the bone marrow it was isolated in only 22 calves. From the kidney 50 strains could be cultured; the four additional strains may have originated from ascending infection from the urinary tract. In this respect it is of interest to refer to FEY and MARGADENT (1961) who reported the distribution of *E. coli* in the body of 37 calves that had died from septicaemia. In 12 the organism was isolated from all parts of the body; in 25 it was missing from part or all of the digestive tract and in 17 the rectum and faeces were free from it. Massive infection of the urinary bladder was found in all animals.

Table 3

isolated from dead calves

78	86	101	111	115	117	119	125	126	137	Total
3	6	-	4	6	16	3	2	5	4	64
-	-	1	-	8	19	-	-	-	-	44
2	3	5	-	8	7	-	-	-	3	36
3	3	3	3	4	6	-	-	-	4	28
-	-	-	-	17	21	4	-	-	-	76
8	-	-	-	3	8	5	5	-	7	48
-	2	-	-	-	-	-	-	-	4	9
-	-	2	-	-	2	-	-	-	-	14
16	14	11	7	46	79	12	7	5	22	319
10	2	9	-	2	2	-	-	-	9	49
26	16	20	7	48	81	12	7	5	31	368

It is worthwhile mentioning that in the different organs more than one serogroup was encountered, giving double, triple or quadruple infections. GOSSLING et al. (1964) isolated an average of 2.9 serotypes per dead calf and in one case they found strains belonging to 12 different serotypes. SOEDERLIND (1965) isolated two different serotypes from nine dead calves.

Summary

Studies of the mortality rate among calves over a period of 8 years on the different farms of the General Meat Organization showed that enteritis was responsible for 11 % of losses among the total newborn suckling buffalo calves (representing 41.7 % of total deaths), while in Friesian calves the mortality was 2.7 % (representing 33.7 % of total deaths).

Bacteriological examination of the internal organs of 100 dead suckling calves revealed that 62 had died of colibacillosis. *E. coli* could be isolated most frequently from intestine, kidney, liver, blood, spleen and lung and less frequently from bone marrow and muscles. In calves dying with symptoms of meningitis *E. coli* could be isolated from the cerebrospinal fluid. Single, double, triple and quadruple infections were found in Friesian calves. A total of 492 *E. coli* strains were isolated, of which 368 could be typed as O 111, O 115, O 35, O 137, O 78, O 9, O 101, O 8, O 26, O 86, O 55, O 119, O 15, O 11, O 125, and O 126.

Zusammenfassung

Untersuchungen über die Colibazillose der Kälber in Ägypten

I. Mortalität bei Büffel- und Friesiankälbern

Die Untersuchungen über die Sterblichkeitsquote bei Kälbern in einem Zeitraum von 8 Jahren auf verschiedenen Farmen der „General Meat Organization“ zeigten, daß die Enteritis 11 % der Verluste unter neugeborenen Saugkälbern (dies sind 41,7 % der Gesamtverluste) ausmachte.

Die bakteriologische Untersuchung der inneren Organe von 100 gestorbenen Saugkälbern bewies, daß 62 an Colibazillose gestorben waren. Am häufigsten wurde *E. coli* aus dem Darmtrakt, der Niere, der Leber, dem Blut, der Milz und der Lunge und seltener aus dem Knochenmark und der Muskulatur isoliert. Bei Kälbern, die unter den Krankheitserscheinungen einer Meningitis starben, konnten *E. coli*-Keime auch aus der Zerebrospinalflüssig-

keit isoliert werden. In den Büffelkadavern wurden Einzel-, Doppel-, Dreifach- und Vierfachinfektionen, in Friesiankälbern dagegen nur Einzel- und Doppelinfektionen gefunden. Von den insgesamt 492 isolierten *E. coli*-Stämmen konnten 368 typisiert werden und zwar als O 111, O 115, O 35, O 137, O 78, O 9, O 101, O 8, O 26, O 86, O 55, O 119, O 14, O 11, O 125 und O 126.

Résumé

Recherches sur la colibacillose des veaux en Egypte

I. Mortalité chez des veaux de buffles et frisons

Les recherches faites sur le taux de mortalité chez des veaux provenant de différentes exploitations de la «General Meat Organization» durant une période de 8 ans, ont montré que les entérites représentaient le 11 % des pertes chez les veaux nouveau-nés (41,7 % des pertes totales). L'examen bactériologique des organes internes de 100 veaux périés a montré que 62 ont péri de colibacillose. *E. coli* fut isolé le plus souvent à partir du tube digestif, des reins, du foie, du sang, de la rate, des poumons et plus rarement à partir de la moëlle osseuse et de la musculature. *E. coli* fut également isolé à partir du liquide cérébrospinal chez des veaux périés qui présentaient des symptômes de méningite. On a trouvé des infections simples, doubles, triples et quadruples chez les buffles; elles furent par contre simples et doubles chez les veaux frisons. 368 souches d'*E. coli* sur 492 ont pu être typisées et ont donné O 111, O 115, O 35, O 137, O 78, O 9, O 101, O 8, O 26, O 86, O 55, O 119, O 15, O 11, O 125 et O 126.

Resumen

Estudios sobre la colibacilosis de los terneros en Egipto

I. Mortalidad en terneros de búfalos y frisonos

Los estudios sobre la tasa de mortalidad en terneros durante un espacio de tiempo de 8 años en varias explotaciones de la «General Meat Organization» revelaron que la enteritis ascendía al 11 % de las pérdidas entre los terneros recién nacidos (41,7 % de las pérdidas totales). El examen bacteriológico de los órganos internos de 100 terneros lactantes muertos demostró que 62 habían sucumbido de colibacilosis. Con frecuencia máxima se aisló *E. coli* del tracto intestinal, riñón, hígado, sangre, bazo y pulmón, y, más rara vez, de la médula ósea y de la musculatura. En terneros que murieron bajo los síntomas nosológicos de una meningitis, también se pudieron aislar gérmenes *E. coli* del líquido céfalorraquídeo. En los cadáveres de búfalos se hallaron infecciones simples, dobles, triples y cuádruples, mientras que en los terneros frisonos solo infecciones simples o dobles. Del total de 492 estirpes *E. coli* aisladas se pudieron tipificar 368, a saber como O 111, O 115, O 35, O 137, O 78, O 9, O 101, O 8, O 26, O 86, O 55, O 119, O 15, O 11, O 125 y O 126.

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