

Transmission of Amakebe by means of *Rhipicephalus appendiculatus*, the Brown Tick.

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THAT the disease in calves of Uganda called Amakebe is identical with East Coast fever had to be concluded after the presence of the so-called blue bodies of *Koch*, plasma bodies, had been demonstrated in the internal organs; these bodies represent certain stages—agametes, agamonts, and gamonts—in the life cycle of *Theileria parva*. Accordingly it had to be expected that amakebe could be transmitted by means of such ticks which act as hosts for this parasite. The most common tick of Uganda is the brown tick, *Rhipicephalus appendiculatus*, which has been proved in South Africa to be the principal transmitter of East Coast fever.

When in Uganda in 1909 an arrangement was made between *Mr. Hutchins*, the Government Veterinary Surgeon of Uganda, and myself, to place adult brown ticks, collected as nymphae from calves suffering from amakebe, on susceptible calves in my Laboratory in Onderstepoort; these ticks were to be collected by *Mr. Hutchins* as opportunity occurred.

On several occasions *Mr. Hutchins* forwarded me brown ticks which he had placed in a glass tube; in every instance they arrived alive and in good condition, having moulted in transit from the nymphal into the adult stage. The first two lots of ticks failed to transmit the disease, the nymphae probably having been collected off calves which had recovered from the disease, when the blood no longer contained the pathogenic parasite. Experiments with the last lot were successful, as will be shown hereunder.

EXPERIMENT TO NOTE WHETHER BROWN TICKS COLLECTED AS NYMPHAE IN UGANDA FROM A CALF SUFFERING FROM AMAKEBE WILL TRANSMIT THE DISEASE TO SUSCEPTIBLE CALVES IN THE TRANSVAAL.

1. *Bull calf* 1118, born and reared in Onderstepoort, was infested on 23rd January, 1911, with ten adult brown ticks, forwarded by *Mr. Hutchins* from Entebbe, and received here on 4th January, 1911. All ten ticks were found attached to the calf the following day.

The calf showed almost immediately a rise of temperature, developing into a definite curve, during which the so-called marginal points (*Anaplasma marginale*) were noted to be present in great numbers; this curve was typical of the disease anaplasmosis, and the blood lesions found were those of an oligocythaemia (anisocytosis, poikilocytosis, polychromasia, and basophilia) which followed as a sequel. The temperature gradually dropped, and the calf was found dead on the 22nd day after tick infestation. An examination of the lymphatic glands was made on the 17th day, and a negative result was registered.

Post-mortem Examination on Calf 1118.

The condition was fair. Rigor mortis was present. Tympanitis was noted. The lungs were partially collapsed and showed some atelectatic areas. On section a slight oedema became noticeable; in the trachea was some foam. The bronchial lymphatic glands were swollen, the mediastinal glands were normal.

The pericardium contained some clear liquid. The blood in the ventricles was well coagulated. The endocardium of both auricles and ventricles was normal. The liver was enlarged, and had a mottled appearance due to pale small areas; the parenchyma was soft. The periportal lymphatic glands were enlarged. The bile was yellow and viscid. The spleen was enlarged, measured 30×10 cm.; the pulp was softened, jam-like; the trabeculae were indistinct. All four stomachs were normal.

The mucosa of the jejunum was slightly thickened and oedematous; that of the caecum and colon was slate-coloured and contained a small number of disseminated parasitic nodules.

The kidneys were pale, the capsule was easily detachable, and the urine was clear. The exterior lymphatic glands were swollen.

The microscopical examination of the blood proved the absence of any parasites. In the lymphatic glands the so-called plasma bodies of *Koch* were found and described as rather small, viz., agametes and young agamonts (according to *Gonder*);* the same observation was made in preparations of the spleen.

Diagnosis : East Coast fever.

2. *Calf* 1143.—On the 14th February, 1911, this calf was infested with ten adult brown ticks of the same lot, obtained from Uganda. On 15th February seven of these ticks were found attached. After an incubation time of thirteen days a typical fever curve ensued, which, however, never reached high records. The animal died on the 24th day.

On the 15th day after the tick infestation both blood and glands were examined, and the result was negative. The examination on the 17th day revealed rare agamonts in the prescapular glands, but no parasites in the blood; on the 20th day both agamonts and gamonts were found in the lymphatic glands in a fair number and *Theileria parva* was frequently met with in the red corpuscles.

Post-mortem Examination of Calf 1143.

Rigor mortis was present. The condition was rather poor. All external lymphatic glands were very much swollen. The lungs had not collapsed, there were some patches of red hepatization in right anterior lobe and a small area in the left lobe. The lesions of hyperaemia and oedema were pronounced. There was a fibrinous coagulum in the trachea.

The bronchial and mediastinal lymphatic glands were enlarged and oedematous.

The heart contained coagulated blood. The endocardium of both auricles and ventricles and the myocardium were normal.

The liver was enlarged, the margins were rounded, the colour was reddish brown, the parenchyma was rather soft.

The bile was green, thick, and viscid.

The spleen measured 30×9 cm.; the pulp was soft and jam-like, and the trabeculae were indistinct.

The mucosa of the fourth stomach was slate-coloured, there were a few small haemorrhagic ulcers.

The mucosa of the jejunum showed longitudinal slate-coloured streaks.

The mucosa of the ileum was slightly thickened and dotted with punctiform haemorrhages.

The mucosa of the caecum was thickened, the blood-vessels were injected, and there were patches of hyperaemia.

The mucosa of the colon was slightly swollen and slate-coloured.

* Report of Government Veterinary Bacteriologist, 1909-10.

The mesenteric glands were much enlarged and rather soft.

The kidneys were rather pale, the boundary zone of the right kidney was slightly hyperaemic, the capsule was easily detachable.

The bladder contained clear yellow urine.

Microscopical Examination.—*Koch's* granules were found frequently in the lymphatic glands and spleen.

Diagnosis: East Coast fever.

Epicrisis.—The infestation of two calves with adult brown ticks collected as nymphae in Uganda from a calf suffering from acute amakebe was succeeded in both instances by a disease and death, which could be diagnosed as East Coast fever from the appearance of the so-called *Koch's* blue bodies or plasma granules, which represent, according to *Gonder*, the agametes, agamonts, and gamonts in the life cycle of *Theileria parva*. The *post-mortem* examination corresponds with amakebe of Uganda, and with what is known as East Coast fever. The fact that the blood of the first calf did not show the parasites (*Theileria parva*) is nothing unusual in amakebe. The agamonts were in the glands, no gamonts had yet developed, and accordingly no gametes of *Theileria parva* could be found. This calf apparently died at the beginning of the disease, the animal being weakened by the preceding anaplasma infection. The second calf represented in every respect a typical case of East Coast fever.

Conclusion.—Amakebe of Uganda is identical with East Coast fever of South Africa, and is transmitted by the tick *Rhipicephalus appendiculatus*. This conclusion corroborates that obtained by the Sleeping Sickness Commission of the Royal Society of 1909.