

S. H. H. H.
10

ANNUAL REPORT

OF THE

VETERINARY DEPARTMENT

SUDAN GOVERNMENT.

— — —
1924.



[Bone (H.)



Acting Director]

ANNUAL REPORT
OF THE
VETERINARY DEPARTMENT
SUDAN GOVERNMENT.

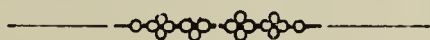
—■—
1924.



ANNUAL REPORT



VETERINARY DEPARTMENT, SUDAN GOVERNMENT, 1924.



STAFF.

The following changes have taken place in the Senior British Staff during the year.

Lt.-Colonel L. Danels, Major B. A. Jarvis and Captain W. St. J. F. Macartney having completed their ten years' tour of seconded service reverted to the British Army on 20th June, 1924, 19th May, 1924 and 31st January, 1924, respectively. The places of these officers have not been filled by the introduction of other officers from England.

The Staff consists at the present date of the following officers :—

Acting Director	...	...	Major H. Bone, M.C.
Veterinary Inspector	...	...	Captain R. S. Audas, M.C.
"	"	...	" E. G. Turner, D.S.O.
"	"	...	" J. Going.
"	"	...	" J. R. Ellison.
Veterinary Bacteriologist	...	"	R. H. Knowles.
Veterinary Inspector	...	"	P. S. Sparling.
"	"	...	" R. T. Smith.
"	"	...	" C. P. Fisher.
"	"	...	" H.B.Williams. O.B.E. (E.A.)
"	"	...	" T. Menzies (E.A.).
"	"	...	" L. E. Prichard, O.B.E.
"	"	...	" F. J. Andrews.
"	"	...	" M. A. Murphy (E.A.).

VETERINARY SECTION.

The total number of deaths from diseases reported in the Sudan shows a great improvement over the total reported for the year 1922-23, especially as regards Cattle Plague.

DISEASES OF CATTLE.

(a) *Rinderpest (Cattle plague).*

The situation with regard to this disease shows an improvement over that of the previous year, over three thousand less deaths having been reported.

The provinces chiefly affected were Berber and Kassala, the two together accounting for more than two-thirds of the total number of deaths reported in the Sudan.

(b) *Contagious Bovine Pleuro-pneumonia.*

The cases of this disease reported from districts amount to about the same as those reported during the previous year, but there is a considerable increase in the numbers discovered amongst export cattle in Sudan quarantines and Egyptian abattoirs.

Extensive inoculations against this disease with serum taken from natural cases have been carried out during the past few years and have certainly been very useful in checking its spread, but a standardized vaccine for this purpose would doubtless have still better results, and with this object in view experiments have been carried out in the Veterinary Research Laboratory. The results of the experiments, so far, have been sufficiently encouraging to justify the hope that there will be enough standardized vaccine available for general use in the near future.

(c) *Anthrax.*

On the whole the Sudan may be regarded as fairly free from Anthrax and as most outbreaks during the year have been discovered in quarantines, one is justified in suspecting the quarantines to be the chief source of infection of export animals. It will be interesting to see how the incidence of the disease in the Sudan will be affected by the use of new quarantines now in progress of erection.

(d) *Foot and Mouth disease.*

Two outbreaks of this disease, of a mild nature, occurred in the quarantine parks. The first outbreak was discovered in January amongst El Obeid cattle on their arrival at Halfa. At that time there were approximately one thousand five hundred cattle awaiting export at El Obeid, and a careful examination was made of these without a single case being discovered. The same result happened on examination of cattle at Shambat quarantine, where the affected cattle had been lodged during their journey to Halfa.

The second outbreak was first discovered in Shambat quarantine amongst El Obeid cattle, but again a careful and individual examination revealed no signs of the disease amongst the cattle at El Obied rail-head.

There can be little doubt, however, that as some of the cases had passed through the acute stage and had only recently arrived from El Obeid by train, that the source of infection so far as both outbreaks were concerned lay somewhere in Kordofan Province.

Two small outbreaks occurred in the Kassala district of Kassala Province in December and February.

(e) *Piroplasmosis.*

Eight cases of this disease were reported from the Halfa Quarantine Park.

(f) *Trypanosomiasis.*

Thirteen cases of this disease in cattle were diagnosed by microscopical examination during the year. Twelve were in Transport bulls at Talodi, and one case - a Kordofan bull - at the Halfa Quarantine Park.

The following is a resume of diseases as affecting different Provinces:—

BAHR-EL-GHAZAL PROVINCE.

No large outbreaks of cattle disease were reported during the year. Herds are reported to be increasing in size, and many cattle are offered for sale.

BERBER PROVINCE.

Cattle Plague.

This disease prevailed in the Shendi district throughout the year, where there was a fairly high average of mortality. The El Damer district was declared free during the months of July, August and September, and Berber district was free during September, October and November. One small outbreak occurred in Abu Deleig in the month of January. There were just over twice as many deaths in the Province as during the previous year.

Contagious Bovine Pleuro-pneumonia.

One small outbreak occurred in May. Only four animals died.

BLUE NILE PROVINCE.

Cattle Plague.

Small outbreaks occurred throughout the province resulting in a total loss of 309 animals. This is a great improvement on last year when the loss totalled 3,083.

Contagious Bovine Pleuro-pneumonia.

One outbreak was reported to have occurred amongst the working oxen of the Sudan Plantation Syndicate. 55 deaths are recorded.

DARFUR PROVINCE.

Cattle plague.

Several small outbreaks occurred, with a total loss of 491 animals.

Contagious Bovine Pleuro-pneumonia.

One small outbreak occurred at J. Murra, and five deaths were reported.

KASSALA PROVINCE.

Cattle Plague.

Outbreaks occurred in the following districts: Kassala, Mafaza, Abu Deleig, Tamarein, Butana and Goz Regeb. 2,675 deaths were reported as against 2,577 for the previous year.

Contagious Bovine Pleuro-pneumonia.

There was only one small outbreak- with ten deaths during March.
Foot and Mouth disease.

Two small outbreaks were reported in the Kassala district, in each of which only five animals were affected. The outbreaks occurred in December and February.

KHARTOUM PROVINCE.

Cattle Plague.

Khartoum North district remained free during most of the year. a small outbreak occurred in February and lasted till May. Only 13 deaths occurred. Geili district suffered an outbreak from October to January, and another from July to the end of the year. The losses in both outbreaks were about 100 animals, as compared with 46 deaths which occurred last year.

KORDOFAN PROVINCE.

Cattle Plague.

The El Obeid district remained infected during the year except during the month of July. El Rahad district was declared free during October and November, and from July to September. One small outbreak occurred in the Nahud district during July. In all the province had 492 deaths, as compared with 113 for last year.

Contagious Bovine Pleuro-pneumonia.

The disease occurred in the El Obeid, Rahad, Nahud and Um Ruaba districts. In all 155 cattle died.

NUBA MOUNTAINS PROVINCE.

Cattle Plague.

The Dilling district became infected in October, and had 15 deaths. Another small outbreak occurred in the Kadugli district in April. The province suffered 26 deaths as against 122 reported last year.

Contagious Bovine Pleuro-pneumonia.

This disease was responsible for 41 deaths during an outbreak in the Kadugli district.

RED SEA PROVINCE.

Cattle Plague.

Small outbreaks occurred at Sinkat, Musmar and Talgwareb. A total of only 22 deaths occurred, as against 341 reported the previous year.

THE FUNG PROVINCE.

Cattle Plague.

The disease was reported in small outbreaks in Karkoj, Singa, Dinder and Roseires districts. A loss of 122 deaths occurred, as compared with 1,547 reported the previous year.

WHITE NILE PROVINCE.

Cattle Plague.

Outbreaks of this disease occurred in the Kosti, El Dueim, Kawa Jebelein, El Geteina and Tendelti districts. 825 deaths occurred as against 942 for the previous year. Some 8,000 animals were serumized in this Province during the year.

DISEASES OF EQUINES.

The following animals - horses, mules and donkeys - the property of Government Officials and employees, died or were destroyed as a result of the disease shown :-

Disease.	Horse.	Mule.	Donkey.
Horse-sickness	45	106	6
Trypanosomiasis	27	11	7
Epizootic Lymphangitis	9	35	—
Piroplasmosis	6	1	—
Pneumonia	6	3	2
Strangles	1	—	—
Abscess	1	—	—
Gastro-enteritis	1	—	1
Tympanitis	8	3	5
Peritonitis	2	—	—
Nephritis	—	1	—
Helminthiasis	1	—	—
Pernicious Anaemia	—	—	1
Paraplegia	8	1	2
Blindness	6	—	—
Incurable lameness	10	2	3
Sprained tendons	3	1	—
Arthritis	3	—	—
Sidebone	1	—	—
Sessamoiditis	3	—	—
Spavin	2	1	—
Dislocation of shoulder	1	—	—
Fistula of withers	—	—	1
Chronic debility	5	1	—
Anthrax... ..	—	1	—
Broken wind	—	1	—
Vegetable poisoning	—	—	2
Drowned	—	1	1
Snake bite	1	1	1
Killed by Hyaenas	—	—	1
Fell down well	1	—	—
Old and worn out	11	—	1
Lost	1	2	2
Unfit for Government Service	18	7	—
Causes unknown	14	9	6
TOTAL	195	188	42

DISEASES OF CAMELS.

The following camels, also the property of officials and Government employees, died or were destroyed from the causes shown :—

Trypanosomiasis	...	...	226	Pneumonia	...	...	17
Pleurisy	...	...	1	Peritonitis	...	...	4
Enteritis	...	...	5	Tympanitis	...	...	9
Rupture of stomach...	...	...	1	Vegetable poisoning	...	...	13
Nephritis	...	...	1	Paraplegia	...	...	1
Rupture of artery	...	...	4	Pyæmia	...	...	1
Fistula of poll	...	...	1	Fistula of withers	...	...	4
Exhaustion	...	...	12	Abscess	...	...	8
Incurable lameness	...	...	12	Necrosis of pad	...	...	2
Sessamoiditis	...	...	1	Broken leg	...	...	7
Arthritis	...	...	4	Rheumatism	...	...	1
Dislocation of neck	...	...	1	Broken jaw	...	...	2
Blindness	...	...	5	Helminthiasis	...	...	1
Drowned	...	...	2	Run down by train	...	...	1
Killed by lightning	...	...	1	Chronic debility	...	...	7
Snake bite	...	...	9	Tumour	...	...	1
Lost	...	...	16	Stolen	...	...	3
Unfit for Government Service	...	...	39	Not stated	...	...	42
			TOTAL	...	...	...	564.

It will be seen that the majority of casualties were the result of Trypanosomiasis. Laboratory experiments in the diagnosis of this disease, and its treatment by "Bayer 205", have been very promising, but a period of six months or more will have to elapse before definite conclusions can be arrived at regarding the value of the treatment.

DISEASES OF SHEEP AND GOATS.

Sheep Pox.

This disease continues to manifest itself amongst sheep for export but not to such a degree as to cause anxiety.

Infectious Pneumonia of Goats.

The disease has been fairly prevalent, more especially in the Shendi district of Berber Province, the Kamlin district of Blue Nile Province and the Geili district of Khartoum Province.

Preventive inoculation has been carried out but without success, and in spite of all Laboratory efforts, an effective vaccine has yet to be discovered. Meanwhile, isolation and segregation of the infected flocks are the only methods by which we can hope to limit the spread of this disease.

VETERINARY SURVEY SECTION.

Authority has been obtained for a large extension of the work in connection with the Research Laboratory, and with this in view a considerable amount of equipment and apparatus has been purchased, and more accommodation acquired for experimental animals.

A number of important preliminary experiments are being carried out, particularly in connection with the cure of Trypanosomiasis in camels by "Bayer 205," and the manufacture of Pleuro-pneumonia vaccine. The results obtained so far are reported as encouraging.

With a view to enabling us to come to a decision as to the advisability of establishing our own Serum Institute, permission was obtained for Captain Knowles, Veterinary Bacteriologist, to visit Serum Institutes in Cairo, Siena and Eritrea, in order to ascertain the most up-to-date methods of manufacturing serum, and the methods employed in the manufacture of serum under climatic conditions approaching those of the Sudan.

A copy of the Veterinary Bacteriologist's report is attached as Appendix I of this report.

QUARANTINE SECTION.

More cattle and sheep have been exported than in the previous year, but the improvement was chiefly confined to the first three months of the year under report. Unfortunately a series of outbreaks of Foot and Mouth disease occurred in the months of January and April, causing a complete stoppage of the trade during a period when our export should have been at its best. Also early in the year the Egyptian markets, with the exception of Cairo and Alexandria, were again closed to Sudan sheep, and it is probable that the Egyptian Veterinary regulations respecting Sudan sheep since brought into force will entirely nullify any advantages to be obtained by Sudan dealers from the use of the open market.

The chief cause of complete stoppage of cattle and sheep trade resulting from an outbreak of contagious disease has been the fact that we have only had, until the middle of the year, one route by which we can conveniently pass our animals for export from the interior to the coast. As more routes become available the easier it will be to maintain the trade when outbreaks of disease occur.

An attempt is being made to establish a cattle trade export to Alexandria via Port Sudan, and if this is successful the difficulty will be partially removed.

The new Kassala railway, particularly if it is extended towards the interior, should also relieve the situation.

Meanwhile, it has been decided to build more quarantine parks on the old route, one object being to use half of them as a make shift for an alternative route should an outbreak of contagious disease occur in those in use.

16,989 cattle passed through the Quarantine Parks, for export, as against 12,270 during the previous year—an increase of 4,719.

30,974 sheep passed through the Quarantine Parks, for export, *i.e.*, an increase of 10,163.

The following Tables give the number of animals dealt with at the various Quarantine Parks during the period 1st October, 1923 to 30th September, 1924, as compared with the similar period 1922-23.

HALFA QUARANTINE PARK.

	Camels.		Cattle.		Goats.		Sheep.	
	1922-23	1923-24	1922-23	1923-24	1922-23	1923-24	1922-23	1923-24
October	—	1	—	—	21	8	465	4239
November	—	—	—	44	5	41	77	5411
December	—	—	68	94	13	12	1171	5009
January	—	—	—	35	7	—	1072	1239
February	—	1	44	—	39	—	395	—
March ...	—	—	78	40	1	3	2182	610
April ...	—	—	437	424	20	—	311	400
May ...	—	—	291	19	77	—	337	500
June ...	—	—	494	125	568	174	712	202
July ...	—	—	—	229	21	88	725	132
August ...	—	—	—	—	—	2	169	154
September	—	—	—	—	6	2	1102	1671
TOTALS	—	2	1412	1010	778	330	8718	19567

KHARTOUM NORTH QUARANTINE PARK.

	Camels.		Cattle.		Goats.		Sheep.	
	1922-23	1923-24	1922-23	1923-24	1922-23	1923-24	1922-23	1923-24
October	—	—	—	2340	—	—	—	1896
November	—	—	—	2077	—	—	—	1202
December	—	—	2796	2459	—	—	1913	2027
January	—	—	1457	1618	—	—	2472	1024
February	—	—	539	350	—	—	723	—
March ...	—	—	1026	1100	—	—	1125	710
April ...	—	—	164	303	—	—	253	323
May ...	—	—	492	715	—	—	70	50
June ...	—	—	351	673	—	—	65	—
July ...	—	—	600	346	—	—	398	—
August ...	—	—	940	1328	—	—	303	65
September	—	—	1695	2167	—	—	1050	874
TOTALS	—	—	10060	15476	—	—	8372	8171

PORT SUDAN QUARANTINE PARK.

	Camels.		Cattle.		Goats.		Sheep.	
	1922-23	1923-24	1922-23	1923-24	1922-23	1923-24	1922-23	1923-24
October	2	—	80	113	—	—	135	317
November	—	—	125	90	—	—	873	301
December	1	—	152	—	—	—	731	175
January	—	2	75	36	—	1	565	530
February	—	—	99	63	—	2	550	687
March ...	—	—	87	43	7	33	329	378
April ...	—	—	51	—	—	—	283	—
May ...	—	—	32	150	—	—	—	140
June ...	—	—	10	—	—	—	—	373
July ...	—	—	—	—	—	—	150	285
August ...	—	—	24	—	—	—	105	50
September	—	—	63	8	—	—	—	—
TOTALS	3	2	798	503	7	36	3721	3236

GRAND TOTAL.

Period.	Camels.	Cattle.	Goats.	Sheep.
1st October, 1922 to 30th September, 23	3	12270	785	20811
1st October, 1923 to 30th September, 24	4	16989	366	30974

HIDES AND SKINS.

The numbers of hides and skins inspected as compared with the previous year, are shown in the following tables :—

HIDES.

	Halfa.		Khartoum.		Port Sudan.		Total.	
	1922-23	1923-24	1922-23	1923-24	1922-23	1923-24	1922-23	1923-24
October	5	—	1248	792	—	—	1253	792
November	—	—	1200	80	—	—	1200	80
December	—	57	1000	441	200	—	1200	498
January	164	—	8262	—	—	—	8426	—
February	81	—	553	1258	—	—	634	1258
March ...	—	110	3599	1937	—	—	3599	2047
April ...	410	—	876	381	1524	—	2810	381
May ...	824	—	880	2029	20	—	1724	2029
June ...	—	345	27	3178	273	—	300	3523
July ...	—	497	132	1492	360	—	492	1989
August ...	35	52	970	4301	—	147	1005	4500
September	—	336	2025	4073	—	—	2025	4409
TOTALS	1519	1397	20772	19962	2377	147	24668	21506

SKINS.

	Halfa.		Khartoum		Port Sudan.		Total.	
	1922-23	1923-24	1922-23	1923-24	1922-23	1923-24	1922-23	1923-24
October	300	575	16420	18352	307	8539	17027	27466
November	—	85	13400	23260	9268	12463	22668	35808
December	1248	65	31034	15101	6600	—	38882	15166
January	980	230	30400	22840	—	7800	31380	30870
February	4018	—	26477	8000	5688	4930	36183	12930
March ...	838	—	33391	24006	1228	265	35457	24271
April ...	—	—	34668	12427	6645	—	41313	12427
May ...	2940	300	12868	15192	1658	7737	17476	23229
June ...	59	3090	21624	18530	3410	6176	25093	27796
July ...	—	1023	18164	15768	5480	5086	23644	21877
August ...	380	480	11520	8000	1709	7531	13609	16011
September	775	3109	12690	15297	789	4770	14254	23176
TOTALS	11538	8957	262656	196773	42792	65297	316986	271027

BREEDING SECTION.

The usual Horse Shows were held in Darfur, Kordofan and Nuba Mountains Provinces, and the greatly increasing attendance annually by the various tribes is some indication of their popularity.

Races, polo and other mounted sports were included in the programmes of the Shows, and no doubt serve to stimulate native interest in breeding and improvement of horses generally.

Good progress continues to be made in Kordofan and Darfur as regards the services of indigenous sires provided by the Government, and it can almost safely be predicted that normal demands of the Army and Civil Authorities for suitable riding horses will easily be met.

During the year 61 horses were purchased for the Egyptian Army, the prices ranging from £E. 13 to £E. 17.

Two sires, one Arab and one Egyptian country-bred, were purchased for the Sudan Government, and have been standing at Khartoum. Since their arrival a number of mares belonging to natives of Khartoum have been served.

Government sires have also stood at Abu Zabad, Shendi and Tokar.

Cattle.

Experiments in the improvement of cattle have so far been confined to the Dairy herd, the object being to increase the milk supply.

A certain amount of cross-breeding has been carried out at the Dairy by the employment of imported bulls, and the results would justify the consideration of further importations from home. One short-horn dairy bull was purchased and brought out from England in

September, but died from Piroplasmosis shortly after its arrival. A certain risk attaches to the importation of cattle from home owing to their susceptibility to diseases prevalent in the Sudan, but past results, on the whole, justify the risk being taken.

For the present it would be useless to attempt a general grading up of the native cattle of the Sudan by the importation of blood from abroad. When the Sudan is in a position to manufacture its own serum and vaccines the grading up of cattle in defined areas by new blood might be worth consideration. Meanwhile improvement might be effected by selection confined to the indigenous breeds.

Sheep.

With regard to the experiment of introducing Meraiis blood into sheep inhabiting the Gezira irrigation area, which was mentioned in the last Annual Report, it is regretted that very little progress has been made and, until a definite policy is decided on between the Government and the Sudan Plantation Syndicate over the question of the provision of the necessary labour and grazing for sheep, no development can be expected.

FINANCE.

For the twelve months January to December, 1924, the actual receipts of the Department were £E. 8,236 as against an estimate of £E. 10,800. The deficit is, no doubt, the result of the unfortunate outbreaks of Foot and Mouth disease which occurred at a time when the cattle trade should have been at its best.

The actual expenditure was £E. 39,930, as against an estimated expenditure of £E. 46,243. Thus the loss on receipts was more than counter-balanced by the saving on the estimated expenditure.

H. BONE, *Major, R. A. V. C.*,

Khartoum.

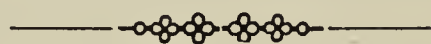
Acting Director, Veterinary Department

22nd January, 1925.

1st October, 1924.



**REPORT OF THE VETERINARY BACTERIOLOGIST,
SUDAN GOVERNMENT,
FOR THE
PERIOD OCTOBER 1st, 1923 to SEPTEMBER 30th, 1924.**



The Director,
Veterinary Department, S.G.,
Khartoum.

KHARTOUM,
7th October, 1924.

SIR,

I have the honour to submit, herewith, a report on the work at the Veterinary Laboratory, during the period from October 1st, 1923 to September 30th, 1924.

(a) **ROUTINE EXAMINATIONS.**

During the year 408 smears and specimens have been examined and reported on at the laboratory, excluding the examinations carried out in the course of the research work.

Horses,

Habronemic Granuloma (Bursati)	...	...	...	20
Habronemic Conjunctivitis	...	...	...	13
Piroplasmosis	...	...	...	17
Epizootic Lymphangitis	...	...	...	6
Trypanosomiasis	...	...	...	3
Horse-sickness	...	...	...	1
Lichen Tropicus	...	...	...	1
Strangles	...	...	...	1
Pyogenic infections	...	...	...	2
Negative	...	...	...	31
TOTAL				95
				95

Mules.

Epizootic Lymphangitis	...	...	...	14
Habronemic Granuloma	...	...	...	13
Habronemic Conjunctivitis	...	...	...	6
Lichen Tropicus	...	...	...	6
Piroplasmosis	...	...	...	1
Anthrax	...	...	...	1
Pyogenic infections	...	...	...	1
Negative	...	...	...	25
TOTAL				67
				162

Donkeys.

Ulcerative Lymphangitis	...	...	...	...	1
Anaplasmosis	...	...	...	...	1
Streptothrix	...	...	...	...	1
Negative	...	...	...	...	6
TOTAL					9
					171

Camels.

Trypanosomiasis	...	...	...	...	40
Pyogenic infections	...	...	...	...	5
Mange	...	...	...	...	4
Microfilaria	...	...	...	...	1
Helminthiasis	...	...	...	...	1
Negative	...	...	...	...	63
TOTAL					114
					285

Cattle.

Trypanosomiasis	...	...	...	...	15
Piroplasmosis	...	...	...	...	8
Anthrax	...	...	...	...	10
Rinderpest	...	...	...	...	13
Contagious Bovine Pleuro-pneumonia	...	...	...	...	4
Negative	...	...	...	...	36
TOTAL					86
					371

Sheep.

Anthrax	...	...	...	...	12
Negative	...	...	...	...	3
TOTAL					15
					386

Dogs.

Piroplasmosis	...	...	...	...	3
Pyogenic infections	...	...	...	...	1
Negative	...	...	...	...	11
TOTAL					15
					401

Birds.

Coccidiosis	...	...	...	...	4
Spirochaetosis	...	...	...	...	2
Necrosis	...	...	...	...	1
TOTAL					7
					408

(b) REVIEW OF DISEASES.

Trypanosomiasis.

(a) *Camels.*

Trypanosomiasis of camels is one of the most widespread diseases in the Sudan.

During the year 1923, over 175 camels belonging to officials of the Sudan Government died or were destroyed owing to this disease, and approximately £E. 1,850 was paid in compensation. During the present year 131 camels belonging to the Army have died or been destroyed for Trypanosomiasis, the value of which was £E. 1,850. Add to this a much greater loss amongst the camels of the native population, and the economical importance of this disease becomes evident.

Much of my time has been spent on investigation of this disease, and I am pleased to report progress. Two lines of research have been carried out :—

(i) *Diagnosis.*—Up to the present the only method of diagnosis has been microscopical examination of the blood. Owing to the fact that trypanosomes can only be demonstrated in the blood at varying intermittent periods, microscopical examination of the blood is unreliable.

Observations have shown that the periods when trypanosomes cannot be demonstrated by microscopical examination exceed those when they can be.

Camels suffering from Trypanosomiasis, especially if rested for a time, may appear normal.

It will therefore be obvious that a percentage of camels bought for the Government are at the time of purchase affected with Trypanosomiasis, and when worked become clinically affected and have to be destroyed and compensation paid.

Reference to Appendix I shows that the Formol-gel test appears to be reliable for the diagnosis of Trypanosomiasis in camels. Up to the present 12 camels affected with Trypanosomiasis have been subjected to this test, all giving positive results, and in addition 25 healthy camels have been tested, all giving negative reactions.

It now remains to apply this test on a large scale to ascertain its reliability. It is my intention to carry this out next month on the Camel Corps at Wad Medani.

(ii) *Treatment.*—Up to the present no reliable treatment of camel Trypanosomiasis has been found.

Reference to Appendix II of this report shows, however, that “Bayer 205” appears to be a reliable curative agent for this disease.

Six out of six camels affected with Trypanosomiasis treated with “Bayer 205” appear to be cured.

I have now obtained a large quantity of "Bayer 205" to continue my investigations, which I propose to do in conjunction with the investigations in diagnosis.

(b) *Cattle*.—During the year, thirteen cases of Trypanosomiasis in cattle have been diagnosed.

Twelve of these were at Talodi, and one at Halfa in a bull from Kordofan Province.

In all cases the type was *Trypanosoma congolense* (nanum). This disease has caused heavy losses in the Ox Transport (Military and Civil) in the Nuba Mountains Province.

As good results are reported from Rhodesia in the treatment of this disease by the intravenous injections of Tartar Emetic solutions, it is being tried at Talodi.

I supplied the Veterinary Officer from Nuba Mountains Province with the necessary outfit, and demonstrated the technique to him on his way through Khartoum.

"Bayer 205" will also be tried when a supply becomes available.

(c) *Horses*.—Three cases of Trypanosomiasis in horses have been diagnosed, all in the Nuba Mountains Province. Two were of the type *Trypanosoma pecaui*, and one *Trypanosoma congolense*.

Contagious Bovine Pleuro-Pneumonia.

The losses from Contagious Bovine Pleuro-pneumonia have been heavy.

This disease heads the list of contagious diseases amongst the Sudanese cattle slaughtered in Egypt. During the twelve months ending September 30th, no fewer than 271 cases of this disease were diagnosed in the Abattoirs in Egypt, 33 of which were destroyed, and 15 died. These 48 were, of course, not passed for consumption.

This total of 271 cases compares very unfavourably with previous years.

The total number of cases of this disease for the previous five years was only 218, or an average annual incidence of 43.6.

During the year, Contagious Bovine Pleuro-pneumonia caused extensive losses in the working oxen of the Sudan Plantation Syndicate. I regret that I have been unable to obtain statistics of these losses.

This disease was the cause of stopping the cattle trade to Malta in 1915, and has been the reason given against the resumption of this trade.

The losses from Contagious Bovine Pleuro-pneumonia must have been very heavy amongst the native herds of this country.

As long as Contagious Bovine Pleuro-pneumonia exists to the extent that it does at present, it represents a menace to the existing export of cattle, and will prevent extension of the trade to other markets.

I therefore recommend an energetic campaign against this disease both in the field and laboratory.

The work to be carried out in the laboratory includes :—

1. Production of a Vaccine.—This involves (*a*) the cultivation of several strains of the virus of Contagious Bovine Pleuro-pneumonia (being carried out at present); (*b*) the testing of the virulence and antigenic properties of these strains; and (*c*) the testing of the susceptibilities of the Sudanese cattle.

2. Diagnosis.—In the early stages, and in recovered animals, it is often impossible to diagnose Contagious Bovine Pleuro-pneumonia clinically, although during these stages the disease is contagious.

The importance of a diagnostic test is therefore evident.

Although many workers have been engaged on the subject of diagnosis, a reliable test has not been found. Considerable progress, however, has been made.

With our present knowledge of this disease, and given efficient Veterinary control, it ought to be possible to eradicate the disease from the cattle in the Gezira area.

It will then be possible to produce herds free from Contagious Bovine Pleuro-pneumonia, and to give certificates of freedom to Malta or other markets.

In addition, I think that more active measures should be taken in areas from which cattle come for export, especially Kordofan.

Anthrax.

During the year 23 cases of Anthrax have been diagnosed, compared with 19 cases in 1923, and 53 cases in 1922. Cases have occurred at Khartoum (Shambat), Halfa, Port Sudan, and one case in a mule at Singa.

The Sudan still enjoys a comparative freedom from Anthrax. Broadly speaking, Anthrax infection in the Sudan is at present confined to the Quarantine Parks.

Anthrax is the only disease which we cannot definitely clear by disinfection from the quarantines, and consequently the only disease, which has necessitated the intended evacuation of the old quarantines, and it has therefore been the cause of considerable expense.

It is therefore evident that the most rigid precautions should be taken against contamination of the new quarantines.

The precautions recommended are :—

(i) All animals which die in quarantine must be suspected of Anthrax.

(ii) Immediate microscopic examinations of the blood of all animals dying in quarantine. This must be done at the quarantine.

(iii) Efficient disposal of Anthrax carcasses.

The discharges from the natural orifices (mouth, nose, and anus) contain Anthrax bacilli which on exposure to air are converted into spores.

If the skin of an Anthrax carcase is cut and blood escapes, the same thing occurs.

During the removal of an Anthrax carcase discharges almost inevitably escape, even although the orifices are plugged.

Therefore, the following precautions must be taken :—

(a) On no account must an Anthrax carcase be opened or skinned. For taking blood for microscopical examination, a small vein inside the ear is cut, and the ear then plugged with tow soaked with lysol.

(b) The carcase should be cremated where it dies, without removal. I suggest that for cremation an iron trellis-work platform in four sections, 18 inches from the ground. This will be carried to the spot, the carcase placed on, and fuel (wood and dried grass) burned beneath.

(iv) The ground where the carcase lay should be scraped, and the scrapings burned.

(v) Disinfection by blow lamp of any material from the old quarantines, intended for use at the new.

Sources of Infection.

I think that the present sources of Anthrax infection are the contaminated kraals at Khartoum (Shambat) and Halfa Quarantines, for the following reasons :—

On 9.3.24 a bull died from Anthrax in the train from Khartoum to Port Sudan. It left Khartoum on 8.3.24, and had been at Khartoum eleven days. The minimum period of incubation for Anthrax in cattle, in a natural infection, is 48 hours, so that train infection is excluded.

It may be argued that infection was from El Obeid, and that this bull may have been a carrier during its stay in Khartoum. Against this, however, is the fact that Anthrax has not been detected at El Obeid, and also that not a single bull out of many thousands has died from Anthrax in the train from El Obeid to Khartoum, or within 48 hours of their arrival in Khartoum.

Owing to the fact that the bulls are tied up short by the head as soon as they enter the train, I think that the chance of Anthrax infection of cattle in the train is small.

Anti-Anthrax Serum.

It was found in several cases that the anti-anthrax serum from India was not protecting the sheep against Anthrax.

This was not surprising when one remembers the long distance the serum has to travel, and the high temperatures to which it is exposed.

Experiments were carried out to test the potency of the Indian serum, and to compare it with the anti-anthrax serum from Italy.

It was found that the Indian serum had lost its protective properties and so a supply of Italian serum was obtained in its place.

Piroplasmosis.

(a) *Cattle*.—During the year 8 cases of Piroplasmosis of cattle have been diagnosed, all being due to *Theileria Mutans*.

One of these cases was the English shorthorn bull imported by the Veterinary Department from England. The bull, unfortunately, died from this infection.

It is interesting to note that Kochs bodies (blue bodies) were found in this case. They were found in the prescapular lymphatic gland, kidneys and liver: this being the first time they have been recorded in the Sudan.

Reference to my Annual Report for the previous year, published in October, 1923, shows that I expressed the opinion that the cases diagnosed in Egypt as East Coast Fever, were in reality cases of infection with *Theileria mutans*, and that the Authorities in Egypt were not justified in diagnosing these cases of *Theileria* infection as East Coast Fever.

In March of this year, Doyle of the Egyptian Veterinary Service published a report in the Journal of Comparative Pathology and Therapeutics, repeating my observations.

I therefore think that we can conclude that East Coast Fever does not exist in the Sudan.

I must repeat, however, the possibility of this disease extending Northwards into the Sudan from Uganda.

No cases of East Coast Fever have been reported this year, all cases of *Theileria* being reported as *Mutans* infection.

(b) *Horses*.—Seventeen cases of equine Piroplasmosis have been diagnosed, seven cases were due to the *Piroplasma Caballi*, and ten due to *Nutallia equi*. Most English horses imported to the Sudan become infected with this disease.

Treatment by intravenous injections of Quinine Hydrobromide, has been continued with good results. It is important to administer the Quinine as early as possible.

The following precautions are suggested for English horses and cattle brought into the Sudan :—

- (i) Keep free from ticks by hand picking.
- (ii) Take the temperature twice daily for a fortnight after arrival, in order to detect the disease early.
- (iii) In case of a rise of temperature, blood smears should be examined.
- (iv) If piroplasms are present, intravenous injection of Trypanblue in the case of cattle, and Quinine Hydrobromide in the case of horses, should be immediately resorted to.
- (v) English stock should be imported during the Winter months.

Habronemiasis.

Under this heading are included Habronemic granulomata, known as Bursati, of which 33 cases were diagnosed, and Habronemic Conjunctivitis of which 19 cases have been diagnosed in horses and mules.

The appearance of both these conditions are too familiar to need description, but a brief outline of the etiology and course of the disease is given.

The cause of both conditions is the larval form of the Habronema worm.

The three species implicated are Habronema Megastoma, H. Microstoma and H. Muscae.

The adult worms live in the stomach of the horse or mule, either free or in stomach tumours. The embryos are passed out in the faeces and are taken up by Musca Domestica (House fly) or by Stomoxys Calcitrans, in which they undergo development to the larval stage.

They are then deposited by the fly either on skin abrasions, and there provoke Bursati, or in the conjunctival sac to cause conjunctivitis.

The larvae provoke a pronounced eosinophilia and necrosis of the tissues, forming the typical bursati core.

These conditions can be diagnosed by the discovery of the larvae in the sores.

The disease occurs during and after the rains, and is an extremely common condition in the Sudan.

Prophylaxis :—

- (a) Measures against flies.
- (b) Eye fringes for all horses and mules.
- (c) Disposal of manure.
- (d) Cover all wounds.

Rinderpest.

In the report, after the visit to the pan-African Veterinary Conference last year, the question of the possibility and advisability of establishing an Institute, for the production of anti-rinderpest serum in the Sudan, was put forward.

This question was discussed in 1914 by Lieut.-Colonel F. U. Carr, then Director of the Veterinary Department, and it was decided that owing to climatic conditions (high temperature, dust and low altitude) it was not advisable to establish a Serum Institute in the Sudan.

During my visit to Cairo and Siena (Italy), I was able to study the technique of serum production.

In addition, I have been in communication with the Imperial Bacteriologist of India, and the Director of the Serum Institute at Asmara, Eritrea, and have consulted experts whilst on leave.

Their opinions differ somewhat, but given a supply of susceptible cattle, I think that anti-rinderpest serum can be made at Khartoum during the four Winter months.

Before a definite opinion on this subject can be given, preliminary experiments are necessary, and these are now being commenced. They include :—

- (1) The testing of the susceptibility of native cattle, and cattle bred at the Dairy Farm.
- (2) The possibility of obtaining susceptible cattle from Eritrea or Abyssinia.
- (3) Observation of serum extraction (freedom from gross contamination, and percentage obtained).
- (4) Study of the incidence of *Theileria Mutans*. This infection is one of the chief difficulties met with at the Serum Institute in Cairo.

PERSONNEL.

In April of this year the appointment of Assistant Veterinary Bacteriologist was provisionally approved, and Captain F. J. Andrews, B.Sc., arrived on September 21st to fill this appointment.

The appointment of Laboratory Assistant was also sanctioned, and I engaged Mr. P. A. C. Kenny, a trained Laboratory Assistant. He is due to arrive in Khartoum on September 12th.

It will be obvious from this report, that the field for investigation is large, and I suggest that the above appointments are included in the new establishment of the Veterinary Department, and also that the estimates for the upkeep of the laboratory and the purchase of experimental animals be increased.

Before closing this report, I suggest a policy for the control of contagious diseases.

Under the heading of Contagious Bovine Pleuro-pneumonia, I referred to the eradication of this disease from the Gezira area.

By this area I mean those parts of Khartoum, White Nile and Blue Nile Provinces bounded by the White and Blue Niles, and a Southern boundary to be selected later.

I think it should be possible, by efficient Veterinary control, to free this large area of the three existing animal plagues (Rinderpest, Contagious Bovine Pleuro-pneumonia, and camel Trypanosomiasis,) and once this is done, to keep it free from these diseases.

The control of less important contagious diseases would follow.

Perhaps this opinion will arouse controversy, but I think the development of the Sudan has advanced far enough to justify this policy.

References have been made in this report to the diseases occurring amongst the export cattle.

I consider that the present supervision in the quarantines (Halfa excepted) is not adequate for the control and detection of contagious diseases. I suggest that :—

- (1) A British Superintendent (whether a qualified Veterinary Surgeon, or not) should be present throughout all the working hours of the quarantine.
- (2) He should be trained to carry out blood examinations.
- (3) Blood smears should be taken from all sick animals.
- (4) That each quarantine should have a diagnostic outfit.

In conclusion, I wish to thank the Staff of the Wellcome Tropical Research Laboratory for the assistance given during the year.

I have the honour to be, Sir,

Your obedient servant,

(Sd) R. H. KNOWLES, *Bimbashi*,

Veterinary Bacteriologist, Sudan Government



APPENDIX I.

THE FORMOL-GEL TEST AS APPLIED TO CAMELS AFFECTED WITH *TRYPANOSOMA SOUDANENSE*.

By CAPTAIN R. H. KNOWLES, R.A.V.C., Veterinary Bacteriologist,
Sudan Government, Khartoum.

The principle of the Formol-Gel or serum-aldehyde test is, that on the addition of formalin to serum of man or animals, suffering from certain infections, after a varying period a change takes place in the serum, resulting in opalescence, opacity, and gelation. On the other hand, the addition of formalin to the serum of healthy animals of the same species, under identical conditions, causes no change in the serum.

Fox and Mackie (1), and Napier (2), have demonstrated that the test is of great value in the diagnosis of Kala-Azar in man.

Spackman (3), has shown that camels affected with Surra in India will react to the serum-aldehyde test.

Plantureux (4), states that camels affected with *Trypanosoma Berberum* react to this test.

Hornby (5), has applied the test to the sera of normal cattle, and to one ox affected with *Trypanosoma vivax*, but he concludes that it is unlikely that the gelation of serum by formalin will ever be of diagnostic value in bovine Trypanosomiasis, owing to the fact that the serum of healthy cattle on addition of formalin becomes gelated.

The test, as applied to camels affected with *Trypanosoma Soudanense*, was carried out in two ways :—

1. Tube Test.

By this method 1 c.c. of the serum to be tested is placed in a small tube (3 inches by 1/3 inch), and four small drops of commercial formalin are added. The tube is then inverted to mix the formalin with the serum. The results were read at intervals from half an hour up to 96 hours, as shown in Table 1.

The test was carried out at room temperature (average 85° F). The blood and serum were kept at room temperature, as it was desired to carry out the test at temperatures similar to those in the field.

The pipettes used in the test are washed with normal saline solution three times between pipetting off each serum.

2. Slide Test.

The technique employed was similar to that described by Fox and Mackie (1), as applied to Kala-Azar.

In this test on camels, however, three small drops of serum are placed on a slide, which is then inverted over a watch glass containing a few drops of formalin,

In the test for Kala-Azar one drop is sufficient, but the reaction in camel Trypanosomiasis takes longer—up to one hour—so that to avoid drying of the serum, and the consequent confusion of dessication for gelation, three small drops of serum were used.

Observations were then carried out every ten minutes, with the results as shown in Table 3.

In carrying out the Formol-Gel test, it is advisable to obtain the serum in as clear a condition as possible, and this applies especially to the slide test.

The blood is taken from the jugular vein, and allowed to stand for 4 or 5 hours. Any clots which are adherent to the sides of the tubes are gently detached, either by rotating the tube or with a needle. The blood is then allowed to stand until a clear serum is obtained—usually 5 to 10 hours.

The serum of the camel is colourless, and with care can be obtained almost water clear : This is in contrast to the yellow serum of the ox and horse.

The lack of colour of camel serum renders the reading of this test easier.

In the Tables the Formol-Gel reactions are indicated by the following signs :—

Doubtful opalescence	...	...	...	+
Slight opalescence	...	...	...	+
Distinct opalescence	...	...	...	+ +
Partial gelation	...	...	...	v
Complete gelation	...	...	...	vv



TABLE I.

FORMOL-GEL TEST ON 7 CAMELS WITH TRYPANOSOMIASIS, 12 HEALTHY
CAMELS, 2 HORSES AND 2 BULLS.

No.	$\frac{1}{2}$ hour.	1 hour.	2 hours.	4 hours.	8 hours.	12 hours.	24 hours.	48 hours.	72 hours.	96 hours.	Tryps in blood	Amount of Bayer 205.	Period under treatment.	Period of known infection
255.	+	+	++	++	++	++	++ VV				A	18	48	5 weeks
251.	+	+	++	++	++ VV						A	10	17	8 ..
1052.	+	+	++	++	++	++ V	++ VV				A	18	19	4 ..
1450.	+	+	++	++	++ V	++ VV					A	19	14	4 ..
30.	+	+	++	++	++	++	++ VV				P	nil.		20 months
1524.	+	+	++	++	++ V	++ VV					P	nil.		4 weeks
264.	—	+	++	++	++	++	++ VV				A	nil.		9 ..
38.	—	—	—	—	—	—	—	—	—	—				
48.	—	—	—	—	—	—	—	—	—	—				
56.	—	—	—	—	—	—	—	—	—	—				
42.	—	—	—	—	—	—	—	—	—	—				
67.	—	—	—	—	—	—	—	—	—	—				
20.	—	—	—	—	—	—	—	—	—	—				
27.	—	—	—	—	—	—	—	—	—	—				
318.	—	—	—	—	—	—	—	—	—	—				
243.	—	—	—	—	—	—	—	—	—	—				
19.	—	—	—	—	—	—	—	—	—	—				
2.	—	—	—	—	—	—	—	—	—	—				
275.	—	—	—	—	—	—	—	—	—	—				
Bull 1.	—	—	—	—	—	—	—	—	—	—				
„ 2.	—	—	—	—	—	—	—	—	—	—				
Horse 1.	—	—	—	—	—	—	—	vv						
„ 2.	—	—	—	—	—	—	v	vv						

A. Trypanosomiasis absent.

P. Trypanosomiasis present,

Reference to Table I shews :—

(a) That in the case of seven camels affected with Trypanosomiasis, a positive result was obtained up to slight opalescence in one hour, and that in two hours the results were definite as evidenced by a distinct opacity.

The opalescence is characteristic, and is quite different from a cloudy serum due to red cells or slight haemolysis.

The reacting sera have a milky white colour. A dense white opacity as in Kala-Azar is not obtained, although the opalescence increases slightly after two hours.

(b) In eight hours gelation has commenced.

Camel No. 251 showed complete gelation in eight hours, whilst Nos. 1450 and 1524 were partly gelated.

All the sera of affected camels were completely gelated at twenty-four hours.

(c) If the results obtained prove to be constant over a large number of animals, the test could be read with confidence at two hours, although a more definite reaction is obtained later owing to gelation.

It is conceivable that when testing the sera of camels for purchase, an early decision will be advantageous.

(d) The result of the test does not appear to be influenced by the presence or absence of demonstrable trypanosomes in the blood, so that the test is of practical value in the purchase of camels, as it is often impossible to demonstrate the presence of trypanosomes in the blood by microscopic examinations for varying periods up to at least 12 days.

(e) Four camels have been treated by intravenous injections of "Bayer 205." No difference in reaction to the test between the treated and untreated appears.

The longest period, however, between the treatment and the test was 48 days.

Observations on this subject will be carried out later.

The periods during which camels are known to be infected are given, but it is very probable that, with the exception of camel No. 30, all have been infected for longer periods.

(f) That the sera of all normal camels remained clear and liquid up to 96 hours.

(g) That the sera from two bulls remained clear and liquid up to 96 hours. This is different to the finding of Hornby(5).

He found that of the sera of 28 normal oxen, after the addition of two drops of formalin, 14 were set within 12 hours and the remainder within 72 hours.

The two bulls employed in this test were about five months old.

(h) That of the sera of two normal horses, one showed partial gelation at 24 hours, and both complete gelation at 48 hours.

Tests were carried out to see if the amount of formalin added had any influence on the test.

Comparative tests using two and four drops respectively on the same sera were made.

TABLE II.

To Show Difference in Reaction Between 2 and 4 Drops of Formalin.

Camel No.	No. of drops. of formalin.	1 hour.	2 hours.	4 hours.	8 hours.	12 hours.	24 hours.	48 hours.
255	2	+	+	+	+	+	+	
255	4	+	+	+	+	+	+	
251	2	+	+	+	+	+		
251	4	+	+	+	+	+		
30	2	+	+	+	+	+	+	
30	4	+	+	+	+	+	+	
1052	2	+	+	+	+	+	+	
1052	4	+	+	+	+	+	+	
38	2	—	—	—	—	—	—	—
38	4	—	—	—	—	—	—	—
48	2	—	—	—	—	—	—	—
48	4	—	—	—	—	—	—	—

Trypanosomiasis camels.

Normal camels.

Reference to Table II shows that although in camels 251 and 255 no difference was observed, in camels 30 and 1052, the gelation was slower with two drops than with four drops, and it is for this reason that four small drops are used in the routine test.

Slide Test.

TABLE III.

SLIDE TEST ON 6 CAMELS WITH TRYPANOSOMIASIS AND 12 NORMAL HEALTHY CAMELS.

No.		10 mins.	20 mins.	30 mins.	40 mins.	50 mins.	60 mins.
255	} Trypanosomiasis camels.	+	+	++	++	++	++v
251		+	++	++	++	++v	++vv
1052		+	+	++	++	++	++v
1450		+	++	++	++	++v	++vv
30		+	+	++	++	++	++v
1524		+	+	++	++	++v	++vv
38	} Normal camels.	—	—	—	—	—	—
48		—	—	—	—	—	—
56		—	—	—	—	—	—
42		—	—	—	—	—	—
67		—	—	—	—	—	—
20		—	—	—	—	—	—
27		—	—	—	—	—	—
318		—	—	—	—	—	—
243		—	—	—	—	—	—
19		—	—	—	—	—	—
2		—	—	—	—	—	—
275		—	—	—	—	—	—

Reference to Table III, shows that opalescence commences in ten minutes, and is distinct in two cases in 20 minutes.

All the six sera tested were positive in half an hour, as evidenced by distinct opalescence.

Gelation commences in 50 minutes, and is shown in all sera from affected animals in one hour.

The sera of normal camels are negative to the test, although three showed a very slight opalescence which for practical purposes can be disregarded.

The gelation is best tested at the end of an hour, by running the point of a dissecting needle through the serum. In positive cases the serum is torn from the slide, whereas in negative cases the needle simply passes through the still liquid serum.

FIG. I

Fig. 1 shows the results of the tube test at 48 hours.

Nos. 1 and 4 are sera from camels affected with Trypanosomiasis, and 5 to 8 are from healthy camels.

The contraction of the upper surface of the positive gelated sera is noticed in comparison with the negative liquid sera.

The photograph rather exaggerates the opalescence of the positive sera, and also makes the negative sera appear more cloudy than they really are.

(1) The Formol-Gel test appears to be reliable for the diagnosis of Trypanosome Soudanense in camels.

(2) The reliability of the test is not affected by the presence or absence of demonstrable Trypanosomes in the blood.

(3) Either the tube test or the slide test can be used, the former is probably more definite, but the latter is simpler, quicker, and requires less apparatus.

(4) The test will be of economic value in the purchase of camels. It should be possible to detect all cases of Trypanosomiasis in camels, with the possible exception of camels very recently infected.

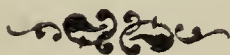
(5) It would now appear that a combination of a reliable diagnostic method (Formol-Gel Test) and a reliable therapeutic agent (Bayer 205) exist for the control of camel Trypanosomiasis.

My experiments on "Bayer 205" will be recorded later, when a sufficiently long period (6 months) after treatment has elapsed.

I wish to acknowledge my indebtedness to Major R. G. Archibald, D.S.O., Director of the Wellcome Tropical Research Laboratories, Khartoum, and Mr. N. Macdonald his Laboratory Assistant, for help and for taking the photographs.

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APPENDIX II.

TREATMENT OF CAMELS AFFECTED WITH TRYPANOSOMA SOUDANENSE WITH "BAYER 205," AND FURTHER OBSERVATIONS ON THE FORMOL-GEL TEST.

It is doubtful if a satisfactory treatment for Trypanosomiasis in camels has been found.

Cross(1) and (2), and Cross and Patel(3) reported a certain amount of success in the treatment of camels in India affected with Trypanosoma evansi, by repeated intravenous administration of aqueous solutions of Tartar Emetic.

It appears, however, that this treatment is somewhat prolonged, and the results of the treatment problematical.

The results obtained from the therapeutic treatment of camels affected with Trypanosoma soudanense, by Tartar Emetic, have not been satisfactory.

Apparent cures have been obtained by repeated intravenous administration of Tartar Emetic solutions, but in the majority of cases the trypanosome reappears in the blood after a variable period.

Up to the present, six camels affected with Trypanosomiasis have been treated with "Bayer 205."

In these experiments the "Bayer 205" was employed in 10 per cent. aqueous solution, administered intravenously by gravitation. No precautions were taken as to the rate of administration, and no inconvenience or toxic symptoms were observed.

Varying amounts of the drug were administered, and a varying number of doses were employed, the object being to ascertain the smallest dose, and the least number of doses, required to effect a cure.

On account of the fact that the administration of "Bayer 205" to the human subject sometimes causes Albuminuria (4), the urine of the camels under treatment was collected daily and tested for albumen, for a period of seven days after the last dose.

No albumen was detected in the urine.

It therefore appears that the camel tolerates well the intravenous administration of "Bayer 205."

The experiments were controlled by the following observations:—

(a) *Microscopic examination of the blood.*—This was done twice daily, before the treatment for at least 10 days, and after the treatment for three months.

(b) *Biological Tests*.—Cerbils (*Cerbillus Pygares*, desert mouse) were inoculated with the blood of the camels in citrate solution before and after treatment.

Gerbils are very susceptible to *Trypanosome soudanense*. They are easily obtainable and naturally stand the hot climate well.

On the other hand, rabbits and Guinea pigs frequently die from the heat.

(c) *Formol-Gel Test*.—This test was only applied before the treatment in two cases, as the test had not been instituted until after the treatment of the others had commenced, as shewn in Table I, Appendix I, of this report.

(d) *Observations and records of the condition of the camels*. — The following Table gives a summary of the results obtained from the treatment of six camels treated with “Bayer 205.”



T A B L E I.

Number of Camel.	Period of known infection before treatment.	Total amount of "Bayer 205".	Number and amount of doses.	Period since treatment ended.	Result of microscopical reverse and biological tests.		Condition of camel.	
					Before treatment	After treatment.	Before treatment.	After treatment.
255.	5 weeks.	18 grammes.	3 doses of 6 grammes each. 1 day interval.	9 months.	Trypanosomes demonstrated by microscopic examination. All positive by inoculation of gerbils.	No trypanosomes present in blood of camels, or in gerbils inoculated from camels.	Emaciated and paraplegia.	Fair. No paralysis.
1052.	4 weeks.			8 months.			Extreme emaciation.	Very good.
1450.	4 weeks.	16 grammes.	2 doses of 8 grammes each. 1 day interval.	8 months.	Trypanosomes demonstrated by microscopic examination. All positive by inoculation of gerbils.	No trypanosomes present in blood of camels, or in gerbils inoculated from camels.	Poor.	Good.
1524.	4 weeks.	10 grammes.	Single dose.	6 months. X. Died.			Poor.	Good at death.
30.	20 months.			7½ months.			Good	V good.
251.	8 weeks.			9 months.			Emaciated.	Fair.

X. Camel 1524 unfortunately died from Enteritis six months after treatment. For five days before death, however, the blood was examined twice daily, but no trypanosomes were present. Gerbils were inoculated but no trypanosomes appeared in the blood. The Formel-Gel Test was not applied. The camel was improving in condition. One may therefore reasonably conclude that this camel was cured.

Further observations were carried out by the Formol-Gel Test, on the serum of the camels treated with "Bayer 205," to ascertain if the serum had lost its property to react to the Formol-Gel Test, and if so, to what extent this test can be employed to estimate the recovery, or cure, of a camel suffering from Trypanosomiasis.

The results of these tests are shewn in Table II. This Table shows the results of the Formol-Gel Test on five camels affected with Trypanosomiasis, and treated with "Bayer 205."

The first test (black type) was carried out before, or a few days after, treatment with "Bayer 205," and is a repetition of part of Table I, Appendix I, of this report.

The second test (red type) was carried out a considerable period (stated in the Table) after the treatment. This includes positive and negative controls, *i.e.*, Nos. K. 1 and 1013.



T A B L E I I.

Number.	1 hours.	2 hours.	4 hours.	8 hours.	12 hours.	24 hours.	48 hours.	72 hours.	96 hours.	Period since treatment.
255	+	++	++	++	++	++ vv				48 days.
255	—	—	—	—	—	+	+	+	+	9 months.
251	+	++	++	++ vv						17 days.
251	—	—	—	—	—					9 months.
1052	+	++	++	++	++ v	++ vv				19 days.
1052	—	—	—	—	—					8 months.
1450	+	++	++	++ v	++ vv					14 days.
1450	—	—	—	—	—					8 months.
30	+	++	++	++	++	++ vv				Not treated.
30	—	—	—	—	—				+	7½ months.
K.1.	+	+	++	++	++ v	++ vv				Positive control. Not treated.
1013	—	—	—	—	—	+	+	+	+	Healthy camel. negative control.

Partial gelatin.
Complete "

v
vv

Distinct opalescence
Negative. "

++
—

Doubtful opalescence.
Slight "

+
+

Reference to Table II shows that the serum of camels affected with Trypanosomiasis, after treatment with "Bayer 205," gradually lose the property of reacting to the Formol-Gel Test.

Taking distinct opalescence and complete gelation (++VV), at 24 hours as a definite positive reaction, all camels affected with Trypanosomiasis have reacted, whereas the five camels tested after treatment with "Bayer 205" failed to react.

It will be seen that in two cases (255 and 30) the serum still retained the power to react after a longer period, 72 hours and 96 hours respectively, tending to show that the loss of the property of the serum to react to the Formol-Gel Test is a gradual one.

The significance of this failure of the serum to react to the Formol-Gel Test, and the relation between the loss of this property and the cure of the camel, cannot yet be estimated without further observations.

Summary.

Six camels before treatment with "Bayer 205" were proved to be affected with Trypanosomiasis by the three tests (a) microscopical, (b) biological, and (c) Formol-Gel.

A considerable period (up to nine months) after the treatment the camels were all negative to the above three tests.

All six camels showed improvement in condition, this being especially marked in camels 1052, 251 and 255.

All camels returned to working condition.

The camels were put to work three months after the treatment.

Conclusions.

(i) Previous experience of the treatment of Trypanosomiasis has taught us to avoid hasty conclusions. The results obtained, however, are very promising, and it would appear that for the first time we have a valuable therapeutic remedy in "Bayer 205" for the treatment of Trypanosomiasis of camels.

(ii) The property of the serum of camels affected with Trypanosomiasis to react to the Formol-Gel Test disappears gradually after treatment with "Bayer 205."

(iii) Camels tolerate well the intravenous injection of 10% aqueous solution of "Bayer 205."

(iv) One dose of 10 grammes of "Bayer 205" appears to be an efficient dose for the cure of Trypanosomiasis of camels.

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