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ANNUAL REPORT  
OF THE  
VETERINARY DEPARTMENT  
SUDAN GOVERNMENT,  
1923.



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# ANNUAL REPORT.

## VETERINARY DEPARTMENT, SUDAN GOVERNMENT.

### GENERAL REMARKS.

Before proceeding with the description of the work and conditions of the past year, it will be as well to give a statement of the present situation and to make a forecast of the development and extra work which will have to be undertaken in the near future.

As regards the present, we are faced with the decision of the Army Council to the effect that they will cease the supply of British Veterinary Officers to the Sudan Government; they are, in fact, determined to reduce the establishment of British Veterinary Officers from 13 to 3. This will come at a time when the duties of the Department will be multiplying and developing in every direction. Consequently the Sudan Government is faced with the necessity of having its own independent Veterinary Service, and not relying as heretofore on the Egyptian Army.

As regards the future: The time is very near when there will have to be a considerable expansion in the Veterinary Services of the Sudan. It cannot at present be considered to be any more than a skeletal Service, and with the fast approaching development of the country it will be essential to increase largely the personnel of the Service. In this connection I wish to draw attention to the Veterinary Services of other African Protectorates. These Protectorates have no export trade in animals and have no herd tax. There was a proposal in Kenya Colony to establish a herd tax, the proceeds of which would be devoted to the Veterinary Department. This proposal however was not adopted. To take the Protectorates and Colonies of Kenya, Tanganyika, Nyassaland and Uganda, which together are not as big as the Anglo-Egyptian Sudan. These countries have provision for 53 Veterinary Officers as against the Sudan's present provision of 13.

To continue as regards development, The Southern provinces are at present practically untouched from a veterinary point of view, and a thorough survey of the diseases which exist there ought to be undertaken.



With regard to the irrigation area in the Gezirah: It has I believe been discovered that much better cotton is obtained from areas on which the intermediate crop has been grazed off by cattle and sheep, than from areas not so manured. This indicates a large animal population in this area. Furthermore it suggests that as the population will be sedentary, and the conditions for the control of disease favourable, every endeavour should be made to grade up the cattle and sheep in this area by imported sires, and thus to obtain a much more marketable animal than at present exists. This would mean the double inoculation of all the cattle in the area against Rinderpest, and their inoculation also with Contagious Bovine Pleuro-pneumonia vaccine. Prior to this there would have to be a very careful census of all animals, and the establishment of a cordon, and strict prohibition of the movement of all animals into the area from outside except through a quarantine. As Cattle Plague would be continually being introduced by indirect means, the process of inoculation of the young stock would have to be continued. With regard to Pleuro-pneumonia we are faced with the difficulty of the chronic carrier, but as these carriers are not usually infective for much more than a year, and the protection afforded by the vaccination lasts two years, the actual carriers already present should be innocuous before the animals again become susceptible. The trouble is the unknown animal from outside which may be a carrier. It may be possible to test all animals before entry into the area by means of the conglutination test, but this is a process requiring considerable laboratory skill and would be reliable only in the hands of a trained bacteriologist.

This double inoculation raises the question of a Research and Serum Institute. It is highly improbable that we should be able to obtain serum in sufficient quantities from other Institutes, particularly as the one in Egypt will close down when they have completed the double inoculation of their cattle. Furthermore, it has been noticed that when there is a heavy demand for serum in one country, there is also a heavy demand in the country in which the Institute exists, and it has none to spare. In other words heavy invasions of Rinderpest appear to be world wide in their cyclic incidence in countries in which the disease exists. Also the serum from countries such as India may lose its protective power owing to the heat to which it is subjected during the journey. The Serum Institute would have to be in the Red Sea Hills, as Khartoum, owing to conditions of wind, dust, sand and temperature is totally unsuitable for one. The research work could be most conveniently carried out in Khartoum as at present, as

could also the production of vaccines. With regard to cost: The sanctioned estimates for 1922 for Veterinary Research and Serum Institute in Kenya Colony were £ 33,000 odd. There would of course be a considerable capital expenditure for buildings etc. I imagine it could be done considerably cheaper in the Sudan. South Africa, which has the finest Veterinary Research Institute in the world, spends annually many hundred of thousands of pounds on its Veterinary Service.

Double inoculation will have to be carried much further afield than the Gezirah area, as this area will not be capable of supplying for some time, if ever, the demand of Egypt for cattle, and it is fairly certain that when Egypt has completed the double inoculation of their cattle they will refuse all importation of cattle in the event of Rinderpest being present.

I think the above sums up the main points of the requirements of the future, although Research is required in every direction, e.g. to name only one disease—Trypanosomiasis, which takes such a heavy toll of camels every year.

## STAFF.

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

Major E. S. Oliver having completed ten years seconded service reverted to the British Army, and Captain F. J. Andrews, Royal Army Veterinary Corps, joined the strength of the Department in April, last.

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

|                            |                                  |
|----------------------------|----------------------------------|
| Director.                  | Lieut-Colonel L. Danels (E.A.)   |
| Assistant Director.        | Major H. Bone, M.C.              |
| Veterinary Inspector.      | Major B. A. Jarvis.              |
| „ „                        | Captain R. S. Audas, M.C.        |
| „ „                        | „ E. G. Turner, D.S.O.           |
| „ „                        | „ W. St. J. F. Macartney (E. A.) |
| „ „                        | „ J. Goings.                     |
| „ „                        | „ J. R. Ellison.                 |
| Veterinary Bacteriologist. | „ R. H. Knowles.                 |
| „ 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.         |
| „ „                        | „ M. A. Murphy (E.A.)            |

## VETERINARY SECTION.

Of deaths from disease reported during the period under review, Rinderpest was responsible for approximately 96 %, Contagious Bovine Pleuro-pneumonia 3 %, and other diseases 1 %. The total number of deaths shews a slight increase over that of the previous year.

### DISEASES OF CATTLE.

#### *A. Rinderpest (Cattle Plague).*

Most deaths occurred during the months of February to May, and during October to January the Disease was least prevalent. Grazing and water supply are probably the chief causes of this variation in incidence of disease in the Sudan. When these are short there are large concentrations of cattle, and consequent greater risk of disease spreading. Moreover, cattle during such times become debilitated and less resistant to attack.

A greatly increased use of serum was adopted during the year. The method employed was the inoculation of the young stock only, and then mixing them with the diseased animals in order that the former should obtain an active immunity.

#### *B. Contagious Bovine Pleuro-pneumonia.*

The losses from this disease have been greater than those of last year, but not to such an extent as to justify unusual alarm. The largest outbreak occurred in Berber Province, in the Damer and Berber Districts, and the disease was reported to have been introduced into the market at Damer by cattle from the Atbara area. In all probability it originated in Kassala Province, where the disease is known to exist, although no cases have been reported from that Province this year.

The disease has not previously been reported in Berber Province, and it is hoped that the preventive measures taken have completely eradicated the infection.

#### *C. Anthrax.*

This disease, which was never very prevalent in the Sudan, has been responsible for 50 % less deaths than last year. All the cases reported took place in the Halfa and Khartoum North Quarantine Parks. The inoculative measures adopted against this disease should obviate the danger of it spreading outside quarantines.

15 cases of this disease amongst Sudan cattle and 4 in Sudan sheep were reported from Egypt.

#### *D. East Coast Fever.*

6 cases were reported from Egypt, as having occurred amongst Sudan cattle. No cases were reported in the Sudan.

Attention is drawn to the remarks on this disease in Appendix 2 of this report. It would appear to be open to doubt whether the cases reported were not really Egyptian Fever, and not East Coast Fever.

#### *E. Foot and Mouth Disease.*

A serious outbreak was reported to have taken place amongst Sudanese cattle at the Shellal Quarantine, but with the exception of two cases reported from Kosti—not amongst export cattle—no cases of this disease were reported in the Sudan during the year.

#### *F. Trypanosomiasis.*

A few cases occurred in Kassala, Mongalla and Kordofan Provinces, and 16 cases amongst Sudanese animals exported to Egypt.

#### *G. Piroplasmosis.*

Some cases were reported from Halfa, Mongalla and Kordofan Provinces.

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

### **Bahr El Ghazal Province.**

#### *Cattle Plague.*

An outbreak of Cattle Plague was reported to have occurred in the Rumbek District in June. On the whole cattle disease appears to have been less prominent this year.

### **Berber Province.**

#### *Cattle Plague.*

This disease prevailed in most Districts of the Province, and, throughout the year, maintained a high average of mortality excepting during the months of June to March, when the losses were practically nil. Deaths were almost twice the number of those last year.

#### *Contagious Bovine Pleuro-pneumonia.*

An outbreak of this disease was reported in May, and continued till July. The infected Districts were Damer and Berber. The measures adopted for its suppression, it is hoped, will entirely obviate any recurrence of the disease.

There is no previous record of an outbreak of this disease in Berber Province.

### **Blue Nile Province.**

#### *Cattle Plague.*

The most severely affected Province in the Sudan. Heavy outbreaks took place throughout the Province, and were most serious

during the months of May to July. The most severe losses seem to have been in the Rufaa and Kamlin areas. At the close of the period under review the losses had greatly diminished.

### **Darfur Province.**

#### *Cattle Plague.*

The disease is reported to have been fairly prevalent throughout the Province, but where details have been obtainable, the deaths resulting have not been shewn as excessive.

Large numbers of Rezeigat cattle are said to have died in the Bahr-el-Arab during May and June.

### **Dongola Province.**

No cases of disease have been reported from this Province.

### **Halfa Province.**

No disease was reported during the year amongst the animals of the Province.

### **Kassala Province.**

#### *Cattle Plague.*

Losses, although less than last year, have been very heavy, the disease being at its height during the months March to May. During these months very large concentrations of cattle take place at watering points in the Kassala District, and the disease spreads very rapidly in consequence. During the last two months of the period under review, losses were almost nil, water and grazing being comparatively plentiful throughout the Province. The Kassala and Gedaref Districts appear to have been the most heavily affected.

### **Khartoum Province.**

#### *Cattle Plague.*

Outbreaks occurred in the Geili District and at Soba village. The disease was kept well under control, and comparatively few deaths ensued.

### **Kordofan Province.**

#### *Cattle Plague.*

On the whole, the Province has been surprisingly free of this disease during the year, outbreaks being confined to the Um Ruaba, Rahad and El Obeid Districts. The losses were about 8% of those occasioned last year.

#### *Contagious Bovine Pleuro-pneumonia.*

The disease was confined to the El Obeid, Rahad and Um Ruaba Districts. Losses exceed those of last year, but were not heavy.

## **Red Sea Province.**

### *Cattle Plague.*

In March an outbreak took place at Tokar, and was reported to have been introduced by cattle from Kassala Province. By April the outbreak was at an end.

## **Nuba Mountains Province.**

### *Cattle Plague.*

A few outbreaks took place in the Talodi, Kadugli and Dilling Districts, but did not cause very heavy losses.

## **The Fung Province.**

### *Cattle Plague.*

Losses from this disease were severe, and considerably greater than last year. The disease was prevalent in the Districts of Singa, Dinder and Karkoj, the first mentioned being the most severely affected.

Towards the end of the year under review, the disease appeared to be dying out.

## **Upper Nile Province.**

### *Cattle Plague.*

The Province was only mildly affected, one outbreak occurring in the Renk District. Only six deaths resulted.

## **White Nile Province.**

### *Cattle Plague.*

The deaths reported amounted to only a little more than half the number reported last year, and occurred mostly in the Kosti and El Dueim Districts. A very large number of animals were serumized with protective serum during the year.

### *Contagious Bovine Pleuro-Pneumonia.*

Made its appearance in the Tendelti District, but was soon at an end.

### *Foot and Mouth Disease.*

Two cases occurred in the Kosti District.



## 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 diseases shewn :—

| D I S E A S E.              |     |     |     |     | Horse | Mule | Donkey |
|-----------------------------|-----|-----|-----|-----|-------|------|--------|
| Horse-sickness              | ... | ... | ... | ... | 63    | 89   | 7      |
| Trypanosomiasis             | ... | ... | ... | ... | 9     | 16   | 11     |
| Epizootic Lymphangitis      | ... | ... | ... | ... | 5     | 28   | 1      |
| Biliary Fever               | ... | ... | ... | ... | 3     | 1    | —      |
| Debility                    | ... | ... | ... | ... | 8     | 2    | —      |
| Chronic Catarrh             | ... | ... | ... | ... | 1     | —    | —      |
| Pneumonia                   | ... | ... | ... | ... | 6     | 10   | 2      |
| Pleurisy                    | ... | ... | ... | ... | 2     | —    | —      |
| Peritonitis                 | ... | ... | ... | ... | 3     | —    | —      |
| Enteritis                   | ... | ... | ... | ... | 3     | —    | —      |
| Paralysis                   | ... | ... | ... | ... | 3     | —    | —      |
| Piroplasmosis               | ... | ... | ... | ... | 1     | 1    | 1      |
| Exhaustion                  | ... | ... | ... | ... | 2     | 2    | 4      |
| Tympanitis                  | ... | ... | ... | ... | 4     | 4    | 5      |
| Rupture of stomach          | ... | ... | ... | ... | 1     | —    | —      |
| Strangles                   | ... | ... | ... | ... | 1     | 1    | —      |
| Vegetable poisoning         | ... | ... | ... | ... | —     | 2    | 3      |
| Tumour                      | ... | ... | ... | ... | 1     | —    | —      |
| Bursati                     | ... | ... | ... | ... | 1     | —    | —      |
| Septicaemia                 | ... | ... | ... | ... | 1     | —    | —      |
| Fistula of withers          | ... | ... | ... | ... | 4     | —    | —      |
| Fatty degeneration of heart | ... | ... | ... | ... | 1     | —    | —      |
| Abscess                     | ... | ... | ... | ... | 2     | 1    | —      |
| Rheumatism                  | ... | ... | ... | ... | 1     | —    | —      |
| Incurable lameness          | ... | ... | ... | ... | 5     | 1    | —      |
| Fracture of leg             | ... | ... | ... | ... | 2     | —    | 1      |
| Fracture of shoulder        | ... | ... | ... | ... | 1     | —    | —      |
| Sessamoiditis               | ... | ... | ... | ... | 2     | —    | —      |

| D I S E A S E,               |     |     |     |     |     | Horse | Mule | Donkey |
|------------------------------|-----|-----|-----|-----|-----|-------|------|--------|
| Arthritis                    | ... | ... | ... | ... | ... | —     | 2    | 1      |
| Spavin                       | ..  | ... | ... | ... | ... | 1     | —    | —      |
| Sprained ligaments           |     | ... | ... | ... | ... | 1     | —    | —      |
| Drowned                      | ... | ... | ... | ... | ... | —     | —    | 1      |
| Broken wind                  |     | ... | ... | ... | ... | —     | 1    | —      |
| Blindness                    | ... | ... | ... | ... | ... | 2     | —    | 1      |
| Killed by Hyænas...          |     | ... | ... | ... | ... | —     | 1    | —      |
| Snake bite                   | ... | ... | ... | ... | ... | 1     | 1    | 2      |
| Staked                       | ... | ... | ... | ... | ... | 2     | —    | —      |
| Lost...                      | ... | ... | ... | ... | ... | 2     | 2    | 1      |
| Unfit for Government service | ... | ... |     |     |     | 33    | 7    | 6      |
| Causes unknown               | ... | ... | ... | ... | ... | 8     | 2    | 7      |
| Total                        |     |     |     |     |     | 186   | 174  | 55     |

### DISEASES OF CAMELS.

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

|                         |     |                     |     |      |
|-------------------------|-----|---------------------|-----|------|
| Trypanosomiasis         | 175 | Pneumonia           | ... | 17   |
| Peritonitis             | ... | Pleurisy            | ... | 1    |
| Enteritis               | ... | Bronchitis          | ... | 1    |
| Gastritis               | ... | Vegetable poisoning |     | 15   |
| Paralysis               | ... | Septicaemia         | ... | 3    |
| Fistula of withers      | ... | Abscess             | ... | 5    |
| Fistula of poll         | ... | Nephritis           | ... | 1    |
| Fistula of foot         | ... | Pericarditis        | ... | 1    |
| Tympanitis              | ... | Botriomyecosis      | ... | 1    |
| Rupture of bladder      | ... | Debility            | ... | 2    |
| Rupture of colon        | ... | Empyaemia           | ... | 1    |
| Helminthiasis           | ... | Fracturs of jaw     | ... | 1    |
| Arthritis               | ... | Dislocation of neck |     | 4    |
| Fracture of leg         | ... | Incurable lameness  |     | 4    |
| Exhaustion              | ... | Synovitis           | ... | 1    |
| Mange                   | ... | Fell down well      | ... | 1    |
| Drowned                 | ... | Blindness           | ... | 5    |
| Killed by lightening    | 1   | Killed by crocodile |     | 1    |
| Snake bite              | ... | Lost                | ... | 15   |
| Unfit for Govt. service | 35  | Causes unknown      | ... | 42   |
| Total                   | ... | ...                 | ... | 412, |

## **DISEASES OF SHEEP AND GOATS.**

### *Sheep Pox.*

Cases of this disease occurred amongst sheep imported from Damer, at the Halfa Quarantine, and a few cases were reported amongst Sudanese sheep imported into Egypt.

### *Contagious Pleuro-pneumonia of Goats.*

This disease, known as Abu Neeni amongst the natives, has been the cause of considerable losses amongst goats, particularly in the neighbourhood of Geili in Khartoum Province. Experiments were carried out by the Veterinary Bacteriologist, with a view to obtaining a satisfactory material for preventive inoculation, but without success. Owners appear to appreciate the value of early isolation of the infected from the apparently healthy as a preventive measure.

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## **VETERINARY SURVEY SECTION.**

Captain R. H. Knowles, Royal Army Veterinary Corps, has been in charge of this Section during the time he has been in Khartoum. He was absent for a considerable period in Kenya Colony, and on leave: but, nevertheless, much valuable work has been done during the year. 585 smears and specimens have been examined and reported on in the laboratory, from horses, mules, donkeys, camels, cattle, sheep, dogs and birds. Various vaccines were prepared, and research work followed the lines of endeavouring to discover a cure for Trypanosomiasis, for Epizootic Lymphangitis, and to ascertain the cause of Infectious Pleuro-pneumonia of goats.

Captain Knowles has lately been fortunate in obtaining a despatch of "Bayer 205", the most recent drug for the treatment of Trypanosomiasis, from the German discoverers. This drug is not yet on the market, and the quantity being sent is for experimental purposes. It is hoped that the drug will prove as efficacious as it is reported to be.

Recently some test experiments have been carried out for the purpose of studying the respective immunising powers of Indian and Italian anti-anthrax serum.

Experiments are now in progress in order to discover the susceptibility of half-bred Sudan cattle to Rinderpest, and to ascertain the possibility of using them as anti-rinderpest serum producers.

Further experiments are following the lines of the manufacture of Contagious Bovine Pleuro-pneumonia vaccine.

A copy of Captain R. H. Knowles' report is attached as Appendix I of this report.

A pan-African Veterinary Conference was held at Nairobi in Kenya Colony in the month of April, 1923. At this Conference the Sudan was represented by Captains B. A. Jarvis and R. H. Knowles, Royal Army Veterinary Corps. Much interesting matter was discussed, and valuable decisions were arrived at. The full report of this Conference has not yet been received from the Kenya Government, but the report of Captains Jarvis and Knowles is appended to this report as Appendix 2.

## QUARANTINE SECTION.

As mentioned in last year's report, there was a complete suspension of the animal trade during the first two months of the year, namely October and November, owing to an outbreak of Foot and Mouth disease at Shellal Quarantine. This suspension greatly affected the numbers of animals exported, as, owing to it, the merchants engaged in the trade ceased buying when the embargo was removed, and subsequently exported only the animals they had on hand. The export of these animals lasted till the summer months, during which the trade always assumes only small proportions.

Buying again started freely in the month of August, and since then a regular supply has been maintained.

Owing to the Shellal Quarantine refusing to accept more than 800 cattle the despatch of cattle has been considerably controlled, but if this had not been done there would merely have been a vast accumulation of animals at this quarantine, with all the attendant dangers of serious outbreaks of disease. The reason that the cattle would have been held up in Shellal was one of demand.

With regard to Cairo, the trouble would appear to arise from the butchers, who refuse to slaughter more than a certain number of animals, in order to keep the price of beef at a high figure. This high price prevents the poor man buying meat, and so long as this attitude of the butchers is maintained there is not likely to be a greater demand. If the price of meat were considerably lowered there would be a much greater demand, with the slaughtering of a greatly increased number of animals, and a consequently large increase in the numbers exported from the Sudan. But the butchers have first of all to be persuaded to do more work for the same amount of money. This appears to be contrary to eastern human nature, so, I doubt, unless forcible measures are adopted, that there will be a very greatly improved export.

With regard to Alexandria, there the matter of competition comes in, as cattle are arriving in increasing numbers from Eritrea, French Somaliland, and from Alexandretta, so that it devolves into largely a matter of the price at which the cattle can be put on the Alexandria market. In the case of cattle from Jibouti (French Somaliland) this is difficult for the Sudan Government, as the cattle are carried on French boats and the trade is subsidised.

Sheep have been exported in much larger numbers than was expected in the middle of the year, and this in spite of the re-establishment of the embargo on Sudan sheep, i.e. the suspension of "free pratique".

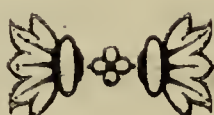
There is considerable competition to be contended with in regard to sheep. The largest exporting countries to Egypt are Tripoli and Syria. The Sudan sheep is heavier and has a better skin, but has no fat tail—a popular feature which the sheep from these other countries to a certain extent possess.

The reason of the stoppage of "free pratique" was given as Anthrax. Outbreaks occurred in various Districts in Egypt and the Sudan animal was blamed. By what means this blame was attached has not been ascertained. It was known that a few cases had occurred amongst Sudanese sheep in the Halfa and Shellal Quarantines, and I presume they were suspect.

12,270 cattle passed through the Quarantine Stations for export as against 23,796 during the previous year—a decrease of 11,526.

20,811 sheep passed through the Quarantine Stations for export i.e. a decrease of 16,945 under the year 1921–1922.

The following tables give the numbers of animals dealt with at the various Quarantine Stations during the period 1st October, 1922, to 30th. September, 1923, as compared with the similar period 1921–1922.



## HALFA QUARANTINE PARK.

|                  | Camels. |      | Cattle. |      | Goats. |      | Sheep. |      |
|------------------|---------|------|---------|------|--------|------|--------|------|
|                  | 1921    | 1922 | 1921    | 1922 | 1921   | 1922 | 1921   | 1922 |
|                  | 1922    | 1923 | 1922    | 1923 | 1922   | 1923 | 1922   | 1923 |
| October ... ..   | 2       | —    | 60      | —    | 15     | 21   | 5144   | 465  |
| November ... ..  | 3       | —    | 25      | —    | 41     | 5    | 1289   | 77   |
| December ... ..  | —       | —    | 1       | 68   | 14     | 13   | 4014   | 1171 |
| January ... ..   | —       | —    | —       | —    | 6      | 7    | 46     | 1072 |
| February ... ..  | —       | —    | —       | 44   | 9      | 39   | 255    | 395  |
| March ... ..     | —       | —    | 187     | 78   | 40     | 1    | 690    | 2182 |
| April ... ..     | —       | —    | 330     | 437  | 4      | 20   | 1209   | 311  |
| May ... ..       | —       | —    | 322     | 291  | 5      | 77   | 327    | 337  |
| June ... ..      | —       | —    | —       | 494  | 12     | 568  | 81     | 712  |
| July ... ..      | —       | —    | 90      | —    | 253    | 21   | 572    | 725  |
| August ... ..    | —       | —    | 26      | —    | 4      | —    | 445    | 169  |
| September ... .. | —       | —    | —       | —    | 6      | 6    | 511    | 1102 |
| Totals ... ..    | 5       | —    | 1041    | 1412 | 409    | 778  | 14283  | 8718 |

## KHARTOUM NORTH QUARANTINE PARK.

|                  | Camels |      | Cattle |       | Goats |      | Sheep |      |
|------------------|--------|------|--------|-------|-------|------|-------|------|
|                  | 1921   | 1922 | 1921   | 1922  | 1921  | 1922 | 1921  | 1922 |
|                  | 1922   | 1923 | 1922   | 1923  | 1922  | 1923 | 1922  | 1923 |
| October ... ..   | —      | —    | 4391   | —     | —     | —    | 6524  | —    |
| November ... ..  | —      | —    | 2695   | —     | —     | —    | 2869  | —    |
| December ... ..  | —      | —    | 3515   | 2796  | —     | —    | 3375  | 1913 |
| January ... ..   | —      | —    | 936    | 1457  | —     | —    | 2195  | 2472 |
| February ... ..  | —      | —    | 2107   | 539   | —     | —    | 1869  | 723  |
| March ... ..     | —      | —    | 660    | 1026  | —     | —    | 658   | 1125 |
| April ... ..     | —      | —    | 607    | 164   | —     | —    | 1736  | 253  |
| May ... ..       | —      | —    | 676    | 492   | —     | —    | 619   | 70   |
| June ... ..      | —      | —    | 635    | 351   | —     | —    | 80    | 65   |
| July ... ..      | —      | —    | 395    | 600   | —     | —    | 898   | 398  |
| August ... ..    | —      | —    | 2205   | 940   | —     | —    | 676   | 303  |
| September ... .. | —      | —    | 3253   | 1695  | —     | —    | 1248  | 1050 |
| Totals ... ..    | —      | —    | 23075  | 10060 | —     | —    | 22747 | 8372 |

## PORT SUDAN QUARANTINE PARK.

|                  | Camels |      | Cattle |      | Goats |      | Sheep |      |
|------------------|--------|------|--------|------|-------|------|-------|------|
|                  | 1921   | 1922 | 1921   | 1922 | 1921  | 1922 | 1921  | 1922 |
|                  | 1922   | 1923 | 1922   | 1923 | 1922  | 1923 | 1922  | 1923 |
| October ... ..   | —      | 2    | 86     | 80   | —     | —    | 62    | 135  |
| November ... ..  | —      | —    | 49     | 125  | —     | —    | 82    | 873  |
| December ... ..  | —      | 1    | 118    | 152  | —     | —    | 120   | 731  |
| January ... ..   | —      | —    | —      | 75   | —     | —    | 170   | 565  |
| February ... ..  | 4      | —    | 54     | 99   | —     | —    | 75    | 550  |
| March ... ..     | —      | —    | 32     | 87   | —     | 7    | 72    | 329  |
| April ... ..     | —      | —    | 29     | 51   | —     | —    | 32    | 283  |
| May ... ..       | —      | —    | 12     | 32   | —     | —    | —     | —    |
| June ... ..      | —      | —    | —      | 10   | 1     | —    | 6     | —    |
| July ... ..      | —      | —    | —      | —    | —     | —    | 2     | 150  |
| August ... ..    | —      | —    | 25     | 24   | —     | —    | —     | 105  |
| September ... .. | —      | —    | 35     | 63   | —     | —    | 105   | —    |
| Totals ... ..    | 4      | 3    | 440    | 798  | 1     | 7    | 726   | 3721 |

## GRAND TOTAL.

| PERIOD.                                | Camels | Cattle | Goats | Sheep |
|----------------------------------------|--------|--------|-------|-------|
| 1st. October 1921 to 30th. Sept. 1922  | 9      | 23796  | 410   | 37756 |
| 1st. October 1922 to 30th. Sept. 1923. | 3      | 12270  | 758   | 20811 |

## HIDES AND SKINS.

The numbers of hides and skins inspected as compared with the previous year, are shewn in the following tables.

## HIDES.

|               |     |     | Halfa        |              | Khartoum     |              | Port Sudan   |              | Total        |              |
|---------------|-----|-----|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
|               |     |     | 1921<br>1922 | 1922<br>1923 | 1921<br>1922 | 1922<br>1923 | 1921<br>1922 | 1922<br>1923 | 1921<br>1922 | 1922<br>1923 |
| October ...   | ... | ... | 15           | 5            | —            | 1248         | —            | —            | 15           | 1253         |
| November ...  | ... | ... | 97           | —            | 2280         | 1200         | 50           | —            | 2427         | 1200         |
| December ...  | ... | ... | 83           | —            | 275          | 1000         | —            | 200          | 358          | 1200         |
| January ...   | ... | ... | 15           | 164          | 3219         | 8262         | —            | —            | 3234         | 8426         |
| February ...  | ... | ... | 817          | 81           | 1823         | 553          | —            | —            | 2640         | 634          |
| March ...     | ... | ... | 252          | —            | 227          | 3599         | —            | —            | 479          | 3599         |
| April ...     | ... | ... | 185          | 410          | 1094         | 876          | —            | 1524         | 1279         | 2810         |
| May ...       | ... | ... | —            | 824          | 2144         | 880          | —            | 20           | 2144         | 1724         |
| June ...      | ... | ... | —            | —            | 1521         | 27           | 28           | 273          | 1549         | 300          |
| July ...      | ... | ... | 50           | —            | —            | 132          | —            | 360          | 50           | 492          |
| August ...    | ... | ... | —            | 35           | 2035         | 970          | —            | —            | 2035         | 1005         |
| September ... | ... | ... | 500          | —            | 160          | 2025         | —            | —            | 660          | 2025         |
| Totals ...    | ... | ... | 2014         | 1519         | 14778        | 20772        | 78           | 2377         | 16870        | 24668        |

## SKINS.

|               |     |     | Halfa        |              | Khartoum     |              | Port Sudan   |              | Totals       |              |
|---------------|-----|-----|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
|               |     |     | 1921<br>1922 | 1922<br>1923 | 1921<br>1922 | 1922<br>1923 | 1921<br>1922 | 1922<br>1923 | 1921<br>1922 | 1922<br>1923 |
| October ...   | ... | ... | 1100         | 300          | 6800         | 16420        | —            | 307          | 7900         | 17027        |
| November ...  | ... | ... | 1325         | —            | 9561         | 13400        | 13750        | 9268         | 24636        | 22668        |
| December ...  | ... | ... | 2741         | 1248         | 32062        | 31034        | 21114        | 6600         | 55917        | 38882        |
| January ...   | ... | ... | 1613         | 980          | 20595        | 30400        | 6945         | —            | 29153        | 31380        |
| February ...  | ... | ... | 5070         | 4018         | 35120        | 26477        | 114          | 5688         | 40304        | 36183        |
| March ...     | ... | ... | 4410         | 838          | 20360        | 33391        | 3266         | 1228         | 28036        | 35457        |
| April ...     | ... | ... | 2245         | —            | 31695        | 34668        | 8466         | 6645         | 42406        | 41313        |
| May ...       | ... | ... | 508          | 2940         | 24538        | 12868        | 4059         | 1668         | 29105        | 17476        |
| June ...      | ... | ... | 4115         | 59           | 10800        | 21624        | 2252         | 3410         | 17167        | 25093        |
| July ...      | ... | ... | 800          | —            | 6000         | 18164        | 4119         | 5480         | 10919        | 23644        |
| August ...    | ... | ... | 1140         | 380          | —            | 11520        | —            | 1709         | 1140         | 13609        |
| September ... | ... | ... | 1000         | 775          | 22304        | 12690        | —            | 789          | 23304        | 14254        |
| Totals ...    | ... | ... | 26067        | 11538        | 219835       | 262656       | 64085        | 42792        | 309987       | 316986       |

## BREEDING SECTION.

The usual Horse Shows were held during the year in Darfur, in Kordofan, and in the Nuba Mountains Provinces.

It is now a recognised procedure that the Army units in Darfur shall be supplied with horses from the Darfur tribes, and as it is proposed to replace a considerable number of the mules of this District by horses, there should be a good demand for horses in Darfur Province.

Of the Kordofan tribes, the Homr horses are too small for Army requirements, but provide useful police horses. The Messeria tribe provides an excellent Army remount, and this tribe supplies the Army East of Darfur with horses.

The Hawazma tribe of Nuba Mountains Province have an indifferent type of horse, and a somewhat false opinion as to its value.  
*Horses.*

I regret to report the death of the Egyptian Country-bred horse "Jobber", which occurred shortly after its return from Kordofan, as the result of Horse-sickness contracted in that Province.

Considerable progress has taken place as regards services by the indigenous sires standing in Kordofan, in the Messeria and Homr countries, and it is rather on these lines that improvement in the breed of these horses will be continued, than by the importation of European stock to this Province. Arab blood will still be available, as the Arab is probably the most suitable animal for mixing with the local horses of Kordofan.

Horses have stood during the year in Khartoum, Berber and Kordofan Provinces.

The horse "Malek" stood at Shendi in Berber Province, 6 mares were served by this horse.

The three horses "Jobber", "Sowari" and "Sultan" were at Abu Zabbad in Kordofan Province from July to the end of September. They served 109 mares.

In Khartoum 38 mares were served by the horses "Jobber", "Sowari", "Sultan" and "Melek".

The District Commissioner, Western Kordofan reports that the indigenous sires belonging to the Nazir of the Homr tribe served 178 mares at Muglad. This is very satisfactory, as these sires are selected Messeria horses.

*Sheep.*

A start has been made to introduce Meraiis blood into the sheep inhabiting the Gezirah irrigation area, and by continued crossing to

gradually produce an improved type of sheep in this area. Rams and ewes have been sent to Tayiba, Wad Medani and Barakat for this purpose. The process will be a long one, and must be accompanied by education of the natives as to the necessity of castrating the male lambs. There is a very strong tendency to reversion to the indigenous type in the Sudan, and also to deterioration of the imported stock when bred for a few generations. This will necessitate the continued importation of new blood.

#### *Cattle.*

Cattle have chiefly been bred with a view to milk production for Dairy purposes, and most of the cross breeding has been done in connection with the Dairy. It is not possible to breed pedigree stock or stock for meat production when the experiments are carried out on a Dairy farm, and the reason is that all the milk is required for sale purposes, and the young stock do not get the full supply of milk from their mothers; they in actual fact, get practically none, but are fed on skimmed milk. This results in their growth being considerably stunted in early life, and the full grown animal is much smaller than might otherwise be the case. With regard to milk production, there has been an enormous improvement. One cow actually gave during its lactation period 600 gallons of milk, and as much as 32 pints in one day. As the milk contains a very high percentage of butter fat, a cow giving this quantity of milk is equivalent, for butter making purposes, to a thousand gallon cow in Great Britain

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### FINANCE.

Although the year has not, financially speaking, come up to expectations as regards the forecasts issued in the late part of 1922, nevertheless the position has greatly exceeded what towards the middle of the year was expected would be the condition of affairs. Trade has continued more or less without interruption during the year, and although the number of cattle exported has not been large, the export of sheep has considerably exceeded expectations.

The receipts are bigger than last year.

The actual receipts were £E. 10.142, as against an estimate of £E. 14.200. The actual expenditure was approximately £E. 41,000, as against an estimated expenditure of £E. 46,377. Thus the actual loss under the estimated revenue was once more than counterbalanced by the saving on the estimated expenditure.

L. DANIELS,

Khartoum,

Lieut.-Colonel, R. A. V. C.,

28th. January, 1924,

Director, Veterinary Department,

# APPENDIX 1.

## REPORT OF THE VETERINARY BACTERIOLOGIST

for the period.

October 1st, 1922 to September 30th, 1923.

Khartoum, 5th. November, 1923.

The Director,

Veterinary Department, S. G.,

Khartoum.

Sir,

I have the honour to submit, herewith, a report on the work at the Veterinary Bacteriological Laboratory during the period from October 1st, 1922, to September 30th, 1923.

### A. ROUTINE EXAMINATIONS.

During the year 585 smears and specimens have been examined and reported on at the laboratory. The total is excluding the examination carried out on research work.

#### HORSES.

|                                        |     |     |     |     |    |
|----------------------------------------|-----|-----|-----|-----|----|
| Piroplasmosis                          | ... | ... | ... | ... | 25 |
| Epizootic Lymphangitis                 | ... | ... | ... | ... | 9  |
| Strangles                              | ... | ... | ... | ... | 10 |
| Horse-sickness                         | ... | ... | ... | ... | 1  |
| Bursati                                | ... | ... | ... | ... | 4  |
| Habronemic-Conjunctivitis              | ... | ... | ... | ... | 1  |
| Botriomycosis                          | ... | ... | ... | ... | 1  |
| Mange (Demodectic)                     | ... | ... | ... | ... | 1  |
| Forage Acari                           | ... | ... | ... | ... | 2  |
| Acne                                   | ... | ... | ... | ... | 1  |
| Pyogenic Infections                    | ... | ... | ... | ... | 6  |
| Lichen Tropicus                        | ... | ... | ... | ... | 5  |
| Ulcerative Lymphangitis (Priez-Nocord) | ... | ... | ... | ... | 1  |
| Dermanysus Gallinae                    | ... | ... | ... | ... | 1  |
| Mammitis (Diphtheroid Bac.)            | ... | ... | ... | ... | 1  |
| Negative                               | ... | ... | ... | ... | 37 |

Total ... 106 106

|                                |     |     |     |                        |     |
|--------------------------------|-----|-----|-----|------------------------|-----|
| <b>MULES.</b>                  |     |     |     | <i>Brought forward</i> | 106 |
| Epizootic Lymphangitis         | ... | ... | ... | 45                     |     |
| Piroplasmosis                  | ... | ... | ... | 9                      |     |
| Bursati                        | ... | ... | ... | 7                      |     |
| Habronemic Conjunctivitis      | ... | ... | ... | 8                      |     |
| Pyogenic Infections            | ... | ... | ... | 5                      |     |
| Microfilaria                   | ... | ... | ... | 2                      |     |
| Ringworm                       | ... | ... | ... | 2                      |     |
| Lichen Tropicus                | ... | ... | ... | 4                      |     |
| Various                        | ... | ... | ... | 5                      |     |
| Negative                       | ... | ... | ... | 66                     |     |
| Total                          |     |     |     | 153                    | 259 |
| <b>DONKEYS.</b>                |     |     |     |                        |     |
| Epizootic Lymphangitis         | ... | ... | ... | 8                      |     |
| Piroplasmosis                  | ... | ... | ... | 3                      |     |
| Bursati                        | ... | ... | ... | 1                      |     |
| Lichen Tropicus                | ... | ... | ... | 2                      |     |
| Pyogenic Infections            | ... | ... | ... | 1                      |     |
| Acne                           | ... | ... | ... | 1                      |     |
| Haematuria                     | ... | ... | ... | 1                      |     |
| Anaplasmosis                   | ... | ... | ... | 2                      |     |
| Negative                       | ... | ... | ... | 15                     |     |
| Total                          |     |     |     | 34                     | 293 |
| <b>CAMELS.</b>                 |     |     |     |                        |     |
| Trypanosomiasis                | ... | ... | ... | 40                     |     |
| Helminthiasis                  | ... | ... | ... | 16                     |     |
| Mange (Sarcoptic)              | ... | ... | ... | 7                      |     |
| Pyogenic Infections            | ... | ... | ... | 2                      |     |
| Micro-Filariasis               | ... | ... | ... | 12                     |     |
| Peritonitis (Diphtheroid Bac.) | ... | ... | ... | 1                      |     |
| Negative                       | ... | ... | ... | 63                     |     |
| Total                          |     |     |     | 141                    | 434 |
| <b>CATTLE.</b>                 |     |     |     |                        |     |
| Trypanosomiasis                | ... | ... | ... | 13                     |     |
| Piroplasmosis                  | ... | ... | ... | 12                     |     |
| Anthrax                        | ... | ... | ... | 15                     |     |
| Rinderpest                     | ... | ... | ... | 14                     |     |
| Cont. Bovine Pleuro-pneumonia  | ... | ... | ... | 28                     |     |
| Tuberculosis                   | ... | ... | ... | 1                      |     |
| Streptothricosis               | ... | ... | ... | 1                      |     |
| Negative                       | ... | ... | ... | 40                     |     |
| Total                          |     |     |     | 124                    | 558 |

|                   |     |     |     |     |     |                        |     |
|-------------------|-----|-----|-----|-----|-----|------------------------|-----|
| <b>SHEEP.</b>     |     |     |     |     |     | <i>Brought forward</i> | 558 |
| Anthrax           | ... | ... | ... | ... | ... | 4                      |     |
| Negative          | ... | ... | ... | ... | ... | 5                      |     |
|                   |     |     |     |     |     | <hr/>                  |     |
| Total             |     |     |     |     |     | 9                      | 567 |
| <b>DOGS.</b>      |     |     |     |     |     |                        |     |
| Mange (Sarcoptic) | ... | ... | ... | ... | ... | 2                      |     |
| Negative          | ... | ... | ... | ... | ... | 5                      |     |
|                   |     |     |     |     |     | <hr/>                  |     |
| Total             |     |     |     |     |     | 7                      | 574 |
| <b>BIRDS.</b>     |     |     |     |     |     |                        |     |
| Spirochaetosis    | ... | ... | ... | ... | ... | 1                      |     |
| Fowl Diphtheria   | ... | ... | ... | ... | ... | 2                      |     |
| Fowl Plague       | ... | ... | ... | ... | ... | 8                      |     |
|                   |     |     |     |     |     | <hr/>                  |     |
| Total             |     |     |     |     |     | 11                     | 585 |
|                   |     |     |     |     |     | <hr/>                  |     |

## B. REVIEW OF DISEASES.

### (i) *Piroplasmosis (Equine).*

There has been a comparatively large number of cases of Equine Piroplasmosis during the year. Of the 37 cases of Equine piroplasmosis diagnosed microscopically, 20 were due to the *Piroplasma caballi*, 3 to *Nutallia equi*, and in 14 cases the type of piroplasma was not differentiated.

Treatment by intravenous injection of quinine hydrobromide has been advised, and the method demonstrated with satisfactory results.

The intravenous injection of quinine must be carried out with caution.

From local observations, the following doses are recommended:—

|                          |     |     |                 |
|--------------------------|-----|-----|-----------------|
| English and Waler horses | ... | ... | 45 to 50 grains |
| Arabs                    | ... | ... | 35 to 40 „      |
| Sudan Country-breds...   | ... | ... | 30 to 35 „      |

### (ii) *Piroplasmosis (Bovine).*

Out of the 12 cases of Bovine Piroplasmosis diagnosed microscopically, four were definitely diagnosed as *Theileria annulatum* (mutans).

Two of the cases were debilitated bulls at the Halfa Quarantine, and two were old, thin cows at Juba in Mongalla. None of these four were actually ill, and all four were cases of Tropical Piroplasmosis (Egyptian Fever).

These cases are interesting on account of the reports by the Egyptian Authorities that East Coast Fever has occurred, and is still occurring, amongst Sudanese cattle exported to Egypt.

The most recent work by Brumpt (Ann. Parasit Humaine et Compares, April 1923) emphasises the difficulty of distinguishing between the *Theileria parva*, *mutans* and *annulatum* infections by microscopical examination, especially in view of the fact that plasma bodies have now been found in all three infections.

Both Sargent and Brumpt are of opinion that the species *Theileria annulatum* should be removed, leaving only *parva* and *mutans*. It will thus be seen that the relationship and differentiation of the *Theileria* has been made a matter of some difficulty by the most recent observations.

Formerly the presence of the plasma bodies was held to be diagnostic of East Coast Fever, and the diagnosis as East Coast Fever of cases having small piroplasms in the blood, and plasma bodies in the spleen and lymphatic glands was justified, but this no longer holds good.

The post-mortem lesions of the two diseases are also similar.

I am therefore of the opinion that the authorities in Egypt are not justified in diagnosing isolated cases as East Coast Fever, and from the available evidence I think it doubtful if East Coast Fever exists in the Sudan, excluding the Southern Border.

The possibility of East Coast Fever extending over the Southern border from Uganda must be admitted.

### (iii) *Strangles*.

Work on *Strangles* was carried out in connection with the outbreak of the disease amongst the horses of the mounted troops at Shendi.

Two strains of the *Streptococcus equi* were isolated from cases of *Strangles* with unopened abscesses in the sub-maxillary glands.

Five hundred doses of vaccine were prepared from the two strains.

A total of 170 horses were vaccinated against the disease.

Vaccination of the horses was completed on 7-10-1923.

The disease gained entrance into the vaccinated Units (No. 3 Coy. Mounted Infantry, and 2nd. Squadron Cavalry) on 8-10-23 and 13-10-23 respectively, but up to 25-10-23 only three cases had occurred.

Comparing these figures with those of No. 2 Coy. Mounted Infantry, where the disease commenced and no vaccination was carried

out, in which 11 cases of Strangles with sub-maxillary abscesses and 23 cases of Catarrhal Fever due to the streptococcus occurred, the results of the vaccination would appear to be beneficial in preventing the spread of the disease.

It will be possible to form a better opinion of the value of the vaccination later.

(iv) *Trypanosomiasis*.

The following types of trypanosomes have been identified up to the present :—

*Trypanosoma soudanense* of camels—wide distribution.

*Trypanosoma peccaudi*. One natural case of this trypanosome has been encountered in a mule from the Bahr-el-Ghazal. It causes an acute, fatal equine Trypanosomiasis which, up to the present, has not been successfully treated. (see case (iii) and (iv) in this report on research. Morphologically it is classed in the dimorphic group of trypanosomes, but pathogenically it is probably closely allied to the *Trypanosoma brucei*

*Trypanosoma congoleuse*, and *nanum*. These two types are morphologically very similar, but are distinguished by the fact the *T. congoleuse* is pathogenic for the laboratory animals, whereas *T. nanum* is non-pathogenic.

It is therefore not possible to differentiate between these two trypanosomes by microscopic examination alone.

The only two case (cases (i) and (ii) research) which were available for inoculation proved to be *T. nanum*.

Two cases of *T. nanum* infection have been seen in equines, one in a horse from Mongalla (case (i)), and one case in a mule from the Bahr-el-Ghazal (case (ii)).

In cattle *T. nanum* has been diagnosed in Mongolla (2 cases), in Kassala near Gedaref (4 cases), and in Kordofan (2 cases).

From the reports, the disease appears to take a sub-acute form both in equines and cattle.

*Trypanosoma vivax*. Four cases of *T. vivax* have been diagnosed in blood from cattle in Mongalla, the smears being sent by El Bimbashi Ellison.

The disease appears to be sub-acute. El Bimbashi Ellison reports that the animals were very debilitated, but that they had been sick for four months.

*Trypanosoma cazalboui* (*vivax*) has been reported once before in the Sudan by Balfour, as occurring in Kassala, but the disease in Kassala was said to be acute, causing the death of the cattle in 7 to 10 days.

It will be obvious from the above summary that further information regarding the distribution of Trypanosomiasis in the Sudan is required.

(v) *Strongylosis of Camels.*

On making two post-mortems on camels (one died and one destroyed on account of chronic debility and intermittent diarrhoea) the abomasum was found to be acutely congested in longitudinal lines, the mucous membrane having a catarrhal exudate adherent.

Examination in both cases revealed the presence of large numbers of strongyles.

Specimens were sent to Captain R. Daubney M. Sc. at the laboratories of the Board of Agriculture in England, who kindly identified them as the *Haemonchus longistipes*.

The fœces of both camels also contained large numbers of ova of these worms.

Anti-mortem examinations of the blood of these camels were negative, and no other abnormality could be found on post-mortem.

Two specimens of the *Trichuris Globulosa* were found in the small intestine of the camel which died, but caused no lesions.

It was therefore thought that the presence of Strongyles might be a cause of debility in camels.

The ova of the *Haemonchus Longistipes* have been found in 16 camels, ten of which were in poor condition, and six in good condition.

It is therefore suggested that in those cases of debility in camels in which no trypanosomes can be found, an examination of the fœces should be made for the ova of the *Haemonchus Longistipes*. If present, treatment with a 2% solution of copper sulphate is suggested.

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## RESEARCH.

### *Experimental treatment of Trypanosomiasis.*

A summary only of the work is given.

A combination of the drugs Tartar Emetic and Picric Acid was used.

Curasson, working in the French Sudan, reports a certain amount of success in the treatment of Trypanosomiasis by the use of this combination of these drugs.

Curasson gave the Tartar Emetic intramuscularly, and the Picric Acid by mouth in the form of balls.

It was thought that if these drugs could be safely administered intravenously at the same time better results would be obtained,

Preliminary intravenous injections of donkeys of solution of Picric Acid in water and alcohol proved that up to 5 grammes of Picric Acid could be administered, but with the production of toxic symptoms, there being colic, micturition, frequent defecation, diarrhoea, and patchy sweating.

Loss of co-ordination was seen in all cases, but this was due to the alcohol used as solvent for the Picric Acid.

The following were the strengths of the solutions injected :—

Picric Acid-aqueous solution — 1 in 90.

Picric Acid-alcoholic solution — 1 in 15.

Tartar Emetic was 2% aqueous solution for equines and 4% aqueous solution for camels.

Five cases of Trypanosomiasis were subjected to treatment as follows :—

*Case (i).*

Bay Sudan Country-bred horse (No. 101), 13.2, 16 years old.

A naturally infected case of *Trypanosoma nanum* from Mongalla.

Condition: Debilitated, intermittent fever, Admitted 6-6-22. Trypanosomes present in blood daily. Steadily lost condition in spite of rest and liberal diet.

On 14th, 15th and 16th June 1922 gave 5 grammes of Picric Acid daily intravenously (4 grammes in 60 c. c. alcohol absolute and 1 gramme in 90 c. c. of water).

Trypanosomes were present on 17-6-22.

On the 25th. and 28th. June, and 1st. July 1922 the following injections were given :—

3  $\frac{1}{2}$  grammes of Picric Acid (3 grammes in alcohol and  $\frac{1}{2}$  gramme in water), and 50 c. c. of 2% solution of Tartar Emetic.

That is, a course of 3 doses every third day.

Daily observations on the blood were carried out for three months. Trypanosomes did not reappear.

The horse was branded with a "T" on the left shoulder and kept under observation in the Hamla lines at Khartoum.

On 20th October, 1923, i.e. 16 months after the treatment, the animal was in good condition, and examination of the blood was negative.

*Case (ii).*

Mule No. 203. Grey. 5 years old. 13.3. From Bahr-el Ghazal. Emaciated and very weak. Intermittent fever. Admitted 17th June, 1922, and kept under observation till 25th June, 1922. Trypanosomes present daily, and animal getting weaker in spite of rest and liberal diet. Natural infection with *Trypanosoma nanum*,

Treatment: Same treatment on same dates as case (i). After three months daily observation with negative results, the mule was branded with a "T" and sent to work in the Hamla lines in Khartoum.

This mule rapidly gained condition after the treatment and on the 20th October, 1923, 16 months after the treatment, the animal was in good condition. This animal has been in regular work.

*Case (iii).*

Grey mule. Cast for lameness. Good condition on 13-6-22. It was artificially infected with a strain of *Trypanosoma pecaui* (strain No. 145) from a natural case in a mule from the Bahr-el-Ghazal. Five days after infection *Trypanosomes* appeared in the blood and continued to increase in numbers.

The animal rapidly lost condition and had intermittent fever.

The table shews date of injection, amount, and when the *Trypanosome* reappeared in the blood:—

| <u>Date.</u> | <u>Injection</u>                                             | <u>Date of re-appearance<br/>of Trypanosome.</u> |
|--------------|--------------------------------------------------------------|--------------------------------------------------|
| 21-6-22      | 3 $\frac{1}{2}$ grammes of Picric Acid                       |                                                  |
| and          | (3 grammes in alcohol & $\frac{1}{2}$ gramme                 |                                                  |
| 29-6-22      | in water) + 50 c.c. of Tartar                                |                                                  |
|              | Emetic sol. 2%.                                              |                                                  |
| 9-8-22       | A course of above dose i.e. 4<br>doses, one every third day. |                                                  |
| 12-8-22      |                                                              |                                                  |
| 15-8-22      |                                                              |                                                  |
| 18-8-22      |                                                              | 28-8-22                                          |

The mule continued to lose condition and had to be destroyed.

*Case (iv).*

Sudan country-bred horse, cast for lameness, in good condition.

On 1st October, 1922 artificially infected with *Trypanosome pecaui* (strain 145). *Trypanosomes* appeared in the blood on 5th October, 1922. They rapidly increased in numbers and the horse lost condition.

On the 14th, 16th, 18th and 20th October, the following intravenous injections were given:—

3  $\frac{1}{2}$  grammes of picric Acid (3 grammes alcoholic and  $\frac{1}{2}$  gramme aqueous) and 50 c.c. of 2% solution of Tartar Emetic.

That is, a course of 4 doses, one every other day.

On the 28th October, 7 days after the last injection, *Trypanosomes* reappeared in the blood.

A course of Atoxyl and Picric Acid was then tried on this case,

On the 6th, 8th, 10th and 12th November, the following injections were given intravenously :—

3½ grammes of Picric Acid and 4 grammes of Atoxyl.

On the 20th November the Trypanosomes reappeared in the blood.

The animal continued to lose condition and had to be destroyed.

*Cases (v) and (vi).*

These were two camels of natural infection with Trypanosome soudanense, both sent from Wad Medani.

They were both typical cases of chronic camel Trypanosomiasis in the Sudan, with sub-acute phases of the disease, during which there is a rise of temperature and Trypanosomes appear in the blood.

Both were given a course of four doses of Tartar Emetic and Picric Acid administered intravenously every other day.

The following doses were given each day :—

+½ grammes of Picric Acid (+ grammes alcoholic and ½ grammes aqueous sol.) and 50 c.c. of 4% solution of Tartar Emetic.

The blood of both camels remained free from Trypanosomes for a month, and improved in condition, but at the end of a month Trypanosomes reappeared in the blood.

*Case (vii).*

This was a case of natural infection with the Trypanosoma soudanense. It was treated with a combination of Atoxyl and Picric Acid.

6 grammes of Atoxyl in 60 c.c. of water, and +½ grammes of Picric Acid were given intravenously every other day for four doses.

Again the blood stream remained free of Trypanosomiasis for about one month, when Trypanosomes appeared in the blood.

*Summary.*

From the above, it will be seen that the treatment of equines affected with Trypanosoma pecaui and camels affected with Trypanosoma soudanense, with combinations of Tartar Emetic and Picric Acid, and Atoxyl and Picric Acid was unsuccessful.

On the other hand treatment with Picric Acid and Tartar Emetic of equines (cases (i) and (ii)) affected with Trypanosoma nanum was successful.

It is known that Trypanosomiasis of cattle, due to infection with T. congoleuse, can be treated with Tartar Emetic alone, but equines infected with congoleuse or nanum have not been successfully treated with Tartar Emetic alone.

It would therefore appear that a step forward in the treatment of Trypanosomiasis of equines affected with Trypanosoma nanum has been made by these experiments.

Encouraging results have been obtained in the treatment of animal Trypanosomiasis with "Bayer 205". I am in communication with the Bayer Co., and it is hoped to obtain a quantity of "Bayer 205" for experimental purposes.

### *Epizootic Lymphangitis.*

Tartar Emetic given intravenously was tried in the treatment of Epizootic Lymphangitis.

One donkey and three mules were subjected to the treatment. No surgical treatment was applied except daily cleansing of the ulcers with a 1% cresol solution.

Two of the mules received a course of five doses, every fourth day, each dose being one gramme of Tartar Emetic in the form of a 2% solution.

One mule and one donkey received the same, but every third day.

The treatment was unsuccessful, no improvement being noticed.

Unsuccessful attempts at the cultivation of the *Cryptococcus farciminosus* were made on the following media:—

- (a). Horse serum glucose Glycerine agar (Bierbaum).
- (b). Horse dung glucose agar with macerated lymphatic gland. (Negri and Bouquet).
- (c). Solid serum.
- (d). Sabouraud's medium.

One case of Epizootic Lymphangitis was successfully treated surgically by total excision of the lymphatic glands and vessels affected. The horse was still at work in the Mounted Infantry, Khor Shambat, over 10 months after the operation.

### *Infectious Pleuro-pneumonia of Goats.*

A summary of the work on this disease only is given, a full account will be written later.

### *Etiology.*

The etiology of this widely spread disease has not yet been determined. Van Sacehem, working recently on this disease in Ruanda, states that a cocco-bacillus of the pasteurella group is the cause of the disease, and that he has been able to produce the disease by inoculation of healthy goats with subcultures of the cocco-bacillus.

I have been able to isolate a *Pasteurella* from four cases of the disease, but inoculation of these subcultures into goats subcutaneously only produced a slight local reaction.

It is probable that these pasteurellae are only secondary factors in the causation of this disease.

In the investigation of the etiology of this disease, the following inoculations were carried out. All the goats used for these experiments were healthy, half-grown goats in good condition.

*Goat No. 5.*

17-5-22. Cotton swabs soaked in the nasal discharge from goat No. 4, an acute case of Infectious Pleuro-pneumonia, were pushed in the nostrils of this goat. Daily observations of temperature and condition were made.

1-6-22. On this day i.e. the 16th. day after infection, the temperature rose to 106°F. The goat stopped eating and was lying down the whole day. Respirations were slightly accelerated but otherwise there were no symptoms of pleurisy or pneumonia.

2-6-22. Maximum temperature 107°6F.

3-6-22. „ „ 106°6F.

4-6-22. „ „ 105°2F. Destroyed.

During these four days the goat ate very little, and rapidly lost condition, but on the fourth day appeared to be improving a little.

Post-mortem. A slight excess of pericardial fluid (1 oz). Lungs and pleura normal.

*Goat No. 12.*

22-6-22. Inoculated with 2 c.c. of pleuritic fluid from an acute case of Infectious Pleuro-pneumonia (goat 11) into the right lung.

27-6-22. Temperature 107°F. Very dull. Loss of appetite. Respirations slightly accelerated.

28-6-22 to 30-6-22. Temperature 107°F.

1-7-22. Temperature 106°F. Destroyed.

Post-mortem. Right lung normal. Right pleura contained about 2 oz. of clear fluid. Left lung, pleura and pericardium normal.

*Goat No. 13.*

22-6-22. Inoculated into right lung with 2 c.c. of a suspension in sterile salt solution of a scraping from the cut surface of a hepatised lung from an acute case of Infectious Pleuro-pneumonia (goat 11).

27-6-22. Temperature 107°F., with symptoms of acute Pleuro-pneumonia. Temperature remained at 107°F until 1-7-22, when it was destroyed. During these four days the goat ate very little and rapidly lost condition.

Post-mortem. Right lung: practically the entire lung was in a state of red hepatisation, with a centre of commencing grey hepatisation. Right pleura: about 4 oz. of a slightly turbid fluid. A quantity

of oedematous deposit in the anterior mediastinum. Left lung: pleura and pericardium normal.

*Goat No. 16.*

6-7-22. Inoculated into right lung with 3 c.c. of citrated pleuritic fluid, from an acute case of Infectious Pleuro-pneumonia (goat 14), which had been passed through a porcelain filter. (Berkfelt).

|           |         |             |         |
|-----------|---------|-------------|---------|
| 22-7-1922 | Maximum | temperature | 104°2F. |
| 23-7-     | „       | „           | 105°2F. |
| 24-7-     | „       | „           | 107°F.  |
| 25-7-     | „       | „           | 107°2F. |
| 26-7-     | „       | „           | 107°6F. |
| 27-7-     | „       | „           | 107°4F. |
| 28-7-     | „       | „           | 107°2F. |
| 29-7-     | „       | „           | 107°F.  |
| 30-7-     | „       | „           | 105°F.  |
| 31-7-     | „       | „           | 104°F.  |
| 1-8-      | „       | Normal      |         |

During the period of fever the goat was very dull, lying down. Ate very little. Respirations slightly accelerated but no symptoms of Pneumonia or Pleurisy. The rise of temperature commenced on the 16th. day after inoculation.

The goat was kept under observation for six weeks and destroyed. Post-mortem. Lungs, pleura and pericardium normal.

*Goat No. 17.*

6-7-22. Inoculated into right lung with 2 c.c. of a suspension in sterile salt solution of a scraping from a hepatised lung of an acute case of Infectious Pleuro-pneumonia (goat 14). Before the inoculation the suspension was well shaken and then passed through a porcelain filter. (Berkfelt).

|            |         |             |         |
|------------|---------|-------------|---------|
| 22-7-1922. | Maximum | temperature | 103°4F. |
| 23-7-      | „       | „           | 105°F.  |
| 24-7-      | „       | „           | 103°2F. |
| 25-7-      | „       | Normal.     |         |

This was a very slight reaction, but it occurred on the 16th. day after the inoculation. This goat was kept under observation and then destroyed.

Post-mortem. Lungs, pleura and pericardium normal.

From these experiments the following conclusions are suggested:

1. That Infectious Pleuro-pneumonia of goats is caused by an ultra-visible virus (see goats 16 and 17).
2. That the lung lesions are due to a secondary invader, probably a *Pasteurella*.

3. That the period of incubation is about 16 days.

4. That the ultra-visible virus can and does cause a febrile condition without the formation of lesions in the pleura and lungs (see goats 5, 12 and 17). Observations on natural outbreaks of the disease in the field supports this theory.

5. That the lesions in goat 13 were due to the secondary invader, as the period between the inoculation of the infective material and the appearance of the symptoms was too short to be caused by the ultra-visible virus. This suggestion is supported by the results obtained with goat 17. In this case filtered suspension of infected lung scraping was injected and produced no lesions, although later i.e. after 16 days, there was a temperature reaction.

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## PERSONNEL.

I wish to again bring forward the question of a trained laboratory assistant, and request that one be appointed.

Major Jarvis and I gave our reasons in the report on the pan-African Veterinary Congress, for thinking that a trained assistant was necessary.

One has only to compare the Staff of this laboratory with that of any other Veterinary laboratory in the world, and also with the Staffs of the Wellcome Tropical Research Laboratories, not omitting to take into consideration the scope of the work and the economic aspect of the case, to see that it is advisable to employ a trained laboratory assistant.

Mohamed El Hassan, the native laboratory assistant, has carried out his duties in a very earnest manner.

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## EQUIPMENT.

This has been kept up to date, a new electric centrifuge having arrived recently from England.

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## SPECIMENS.

Two hundred and three slides of interesting specimens have been made and sent to the Royal Army Veterinary School, at Aldershot for class demonstration purposes. The slides used have been replaced by the Royal Army Veterinary School.

I would suggest that a copy of this report be circulated to the Veterinary Inspectors and Officers, so that they will know the numbers of cases of various diseases diagnosed and the work which has been done, and in the hope that it may stimulate interest in the collection of pathological material for the laboratory, and also in veterinary survey work.

In conclusion, I wish to acknowledge the assistance obtained from Major R. G. Archibald, D.S.O., Captain N. T. Whitehead, M. C. and Mr. A. Marshall of the Wellcome Tropical Research Laboratories.

I have the honour to be,

Sir,

Your obedient servant,

(Sd.) R. H. KNOWLES,

Bimbashi,

Veterinary Bacteriologist,

Sudan Government.

## APPENDIX 2.

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

Sir,

We have the honour to present a joint report on our visit to the pan-African Veterinary Conference held at Nairobi, Kenya Colony, from April 6th to April 14th 1923.

The proceedings of the Conference were taken down verbatim. They are being printed, and copies will be forwarded to you in due course. It will therefore appear redundant to present here a lengthy report on the discussions on animal diseases and stock economics, but we wish to draw attention in this report to questions arising from the discussions which might be considered to have a special bearing on veterinary interests in the Sudan, and to include such subjects which were not actually discussed at the Conference.

### 1. CONTAGIOUS BOVINE PLEURO-PNEUMONIA.

The most interesting subject, from our point of view, in connection with this disease is that of protective inoculation.

At the Veterinary Pathological Laboratory of Kenya Colony, the question of the manufacture of an artificial vaccine, as distinct from the field virus (lymph from an actual case of the disease) as used in the Sudan, has been extensively investigated, and the Veterinary Pathologist of Kenya is of opinion that the method of vaccinating against Contagious Bovine Pleuro-pneumonia is greatly superior to the old method.

Captain Knowles had the opportunity of working in the Veterinary Laboratory of Kenya, and studying closely the technique employed in the production of this vaccine.

Experiments will be started at Khartoum as opportunity occurs for the preparation of this vaccine, to test its suitability for application in the Sudan.

A difficulty which presents itself in the Sudan is that, for the cultivation of the virus and the preparation of the vaccine against Contagious Bovine Pleuro-pneumonia, Martin's broth is necessary.

Martin's broth is made from fresh pigs stomachs which would be difficult to obtain in Khartoum. It is thought that this difficulty can be overcome by asking the Veterinary Laboratory at Cairo to carry out the first stage of the preparation of Martin's broth, and to send it to Khartoum in that state.

## 2. RINDERPEST.

We are of opinion that the present "serum alone" method of protective inoculation employed in the Sudan is the most suitable under the present conditions.

On the other hand, should a large concentration of cattle occur, as conceivably might in the Gezirah, we would recommend that the double inoculation (virulent blood and serum) should be employed. This would be particularly applicable to large numbers of working oxen amongst which an acute epidemic would bring about a stoppage of work just at a critical stage of land cultivation.

It might be thought that very acute epidemics of this disease would not occur in the Sudan where the disease is endemic, but this is not so, as acute epidemics occurred in 1911 in Kenya, where the disease had been endemic for 20 years, involving the loss of 90% of the cattle in many areas.

In the Sudan the difficulty of the production of virulent blood necessary for the double inoculation suggests itself. Recent investigation has been carried out on this subject, and it would appear that the blood of sheep inoculated with Rinderpest blood can be used for this purpose.

The inoculated sheep are easily transported to the place where required for the double inoculation, and their fresh citrated blood then employed as the virus.

Further investigations are, however, required on this subject, and it is proposed to carry out investigations at Khartoum, especially to work out the details of technique required to suit local conditions.

We might briefly mention one or two points in connection with the establishment of an Institute for the Production of anti-rinderpest serum.

We are aware that it is not considered economic and advisable to establish such an Institute at present, but it is quite possible that such an Institute will be necessary to the Sudan in the future.

It is conceivable that the Institute in Cairo may be closed, as conditions in Egypt make it possible to completely eradicate the disease, as has been done throughout the Union of South Africa, with the consequent closing of the serum Institute in that country.

One of the chief difficulties in the Sudan in the working of a serum Institute has been the obtaining economically of susceptible cattle. This difficulty could be overcome by some of the following possibilities :-

(a). Recent work by Poole in India has shewn that partially susceptible cattle might be employed,

(b). Cattle could be bred from selected parents on an isolated farm with precautions against the introduction of the disease, so that the progeny bred there would be susceptible.

(c). If the cattle in areas such as the Gezirah were protected as we recommended by double inoculation against Rinderpest, the young stock in these areas could be employed for the production of anti-rinderpest serum. This is the method used in Kenya. The half-bred cattle from the settlers farms are used, as all the cattle belonging to the settlers are protected by the double inoculation method.

Experiments might prove that the young stock bred at the Dairy farm in Khartoum would be suitable for the purpose of serum production.

We had the opportunity of studying the technique of the production of anti-rinderpest serum at the institute at Kenya.

### 3. EAST COAST FEVER.

This disease has not been reported in the Sudan, although it has been reported by Mason as occurring in Sudanese cattle exported to Egypt.

It is hardly conceivable that a few cases of this disease could occur, as a reference to the history of East Coast Fever in Africa shows that on its first introduction into a country the mortality amongst the cattle is enormous.

It first broke out in East Africa in 1900, and rapidly spread. It appeared in the Transvaal in 1905, and in that year 50,000 cattle died of the disease in that country.

It exists now in all East and South African countries and immense sums of money are now being spent on its control.

Our more recent knowledge would suggest that the cases reported as East Coast Fever from the Sudan were cases of Tropical Piroplasmosis, caused by the *Piroplasma annulatum*, which is reported to be very common in Egypt. The histology and morbid anatomy of these two diseases are very similar.

It appears to us, however, that East Coast Fever is a very important disease to the Sudan, as in Uganda the disease has spread Northwards and now exists on the border between Uganda and the Sudan. One has therefore to anticipate the possibility of its spread Northwards into the Sudan. We take this opportunity of offering the suggestion that a veterinary survey of the Southern border of the Sudan be carried out,

#### 4 ANTHRAX.

Anthrax is increasing throughout Africa. In South Africa this disease causes more loss than any other disease. It is therefore conceivable that the Sudan will not long enjoy its comparative immunity to Anthrax.

Extensive investigations into the preparation of a vaccine against this disease are being carried out in South Africa, and in East Africa, and a very satisfactory immunising vaccine has been obtained. One of us had the opportunity of studying the technique of the production of this vaccine, and strains of the attenuated cultures used in vaccine production were kindly supplied to us by the Veterinary Pathologist of Kenya.

Here again it is conceivable that in future it will be necessary to vaccinate all cattle against Anthrax in the Gezirah area, and it is proposed to carry out experiments to test the efficacy of the vaccines in Khartoum.

#### 5. HORSE SICKNESS.

It is encouraging to learn that Sir Arnold Theiler, the head of the Veterinary Research Division in the Union of South Africa is still devoting his energies to the investigation of a method of protective inoculation against this disease, and that he is able to report an improvement in his method of protective inoculation.

The stage has, however, not been reached when the protective inoculation is of use for application in the Sudan, as the mortality from the vaccination itself is too high.

We would take the opportunity of here recording the method adopted in Kenya in dealing with Horse-sickness in areas where it is known to occur yearly.

During the dangerous season the temperatures of all horses are taken night and morning, so that the disease can be detected in its initial stages.

Any horses shewing a rise of temperature are immediately put under treatment. This consists of giving Magnesium Sulphate and Sodium Bicarbonate three times daily, and continuous cold douches (preferably with iced water) until the temperature is reduced. This method of treatment has been reported to give very satisfactory results, although no statistics in its support are available.

## 6. PATHOLOGICAL RESEARCH.

It is evident from the foregoing remarks of this report that the countries in Africa are keenly alive to the economic importance of Veterinary Research, and that considerable sums of money are devoted to the work.

I attach the estimates for the Research Division of the Veterinary Service of Kenya.

Five Veterinary Officers and nine European Laboratory Assistants are employed.

The live stock has a lower economic value than that of the Sudan, as there is no export trade of cattle.

In Uganda a new Pathological Veterinary Laboratory is just being built, commencing with a personnel of one Veterinary officer, two European Assistants, and one Clerk.

The Veterinary Laboratory of South Africa is the largest in the world.

Veterinary research is most important in the Sudan, and there is a large field for investigation. We therefore recommend that the Veterinary Laboratory should have one trained European Laboratory Assistant, and suggest that the matter should receive attention in this year's budget. Also that facilities for a certain amount of extension of the Veterinary Laboratory should be afforded as the necessity arises.

## 7. VETERINARY SURVEY.

The Veterinary Departments of the countries in East Africa and Uganda have an ambitious policy of eradicating the three great animal scourges of their countries. These are Rinderpest, Contagious Bovine Pleuro-pneumonia and East Coast Fever. With this object in view, the Veterinary Department in Uganda is completing its veterinary survey of their Northern border, and Mr. Montgomery, the Veterinary Adviser to this group of countries, has requested information as to the incidence of these diseases on the Southern border of the Sudan.

The importance of the possession of this knowledge has been referred to under the heading of East Coast Fever.

We therefore offer the suggestion that a Veterinary Survey of the Southern border of the Sudan should be carried out and that this should be done in co-operation with the Veterinary Department of Uganda.

In conclusion, we are convinced that our visit to Kenya, and the opportunity presented of discussing the problems of epidemics and stock economics, have been of great benefit in increasing our knowledge of the questions.

We had the opportunity of working at the Veterinary Laboratory of Kenya and of gaining much valuable information.

We take this opportunity of expressing our thanks to the Government of Kenya, and to the Veterinary Officers of that Government for the kind way in which they extended their hospitality to us, and for the opportunities for observation afforded to us.

We have the honour to be,

Sir,

Your obedient servants.

(Sd.) B. A. JARVIS, Kaimakam,  
*Veterinary Inspector, Sudan Govt.*

(Sd.) R. H. KNOWLES, Bimbashi,  
*Veterinary Bacteriologist, V. D. S. G.*

Khartoum, 23rd. May, 1923.







