

Annual report of the Sudan Veterinary Service.

Contributors

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ANNUAL REPORT
OF THE
SUDAN VETERINARY SERVICE
FOR THE YEAR
1948.



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ANNUAL REPORT

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SUDAN VETERINARY SERVICE

FOR THE YEAR

1948

GENERAL.

Departmental activities continued to increase but owing to staff shortages due to retirements and inability to recruit, it was impossible adequately to maintain existing services and meet the demand for their expansion.

Bovine trypanosomiasis which has been of considerable concern in recent years, received much attention. Research work on the chemotherapeutic and chemoprophylactic value of antrycide was carried out throughout the year. Dr. D. G. Davey (co-discoverer of the drug) and other technicians of Imperial Chemical (Pharmaceuticals) Ltd., visited the Sudan and co-operated and assisted in much of this experimental work. In May, trypanosomiasis and tsetse fly control were discussed at a conference held in Juba. The meeting was presided over by Governor, Equatoria Province and was attended by the Director and Assistant Director (Research) Veterinary Services and other representatives of the Veterinary, Medical, Agricultural and Game Preservation departments. A number of recommendations were made for dealing with the problem which it was agreed was essentially a veterinary one.

As a result of a very favourable report by Mr. E. C. Cunningham, C.B.E., it was agreed that a meat processing factory should be established in the Sudan.

The Rinderpest Conference held at Nairobi in October was attended by the Director and Assistant Director (Research).

Revenue amounted to £E. 70,529 and expenditure to £E. 150,241 from normal budget sources and to £E. 4,465 from special development funds.

SECTION I.

STAFF.

The department's strength in the Southern Sudan was increased by the appointment, for the first time in the history of the Sudan, of a veterinary inspector to the reconstituted Equatoria Province. He was posted to Torit. A second veterinary inspector was appointed to the Bahr el Ghazal Province, being posted to Yirol.

After almost twenty nine years service in the Sudan, Capt. T. Menzies, O.B.E., retired in February to take up the post of Chief Veterinary Officer, British Military Administration, Cyrenaica. He will be long remembered, especially in Darfur and Kordofan Provinces where he did so much for the welfare of the animal owning tribes.

Other retirements during the year were Messrs. T. Stewart, Veterinary Inspector, A. Mackay, Veterinary Research Officer and G. M. Anderson, Assistant Superintendent. Unfortunately, it was impossible to obtain recruits for the vacancies caused by the above retirements or for other vacant posts of veterinary inspector, veterinary research officer and entomologist.

A well deserved promotion occurred in June when Mr. J. McKay was promoted from Superintendent to Inspector, Headquarters.

Headstockman Hussein Ahmed, Wad Medani, was awarded the Meritorious Service Medal of the Order of the British Empire.

Distribution of classified technical staff on 31st December, 1948 was as follows :—

DESIGNATION.	NAME	STATION
Director	W. H. Glanville, 4N, M.R.C.V.S.	Khartoum
A/Director (Admn)	J. E. Furney, 4N, M.R.C.V.S.	Khartoum
Senior Veterinary Inspector ..	I. A. Gillespie, M.R.C.V.S.	El Fasher
.. .. .	A. W. Chalmers, M.R.C.V.S.	El Obeid
.. .. .	P. Durran, M.R.C.V.S.	Malakal
.. .. .	J. D. M. Jack, M.R.C.V.S.	Wad Medani.
Veterinary Inspector	J. K. Thomson, M.R.C.V.S., D.V.S.M.	Khartoum
.. .. .	P. Z. Mackenzie, M.B.E., M.R.C.V.S.	Wau
.. .. .	H. B. Luxmoore, B.Sc., M.R.C.V.S.	Torit
.. .. .	D. G. Clow, M.R.C.V.S.	Malakal
.. .. .	C. P. Williams, M.R.C.V.S.	Yirol
.. .. .	C. N. Chappel, M.R.C.V.S.	Kosti
.. .. .	Ibrahim Mohd Khalil, Dip. Vet. Sci.	Shendi
.. .. .	M. J. Henigan, M.R.C.V.S.	Nyala
.. .. .	J. S. Robertson, M.R.C.V.S.	El Obeid
Veterinary Officer	Ahmed Magdoub Abdoun, Dip. Vet. Sci.	Wadi Halfa
.. .. .	Hussein Hassan Abbo, Dip. Vet. Sci.	Kassala
.. .. .	Zein El Abdin Mahmoud, Dp. Vet. Sci.	Wad Medani.
Inspector, Headquarters ..	J. McKay	Khartoum
Inspector of Hides.	E. Knew, Dip. Leathersellers Coll	Omdurman
RESEARCH		
A/Director, (Research)	J. T. R. Evans, B.Sc., M.R.C.V.S.	Khartoum
Veterinary Research Officer ..	F. W. Priestley, M.R.C.V.S. Dip. Bact. (Lond).	Khartoum
A/Veterinary Research Officer	El Amin Abdalla El Karib, Dip. Vet. Sci.	Malakal
A/Veterinary Research Officer	Mohd Ali Miheimeid, Dip. Vet. Sci.	U. K. on Study course
Veterinary Officer	El Nazeer Dafalla, Dip. Vet. Sci.	Khartoum
.. .. .	Saad Mahanna Ahmed Dip. Vet. Sci.	Khartoum
Pasture Research Officer ..	M. N. Harrison, B.Sc. (Agric).	Khartoum

There was little change in the establishment of other classified staff which totalled seventy six compared with seventy four in 1947.

The number of unclassified staff on the strength at the end of the year was 405, an increase of fifty one over last year's figures. The increase was chiefly attendants and motor drivers.

SECTION II.

DISEASES OF ANIMALS.

Cattle Plague (Rinderpest).

Though outbreaks were reported from all provinces there were no serious epizootics and the mortality figures must have been the lowest for many decades.

Approximately 41,000 cattle were vaccinated and 10,000 serumised in the control of the disease in the Bahr el Ghazal Province where the disease occurred sporadically at various places all through the Dinka grazing lands between Yirol and Aweil throughout the year. It was decided to allot annually to the province 150,000 doses of vaccine, the cost of which will be met by an increase in tribute. This vaccine will be used at the veterinary inspector's discretion as a first step in an attempt to eliminate cattle plague from the province.

Although the disease remained endemic throughout the Blue Nile Province the reported incidence showed a decline of about one third compared with the previous year. The most spectacular decrease occurred in the Kosti area where for the first time since before the war a veterinary inspector was stationed throughout the year. During the year it was decided to vaccinate all cattle en route to the Gezira, before they crossed the Kosti bridge. Such cattle are always a source of danger and quarantines on the borders of the Irrigated Area are difficult to enforce efficiently, especially in the summer when grazing is scarce. Approximately 42,000 cattle were vaccinated and 29,000 serumised in the province. In addition 3,159 cattle, chiefly working bulls, were immunised by the serum-virus method in the Irrigated Area.

In Darfur Province the disease continued sporadically in all districts throughout the year, but was nowhere serious, with one exception. In the Northern District during July and early August, a considerable outbreak involving Zaghawa cattle and causing many losses occurred. The tribe had not taken advantage of the offer made earlier to obtain vaccine on payment under the mass immunisation scheme. Over 22,000 doses of serum were issued for the control of outbreaks in the province. The large scale immunisation scheme initiated last year was continued and approximately 230,000 cattle were vaccinated. An early break in the rains with a subsequent scattering of the nomad herds together with a petrol shortage made it difficult to maintain a high rate of vaccination during October.

In Kassala Province, where the incidence was much the same as last year, about 32,000 cattle were vaccinated and 9,500 serumised.

A few sporadic outbreaks which were quickly suppressed occurred in Khartoum Province. 2,000 cattle were serumised and 700 vaccinated. An outbreak occurred in the Khartoum Zoolo-

gical Gardens and cases were observed amongst the following animals:— Addax, White-eared Cob, Waterbuck, Nile Lechwe, Eland, Bush Pig and Wart Hog.

The disease occurred sporadically in Kordofan Province throughout the year but losses were low. Over 151,000 doses of vaccines and about 26,000 doses of serum were used in the control of the disease. Poor communications, as in most other provinces, greatly hampered control of the disease and until these are improved there will always be instances when news of outbreaks are received too late to be of value. At present animals are the only means of transport over large areas. Before the end of the year plans were made for the rational use in 1949 of vaccine in Dar Messeria to be paid for indirectly through increased tribute.

The incidence of the disease in Northern Province was very low compared with last year and the province was free of the disease from April to December. A large scale vaccination campaign was carried out in the Merowe/Dongola District. This together with the quarantine measures enforced at Debba and Tangasi on all cattle arriving from outside the area were responsible for the very satisfactory position during the major portion of the year. Approximately 28,000 cattle were vaccinated during the year.

In the Upper Nile Province the first large outbreak to be reported occurred in Bor District in April. During the remainder of the year no district remained free but the outbreaks were not serious. Approximately 22,000 doses of vaccine and 18,000 doses of serum were used in the control of the disease.

Contagious Bovine Pleuro-Pneumonia.

The disease was present throughout the Dinka cattle districts of the Bahr el Ghazal Province and there was a very big demand for vaccine which could be only partially met. Approximately 24,500 cattle were vaccinated. The province veterinary inspector was of the opinion that the vaccination of this number of cattle and the 15,500 in 1947 has had some effect on the incidence of the disease and that deaths had been less numerous during the latter half of 1948 than previously.

In the Blue Nile Province the disease never reached epidemic proportions and the incidence showed little change from 1947. The largest outbreak was in August in the Kosti area where 2,000 cattle were involved of which 15 died. No vaccine was available at the time and the outbreak was suppressed by strict quarantine. The disease appeared sporadically throughout the year in the Irrigated Area but the casualties only totalled 30. 1,900 cattle were vaccinated in the province.

In Darfur Province, where the disease is enzootic approximately 14,000 cattle were vaccinated.

There was a considerable increase in the incidence of the disease in Kordofan Province. Most of the outbreaks occurred initially on the trade routes from Darfur. At the end of the rains it was impossible to stop movement of infected nomad herds southward in search of water and grazing. Demands for vaccine were heavy, but it was only possible to vaccinate approximately 10,500 cattle.

In Upper Nile Province outbreaks occurred in all districts. The 14,700 doses of vaccine used fell far short of requirements.

No outbreaks were reported from Kassala, Khartoum and Northern Provinces.

Bovine Trypanosomiasis.

The Assistant Director (Research) in his report describes the research work carried out on the chemotherapeutic and chemoprophylactic values of antrycide in cattle and camel trypanosomiasis.

An increased incidence of the disease was reported from the Bahr el Ghazal Province and losses in some areas were considerable. There were two main extensions, the first of which was caused by the Rokac Dinka herds of Lakes District, in search of fresh grazing and fishing, entering the tsetse fly belt where they became heavily infected. On their return the disease spread by mechanical transmission to neighbouring herds. The second spread, in the Jur River District, was westward from the Upper Nile Province boundary. Approximately 10,000 cattle were treated with dimidium bromide in November and December to control the disease. 1,500 doses of stibophen were also used before dimidium bromide became available.

The disease was not reported as occurring in the Blue Nile Province on any significant scale. A few sporadic cases were reported from the White Nile area during the rains and in October a case of *T. congolense* infection was confirmed in a bull of the Umm Gerr Pump scheme. A positive case of *T. vivax* infection occurred in the Irrigated Area in April.

No abnormal incidence of the disease was reported from Darfur Province. In January the Nazir of the Rizeigat reported that 28 out of the 30 sick beasts in his own herds treated with dimidium bromide in late 1947 were completely cured.

A few positive cases (*T. congolense* and *T. vivax*) occurred among herds on the Atbara and Setit rivers in Kassala Province.

Some 2,100 doses of dimidium bromide were used in Kordofan Province where the incidence of the disease was very low compared with 1947.

The disease remains endemic in the Upper Nile Province in areas where it has not yet been treated. The large scale treatment

with dimidium bromide which had been started in September, 1947, was continued and by April 1948, over 360,000 head of cattle in the Upper Nile Province and the adjacent Aliab Dinka area of the Bahr el Ghazal Province had been inoculated. The result of this operation was extremely satisfactory. An area of about 20,000 square miles, where exceptionally heavy losses from trypanosomiasis had occurred during recent years, was virtually cleared of the infection. Some cattle died of photosensitisation as a result of inoculation but it was estimated that the number of deaths was less than one per cent of those treated. Plans were made at the end of the year to inoculate a further 200,000 cattle in 1949 and following the successful experimental laboratory and field trials with antrycide it was decided to use this drug instead of dimidium bromide.

Camel Trypanosomiasis.

The incidence of trypanosomiasis in camels was low but an increasing number of cases of antrypol-resistant, *T. evansi* infections have been reported in recent years, particularly in Kassala, Blue Nile and Kordofan Provinces. It is hoped that antrycide will be successful in curing these antrypol-resistant infections.

Foot and Mouth Disease.

A few mild outbreaks were reported from Bahr el Ghazal, Blue Nile, Kassala and Kordofan Provinces. All cattle registered for export were inoculated with virus with the result that no cases of the disease appeared in the quarantine parks.

Haemorrhagic Septicaemia.

Sporadic cases occurred throughout the year in most parts of the Blue Nile and Upper Nile Provinces, but the disease never reached epidemic proportions. Over 10,000 cattle were vaccinated in these two provinces while 400 cattle were vaccinated in the Bahr el Ghazal Province where a single outbreak was reported.

Anthrax.

Only three cases occurred in cattle at the export quarantine parks. Odd cases were reported from Blue Nile, Kassala, Kordofan and Northern Provinces.

Tetanus.

This disease assumed importance when it was observed that a number of cattle vaccinated against cattle plague contracted tetanus. It was subsequently discovered that a batch of vaccine had become contaminated with tetanus spores. The Assistant Director (Research) deals with the matter in his report. Losses were greatest in the Blue Nile Province where it was estimated over 1,000 cattle had died. Compensation was awarded to the owners.

Fascioliasis.

This disease at certain times of the year causes mortality among cattle, sheep and goats in the riverain areas of Kosti and Ducim in the Blue Nile Province. Usually the heaviest casualties are at the beginning of the dry season when river grazing is being used and again in April and succeeding months due to the great drop in the level of the Nile after the Jebel Auliya dam has been opened. This year severe outbreaks of the disease were reported in April and mortality continued to be heavy until July when the river started to rise. Incidence then declined. Treatment with hexachloroethane was made available and was satisfactory.

African Horse Sickness.

This disease was reported to be of very low incidence everywhere except in Darfur Province where several cases were observed during the year and at least two tribal stallions were reported to have succumbed to the disease.

Cryptococcus Infections.

There was a further reduction in the number of cases reported particularly in the Blue Nile Province where 19 mules, 1 horse and 1 donkey were destroyed compared with 35 mules the previous year.

Sarcoptic Mange In Camels.

There were very few cases of the disease among police and other Government camels and those that occurred were effectively treated with gammatox paste dip. There was a big demand from camel owning arabs for the paste which has become very popular with them on account of the ease of application and the excellent results obtained.

Rabies.

Reported losses from rabies were greater than last year.

The following table shows the number and distribution of positive cases among animals :—

Province	Dogs	Donkeys	Cats	Cattle	Horses	Camels	Sheep	Goats	Total
Blue Nile ..	33	5	1		1	1			41
Kordofan ..	22	2		2			1		27
Khartoum ..	9		1					1	11
Kassala ..	3								3
Equatoria ..	1								1
TOTAL	68	7	2	2	1	1	1	1	83

The destruction of stray dogs, cats and wild carnivores continued as a control measure. 5,688 dogs in the Blue Nile Province ; 1,460 dogs, 217 jackals, 42 hyaenas and 34 foxes in Northern Province ; 34 dogs and 910 cats in Khartoum Province ; and 97 jackals and 28 hyaenas in Kassala Province were destroyed.

Other Diseases.

Other diseases which received attention during the year included :—

- Black quarter in cattle.
- Contagious abortion in cattle.
- Mastitis in cattle.
- Psoroptic and demodectic mange in cattle.
- Piroplasmosis in bovines and equines.
- Trypanosomiasis in equines.
- Ulcerative cellulitis in equines.
- Strangles in equines.
- Equine encephalomyelitis.
- Botriomycosis in equines.
- Psoroptic mange in equines.
- Contagious necrosis in camels.
- Entropion in camels
- Sheep-pox.
- Caseous Lymphadenitis in sheep.
- Contagious pneumonia in goats.
- Distemper in dogs.
- Avian diseases including scaly leg, spirochaetosis, fowl pox, fowl cholera and infectious laryngo-tracheitis.

SECTION III.

TRADE IN LIVESTOCK AND LIVESTOCK PRODUCTS.

EXTERNAL TRADE.

General.

The railway strike was responsible for a hold-up in the export trade for two months (April and May). Nevertheless, exports were greater than in 1947 and the total value of livestock and livestock products amounted to over £E. 2½ million.

Cattle and Sheep.

Cattle exports totalled 21,583 valued at £E. 318,158 compared with 19,000 valued at £E. 277,538 in 1947. 36,070 sheep valued at £E. 128,318 were exported compared with 36,906 valued at £E. 111,922 the previous year. All cattle and sheep were exported to Egypt mainly via Wadi Halfa.

Camels.

Exports to Egypt by overland routes were estimated at 54,650 head valued at £E. 1,335,000 compared with 50,000 head valued at £E. 1,200,000 in 1947.

Hides, Skins and Leather.

There was a large increase in the number of hides exported ; 1,989 tons valued at £E. 271,380 compared with 1,062 tons at £E. 115,116 in 1947. Egypt with 896 tons, Poland with 440 tons and Italy with 245 tons were the chief importers. To facilitate the export trade from the western provinces a sub-depot for grading was opened at El Obeid in December. 286,733 hides passed through the export grading depots during the year and of these 78,674 were drysalted hides, the vast majority from slaughter houses. Just over 10 percent of the air dried hides had been framed, the rest having been ground dried.

1,235 tons of sheep skins valued at £E. 213,362 and 145 tons of goat skins valued at £E. 31,619 were exported. Figures for 1947 were 1,125 tons of sheep skins value £E. 169,899 and 175 tons of goat skins value £E. 46,324. The United Kingdom with 683 tons of sheepskins and 26 tons of goat skins and the United States of America with 378 tons of sheep skins and 45 tons of goat skins were the principal buyers.

Exports of other hides and skins, chiefly reptile, totalled 10 tons valued at £E. 13,363 compared with 24 tons valued at £E. 61,415 in 1947.

Leather exports totalled 149 tons valued at £E. 47,757 compared with 120 tons valued at £E. 30,323 the previous year.

INTERNAL TRADE.

Livestock Markets and Slaughtering Figures.

Recorded sales of cattle, sheep and camels in the main animal markets showed an increase over last year. 362,996 sheep, 100,536 cattle, 27,282 goats and 22,122 camels were sold in these markets for a total of over £E. 1½ million. Average prices were slightly lower than in 1947. The average price of cattle sold in el Obeid market was £E. 5.079 $\frac{ms}{ms}$ compared with £E. 5.360 $\frac{ms}{ms}$ last year.

There was little change in the total number of cattle, camels and goats slaughtered in the ten principal towns of the Sudan, but sheep slaughterings increased by 35,760. The figures for the two years are as follows :—

	Sheep	Cattle	Goats	Camels	Total.
1947	222,932	40,062	25,136	1917	290,047
1948	258,692	39,033	21,799	1892	321,416

Hides and Skins.

The Inspector of Hides and his staff toured extensively and demonstrated improved methods of flaying and curing of hides. Diagrams illustrating methods of flaying, framing, dry salting and folding were distributed throughout the country. There will be no great improvement in Sudan hides until frame drying becomes more universal in the pastoral areas and hoist-flaying and control of flayers is enforced in the principal slaughter houses. The Khartoum slaughter house was reconstructed to facilitate the production of better flayed hides and it is hoped that other slaughter houses will be improved in the near future. A consignment of dry salted slaughter house hides forwarded by the department for tanning tests was well reported on by tanners in the United Kingdom.

SECTION IV.

ANIMAL HUSBANDRY AND LIVESTOCK IMPROVEMENT.

Unsatisfactory rains in many parts of the country resulted in poor grazing and scanty water supplies over large nomadic pastoral areas. Deaths from starvation, thirst and exhaustion occurred among many flocks and herds, particularly in Kassala and Northern Provinces, whilst many animals were sold to avoid such a fate or to buy grain.

The condition of Government animals was good on the whole. The wastage from all causes was estimated to be about 15 percent and was highest in camels and lowest in donkeys.

Only three horse shows were held in Darfur Province ; the important Beni Helba show at Id El Ghanam being cancelled owing to the Nazir's death. Approximately 7,300 horses attended the three shows and only about 9 percent were offered for sale. 80 horses were purchased and of these 9 were selected as tribal stallions. The average price paid was just over £E. 16 for all remounts. The tribal stallion position has shown little improvement over last year. The establishment is now 78 which is far short of the 135 which it was hoped would be purchased by 1951.

Thirty six remounts were bought at Muglad in Kordofan Province. Two Government stallions were stationed in Western Kordofan District and their services totalled 71. Four tribal stallions in Dar Homr totalled 59 services.

In Khartoum the Arab stallion Registan covered 13 mares before he was sent in July to Northern Province where he covered another 13 mares before the end of the year. Ramleh, an Egyptian country bred horse was purchased as a government sire in March and covered 21 mares in Khartoum. Mozer, a pure bred Arab stallion, which had been purchased in Egypt arrived in Khartoum in May and covered 20 mares before the end of the year.

SECTION V.

EDUCATION.

In most provinces the training of subordinate staff placed an additional burden on busy senior staff. As well as their own departmental personnel, courses of instruction were given to tribal retainers and the police. Though tribal veterinary retainers still fulfil a useful purpose in many areas it has been found that it is much more satisfactory, on the whole, for all veterinary personnel to be directly controlled by Government. This is especially the case in disease control work. During the year many tribal retainers were absorbed by the department

At the various agricultural shows held in most provinces, the department took an active part, not only by assisting in the judging of livestock but by broadcast talks on contagious diseases and their control, exhibitions of veterinary instruments and appliances, demonstrations in bloodless castration, poisoning of animal pests, hide flaying and curing etc.,

El Amin Eff. Abdulla El Karib, Assistant Veterinary Research Officer returned to the Sudan in August after his 12 months post graduate course at the Liverpool School of Tropical Medicine. Assistant Veterinary Research Officer, Mohd. Eff. Ali Meheimid was awarded a British Council Scholarship and left the Sudan in August for a year's post graduate course at the London School of Tropical Medicine and Hygiene.

SECTION VI.

MISCELLANEOUS.

Veterinary Hospitals and Dispensaries.

A large number of new dispensaries were opened during the year, mainly in the Blue Nile and Northern Provinces. The need for properly equipped dispensaries in settled agricultural areas has greatly increased in recent years. The present high animal prices has resulted in owners bringing forward their animals for treatment to a much greater degree than formerly.

Revenue and Expenditure.

The following figures show the actual revenue and expenditure of the department for the past three years.

	1946	1947	1948
1. Revenue	52,574	75,515	70,529
2. Expenditure			
(i) Personnel and Personal Allowances	29,049	57,582	73,787
(ii) Services	33,247	57,449	67,746
(iii) Capital	2,327	1,577	8,708
TOTAL	56,893	116,608	150,241
3. Development Budget	—	673	4,465

W. H. GLANVILLE, Director
Sudan Veterinary Service

**ANNUAL REPORT OF THE ASSISTANT DIRECTOR
(RESEARCH)**

A. STAFF.

The establishment of the technical classified staff of the Research Section was increased by one Veterinary Research Officer and at the end of the year was as follows :—

- 1 Asst. Director (Research)
- 3 Veterinary Research Officers
- 2 Asst. Veterinary Research Officers (Sudanese)
- 2 Veterinary Officers (Sudanese)
- 1 Pasture Research Officer
- 1 Entomologist
- 4 Veterinary Assistants (Sudanese)

Mr A MacKay, B.Sc., M.R.C.V.S., resigned his post as Veterinary Research Officer and was struck off the strength on 9.6.1948.

The terms of service offered failed to attract non-Sudanese scientists of the type required under present day conditions and no appointment could be made during the year in spite of wide and repeated advertising of the posts of two Veterinary Research Officers and one Entomologist. All these posts remained vacant and this deficiency of professional staff seriously handicapped research work on problems that urgently required solution and limited the production of the biological products to less than was required by the field staff.

Asst. Veterinary Research Officer El Amin Eff. Abdulla El Karib, Dip. Vet. Sci. (Khartoum) returned to Khartoum in August after attending a year's postgraduate course at the Liverpool School of Tropical Medicine.

Asst. Veterinary Research Officer Mohammed Ali Mihemied, Dip. Vet. Sci. (Khartoum) gained a British Council Scholarship and proceeded in August to the London School of Tropical Medicine and Hygiene for a year's postgraduate study.

B. BUILDINGS.

No new buildings were erected at the laboratory during the year. The continued lack of adequate accommodation aggravated the difficulties of preparation of biological products.

C. ROUTINE WORK.

As in previous years there was a steady increase in demands for biological products and although most of the staff's time was taken up with this routine work it was not possible to supply all requirements. The main items were, as usual, the following :—

- I. Preparation and issue of cattle plague antiserum (Malakal)
- II. Preparation and issue of cattle plague vaccine (Khartoum, Malakal, and Nyala.)
- III. Issue of cattle plague virus for "serum-simultaneous" immunisation (Khartoum).
- IV. Preparation and issue of contagious bovine pleuro-pneumonia vaccine (Khartoum).
- V. Preparation and issue of haemorrhagic septicaemia vaccine (Khartoum).
- VI. Issue of diagnostic materials (for mercuric chloride tests) and of antrypol for the control of camel trypanosomiasis (Khartoum).
- VII. Distribution of Horse sickness vaccine (Khartoum).
- VIII. Preparation and issue of blackleg vaccine (Khartoum)
- IX. Issue of foot and mouth disease virus (Khartoum).
- X. Distribution of anthrax vaccine purchased from Kenya (Khartoum).
- XI. Examination of specimens (Khartoum, Malakal, Nyala).

I. Cattle Plague Antiserum.

There was still a great demand for this product, particularly in the many remote cattle rearing areas of the Sudan where the use of tissue vaccine was difficult. A total of 4,900 litres (147,000 nominal doses of 30cc.) was prepared and issued to the field staff. This amount was sufficient for the country's requirements.

II. Cattle Plague Vaccine (inactivated glycerinised lymphoid tissue)

Mass vaccination of cattle in Darfur Province was continued in 1948 and increased vaccination of cattle in Kordofan Province was planned towards the end of the year. Vaccine for these operations was prepared at the branch laboratory at Nyala where 850,000 doses were produced. A further 191,315 doses were prepared at the Malakal branch laboratory for distribution to the other provinces, making a total output of 1,041,315 doses.

This quantity of vaccine was not sufficient to supply all demands. It was however the maximum amount that could be prepared by the staff available during the periods in which climatic conditions make it possible for the branch laboratories to operate.

One batch of the vaccine proved to be contaminated with tetanus spores and its use resulted in the death of some 1,300 cattle. The source of the contamination could not be definitely traced but it was assumed to be from intestinal contents and that it took place during careless removal of glands and spleens from carcasses of vaccine producers. This accident was probably the result of an over-ambitious programme with the existing small staff and future plans must be on a lower scale. The testing of individual batches for safety was not carried out as experience during the preceding ten years had shown it to be unnecessary. This will have to be done in the future and it will add to the cost of production and the additional work will result in a reduced output.

III. Cattle Plague Virus.

Virus in the form of glycerinised lymphoid tissue was supplied for serum-virus immunisation of working oxen belonging to the Sudan Plantations Syndicate. Sufficient virus was issued to inject about five thousand cattle.

IV. Contagious Bovine Pleuro-Pneumonia Vaccine.

This disease appeared to be more widespread than in previous years and although a record total of 103,775 doses of vaccine was issued this amount was not nearly sufficient to satisfy all demands.

V. Haemorrhagic Septicaemia Vaccine

Slightly over twelve thousand doses of formalised culture vaccine were prepared and issued for distribution, mainly in the Blue Nile and Upper Nile Provinces.

VI. Camel Trypanosomiasis Control.

There were more reports, particularly from Kassala Province, of the spread of a strain of trypanosomes resistant to treatment with antrypol. In other parts the incidence of the disease appeared to be less than usual and the issues of antrypol fell during 1948 to 27,548 doses of 10gms. which was only slightly more than half the number distributed in 1947.

VII. Horse Sickness Vaccine.

The vaccine was obtained from the East African Veterinary Research Organisation. The issues were 1,307 doses as compared with 2,006 doses in 1947, and field reports indicated that it gave very satisfactory results.

VIII. Blackleg Vaccine.

Only 900 doses of "anaculture" were issued. Several infected areas were known but it seemed that the local cattle owners were not very concerned about this disease and were not prepared to go to the trouble of vaccinating their stock.

IX. Foot and Mouth Virus

All cattle registered for export to Egypt were infected with foot and mouth disease by injection of a mixture of two types of virus (not yet identified) under the mucous membrane of the tongue. Sufficient virus for the injection of 32,184 cattle was issued to Kordofan Province.

X. Anthrax Vaccine.

This vaccine was purchased from the East African Veterinary Research Organisation and used only on cattle destined for export to Egypt. A total of 27,199 doses was issued.

XI. Examination of Specimens.

The diagnosis of specimens submitted for examination by the field staff were representative of those made almost every year. There were none of particular interest except a single case of tuberculosis in a bull. This merits mention merely to indicate the rarity of this disease amongst cattle in the Sudan. It occurred in a short-horned zebu bull slaughtered at El Obeid.

D. RESEARCH

Chemotherapeutic and Chemoprophylactic Values of M. 7555 Bovine Trypanosomiasis.

At the beginning of the year Imperial Chemical (Pharmaceuticals) Ltd offered to supply some M. 7555 (later known as antrycide) for chemotherapeutic and chemoprophylactic trials in *T. congolense* infection in cattle and also to assist in carrying out some of the experiments. This offer was gladly accepted and Dr. D.G. Davey and Mr. J.S. Steward together with two laboratory technicians (Messrs H. Moores and A. S. Taylor) arrived in January and stayed for a few weeks. Their assistance is gratefully acknowledged.

Dr. Davey later carried out trials of the drug in Uganda and Kenya in cooperation with the local Veterinary Services. A detailed account of the Khartoum experiments is being incorporated in a paper by Dr. Davey on the results of chemotherapeutic and chemoprophylactic trials of the drug in the three territories and which will be submitted to the Colonial Office Tsetse Fly and Trypanosomiasis Committee. This is being done because many of the experiments in the three territories were complementary. A summary only of the work done in Khartoum will therefore be given in this report.

Earlier work by Dr. Davey at the I.C.(P) Biological Laboratories in England had shown that both the dichloride and dimethylsulphate salts of M.7555 were very active against *T. congolense* in small laboratory animals, but the first trials of the drug in cattle were carried out at the Khartoum Laboratory and consisted of experiments designed to determine the minimum curative dosage and the prophylactic value of the dichloride salt. This salt was chosen first in preference to the dimethylsulphate because it was thought that, on account of its low solubility and consequent slow

absorption in the body, it would have a longer prophylactic effect. The results of the early experiments, however, showed that the therapeutic value, even at a dosage of 2.0 mg. per kilo, was too low. This was presumably due to there being an insufficient concentration of the drug in the blood. The soluble dimethylsulphate, on the other hand, cured *T. congolense* infection, at 1.0 mg. per kilo. and, by comparison, was much more active against *T. vivax*.

Further experiments on the chemotherapeutic and chemoprophylactic values of the dimethylsulphate salt for *T. vivax* were in progress at the end of the year. The results were very encouraging but were not then complete.

1. Treatment of *T. congolense* with M. 7555 dichloride

The results of the chemotherapeutic trials showed that dosages up to 1.0 mg. per kilo. body weight injected subcutaneously did not cure artificially infected cattle but that at 2.0 mg. per kilo six out of seven cattle were cured and at 4.0 mg. per kilo. three out of three were cured. Administration of the drug intramuscularly appeared to be no more effective than subcutaneously.

Re-treatment of one calf that had received a subcurative dose of 0.1 mg. per kilo. showed that the trypanosomes had developed appreciable resistance and that they tolerated successive treatments with 2.0 mg. and 4.0 mg per kilo. of dichloride and 1.0 mg per kilo. of dimethylsulphate. This strain was later sent to I.C. (P.) Laboratories for further study of this important development.

2. Treatment of *T. congolense* with M.7555 dimethylsulphate

Five cattle, artificially infected, were cured by injection of M.7555 dimethylsulphate at 1.0 mg. per kilo.

3. Prophylactic values of M. 7555 dichloride against *T. congolense*.

Two prophylactic experiments were carried out. One showed that injection at 1.0 mg. per kilo. protected against infection for at least 56 days and at 5.0 mg. per kilo for at least 84 days. Unfortunately it was not possible to include more animals in this experiment and therefore the limit of the period of protection could not be determined.

In the second experiment started at the Malakal Laboratory with southern cattle (Sanga type) eight cattle were injected at a dosage of 10.0 mg. per kilo. and when challenged 207 days later they all resisted infection.

4. Treatment of *T. vivax* with M. 7555 dichloride

Four out of four cattle, artificially infected with *T. vivax* and treated with M. 7555 dichloride at a dosage of 2.0 mg. per kilo., relapsed between the 12th and 35th days after treatment.

5. Treatment of *T. vivax* with M. 7555 dimethylsulphate

Three out of four cattle, artificially infected with *T. vivax* and treated with a mixture of M.7555 dimethylsulphate at a dosage of 1.0 mg. per kilo., were cured. The fourth relapsed.

6. Treatment of *T. vivax* with a mixture of M.7555 dichloride and dimethylsulphate.

Five out of five cattle artificially infected with *T. vivax* and treated with a mixture of M.7555 dichloride and dimethylsulphate at dosages of 3.0 mg. per kilo. and 1.0 mg. per kilo respectively, were cured.

Note: In the above experiments the criterion for judging cures was negative blood examinations over a period of sixteen weeks.

FIELD TRIALS OF M.7555.

1. Fangak Field trial

The first field trial of the drug was carried out in the Southern Sudan in an area presumed to be free from tsetse flies but in which the incidence of bovine trypanosomiasis (predominantly *T. congolense*) was high. A mixture of the two salts in the proportion of three of dichloride to one of dimethylsulphate was used and the approximate dosage was 3.0 mg. per kilo. of the former and 1.0 mg. per kilo. of the latter.

The herd treated consisted of 237 cattle of which about 10 per cent. appeared to be clinically infected with trypanosomiasis. Blood examinations of 34 of them chosen at random were however, negative except for one beast which showed *T. congolense*.

The herd was inaccessible during the rainy season and was next inspected by the Province Veterinary Inspector seven months after treatment. He reported that there had been no casualties and that the cattle were in excellent condition. Complete recovery of the clinically infected ones was said to have taken about one month. The cattle owners reported a severe decline in the milk yield following injection and that it had taken a few weeks for it to return to normal. Considerable losses from trypanosomiasis were known to have taken place in neighbouring herds and there was a general demand by the cattle owners for immediate treatment of their stock.

2. Amadi Field Trial.

In this field trial a herd of cattle were injected with M.7555 and driven to a place heavily infested with *Glossina morsitans* and kept there. A mixture of the two salts was again given but in this case a bigger dosage of dichloride was used in the belief that, on account of slow absorption of it a longer period of prophylaxis would result. The dosage administered was approximately 7.0 mg. per kilo. of dichloride and 1.0 mg. per kilo. of dimethylsulphate.

Eighty four cattle were injected and together with 15 untreated controls they were driven into the tsetse area. Regular professional supervision of them was not practicable (they were nearly a thousand miles away from the Khartoum Laboratory) but arrangements were made for blood smears to be sent for examination from any cattle that appeared sick. The results were as follows:—

1. Two treated cattle showed *T. vivax* on the 54th and 84th days, respectively, and were slaughtered.

2. One treated beast was slaughtered on the 77th day on account of some undiagnosed skin disease probably demodectic mange. Blood smears taken on the day of slaughter were negative.

3. No trypanosomes could be found on examination of wet blood smears taken on three successive days (84th, 85th, and 86th days) from the remaining 81 cattle.

4. Examination of wet and thick dry smears on three successive days (182nd, 183rd, and 184th days) from the 81 cattle showed *T. vivax* in 25, *T. congolense* in 16 and a mixture of the two trypanosomes in 7, i.e. total of 48 were positive out of 81.

5. One beast died of *T. congolense* on the 190th day.

6. The experiment was closed on 234th day. Eighty of the cattle were still alive and most of them were in good condition.

7. Fourteen out of the fifteen controls died of trypanosomiasis (11 from *T. vivax* and 3 from *T. congolense*) within 90 days. No trypanosomes were found in the blood of the fifteenth control and it remained apparently healthy throughout the experiment.

LARGE SCALE APPLICATION OF ANTRYCIDE.

As trypanosomiasis was killing off very many cattle in the Southern Sudan large scale use of the drug was decided upon as soon as the experimental results appeared to justify such action. The results of work done in East Africa were taken into consideration with those obtained in the Sudan and at the end of the year plans were made to inject *all* cattle in an area of about 20,000 square miles and estimated to number about 200,000 head, where the incidence of the disease was causing grave concern. This area is presumed to be free from tsetse because they have never been found there and the land appears to be unsuitable for their survival. Long prophylaxis was not considered to be of great importance under the circumstances and it was decided to use the dimethylsulphate alone at an approximate dosage of 5.0 mg. per kilo.

CHEMOTHERAPEUTIC AND CHEMOPROPHYLACTIC VALUES OF ANTRYCIDE FOR *T. EVANSI* INFECTION IN CAMELS.

Experimental work showed that both the dichloride and dimethylsulphate salts of antrycide were active against *T. evansi* in camels. Although the results were incomplete at the end of the year the indications were that the dimethylsulphate would probably be as effective as antrypol and that it would consequently be of particular value in curing infection with antrypol-resistant *T. evansi* which has become widespread in the Sudan.

PASTURE RESEARCH

The Pasture Research Officer carried out a survey of pastures in the Upper Nile Province connected with the Jonglei Canal proposals.

The general conclusions of his interim report on this work were that for practical purposes all the dry season river grazing would be lost if the present canal scheme materialises. A possible alternative area for pasturing half a million cattle would be a flood plain of *Hyparrhenia rufa* east of the Bahr-el Jebel and roughly intersected by the road between Pengko and Pibor. The problems to be solved before this alternative proved feasible were discussed.

The Pasture Research Officer spent some weeks at the Herbarium of the Royal Botanical Gardens, Kew identifying grass specimens collected during the previous season's work.

Towards the end of the year a start was made on the survey of the pastures of the western half of Equatoria Province.

E. PUBLICATIONS.

Two papers were published during the year :—

Priestley F. W., Mohd. Ali Mihemied, and El Nazeer Daffalla, Preservation of the Contagious Bovine Pleuro-Pneumonia Organism *Veterinary Record*, 1948 Vol. 60, P. 203.

Evans, J. T. R. *Trypanosoma congolense* in Cattle in the Sudan : Treatment with Dimidium Bromide (Phenanthridinium 1553) *Veterinary Record*, 1948, Vol. 80, PP.418-420.

F. SUMMARY.

The demands for biological products prepared at the laboratory were higher than ever before and on many occasions it was not possible to supply requests made on account of the lack of adequate professional staff.

Research work on the chemotherapeutic and chemoprophylactic values of antrycide in cattle and camel trypanosomiasis was carried out.

The Pasture Research Officer surveyed part of the territory that would be affected by construction of the Jonglei Canal and investigated possibilities of providing alternative grazing for half a million cattle.

G. ACKNOWLEDGMENTS

The failure to recruit Veterinary Research Officers has entailed heavy demands on the existing small staff and particularly on Mr. F. W. Priestley, upon whom fell the major share of the extra work. Without their unfailing cooperation at all times the laboratory work would have been seriously impaired.

The antrycide experiments could not have been carried out without the technical assistance of Messrs H. Moores and A. S. Taylor (Imperial Chemical (Pharmaceuticals) Ltd.) who examined thousands of blood smears.

The willing cooperation of the field staff of the Veterinary Service has been of great value and I wish to acknowledge particularly the help given by Messrs J.K. Thomson and P.Z. Mackenzie, M.B.E., in carrying out field trials of antrycide.

J. T. R. EVANS.

Asst. Director (Research).

22.3.49.



