EXPERIMENTAL DRUG TREATMENT OF EAST COAST FEVER OF CATTLE.

BY GEORGE H. F. NUTTALL, F.R.S.

(From the Quick Laboratory, University of Cambridge.)

(With 1 Chart.)

THE results obtained in the treatment of East Coast Fever have been uniformly negative. Nevertheless it appears desirable to publish the records of 18 experimental cases which we have treated with various drugs, since the negative evidence afforded may help other workers in the search for the remedy which we must hope will ultimately be found.

Trypanblue was found to be ineffective by Nuttall and Hadwen (v. 1909, *Parasitology*, II. p. 190), in one experiment the dye "exerted no effect whatsoever on the parasite." The record and chart of the case accompanies the paper by Nuttall, Fantham and Porter (9. II. 1910, *Parasitology*, II. pp. 329, 331, 332). A cow was infected by means of *Rhipicephalus evertsi* adults, she showed fever on the 14th day, and a few parasites were found in her blood 20 days after the ticks had been placed upon the animal. The trypanblue was given intravenously on the 21st (200 c.c. of 1 % solution), 22nd (200 c.c. of 2 % solution) and 23rd day (100 c.c. of 2 % solution), but the number of parasites steadily increased until the animal died. Negative results were subsequently obtained in a field trial conducted in South Africa. We have shown that trypanblue is an excellent remedy for piroplasmosis in dogs and cattle, and it has been found effective in biliary fever in horses. As the question is frequently asked "What is trypanblue?" I herewith append the formula ($C_{34}H_{24}N_6O_{14}S_4Na_4$; the tetrazo compound of toluidine and amidonaphtholsulphonate of sodium).

The drugs used in the experiments herein recorded were the following:

I. *Congo red* ("concentrated," obtained from Messrs Levinstein, Ltd., Blackley, near Manchester). It was used once, 70 c.c. of a

0.5 % solution being injected subcutaneously into Calf 8 (see protocol of Exp. I) before the parasites appeared in the animal's blood, Koch's "blue bodies" having, however, been found in gland smears coincidentally with the onset of fever. The administration of this dye did not retard the appearance of the parasites in the blood. The dye was tried because it had been found by me to exert an effect on *Piroplasma canis* (*Parasitology*, II. p. 415).

I a. *Sodium salicylate* (10 %) + *Sodium bicarbonate* (1 %) in 100 c.c. of NaCl solution was subsequently injected intravenously into Calf 8 on three days, beginning on the second day after the appearance of the parasites in the blood, but the result was negative.

II-III. *Tryposafrol* (according to Prof. Brieger and Dr Krause, kindly supplied by the Aktien-Gesellschaft für Anilin Fabrikation, Berlin). This dye was given to two calves. In Exp. II it was given in daily doses ranging from 0.25 to 3 grammes dissolved in sugared water which the animal drank. Treatment began on the fifth day after the onset of fever and for six days before the parasites appeared in the animal's blood, and continued daily up to and including the day of death. The number of parasites in the blood remained small but they showed a definite increase in spite of treatment. In Exp. III the calf received the same treatment, the dose of tryposafrol being 0.25, rising to 1.5 grammes daily; treatment began on the day after the first parasites appeared in the animal's blood and was maintained to the end. The number of parasitized corpuscles steadily increased in spite of treatment. (See protocol on p. 63.) This dye was tried because of the claims made by Brieger and Krause that it exerted a curative effect in piroplasmosis of cattle and in trypanosomiasis. Our experiments with tryposafrol in relation to piroplasmosis and trypanosomiasis will be reported upon in a future paper.

IV. *Creosote* 0.2 c.c. + *Oleum copaivae* 3.7 c.c. in 3 % solution injected intravenously in seven daily doses of 5 c.c. beginning on the third day of fever and three days before the appearance of parasites in the animal's blood. No effect was exerted by the treatment (see protocol, p. 64). Creosote was chosen as a representative of antiseptic drugs belonging to the volatile aromatic series, being more powerfully antiseptic than carbolic acid and possessing greater penetrating power. The copaiva was added as a representative of the less irritant volatile oils with antiseptic properties.

58 . *Drug Treatment of East Coast Fever of Cattle*

V. *Arsacetin* (sodium-p-acetyl-aminophenylarsinate-acetylarsanilate. Obtained from Farbwerke vorm. Meister Lucius und Brüning, Hoechst a. M.) was given in doses of 2 to 5 c.c. of a 5 % solution, intravenously on seven alternate days. Treatment began on the day after the parasites appeared in the animal's blood. The drug exerted no effect, as will be seen by reference to the protocol on p. 65.

VI-VII. *Soamin* (sodium-para-amino-phenylarsonate. Obtained from Messrs Burroughs Wellcome and Co.). In Exp. VI 2.5 grammes dissolved in 12.5 c.c. of hot water and injected intramuscularly, whilst warm, on seven days. Treatment began on the day when parasites first appeared in the calf's blood. In Exp. VII a 2 % solution was injected intravenously in doses ranging from 3 to 13 c.c. following on the injection of 2 to 4 c.c. of a solution of eosin and sodium bicarbonate ($\frac{1}{2}$ a grain of each per c.c.). The treatment began on the fifth day after the parasites appeared in the calf's blood. In both experiments the drug exerted no influence on the progress of the disease. (See protocols, pp. 66, 67.)

VIII. "606": a single dose of 2 grammes was injected intravenously on the third day after the parasites appeared in the cow's blood. The drug did not produce any visible effect on the parasites and the animal died of East Coast Fever within 48 hours. (See protocol, p. 68.)

IX. *Emetine hydrochloride*, 1 % in NaCl solution was injected intravenously in doses ranging from 1 to 10 c.c. on nine successive days, beginning on the second day of the appearance of parasites in the calf's blood. The drug did not affect the course of the disease, the number of parasitized corpuscles in the peripheral blood mounted steadily until the animal died. (See protocol, p. 69.) The drug was used because of the favourable reports relating to its curative action in Amoebiasis.

X. *Mercury salicylate*, 1 % in 0.8 % NaCl solution was injected intravenously in doses ranging from 4 to 20 c.c. on nine days. Treatment was commenced two days before the parasites appeared in the animal's blood. The drug exerted no retarding effect upon the progress of the disease. (See protocol, p. 70.)

XI. *Mercury succinimide* ($\text{Hg}[\text{C}_2\text{H}_4(\text{CO}_2\text{N})_2]$) in 3 % solution was injected intravenously in three doses of 2, 4 and 3 c.c. in as many days, beginning on the day when the first parasites appeared in minimal

numbers in the calf's blood. The drug exerted no effect whatever. (See protocol, p. 71.)

XII-XIII. *Quinine bihydrochloride*. In Exp. XII the animal received on 14 successive days subcutaneous injections of 55 to 60 grains dissolved in 25 c.c. of water. Treatment commenced on the third day of the appearance of parasites in the animal's blood. In Exp. XIII quinine hydrochloride was given on five successive days followed by the bihydrochloride on seven out of nine days, the drug being injected intramuscularly. Treatment in this case began on the first appearance of parasites in the calf's blood. No effect was observable from the treatment. (See protocols, pp. 72-74.)

XIV. *Ethylhydrocupreine HCl*, 24 c.c. of an 8 % solution was injected subcutaneously on five successive days, beginning on the second day after the appearance of parasites in the calf's blood. The result was negative. (See protocol, p. 75.) This drug had been recommended because of its bactericidal effect in pneumococcus infections.

XV. *Ammonium fluoride*, 0.5 % in 0.8 % NaCl solution was injected in doses of 18 to 20 c.c. intravenously on nine successive days. Treatment began on the second day of the parasites appearing in the calf's blood. There was no observable effect. (See protocol, p. 76.) The trial of ammonium fluoride was suggested by its known inhibitive effect on bacteria producing lactic and butyric acid fermentation without interfering with the growth of yeast.

XVI. *Potassium iodide* in 25 % solution was injected intravenously on five successive days, the dose ranging from 20 to 40 c.c. Treatment commenced a day before the parasites appeared in the animal's blood but the result was negative. (See protocol, p. 77.)

XVII. *Calcium lactate* in 10 % solution was injected intravenously on seven successive days, the dose ranging from 3 to 5 c.c. Treatment began on the second day of the appearance of parasites in the calf's blood. There was no effect observable. (See protocol, p. 78.)

XVIII. *Nuclein* from thymus gland, 10 c.c. of a 5 % solution was given subcutaneously on five days, commencing on the third day of fever and two days before the parasites appeared in the calf's blood. The treatment was without effect. (See protocol, p. 79.)

60 *Drug Treatment of East Coast Fever of Cattle*

Records of Cattle subjected to Drug Treatment.

When the experiments took place in winter the animals were kept in stalls warmed to 60–70° C. The ticks used for infecting the animals were enclosed in bags fastened about the ears of the cattle.

Blood films were prepared from the animals every day from the time that fever occurred. In some cases films were prepared twice a day or oftener. The films were stained by Giemsa's method. To determine the percentage of infected red blood corpuscles it was usually found sufficient to count 250 corpuscles all told (infected and uninfected), but on some occasions 500 to 1000 were counted so as to arrive at a more exact result.

Autopsies were made and the presence of typical lesions was noted in all cases.

EXPERIMENT I (*Calf 8*).

- Treatment: (1) *Congo red*, 0.5 % solution, 70 c.c. injected subcutaneously on the 14th day.
 (2) *Sodium salicylate*, 10 % solution + *Sodium bicarbonate*, 1 % in normal NaCl solution, 100 c.c. injected intravenously on the 21st, 22nd and 24th day.
 (3) *Mercury salicylate* in 1 % solution, 5 c.c. injected intravenously on the 29th day (too late).

Date 1911	Day	Temp. ° F. a.m. p.m.	
11. x.	1	—	12 infected <i>R. appendiculatus</i> adults (6 ♂, 6 ♀) were placed on the calf
	2	101.2	
	3	101.4	
	4	101.4	
	5	101.2	
	6	100.8	
	7	101.8	
	8	100.6	
	9	101.8	
	10	102	
	11	102	
	12	102	
	13	102.6	

EXPERIMENT I (*cont.*).

Date 1911	Day	Temp. ° F. a.m. p.m.		
24. x.	14	104	Fever begins.	Koch's "blue bodies" found in gland smear.
		104.8		<i>Treatment</i> : 70 c.c. 0.5 % Congo red,
	15	103.4		subcutaneously
		—		
	16	103.6		
		106.4		
	17	105.2		
		105.4		
	18	104.6		
		105		
	19	105.4		
		105		
	20	106.2	M. 1.2 % of r.b.c. contain parasites	<i>Treatment</i>
		106	E. 3.6	
	21	105.6	M. 6.4	" " "
		105.2	E. 6.8	" " "
	22	105.4	M. 9.6	" " "
		105	E. 13.2	" " "
	23	104.2	M. 18.4	" " "
		105.6	E. 21.6	" " "
	24	104.4	M. 24.0	" " "
		104	E. 20.0	" " "
	25	106.2	M. 22.0	" " "
		105.4	E. 28.4	" " "
	26	105.2	M. 24.8	" " "
		105.4	E. 28.4	" " "
	27	104.8	M. 35.6	" " "
		105	E. 36.4	" " "
	28	105.6	M. 36.4	" " "
		106.2	E. 38.4	" " "
	29	105.6	M. 45.6	" " "
		106.2	E. 46.0	" " "
9. xi.	30	—	Calf died at 8 a.m.	5 c.c. of salicylate of mer- cury solution intra- venously

EXPERIMENT II (*Calf 18*).

Treatment: *Tryposafrol*, 0.25 grammes rising to 3 grammes daily in 5 litres of sugared water on 17 successive days.

Date 1913	Day	Temp. ° F. a.m. p.m.	
16. iv.	1	102	30 infected <i>R. appendiculatus</i> nymphs were placed on the calf
		102.4	
	2	101.4	
		101.2	
	3	101.6	
		101.4	
	4	101.4	
		101.2	
	5	102	
		102.2	
	6	102.2	
		102.4	
	7	100.8	
		100.6	
	8	101.8	
		101.8	

62   *Drug Treatment of East Coast Fever of Cattle*

EXPERIMENT II (*cont.*).

Date 1913	Day	Temp. ° F. a.m. p.m.				
24. iv.	9	101·4				
		101·2				
	10	101·4				
		101·2				
	11	102·1				
		102·2				
	12	102·4				
		102·2				
	13	104·4	Fever begins			
		104·6				
	14	105·2				
		105·4				
	15	105				
		105·2				
	16	104·4				
		104·6				
	17	104·6				
		104·5				
	18	104·6				
		104·4				
	19	104·2				
		104·4				
	20	104·3				
		104·2				
	21	105				
		105·2				
	22	104				
		104·2				
	23	104·4	Very few parasites found			
		104·4				
	24	104	0·8 % of r.b.c. infected			
		104·2				
	25	104·1				
		104	2·4 " "			
	26	104·2				
		104·4	1·6 " "			
	27	104				
		104·2	1·6 " "			
	28	104·6				
		104·4	1·6 " "			
	29	104·8				
		104·5	5·2 " "			
	30	105·2				
		105·3	4·8 " "			
	31	105·2				
		105·2	8·0 " "			
	32	105				
		105·2	5·2 " "			
18. v.	33	104				
		103·2	5·6 " " Calf died at 6 p.m.			

Treatment: *Tryposafrol*, 0.25 rising to 1.5 grammes daily in 5 litres of sugared water as a drink on 11 successive days.

Date 1913	Day	Temp. ° F. a.m. p.m.								
14. v.	1	101·1	40 infected <i>B. appendiculatus</i> nymphs were placed on the calf							
	2	101·4								
	3	101·4								
	4	100·8								
	5	100·2								
	6	100·6								
	7	101·2								
	8	101·4								
	9	101·2								
	10	101·1								
	11	101·4								
	12	101·2								
	13	101·2								
	14	101·3								
	15	105	Fever begins							
	16	107								
	17	104								
	18	104·4	Very few parasites found							
	19	105	0·8 % of r.b.c. infected		Treatment					
	20	105·8	2·4 " "		0·25 grammes of tryposafrol in drink					
	21	105·6	6·0 " "		1·0 " " " "					
	22	105·2	15·6 " "		1·0 " " " "					
	23	105·6	16·8 " "		1·5 " " " "					
	24	103·4	32·0 " "		1·5 " " " "					
	25	102·1	34·0 " "		1·5 " " " "					
	26	102·4	41·2 " "		1·5 " " " "					
	27	104·4	51·2 " "		1·5 " " " "					
	28	106·4	52·4 " "		1·5 " " " "					
11. vi.	29	105·6	57·2 " "		1·5 " " " "					
		106·6	Calf died at 6.35 p.m.							

64 *Drug Treatment of East Coast Fever of Cattle*

EXPERIMENT IV (*Calf 7*).

Treatment: *Creosote and Oleum copaivae* (Creosote 0.2 c.c. + Ol. copaivae 3.7 c.c. diluted to form a 3 % solution).

Date 1912	Day	Temp. ° F. a.m. p.m.		
29. II.	1	101.2	12 infected <i>R. appendiculatus</i> adults (6 ♂, 6 ♀) were placed on the calf	
		101.6		
	2	101.6		
		101.2		
	3	101.2		
		101.4		
	4	101.2		
		101		
	5	101.6		
		101.2		
	6	100.8		
		101.4		
	7	101		
		101.2		
	8	101.6		
		101.8		
	9	100.4		
		101		
	10	102		
		101.8		
	11	101		
		101.6		
	12	102.8		
		102.4		
	13	104.2	Fever begins	
		103.2		
	14	105.2		
		105.6		
	15	106		<i>Treatment</i> 5 c.c. of drug injected intravenously
		105.2		
	16	105.4		5 c.c. " " "
		106.2		
	17	106.2		5 c.c. " " "
		105.8		
	18	106.2	Very few parasites found	5 c.c. " " "
		105.6		
	19	105.4	" " "	—
		105.2		
	20	105	4.0 % of r.b.c. infected	5 c.c. " " "
		105.2		
	21	104.8	6.0 " "	5 c.c. " " "
		104.8		
	22	105	13.2 " "	5 c.c. " " "
		104.6		
	23	104.2	16.4 " "	
		104.4		
	24	104.6	20.4 " "	
		104.8		
	25	105	31.6 " "	
		105.2		
	26	105.8	39.6 " "	
		106		
	27	106.8	43.6 " "	
		106.2		
	28	106.4	49.2 " "	
		105.6		
	29	105	55.2 " "	
		97.6		
29. III.	30	—	Calf died at 5 p.m.	

EXPERIMENT V (*Calf* 6).

Treatment: *Arsacetin*, 5 % solution given on 7 alternate days in doses ranging from 2 to 5 c.c. intravenously.

Date . 1912	Day	Temp. ° F. a.m. p.m.				
9. VII.	1	101·4	18 infected <i>R. appendiculatus</i> adults (9 ♂, 9 ♀) were placed on the calf			
		101·8				
	2	101·6				
		101·2				
	3	101				
		101·4				
	4	101·2				
		101·4				
	5	101·8				
		101·6				
	6	101·2				
		101·6				
	7	101·8				
		101·2				
	8	100·6				
		101				
	9	100·8				
		101·4				
	10	101·2				
		101·8				
	11	102·4				
		102·2				
	12	103·4	Fever begins			
		104				
	13	104·6				
		105·2				
	14	104·2				
		104·4				
	15	104·6	Very few parasites found			
		104·6				
	16	104·8	0·4 % of r.b.c. infected	2 c.c. of 5 %	<i>Treatment</i> arsacetin solution	
		105			intravenously	
	17	105·4	0·8 " "			
		106				
	18	106	2·0 " "	2 c.c.	" " "	
		106·2				
	19	106	6·8 " "			
		105·4				
	20	105	13·2 " "	4 c.c.	" " "	
		105				
	21	104·8	19·2 " "			
		104·6				
	22	104·8	—	5 c.c.	" " "	
		105				
	23	105·2	24·4 " "			
		105				
	24	105·2	30·0 " "	5 c.c.	" " "	
		105				
	25	105·8	31·2 " "			
		106				
	26	106·4	41·2 " "	5 c.c.	" " "	
		106·6				
	27	106·6	41·6 " "			
		106				
	28	105·2	—	5 c.c.	" " "	
		104·8				
6. VIII.	29	104	Calf died at 6 p.m.			

Parasitology VIII

5

66 *Drug Treatment of East Coast Fever of Cattle*

EXPERIMENT VI (*Calf 3*).

Treatment: *Soamin*, 2·5 grammes dissolved in 12·5 c.c. of hot water and injected intramuscularly, whilst warm, on 7 days.

Date 1911	Day	Temp. ° F. a.m. p.m.			
3. VII.	1	100·6	7 infected <i>R. appendiculatus</i> adults (1 ♂, 6 ♀) were placed on the calf		
		101·8			
	2	99·6			
		101			
	3	101			
		102			
	4	101·4			
		101·8			
	5	100·8			
		103			
	6	101			
		102·4			
	7	101			
		102·6			
	8	100·4			
		102·6			
	9	101·4			
		101·8			
	10	102·4			
		102·2			
	11	101			
		101·6			
	12	102·4			
		103·8	Fever begins		
	13	102·6			
		105·4			
	14	105·4			
		105			
	15	105·6			
		104·8			
	16	105·2			
		105			
	17	105·4			
		105·4			
	18	105·2			
		105·6			
	19	106			
		105·8			
	20	105·6	E. Very few parasites found	<i>Treatment</i> 2·5 grammes of soamin, intramuscularly	
		105·6	M. " " "		
	21	105·8	E. 0·8 % of r.b.c. infected	2·5	" "
		106·2	E. 15·2 " "		
	22	104·8	M. 25·6 " "	2·5	" "
		105·6	E. 34·0 " "		
	23	105	M. 39·2 " "	2·5	" "
		104·6	E. — " "		
	24	104·6	M. 46·4 " "		
		105·2	E. 54·4 " "		
	25	105	M. 60·8 " "	2·5	" "
		105·6	E. 61·6 " "		
	26	104·8	M. 66·8 " "		
		105·4	E. 68·4 " "		
	27	105	M. 66·0 " "	2·5	" "
		104·8	E. 75·0 " "		
	28	103·8	M. 75·0 " "	2·5	" "
		106	E. 75·6 " "		
	29	106			
		105·2			
	30	105·4	M. 75·8 " "		
		101			
2. VIII.	31	102	Calf died at 3 p.m.		

EXPERIMENT VII (*Calf 11*).

Treatment: *Soamin*, 2 % solution given intravenously in doses ranging from 3 to 13 c.c., following on the intravenous injection of 2 to 4 c.c. of a solution of eosin and sodium bicarbonate ($\frac{1}{2}$ a grain of each per c.c.).

Date 1912	Day	Temp. °F. a.m. p.m.				
7. x.	1	101.2	30 infected <i>R. appendiculatus</i> nymphs were placed on the calf			
			101.6			
	2	101.8		101.2		
	3	101.6		101.8		
	4	102		101.6		
	5	101.4		101.8		
	6	101.6		101.8		
	7	102.8		102.2		
	8	102		101.4		
	9	100.8		100.8		
	10	100.4		—		
	11	101.2		103.8		
	12	101.8		102.6		
	13	101.6		101.6		
	14	101.8		103.2		
	15	104.4	Fever begins			
	16	105.4		106		
	17	105.2		106.2		
	18	106.8		106.6		
	19	107	Very few parasites found			
	20	105.8		106.8		
	21	104.6		104.8		
	22	104	3.6 % of r.b.c. infected			
	23	104	14.4	„	„	
	24	104.8	20.4	„	„	
	25	105	25.6	„	„	
	26	105.8	39.6	„	„	
	27	106.4	42.8	„	„	
	28	106.4	43.6	„	„	
			100.2			
4. xi.	29	—	Calf died at 5.30 a.m.			

Treatment

Eosin + sod.

bicarb.

solution.

2 %
soamin.

Dose

3 c.c.

3 c.c.

10 c.c.

13 c.c.

10 c.c.

8 c.c.

Dose

2 c.c.

2 c.c.

2 c.c.

3 c.c.

3 c.c.

4 c.c.

68   *Drug Treatment of East Coast Fever of Cattle*

EXPERIMENT VIII (*Cow 4*).

Treatment: "606," 2 grammes given intravenously in one dose.   Weight of cow 1008 lbs.

Date 1911	Day	Temp. ° F. a.m. p.m.	
18. II.	1	—	12 infected <i>R. appendiculatus</i> (6 ♂, 6 ♀) were placed upon the cow
	2	100·6	
	3	100·8	
	4	100·6	
	5	100·8	
	6	101	
	7	101·2	
	8	100·8	
	9	101·2	
	10	100·6	
	11	101	
	12	101·4	
	13	101·6	Fever begins
	14	101·6	
	15	103·6	
	16	103·6	
	17	103·6	
	18	103·8	
	19	103·8	
	20	103·8	
	21	101·8	
	22	103·4	
	23	103·2	
	24	103·4	
	25	104·6	
	26	105·2	
	27	105	
	28	105·4	M. 0·4 % of r.b.c. contain parasites
	29	105·2	E. 0·8 " " "
	30	104·4	M. 6·0 " " "
	31	104·2	E. 4·0 " " "
	32	103·6	at 10 a.m. 6·4 % of r.b.c. contain parasites
			3 p.m. 8·4 " " "
			at time when treated with "606" intra- venously
			2 hrs later
		104·4	5 " 8·4 " " "
			7 " 8·8 " " "
			9 " 13·2 " " "
			6 " "
	23	101·4	11 a.m. 21·0 " " "
		98·2	
13. III.	24	—	Cow found dead at 6 a.m.

EXPERIMENT IX (*Calf 15*).

Treatment: *Emetine hydrochloride*, 1 % in NaCl solution given intravenously in doses ranging from 1 to 10 c.c. on 9 successive days.

Date 1913	Day	Temp. ° F. a.m. p.m.					
14. I.	1	102	26 infected <i>R. appendiculatus</i> adults (19 ♂, 7 ♀) were placed on the calf				
	2	102					
	3	101.2					
	4	101.6					
	5	101.2					
	6	101					
	7	101.4					
	8	101.2					
	9	101.2					
	10	101.2					
	11	101					
	12	101.2					
	13	101.4					
	14	105.4					
			Fever begins				
	15	105					
	16	107.4					
	17	106.2					
	18	106.4					
			0.8 % of r.b.c. contain parasites				
	19	106.6					
	19	107.2	13.2	"	"	"	"
			Treatment 1 c.c. of drug intravenously				
	20	107.4					
	20	106	22.4	"	"	"	"
			2 c.c. " " "				
	21	106.4					
	21	106	24.0	"	"	"	"
			4 c.c. " " "				
	22	106.4					
	22	105	44.8	"	"	"	"
			5 c.c. " " "				
	23	105.4					
	23	105	65.2	"	"	"	"
			8 c.c. " " "				
	24	105					
	24	105	73.6	"	"	"	"
			10 c.c. " " "				
	25	105					
	25	105	76.4	"	"	"	"
			4 c.c. " " "				
	26	105					
	26	105	78.8	"	"	"	"
			5 c.c. " " "				
	27	104.8					
	27	106.1	78.8	"	"	"	"
			5 c.c. " " "				
	28	106.2					
	28	107	84.2	"	"	"	"
			Calf killed when moribund at 8.30 a.m.				
	11. II.	107					
	29	101.6					

70 *Drug Treatment of East Coast Fever of Cattle*

EXPERIMENT X (*Calf 9*).

Treatment: *Mercury salicylate*, 1 % in 0·8 % NaCl solution given intravenously on 9 days in doses ranging from 4 to 20 c.c.

Date 1911	Day	Temp. °F. a.m. p.m.	
8. XI.	1	—	14 infected <i>R. appendiculatus</i> nymphs were placed on the calf
		103	
	2	102·4	8 infected <i>R. appendiculatus</i> adults (4 ♂, 4 ♀) were placed on the calf
		102·6	
	3	103	
		102·2	
	4	101·4	
		101·6	
	5	101·6	
		101·2	
	6	101·4	
		101·6	
	7	101·6	
		101·2	
	8	101·2	
		101·2	
	9	101·4	
		101·6	
	10	101·6	
		101·8	
	11	102·4	
		101·8	
	12	104·4	Fever begins
		104·6	
	13	105	Koch's "blue bodies" found in gland smear
		104·4	
	14	104·4	<i>Treatment</i> 4 c.c. of 1 % salicylate of mercury intravenously
		104·6	6 c.c. " " "
	15	104	
		104·2	
	16	105	M. Very few parasites found 10 c.c. " " "
		106·6	E. " " " "
	17	106	M. " " " " 5 c.c. " " "
		105·2	E. " " " "
	18	105·8	M. " " " " 5 c.c. " " "
		106·4	E. " " " "
	19	104·2	M. 6·0 % of r.b.c. infected 10 c.c. " " "
		104·4	E. 6·2 " " "
	20	104·6	M. 8·4 " " "
		104·2	E. 10·0 " " "
	21	104·6	M. 14·8 " " " 20 c.c. " " "
		104·6	E. 13·8 " " "
	22	104·6	M. 13·2 " " " 12 c.c. " " "
		104·2	E. 17·2 " " "
	23	105·8	M. 19·2 " " " 12 c.c. " " "
		105·4	E. 21·2 " " "
	24	105·2	M. 28·0 " " "
		106·6	E. 23·2 " " "
	25	106·4	M. 30·4 " " "
		105·8	E. 31·2 " " "
	26	103·2	M. 32·0 " " "
		103·6	E. 37·6 " " "
4. XII.	27	97	M. 39·2 " " "

Calf killed when moribund at 2.30 p.m.

EXPERIMENT XI (*Calf* 10).

Treatment: *Mercury succinimide* in 3 % solution given intravenously, 2, 4 and 3 c.c. being injected on the 15th, 16th and 19th days respectively.

Date 1912	Day	Temp. ° F. a.m. p.m.		
30. I.	1	—	12 infected <i>R. appendiculatus</i> nymphs were placed on the calf	
	2	101·4	101·2	
	3	101·6	101·4	
	4	101·2	101	
	5	101	101·4	
	6	101·4	101·2	
	7	101·2	101	
	8	101·6	102	
	9	101·8	101·4	
	10	101·4	101·2	
	11	103	101·8	Fever begins
	12	103·2	103·2	
	13	104·6	103·8	
	14	104·8	104·6	
	15	104·8	104·4	Very few parasites found
	16	105·2	105	
	17	104·4	105·4	0·4 % of r.b.c. infected
	18	102·6	104·8	
	19	102·6	103·4	3 c.c. „ „
	20	100·6	103·2	
	21	100·6	8·4 „ „	3 c.c. „ „
	22	100·2	100·8	
	23	99·6	14·8 „ „	3 c.c. „ „
	24	99·4	100·6	
	25	99·4	11·6 „ „	3 c.c. „ „
	26	99·4	100·2	
	27	98·6	20·8 „ „	3 c.c. „ „
	28	—	99·8	
26. II.	28	—	15·6 „ „	3 c.c. „ „
			99·4	
			19·2 „ „	3 c.c. „ „
			99·2	
			24·0 „ „	3 c.c. „ „
			99·2	
			23·4 „ „	3 c.c. „ „
			97·8	
				Calf found dead

72 *Drug Treatment of East Coast Fever of Cattle*

EXPERIMENT XII (*Calf 5*).

Treatment: *Quinine dihydrochloride*, 55-60 grains dissolved in 25 c.c. of water, injected subcutaneously at 11 a.m. on 14 successive days. (Prepared as 5 grain tabloids.)

Date 1911	Day	Temp. ° F. mean M. & E.	
25. IV.	1	101.2	12 infected <i>R. appendiculatus</i> adults (6 ♂, 6 ♀) were placed on the calf
	2	101.4	<i>Note</i> : it is not clear which lot of ticks produced infection,
	3	101	possibly it may have been one of those following
	4	101.5	16 infected <i>R. appendiculatus</i> nymphs were placed on the calf
	5	101.2	
	6	101.8	
	7	102.3	some " " " " " "
	8	101.8	
	9	101.2	
	10	101.3	some " " " " " "
	11	100.6	
	12	101	some " " " " " "
	13	101.5	
	14	101.6	
	15	101	
	16	102	
	17	102.1	
	18	102	
	19	101.5	
	20	102.1	
	21	101	
	22	100.6	
	23	101.5	
	24	102.1	
	25	101.3	
	26	101.2	
	27	101.4	
		Temp. ° F. a.m. p.m.	
	28	103	Transitory febrile rise
		104.4	
	29	104.6	
		101.8	
	30	101.4	
		102.2	
	31	100.2	
		102.2	
	32	100.6	
		101.6	
	33	100.6	
		101.4	
	34	101.8	
		101.6	
	35	100.8	
		101.4	
	36	100.1	—
	37	101	—
	38	101	—
	39	101.6	

EXPERIMENT XII (*cont.*).

Date 1911	Day	Temp. ° F. a.m. p.m.				
3. VI.	40	104	Fever begins			
		105.2				
	41	105.8	Very few parasites found			
		106.2				
	42	104.8	" " " "			
		106.8				
	43	105.2	M. 0.8 % of r.b.c. infected	60 grains quinine bihydrochloride	<i>Treatment</i>	
		105.2	E. 0.8	" "	" "	" "
	44	105.6	M. 0.8	" "	60	" " " "
		105.8	E. 1.2	" "	" "	" "
	45	104.8	M. 0.4	" "	60	" " " "
		104.8	E. 3.2	" "	" "	" "
	46	105.6	M. 3.2	" "	60	" " " "
		105	E. 3.2	" "	" "	" "
	47	104.8	M. 4.4	" "	60	" " " "
		103.2	E. 6.0	" "	" "	" "
	48	104.2	M. 8.8	" "	60	" " " "
		103.4	E. 4.8	" "	" "	" "
	49	102	M. 3.2	" "	60	" " " "
		101.8	E. 9.2	" "	" "	" "
	50	100	M. 13.2	" "	55	" " " "
		102	E. 11.6	" "	" "	" "
	51	102.6	M. 15.6	" "	60	" " " "
		102.6	E. 18.0	" "	" "	" "
	52	101	M. 16.0	" "	60	" " " "
		104.2	E. —	" "	" "	" "
	53	102	M. 24.0	" "	60	" " " "
		103.8	E. 25.2	" "	" "	" "
	54	103	M. 24.0	" "	60	" " " "
		105	E. 21.6	" "	" "	" "
	55	103.6	M. 29.6	" "	60	" " " "
		105.2	E. 33.2	" "	" "	" "
19. VI.	56	102.6	M. 31.2	" "	60	" " " "
		101.8	Calf killed when moribund at 6.15 p.m.			

74   *Drug Treatment of East Coast Fever of Cattle*

EXPERIMENT XIII (*Calf 4*).

Treatment: *Quinine hydrochloride*, 30–45 grains in 20 c.c. of water injected intramuscularly at 10.45 a.m. on 5 days (5 grain tabloids) and *Quinine bihydrochloride*, ditto on 7 days.

Date 1911	Day	Temp. ° F. a.m. p.m.	
29. v.	1	—	9 infected <i>R. appendiculatus</i> nymphs were placed on the calf
	2	100.6	
	3	101.2	
	4	100.2	
	5	101.2	
		101.8	
	6	101	
		103	
	7	101.4	
		102.4	
	8	101.6	
		102	
	9	101	
		102.4	
	10	100.6	
		103	
	11	102.6	
		102.8	
	12	102.6	
		104.4	
	13	104.8	
		104.2	
	14	105.6	
		106.4	
	15	104.6	
		106.4	
	16	104.2	
		104	
	17	106.2	
		106.2	
	18	104.8	
		106.4	
	19	105	
		105	
	20	106.4	
		105.4	
	21	104.4	
		105	
	22	104.6	
		104.2	
	23	104.4	
		105	
	24	103.8	
		104.2	
	25	103.4	
		104.6	
	26	105	
		105.8	
	27	106.2	
		106	
	28	106.2	
		106	
	29	105.8	
		105.7	
27. vi.	30	104	
		99.2	

Calf died during the night

EXPERIMENT XIV (*Calf 22*).

Treatment: *Ethylhydrocupreine HCl*, subcutaneous injection of 24 c.c. of an 8 % solution on each of five successive days, beginning on the second day after the appearance of parasites in the calf's blood.

Date 1911	Day	Temp. ° F. a.m. p.m.				
22. XII.	1	102	50 infected <i>R. appendiculatus</i> nymphs were placed on the calf			
	2	101				
	3	101.4				
	4	101.6				
	5	102.4				
	6	101.6				
	7	101.4				
	8	101.2				
	9	101.8				
	10	102.6				
	11	101.8	Fever begins			
	12	101.6				
	13	103.4				
	14	102.8				
	15	105.3				
	16	104.8				
	17	104				
	18	105				
	19	106	Very few parasites found			
	20	105	2 % of r.b.c. infected		<i>Treatment</i> 24 c.c. of drug subcutaneously	
	21	104.2	7.2 " "		24 c.c. " " "	
	22	102.2	8.8 " "		24 c.c. " " "	
	23	101.6	20.8 " "		24 c.c. " " "	
	24	102.6	22.0 " "		24 c.c. " " "	
	25	103.4	—			
	26	104.6	36.0			
16. I. 1912			Calf killed at 12.20 p.m.			

76   *Drug Treatment of East Coast Fever of Cattle*

EXPERIMENT XV. (*Calf 16*).

Treatment: *Ammonium fluoride*, 0·5 % in 0·8 % NaCl solution injected in doses of 18–20 c.c. intravenously on 9 successive days.

Date 1913	Day	Temp. ° F. a.m. p.m.	
4. III.	1	—	50 infected <i>R. appendiculatus</i> nymphs were placed on the calf
		102·2	
	2	102·2	
		102·4	
	3	102·2	
		102·6	
	4	101·8	
		104·6	
	5	102·2	
		102·4	
	6	102·4	
		102·6	
	7	102·4	
		102·4	
	8	102·4	
		102·2	
	9	102·6	
		102·4	
	10	102·2	
		102·4	
	11	103	
		102·6	
	12	103·6	Fever begins
		103·4	
	13	103·4	
		103·6	
	14	105	
		105·2	
	15	106·2	
		106·6	
	16	105·8	A few parasites found
		105·2	
	17	107·4	<i>Treatment</i> 20 c.c. of ammonium fluoride sol. intrav.
		107·4	
	18	104·4	20 c.c. „ „ „ „
		104·2	
	19	105	20 c.c. „ „ „ „
		105·2	
	20	105·4	20 c.c. „ „ „ „
		105·8	
	21	104·8	20 c.c. „ „ „ „
		104·6	
	22	104·8	18 c.c. „ „ „ „
		104·6	
	23	105·2	20 c.c. „ „ „ „
		105·4	
	24	106·4	20 c.c. „ „ „ „
		106·2	
	25	107	46·8 % of r.b.c. infect. 20 c.c. „ „ „ „
		107	
	26	107·4	43·6 „ „
		107·2	
	27	107	47·2 „ „
		107	
31. III.	28	—	Calf died

EXPERIMENT XVI (*Calf 20*).

Treatment: *Potassium iodide* in 25 % solution, injected intravenously on 5 successive days, the dose rising from 20 to 40 c.c.

Date 1913	Day	Temp. ° F. a.m. p.m.	
10. VIII.	1	101.4	24 infected <i>R. appendiculatus</i> nymphs (removed when partly gorged from calf 21 on 10. VIII. 1913) were placed on the calf
		101.4	
	2	102.2	
		101.6	
	3	102	
		101.6	
	4	101	
		101.4	
	5	101.6	
		101.1	
	6	101.4	
		101.8	
	7	101.6	
		101.6	
	8	102	
		102	
	9	101.4	
31. VIII.		102.2	
	10	104.1	Fever begins
		104.2	
	11	104.4	
		104.6	
	12	105	
		105	
	13	105.4	
		105.4	
	14	105.3	
		105.2	
	15	105.4	
		105.2	
	16	107	
		106.8	
	17	106.2	Very few parasites found
		106.4	
	18	105.8	2.0 % of r.b.c. infected
		106.8	
	19	105.8	7.6 " " "
		106.4	
	20	105.4	12.4 " " "
		106.2	
	21	104.8	—
		105.4	
	22	104.6	16.8 " " "
			Calf died at 11 a.m. "

Treatment
20 c.c. of drug intravenously

20 c.c.   "   "

40 c.c.   "   "

40 c.c.   "   "

40 c.c.   "   "

78 *Drug Treatment of East Coast Fever of Cattle*

EXPERIMENT XVII (*Calf 21*).

Treatment: *Calcium lactate*, in 10 % solution, was injected intravenously on 7 successive days, the dose rising from 3 to 5 c.c.

Date 1913	Day	Temp. °F. a.m. p.m.						
31. x.	1	101·6	50 infected <i>R. appendiculatus</i> nymphs were placed on the calf					
		102·6						
	2	102·2						
		102·8						
	3	102						
		102·8						
	4	101·8						
		102·4						
	5	102·6						
		102·6						
	6	102·4						
		102·6						
	7	102·6						
		102·8						
	8	102						
		102·2						
	9	102·4						
		102·6						
	10	102·2						
		102·8						
	11	103·2						
		103·4						
	12	102·6					Fever begins	
	104·4							
13	105·2							
	106							
14	105·1							
	106·2							
15	105·6							
	106·6							
16	106·8							
	106·9							
17	106·4							
	106·8							
18	105·6	Very few parasites found						
	106·2							
19	105·4	6·8 % of r.b.c. infected		<i>Treatment</i> 3 c.c. of drug intravenously				
	102·8							
20	103·2	14·0	„	„	5 c.c.	„	„	
	102							
21	105	26·8	„	„	5 c.c.	„	„	
	103							
22	104·8	37·2	„	„	5 c.c.	„	„	
	103							
23	104·6	54·4	„	„	5 c.c.	„	„	
	103·2							
24	106·2	55·2	„	„	5 c.c.	„	„	
	104·2							
24. xi.	25	105·2	56·0	„	„	5 c.c.	„	„
			Calf died at 3.30 p.m.					

EXPERIMENT XVIII (*Calf* 17).

Treatment: *Nuclein* from thymus gland, 10 c.c. of a 5 % solution given subcutaneously on 5 days.

Date 1913	Day	Temp. ° F. a.m. p.m.				
7. III.	1	—	ca. 140 infected <i>R. appendiculatus</i> nymphs were placed on the calf			
	2	101.8				
	3	101.4				
	4	102				
	5	102.2				
	6	102				
	7	102				
	8	102				
	9	102				
	10	102				
2. IV.	11	104.6	Fever begins			
	12	105.5				
	13	105.2	Treatment 10 c.c. of nuclein solution subcutaneously			
	14	105.4				
	15	106.6	Very few parasites found			
	16	106				
	17	106.2	2.4 % of r.b.c. infected			
	18	104.4				
	19	104	16.0 " " "			
	20	104.2				
	21	105	10 c.c. " " "			
	22	105.4				
	23	106	44.4 " " "			
	24	106.4				
	25	106.8	44.8 " " "			
	26	106.2				
	27	105.4	58.8 " " "			
		105.8				
			Calf died 28th day			

80 *Drug Treatment of East Coast Fever of Cattle*

CHART RELATING TO CONTROL I (*Cow 1*).

The body temperature is indicated by the thin line above. The increase in the percentage of infected red blood corpuscles is represented by the bold black line rising from 1.2 % on the 20th day after tick infestation to 56 % on the 27th day. The vertical columns represent the total number of infected corpuscles taken as 100 (corresponding to the percentage column on the left); the white part above each column represents the proportion of corpuscles containing a single parasite, the vertically, horizontally shaded, and black parts indicate respectively the proportion of corpuscles containing 2, 3 and 4 or more parasites. The days of observation are recorded below. The blood films were prepared every two hours, day and night, starting on day 22.

Records of Cattle which were not treated.

For the sake of comparison I append the protocols relating to three animals which were not subjected to treatment and which may be regarded as controls. In the case of Control I a very careful examination of the blood was made in respect to parasites, the results being given graphically in the accompanying chart.

CONTROL I (*Cow 1*).

			Untreated.
Date	Day	Temp. ° F. a.m. p.m.	
10. x. 1910	1	102-2 102	13 infected <i>R. appendiculatus</i> (6 ♂, 7 ♀) were placed on the cow at 4.30 p.m.
	2	101-6 101-8	
	3	102-2 101-6	
	4	101-8 —	
	5	102-2 101-8	
	6	102-2 102	
	7	101-8 99-8	
	8	101-6 100-2	
	9	101-4 101	
	10	100-2 99-2	
	11	99-4 100-2	
	12	102 102-4	
	13	100-6 98-6	
	14	103-6 102-6	Fever begins
	15	104-4 103-8	
	16	105 104-6	
	17	103-8 104-4	
	18	104-2 103-6	
	19	104-6 104-4	Two r.b.c. in a blood-film are found to contain parasites

82   *Drug Treatment of East Coast Fever of Cattle*

CONTROL I (cont.).

Date 1910	Day	Temp. °F.		Time	% of r.b.c. infected	% of r.b.c. containing					Free forms found per 1000 r.b.c.	Remarks
		a.m.	p.m.			1	2	3	4	5 or more parasites		
29. x.	20	103.6		11 a.m.	1.2	90*	7	1	1	1	—	
	21	103.6		11 „	1.6	95*	5	—	—	—	—	
	22	104		11 „	10.8	87	9	2	2	—	—	
				1 p.m.	8.4	84	8.5	4	0.5	3	—	
				3 „	10	86.5	12.5	1	—	—	—	
				5 „	10	90.5	8	1.5	—	—	—	
				7 „	10.8	88.5	8	1.5	1	1	—	
				9 „	10.4	91	6.5	2	0.5	—	—	
				11 „	15.5	89	9	1.5	0.5	—	—	
	23	103.8		1 a.m.	12.8	88	11	0.5	0.5	—	—	Cow not feeding
		104		3 „	16.8	85	13	1.5	—	0.5	—	
				5 „	15.2	89	8.5	1.5	0.5	0.5	—	
				7 „	18.8	83	12.5	3	1.5	—	—	
				9 „	19.2	84.5	13	1.5	—	1	—	
				11 „	18	88	11.5	0.5	—	—	—	
				1 p.m.	17.6	85	12	1.5	0.5	1	—	
				3 „	19.6	86	13	—	1	—	—	
				5 „	17.6	84	14	0.8	0.4	0.8	—	
				7 „	19.6	86	12.5	0.5	1	—	—	
				9 „	19.6	85	12.5	2	0.5	—	—	
				11 „	20.8	85	13	1	1	—	—	
	24	104.2		1 a.m.	20.4	85	13	1	1	—	—	Cow not feeding
		103.6		3 „	18.4	87	12.5	—	—	0.5	—	
				5 „	18.4	85	14	0.5	0.5	—	—	
				7 „	21.2	81	16.5	2	—	0.5	—	
				9 „	22	84	13	2	1	—	—	
				11 „	20.8	85	14	1.0	—	—	—	
				1 p.m.	22.4	84	12.5	2	1	0.5	—	
				3 „	24	84	12.5	1	2	0.5	—	
				5 „	22.4	84	13	1.5	0.5	—	—	
				7 „	24.4	81	14.5	1.5	0.5	—	—	
				9 „	21.6	85	12	0.5	2	0.5	—	
				11 „	23.2	83	14.5	1.5	1	—	—	
	25	100.8		1 a.m.	23.2	83	15.5	1.5	—	—	0	Cow not feeding
		102.8		3 „	26.8	82	15	2	1	—	0	
				5 „	26	83	13.5	2.5	0.5	0.5	0	
				7 „	27.2	81	16	2	1	—	1	
				9 „	28.4	80	16.5	2.5	1	—	0	
				11 „	26	80	15	4	1	—	0	
				1 p.m.	23.2	87	9.5	2	0.5	1	0	
				3 „	25.2	84	13.5	2	—	0.5	0	
				5 „	28	82	16.5	1	0.5	—	0	
				7 „	27	80	16	1	2	1	0	
				9 „	29.3	79	20	0.5	0.5	—	0	
				11 „	29	82	16.5	1	0.5	—	0	

* 100 infected r.b.c. counted for types, 200 in the rest.

CONTROL I (*cont.*).

Date 1910	Day	Temp. °F.		Time	% of r.b.c. infected	% of r.b.c. containing					Free forms found per 1000 r.b.c.	Remarks
		a.m.	p.m.			1	2	3	4	5 or more parasites		
4. XI.	26	102.2		1 a.m.	28	80	16.5	2	1.5	—	2	Cow weak
			102.2	3 "	27	81	17.5	1	0.5	—	0	
				5 "	27	77	18.5	3	1	0.5	0	
				7 "	30.4	79	17.5	1.5	1	1	0	
				9 "	30	78	16	4	1.5	0.5	4	
				11 "	33	76	21	2	0.5	0.5	2	
				1 p.m.	35.2	73	23	2.5	1	0.5	8	
				3 "	35	73	24	2	1	—	6	
				5 "	38.4	81	13.5	1.5	2.5	1.5	8	
				7 "	39.2	77	18	3.5	1.5	—	8.5*	
				9 "	38	75	19	4.5	1.5	—	32	
				11 "	41.6	72	21.5	6	0.5	—	5	
27	102.4			1 a.m.	38	74	22.5	2.5	1	—	—	
			102.8	3 "	38	72	26	2	0	0	12	
				5 "	38.8	79	19	1	1	0	2	
				7 "	42	74	20.5	2.5	2.5	0.5	3	
				9 "	42	73	21.5	4	0	1.5	5	
				11 "	38	74	24.5	1	0.5	0	77†	
				1 p.m.	38.8	66	25.6	5.2	2	1.2	8	
				3 "	38†	72	22.5	2.5	2.5	0.5	6	
				5 "	40	72	18	5.5	3	1.5	8	
				7 "	40	75	19	2.5	1.5	2	2	
				9 "	56†	69	24	4.5	1.5	1	7	
				11 "	47.6	71	20.5	6	1	1.5	3	
28	104.8			1 a.m.	44.4	72	23	4.5	0	0.5	1	
			105	3 "	50.8	63	27.5	6	3	0.5	1	
				5 "	49.6	70	23	3	3	1	18	
				7 "	52.8	73	19.5	5	1.5	1	3	
				9 "	46.4	69	24.5	3.5	1	2	33	
				11 "	54†	77	24.5	5.5	3	0	11	
				1 p.m.	54	68	23.5	6	1.5	1	2	
				3 "	54.8	63	25.5	8.5	2	1	1	
				5 "	52.8	69	23	6	1	1	9	
				7 "	54.8	60	26.5	8	4.5	1	5	
				9 "	45.4†	68	25	4	2.5	0.5	6	
				11 "	52.4	65	25.5	7.5	2	0	13	
7. XI.	29	—		1 a.m.	Cow found dead							

* 2000 r.b.c. counted.

† Film very unequal, 2000 r.b.c. counted.

‡ 500 r.b.c. counted for % of infection, 250 counted otherwise.

84   *Drug Treatment of East Coast Fever of Cattle*

CONTROL II (*Cow 2*).

Untreated.

Date	Day	Temp. ° F. a.m. p.m.	
22. XI. 1910	1	—	19 infected <i>R. appendiculatus</i> (10 ♂, 9 ♀) were placed on the cow at 9 p.m.
	2	100·6	
		100·8	
	3	101	
		100·6	
	4	100·8	
		101·2	
	5	100	
		100·6	
	6	100·2	
		101·2	
	7	101·2	
		101·8	
	8	102	
		101·6	
	9	101	
		100·4	
	10	101·2	
		101	
	11	100·6	
		100·8	
	12	100·2	
		100·4	
	13	100·4	
		100·6	
	14	100	
		101·2	
	15	102	
		101·8	
	16	102·2	
		102	
	17	103	Fever begins
		104	
	18	103·8	One parasitized r.b.c. found in a blood-film
		104	
	19	104·6	M. 0·2 % of r.b.c. contained parasites
		104·8	
	20	104·6	M. 0·4 " " " "
		104	
	21	103·8	M. 0·8 " " " "
		104·8	
	22	105	E. 1·6 " " " "
		104·6	
	23	104·2	M. 2·4 " " " "
		104·8	
	24	104	E. 4·0 " " " "
		104·6	
	25	104	M. 6·0 " " " "
		104·2	
	26	105	E. 6·8 " " " "
		104·8	
	27	106	M. 9·6 " " " "
		105·8	
	28	105	E. 9·6 " " " "
		102·2	
	29	—	E. 17·6 " " " "
20. XII. 1910			Cow died at 6 a.m.

CONTROL III (*Calf* 23).

Date	Day	Temp. ° F. a.m. p.m.	
30. iv. 1914	1	—	Infected <i>R. appendiculatus</i> nymphs placed on calf
		102	
	2	101·7	
		102	
	3	101·8	
		102·4	
	4	102·1	
		102	
	5	101·8	
		101·8	
	6	101·4	
		102·8	
	7	101·2	
		101·4	
	8	101·6	
		102·4	
	9	101·8	
		102·1	
	10	101·2	
		101·4	
	11	101	
		101·8	
	12	102·3	
		102·5	
	13	104	Fever begins
		104·8	
	14	105·2	
		104·4	
	15	104·4	
		106·2	
	16	106	
		106·2	
	17	106·1	
		106·2	
	18	105·2	
		105·6	
	19	103·6	Parasites in 0·8 % of corpuscles
		104·2	
	20	102·4	
		103	
	21	101·8	
		102·4	
	22	103·9	
		104·2	
	23	105·2	
		106·5	
	24	105·7	
		105	
	25	106	
		105·8	
25. v. 1914	26	105·6	Calf died

SUMMARY AND CONCLUSIONS.

No drug has been found which will influence the fatal course of East Coast Fever or retard the multiplication of *Theileria parva* in the blood of the affected cattle.

The drugs which were tried with negative results were Trypanblue, Congo red, Tryposafrol, Creosote and Oleum copaivae, Arsacetin, Soamin, "606," Emetine hydrochloride, Mercury salicylate, Mercury succinimide, Quinine bihydrochloride and hydrochloride, Ethylhydrocupreine, Ammonium fluoride, Potassium iodide, Sodium salicylate, Calcium lactate, and Nuclein.

All of our animals died—18 treated and 3 untreated—and showed typical lesions at autopsy. They were all infected by means of ticks (*Rhipicephalus appendiculatus*) which had fed on infected cattle as larvae and nymphs and been placed on the experimental animals as nymphs and adults respectively.

The increase in the number of parasitized red blood corpuscles, but for slight irregularities, proceeds continuously night and day until the animal dies. We have not as yet observed a case ending in recovery.

The accompanying table gives a summary relating to each experimental animal (except XII): the number and kind of ticks which produced infection, the incubation period, the time when the parasites appeared in the peripheral blood, the time when the animals died, and the maximum percentage of parasitized blood corpuscles observed during the course of the disease. The days are all reckoned from Day 1 when the infective ticks were placed upon the cattle.

The expenses of this investigation were mainly defrayed by means of a grant made by the Parliament of the Union of South Africa.

My thanks are due to Dr W. E. Dixon, F.R.S., University Lecturer in Pharmacology, Cambridge, for kindly suggesting the trial of several of the drugs which were used. I am also indebted to my Laboratory Assistant, Mr B. G. Clarke, for much valuable help, especially in the making of the blood counts.

Expt. No.	The ticks which produced infection were	Day on which animal showed fever (= incuba- tion period)	Day on which parasites were first found in animal's blood	Day when animal died	Maximum number of parasitized corpuscles recorded during illness
I	12 ♂ ♀	14	20	30	46 %
II	30 ♂s	13	23	33	8.0 %
III	40 ♂s	14	18	29	57.2 %
IV	12 ♂ ♀	13	18	30	55.2 %
V	18 ♂ ♀	12	15	29	41.6 %
VI	7 ♂ ♀	12	19	31	75.8 %
VII	30 ♂s	15	19	29	43.6 %
VIII	12 ♂ ♀	13	20	24	21.0 %
IX	26 ♂ ♀	14	18	29	84.2 %
X	14 ♂s, 8 ♂ ♀	12	16	27	39.2 %
XI	12 ♂s	11	15	28	24.0 %
XIII	9 ♂s	12	17	30	59.2 %
XIV	50 ♂s	11	19	26	36.0 %
XV	50 ♂s	12	16	28	47.2 %
XVI	24 ♂s	10	17	22	16.8 %
XVII	50 ♂s	12	18	25	56.0 %
XVIII	140 ♂s	11	15	28	58.8 %
Control I	13 ♂ ♀	14	19	29	56.0 % (untreated)
II	19 ♂ ♀	17	19	29	17.6 % „
III	? ♂s	13	19	26	31.6 % „
Cow 1	30 ♂ ♀	15	17	32	75.0 % „
2	12 ♂ ♀	14	20	30	60.0 %

Note : The last two experiments are recorded in *Parasitology*, II, pp. 328, 329. These animals were infected by means of *Rhipicephalus evertsi* whereas all of the other animals were infected through our strain of *R. appendiculatus* originally received from Cape Colony through the courtesy of Mr C. P. Lounsbury.