

experiment shows that the formation of toxin begins at a comparatively early time in the cadaver, an observation that is in conformity with that of Walker. It is, however, somewhat surprising to note that the same spleen did not prove to be toxic after the putrefaction had further advanced. There being no reason to accept that tollie 4372 was not susceptible for the toxin, it may be concluded that under certain conditions a carrion may lose its toxicity, probably by the further process of decomposition and dissolution. It is interesting to note that the toxicity of organs of a carcass may be established as early as twenty hours after death, and that in this instance the toxogenetic bacteria which produced toxicity could have entered the organs only from the alimentary canal since the carcass was not opened before twenty hours had elapsed after death.

EXPERIMENT NO. 16.—DRENCHING OF CATTLE WITH CRUSHED BONES OR DRY PUTRID FLESH FROM THE CARCASS OF A DOG.

NOTE.—The object of the experiment was to ascertain whether the putrid carcass of Carnivora would produce lamsiekte, it having been stated that cattle had been seen dying from this disease after eating the carcass of a jackal.

(a) **DUN AND WHITE TOLLIE 4108.**—Born at Armoedsvlakte on the 18.12.17.

Treatment: 30.5.19: Drenched with 12 oz. crushed bones from the carcass of a dog.

Result: 2.6.19: This morning the tollie was found in sterno-costal position, with the point of the tongue between the lips, protruding about one inch. Salivation was present. Food was refused. The flanks were hollow. Subsequently the tollie rose and was able to stand. A short while later it went down and took up the sterno-costal position, with the head doubled back on the right flank. In the afternoon the tollie was unconscious, taking no notice when forced to rise. The tongue was still between the lips, and the ears were drooping, the eyes closed, the respiration was hurried. Examination of blood-smears gave negative results. The temperature was normal on the day following the drenching. 3.6.19: The tollie died during the night.

Diagnosis of the Disease.—Lamsiekte (*vide* post-mortem report in appendix, page 915).

CONCLUSION.—The disease appeared three days after drenching and lasted for a little more than twelve hours. It thus represented a peracute case. Paresis of the locomotor system and paralysis of the tongue were the striking symptoms.

(b) **BLACK AND WHITE OX 3448.**—Arrived at Armoedsvlakte from Pretoria on the 28.4.17. It had been used on the 13.5.19 in a previous experiment, with negative results. It had also been drenched with crushed bones, the flesh of which had been removed when still fresh.

Treatment: 3.6.19: Drenched with 4 oz. of dry flesh from the carcass of the same dog the bones of which had been used for drenching tollie 4108 (*vide* previous animal).

Result: 5.6.19: The ox was reported to have eaten its ration on the evening of this date. 6.6.19: In the morning the ox was found standing and attempting to eat, pushing the head into the food (bran and crushed mealies), which stuck to the muzzle and nostrils. Subsequently, the animal was salivating profusely, keeping the mouth

slightly open and moving the mandible very slowly. At noon it was standing; the tip of the tongue was between the lips, and protruding slightly. In the afternoon the ox was in sterno-costal position, with the head extended forward. It was salivating; the tongue was protruding. The eyes were staring; the lids were moved only once, viz., on the occasion when the animal was approached. The temperature of this animal was normal during the period of observation. Examination of blood-smears gave negative results. 7.6.19: The animal was found dead this morning.

Diagnosis of the Disease: Lamsiekte (for post-mortem report *vide* appendix, page 914).

CONCLUSION.—The disease appeared about two days after drenching and lasted for less than forty-eight hours. It thus represented an acute case. Paresis of the tongue, of the mandible, and of the locomotor system were the striking symptoms.

(c), (d), (e) TOLLIES 4099, 4050, AND 4087.

(c) 4099 DUN AND WHITE TOLLIE.—Born at Armoedsvlakte on the 5.12.17.

(d) 4050 DUN TOLLIE.—Born at Armoedsvlakte on the 12.9.17.

(e) 4087 RED TOLLIE.—Born at Armoedsvlakte on the 23.10.17.

Treatment: 25.6.19: Each drenched with 1 oz. of putrid, dry bones collected from the carcass of a dog killed for the purpose. The drenching was to be repeated daily in the case of tollie 4099, every second day for tollie 4050, and every third day for tollie 4087. The object of the experiments was to note at the same time whether cattle dosed with small quantities of carrion distributed over a long period would contract the disease, and, if so, in which form it would appear. The experiment would thus be something like an approach to natural conditions, the cattle picking up bones in the veld at various times as had been noted in our observations.

Results:—

(c) TOLLIE 4099.—8.7.19: In the morning the tollie was noticed to be ill. It was frothing at the mouth and the tongue was frequently moved in and out, licking the lips, muzzle, and nostrils. Saliva was hanging down in strings. The tollie was not feeding; it was standing, and when let loose, it walked about. It approached the water-trough, moved the tongue about in the water, and subsequently drank for an unusually long time. The water was observed to pass down the oesophagus. On examination, the blood was found to be negative. 9.7.19: This morning the tongue protruded from between the lips for about an inch or more. The tollie was salivating profusely. It had made an attempt to eat the bran and mealie ration. The food was sticking to the muzzle and nostrils. The tollie was standing and moving about freely, and the eyes were fairly bright. It was treated with an intra-jugular injection of acacia-gum, but died during the injection. The temperature recorded since the 25.6.19 was regular.

Diagnosis of the Disease: Lamsiekte (*vide* post-mortem report in appendix, page 913).

CONCLUSION.—Tollie 4099 had received 12 oz. crushed bones between the 25.6.19 and the 7.7.19. At the commencement, the disease showed itself as a paresis of the tongue thirteen days after the first drenching. Paresis of the locomotor system was absent. Death was probably hastened by the infusion.

(d) TOLLIE 4050.—11.7.19: Two days ago this animal had been noticed to be slightly salivating, but this symptom disappeared. To-day the tollie was noted to be ill, not feeding and frothing very much at the mouth. The tongue was kept moving all day long. The place where the tollie was standing was very wet; enormous quantities of saliva had been discharged. Examination of blood-smears gave negative results. 12.7.19: The animal was standing and was still salivating profusely; the saliva was running in a little stream and collected in pools on the floor. The tollie kept the tongue moving backwards and forwards between the lips, so that the mouth was constantly open. The movements at times were accompanied by nodding of the head. Mucus was also running from the nostrils. The muzzle and nostrils were soiled with bran and mealie-meal, indicating that the animal had attempted to eat. The flanks were deeply fallen in; the eyes were sunken. In the afternoon the animal was placed in the shed, where it took up the sterno-costal position. 13.7.19: The tollie had moved from one end of the shed to the other since last night, and this morning it was in sterno-costal position, with the tongue hanging out for about one inch and saliva dribbling from the apex. No movements of either tongue or mandible were noted. The tollie died in the afternoon. Recording of temperature was commenced on the 25.6.19. The temperature was somewhat irregular on the 2nd and 3rd July, 1919, but no unusual exacerbation or remission was noted.

Diagnosis of the Disease: Lamsiekte (*vide* post-mortem report in appendix, page 912).

CONCLUSION.—From the 25.6.19 to 10.7.19 the tollie had received 7 oz. of putrid bones. The disease showed itself sixteen days after the first drenching, the symptoms being paralysis of the tongue and of the pharynx. Paresis of the locomotor system was absent.

(e) TOLLIE 4087.—11.7.19: The tollie was lying down and listless, having refused to feed in the morning. It was salivating slightly. In the afternoon it was found with the mouth slightly open, the mandible was hanging, the tip of the tongue was between the lips and was moving backwards and forwards all the time. Examination of a blood-smear gave negative results. 12.7.19: The tollie was left in sterno-costal position, lying quietly, with head doubled back on to the off side. When pinched in the tail, it hardly responded and was unable to rise. The mouth was closed. Slight salivation was present. 13.7.19: The tollie was still in left sterno-costal position with head turned back. It was lying quietly. The surface of the body was still fairly warm. The tollie died in the afternoon after an intra-jugular infusion of magnesium sulphate. This infusion probably hastened the death. The temperature of this tollie was recorded from the 25.6.19. Although the evening exacerbations never reached 104° F., there was a disturbance in the curve from the 30.6.19 to the 6.7.19, indicated by high evening remissions. After the latter date the temperature was normal.

Diagnosis of the Disease: Lamsiekte (*vide* post-mortem report in appendix, page 911).

CONCLUSION.—The tollie had received 6 oz. of crushed bones since 25.6.19. The last dose was given on the 11.7.19. The disease showed itself as a paresis of the mandibula, of the tongue, and of the locomotor system on the sixteenth day after the first drenching.

SUMMARY OF OBSERVATIONS.—All five head of cattle drenched with either bones or dry flesh from putrid carcasses of dogs contracted lamsiekte. The disease showed itself in the first two instances two and three days after drenching respectively. Of the three cases in which the bones were administered at different intervals, the tollie that received the bones daily showed the disease first. The symptoms were those of paresis of the organs of deglutition. In the last two tollies that received bones every second or third day the disease appeared three days later. In the tollie that received the smallest quantity of bones symptoms of locomotor disturbance were most pronounced. It would appear that a large amount of putrefactive material given as a single dose produced the disease more rapidly than an equal or greater quantity spread over a number of days. The disease was diagnosed as lamsiekte and was in every respect identical to that naturally contracted. It thus appears that in carcasses of dogs to the toxin which causes lamsiekte is also produced.

EXPERIMENT No. 17.—DRENCHING OF CATTLE WITH ROTTEN MATERIAL TAKEN FROM THE CARCASSES OF LAMBS.

(a) **RED COW 2756.**—Arrived from Bestersput, Orange Free State, on 11.8.16 and had been running on the veld until 2.9.19, when she was stabled and injected, with negative results, with a culture of bacteria obtained from blow-fly larvae.

Treatment: 19.9.19: Drenched with 8 oz. milled bones collected from carcasses of several lambs.

Result: 21.9.19: The cow developed symptoms of illness since the previous night, showing a distinctly stiff gait; she also showed slight salivation. She died early this morning.

Diagnosis: Lamsiekte (*vide* post-mortem report in appendix, page 925).

CONCLUSION.—The cow developed an acute attack of illness that could be diagnosed as acute lamsiekte.

(b) **RED AND WHITE POLL BULL 192.**—Arrived from Johannesburg on 15.6.19.

Treatment: 4.9.19: Fed with 8 oz. milled bones from the carcasses of three young lambs. The lambs had rotted in the carcass Camp II and had become quite dry when used.

Result: Negative.

CONCLUSIONS.—The material taken from the rotten dry carcasses of lambs proved to be toxic in the first case and not in the second. It thus appears that toxin that causes lamsiekte can be produced in carcasses of lambs, but that not all such carcasses are toxic.

EXPERIMENT No. 18.—DRENCHING OF A HEIFER WITH MATERIAL OBTAINED FROM A DEAD OSTRICH UNDERGOING PUTREFACTION.

(a) **RED AND WHITE HEIFER 121.**—Arrived from Pretoria on the 30.3.19 and on the 2.9.19 she was used in an experiment with negative results.

Treatment: 2.10.19: Drenched with 1 lb. crushed bones and flesh taken from the carcass of an ostrich found in the veld (Camp C) on the 28.9.19.

Result: 4.10.19: The heifer did not rise this morning. She showed a somewhat dry nose and a mucous discharge from the nostrils. She was turned out to graze with the cattle, where she lay down in the hospital camp. At 5 p.m. she made an attempt to rise, but was unable to get on to her feet. When lifted on to the feet she walked

into the stable and commenced to feed from the trough. 5.10.19: The heifer was found in right sterno-costal position and was apparently unable to rise. The ration of bran was still in the trough. When subsequently forced to rise the heifer did not make the slightest attempt to do so. The muzzle was sprinkled with dew drops. The animal carried the head well and was attentive. She was drenched with 50 grammes salol in a litre of water. Subsequently she was feeding grass which had been placed on the ground. In the afternoon she was still down and at times seen to lick her back, throwing the head and tongue backwards. She had passed a large quantity of well-formed faeces. 5.10.19: The heifer received another dose of salol. 6.10.19: The heifer was found in the same position as yesterday; she was not able to rise. She was eating from the ground. A large quantity of faeces was evacuated since yesterday. The heifer was subsequently lifted on to the feet and was able to stand. She walked in a straggling manner and dropped down twice. The eyes were much sunken and the bony ridges were standing out prominently. 7.10.19: This morning the heifer was in left sterno-costal position with head doubled back on to the right side. She had passed soft faeces during the night. The respiration was normal. Slight salivation was present. Subsequently the heifer was lifted on to her feet and was able to stand. She then picked up food from the ground. The eyes were sunken. In the afternoon the animal was again in right sterno-costal position. She was reported to have been drinking and feeding. 8.10.19: This morning the heifer was in right sterno-costal position, carrying head and neck well and pricking the ears and shaking them when flies attempted to settle on them. She was reaching for food which was lying close by. A large quantity of faeces had been passed during the night. This was of soft consistence. The animal had lost markedly in condition during the last few days. No further changes were noted in the afternoon. 9.10.19: The heifer died during the night.

Diagnosis of the Disease: Lamsiekte (*vide* post-mortem report in appendix, page 923).

CONCLUSION.—The disease produced by the putrid flesh and bones from the carcass of an ostrich appeared two days after the heifer was drenched and lasted for about four days. It was a case of subacute lamsiekte. The experiment proves that also in the carcass of an ostrich a toxin is produced that causes lamsiekte.

EXPERIMENT NO 19.—DRENCHING OF A HEIFER WITH BONES AND FLESH FROM THE CARCASS OF A STEENBOK FOUND ON THE VELD.

(a) **RED HEIFER 4528.**—Arrived from Pretoria on 23.1.19 and used on 12.3.19 in a drenching experiment with negative results.

Treatment: 12.9.19: The animal was fed with 8 oz. milled bones and flesh from a steenbok carcass, which had been found on the veld (C Camp). The intestines of the buck had been eaten, probably by some wild animal, and the remains had dried up. Putrefaction had set in to a slight extent only. No evidence of fly larvae infestation was noted.

Result: Negative.

CONCLUSION.—The carcass of the steenbuck did not produce the disease. It would thus appear that it was not toxic at the time of drenching. The negative result does not exclude the possibility of the carcass of a steenbok being a source for the production of a toxin that causes lamsiekte.

EXPERIMENT NO. 20.—DRENCHING OF CATTLE WITH BONES AND FLESH FROM THE CARCASS OF A MIERKAT FOUND ON THE VELD.

(a) BLACK HEIFER 3507.—Arrived from Pretoria on 28.4.17. It had been used on 11.7.19 in an experiment with negative results.

Treatment: 4.9.19: Drenched with 4 oz. milled remains of a red mierkat, which had been found on the veld (C Camp) and was completely dried up.

Result: 7.9.19: The heifer was noted to be ill this morning. She refused to take food and was lying in left sterno-costal position. The mouth was kept open; at intervals it was closed only to be opened again. It would appear that the heifer could not keep the mouth closed for any length of time. The tip of the tongue was resting on the incisors. Saliva was running freely and hanging down to the ground in strings. The nostrils were filled with mucus. At midday the animal received a subcutaneous injection of 2 per cent. salol in 200 c.c. alcohol. 7.9.19: In the afternoon there was not much change in the appearance of the heifer; she was still in sterno-costal position and not feeding. The mandible was hanging slightly and saliva was dribbling from the mouth. At 4 p.m. the heifer received a subcutaneous injection of salol, 25 grammes in 250 oil; 50 grammes salol dissolved in 500 c.c. absolute alcohol were injected via the abdominal wall into the rumen. The heifer had not been eating. The faeces were soft. 8.9.19: This morning the heifer was found in left sterno-costal position with head resting on the ground. Slight salivation was present. The mouth was somewhat open. Abdominal respiration was pronounced and slightly increased in frequency. At 10 a.m. the heifer was in left lateral position with head stretched out. She was grunting slightly, the abdominal respiration was still increased and accentuated; the nostrils were moving. The heifer died in the afternoon.

Diagnosis of the Disease: Lamsiekte (*vide* post-mortem report in appendix, page 922).

CONCLUSION.—Three days after drenching with material from the carcass of a mierkat the heifer developed lamsiekte. She showed paralysis of the locomotor system and of the mandible and tongue. The disease lasted for two days.

(b) DUN TOLLIE 4328.—Born at Armoedsvlakte on 19.5.18.

Treatment: 3.6.19. and 25.7.19: Dosed with the remains of a mierkat carcass (120 grammes).

Result: Negative.

CONCLUSION.—It was possible that the quantity of 120 grammes did not contain sufficient toxin. There was no proof, however, to show that the material was really toxic. The experiment shows that the carcass of a mierkat may prove to be toxic when ingested by cattle.

EXPERIMENT NO. 21.—DRENCHING OF CATTLE WITH ROTTEN BONES FROM THE CARCASS OF A HORSE.

(a) BLACK BULL 188.—Arrived from Johannesburg on 15.6.19 and had been used on 1.9.19 in experiments with negative results.

Treatment: 13.10.19: Drenched with 1 lb. rotten bones from the carcass of a horse.

Result: 30.10.19: In the morning the bull appeared to be unwell. The muzzle was somewhat dry. Some greyish white gelatinous mucus was present in the nostrils. The horns were cool. The back was arched. The eyes were somewhat sunken and without gloss. In the afternoon the bull was found standing and chewing; the mastication of the same bolus was continued without interruption for at least five minutes and no deglutition took place. On exploration a small bolus was found at the root of the tongue. 31.10.19: The bull seemed to be better this morning, but eyes and habitus had not yet assumed the usual appearance. In the afternoon nothing particular was noted. The bull recovered.

Diagnosis of the Disease: Lamsiekte.

CONCLUSION.—Sixteen days after drenching the bull showed an illness that lasted for about two days, and which had to be interpreted as a paresis of the pharynx, the animal being apparently unable to swallow. This case represents one of lamsiekte of an unusually short duration and mild type, preceded by an unusually long incubation period.

(c) HEIFER 4763.—(Weight 201 kg.)

Treatment: Drenched on the 27.3.20 with 4 oz. rotten bones collected from the carcass of a horse.

Result: Found dead at 6 a.m. on the 3.4.20. The diagnosis of lamsiekte was made.

CONCLUSION.—Material taken from the carcasses of horses proved to be toxic, but in one case the disease produced was a mild one, notwithstanding the large quantity of rotten bones given. In the second case the material proved to be toxic, and the animal was found dead on the seventh day (peracute lamsiekte).

EXPERIMENT NO. 22.—DRENCHING OF A COW WITH THE CARRION COLLECTED FROM THE CARCASS OF A FOWL.

(a) WHITE AND RED COW 3659.—At Armoedsvlakte since 8.10.16, she had been used in a previous experiment with negative results.

Treatment: 5.7.19: Drenched with 4 oz. dry rotten flesh and bones from a fowl found near a native hut.

Result: 7.7.19: The cow was found dead this morning. She had not shown any symptoms of illness the previous day.

Diagnosis of the Disease: Lamsiekte. (Post-mortem report in appendix, page 910).

CONCLUSION.—The case corresponded with a peracute case of lamsiekte. The experiment shows that a dried rotten carcass of a fowl picked up on the "werf" of a native kraal proved to be extremely toxic and the disease so produced corresponded with a peracute case of lamsiekte. It would thus appear that also in the carcass of a fowl toxin that causes lamsiekte can be produced.

SUMMARY OF CONCLUSIONS RE TOXICITY OF CARCASSES OTHER THAN CATTLE.—Material from the carcasses of dogs, lambs, mierkat, horse, ostrich, and fowl proved to be toxic, and this fact shows distinctly that the toxin which produces lamsiekte is not dependent on the carcass of cattle. However, not all carcasses are toxic. It is possible that the climatic factor has an influence on the toxicity, since in the winter in the absence of rain and suitable temperature, putrefaction does not advance as rapidly and may even be absent.

This is clearly shown by the non-appearance of pycnosoma flies, the larvae and pupae of which are not or only rarely found in carcasses during the colder period of the dry winter and only reappear with the spring and the return of the rain. These larvae play an important rôle in the putrefactive process of a carcass, and the rapidity with which such a carcass undergoes decomposition seems to stand in direct proportion to the number of larvae present. The disease produced by the toxin originating in the carcass of different animals is identical in its symptoms to lamsiekte naturally contracted. It is thus evident that the toxin causing lamsiekte may be produced in the carcass of any animal undergoing putrefaction on a lamsiekte veld.

EXPERIMENT NO. 23.—DRENCHING EXPERIMENTS TO TEST THE TOXICITY OF BONES THAT, TO JUDGE BY SIGHT AND SMELL, COULD NOT BE CONSIDERED TO BE PUTRID IN THE STRICT SENSE OF THE WORD.

(a) **BLACK HEIFER 4550.**—Arrived from Pretoria and kraaled on the 23.1.19.

Treatment: 13.3.19: Drenched with 2 oz. (60 grammes) crushed ribs from the carcass of a bovine that had died six week previously. The ribs did not have an offensive smell. The temperature of the animal was normal during the time of observation (four weeks).

Result: Negative.

(b) **RED HEIFER 4539.**—Arrived from Pretoria on the 23.1.19 and was kraaled on the same day.

Treatment: 19.3.19: Drenched with an emulsion of 180 grammes minced ribs collected in the old carcass camp. The bones were several weeks old, but the exact age was not known.

Result: Negative.

(c) **BLACK HEIFER 4523.**—Arrived from Pretoria on the 23.1.19 and was kraaled on the same day. She had been used in a lamsiekte blood transfusion experiment on 28.1.19 with negative results.

Treatment: 25.3.19: Drenched with 1 lb. crushed bones. (These bones belonged to a lot which had been used in experiments to test cattle for craying). At the time of collection they were not considered to be toxic. They did not have an offensive smell, but they were not completely bleached. The temperature during the time of observation was normal (four weeks).

Result: Negative.

(d) **BLACK HEIFER 4526.**—Arrived from Pretoria 23.1.19 and was stabled since 28.1.19. She had been used in an experiment for blood transfusion with negative results.

Treatment: 25.3.19: Drenched with 10 oz. crushed bones from the same lot as was given to heifer 4523. The temperature during the period of observation was normal.

Result: Negative.

(e) **BLACK COW 2315.**—In Armoedsvlakte since 27.8.15.

Treatment: 17.7.19: Fed 1 lb. milled bones collected on the veld by the cattle herd. These bones were of yellow appearance and probably dug up recently. They did not have an offensive smell.

Result: Negative.

(f) **HEIFER 4028.**—(Weight 188 kg.)

Treatment: Drenched with 4 oz. bleached (cattle) bones, 27.3.20 (age unknown).

Result: 5.4.20 (6.30 a.m.): The heifer was not feeding, and looked ill. (11 a.m.): She had great difficulty in rising. 6.4.20 (6.30 a.m.): The heifer was lying down, stretched out on left side. (11 a.m.): Treated with 10 grammes ammonium carbonate dissolved in 200 c.c. normal saline solution and injected subcutaneously. After injection the breathing was somewhat accelerated. 7.4.20 (6.30 a.m.): The heifer appeared very weak. (3 p.m.): The above treatment was repeated. Before the injection the heifer lay down, stretched out, and showing very little signs of life. She then received 25 grammes of ammonium carbonate dissolved in 500 c.c. normal saline, and immediately afterwards the respiration was noticed to get much deeper. The pulse was hardly perceptible. The heart beats were tumultuous and very irregular. The heifer was lifted into the sterno-costal position, in which she remained. She looked much brighter and took interest in her surroundings. Sensibility was present. The heifer showed signs of excitation. The eyes were wild, the ears were moved about, and more than once she made an attempt to rise. (5 p.m.): The heifer was lifted. She was able to support herself on her hind legs, but not on her fore-legs. 8.4.20 (6.30 a.m.): The heifer was lying down, stretched out. She was lifted into the sterno-costal position, in which she remained. She ate the green forage given to her. (3 p.m.): Again treated with ammonium carbonate, 50 grammes dissolved in 1 litre normal saline and injected under the skin. After injection the heifer showed signs of collapse, but recovered a few minutes later. 9.4.20 (6.30 a.m.): No change. 10.4.20 (10 a.m.): Treated with 100 grammes ammonium carbonate dissolved in 1 litre normal saline. After injection the heifer licked her nose and sides, and yawned. Respiration was increased. 11.4.20 (6.30 a.m.): The heifer showed no improvement. 12.4.20 (7 a.m.): She looked somewhat brighter, and was lying in sterno-costal position and feeding. 13.4.20 (7 a.m.): No change. 17.4.20 (7 a.m.): The heifer was stretched out on one side. She was put in sterno-costal position, and started feeding. 19.4.20 (7 a.m.): No change was noted. 23.4.20 (7 a.m.): Same condition as yesterday. (3 p.m.): Treated with 500 c.c. lugol solution intravenously. No reaction. 25.4.20: No change noted to-day. 28.4.20 (7 a.m.): The heifer had lost very much in condition; otherwise no changes were observed. (11 a.m.): Treated with 500 c.c. 0.5 per cent. iron sulphate solution intravenously and 500 c.c. intraperitoneally. No reaction (2 p.m.). Killed.

CONCLUSION.—The heifer represents a case of chronic lamsiekte.

RÉSUMÉ OF OBSERVATIONS CONCERNING THE TOXICITY OF BONES THAT BY APPEARANCE AND SMELL DID NOT APPEAR TO BE TOXIC.

Six head of cattle were drenched. It is possible that in the one instance (heifer 4550) the quantity (2 oz.) was not sufficient, since the minimum quantity of bones that had in earlier experiments proved to be toxic was 4 oz. (120 grammes). In the other five cases more was given, and one case of chronic lamsiekte occurred, the animal being killed after twenty-three days of illness. The bones selected did not give the impression of being putrid. Care should be exercised in generalizing from the results obtained in these experiments. The conclusion that can be drawn from the observations is only to the effect that not all bones are toxic, and that those that do not appear to be putrid are most likely not toxic, particularly those that have no bad smell.

EXPERIMENT No. 24.—DRENCHING EXPERIMENTS WITH STERILIZED PUTRID BONES TO NOTE WHETHER TOXIC BONES BOILED FOR ONE HOUR WILL STILL PRODUCE THE DISEASE.

(a) RED BULL 195.—Arrived from Johannesburg on 15.6.19 and was used on 1.9.19 in an experiment with negative result.

Treatment: 10.10.19: Fed 1 lb. of sterilized rotten bones. The same lot of bones had produced lamsiekte in a former experiment [Experiment 12 (j)]. The bones had been boiled in an open pot for one hour.

Result: Negative.

(b) BLACK TOLLIE 191.—Arrived from Johannesburg on 15.6.19 and was used on 1.9.19 in an experiment with negative results.

Treatment: 17.10.19: Dosed (fed) with 1 lb. sterilized crushed rotten bones of the same lot as given to bull 195.

Result: Negative.

(c) LIGHT RED TOLLIE 209.—Arrived from Johannesburg on 20.6.19 and was used on 1.9.19 in an experiment with negative results.

Treatment: 17.10.19: Dosed with 1 lb. sterilized crushed rotten bones of the same lot as used for bull 195.

Result: Negative.

CONCLUSION.—Bones that had proved to be toxic were rendered harmless by boiling for one hour.

EXPERIMENT No. 25.—EXPERIMENT TO ASCERTAIN WHETHER THE TOXICITY OF BONES AND SEMI-DRY PUTRID FLESH CAN BE DESTROYED BY BOILING FOR HALF AN HOUR.

(a) BLACK HEIFER 178.—Arrived from Pretoria on the 30.3.19.

Treatment: 21.4.19: Drenched with 12 oz. minced, semi-dry, putrid flesh, and 6 oz. finely crushed bones from different carcasses, emulsionized in 3 litres of water. The material came from the carcass camp and was a few months old.

Result: In the evening this heifer was reported ill. The first symptom noted was salivation. 25.4.19: In the morning the heifer was found to be lying down, but when assisted she was able to rise, although with some difficulty. Salivation was fairly profuse. When forced to walk the heifer moved with a somewhat stiff gait in the forelegs, but lay down soon afterwards. The muzzle was dry, the nostrils were somewhat dirty, the look was staring, the coat was not so smooth as it was previously. In the afternoon the heifer was unable to rise, but was lying in sterno-costal position and the head being doubled on to the shoulder; she was capable of carrying the head after it was placed into position. The neck, however, appeared to be unsteady and weak. The heifer refused to drink and eat. 26.4.19: The heifer died during the night. The temperature was somewhat high at the commencement of the experiment, averaging about 103° F. on the evening of the 24th. On the 25th it dropped to 100.2° F., and on the evening before death it was 100.8° F. Microscopical examination of the blood showed slight basophilia and anisocytosis on 25.4.19.

Diagnosis of the Disease: Lamsiekte (*vide* post-mortem report in appendix, page 918).

CONCLUSION.—The disease appeared in less than twenty-four hours after drenching and lasted for four days. The basophilia and anisocytosis were probably the sequel of a babesiosis or anaplasmosis contracted previous to arrival.

(b) RED AND WHITE HEIFER 183.—Arrived from Pretoria on the 30.3.19.

Treatment: 21.4.19: Drenched with 12 oz. minced, semi-dry, putrid flesh and 6 oz. finely crushed bones collected from different carcasses and emulsionized in 3 litres of water. The material had been steamed in the autoclave for half an hour without pressure and was left in the autoclave during the night.

Result: 23.4.19: In the afternoon the heifer was observed with a prolapsus linguae, the tongue hanging out about 10 cm. It was slightly swollen. Much salivation was present. A diffuse swelling was noted in the mandibular space. At times the tongue was drawn in, but always dropped out again. 24.4.19: In the morning the heifer was found in sterno-costal position with the head doubled back to the right side; the tongue was hanging out. When the head was put back in its normal position it immediately fell back again to the side. The heifer died after 8 a.m. The temperature was somewhat high from the beginning, reached 103° F. and 104° F. in the evening of the 21st and 22nd respectively. Subsequently it dropped to sub-normal. Microscopical examination of blood showed anisocytosis, sequel to redwater or anaplasmosis infection.

Diagnosis of the Disease: Lamsiekte (*vide* post-mortem report in appendix, page 917).

CONCLUSION.—The disease which appeared two days after drenching was acute lamsiekte, with the symptoms of prolapsus of the tongue. Half an hour boiling is apparently not sufficient to destroy the toxin.

(c) BLACK Cow 2886.—At Armoedsvlakte since 22.10.16. Kraaled since 5.3.19.

Treatment: 24.4.19: Drenched with 1 lb. crushed bones and marrow from the carcass of ox 2519, an animal that had died on 8.4.19 of internal hæmorrhage. The material was steamed for half an hour in the autoclave. The temperature of the animal during the period of observation (fourteen days) was normal, with the exception of an exacerbation to 103° F. on three different occasions.

Result: Negative.

(d) RED Cow 3379.—At Armoedsvlakte since 25.8.16 and running with the controls since 4.3.19.

Treatment: 24.4.19: Drenched with 1 lb. crushed bones and marrow of carcass of ox 2519 (an animal that had died on 8.4.19 of internal hæmorrhage). The material was not autoclaved, and cow 3379 acted as a control to cow 2886.

Result: 26.4.19: The cow was found in sterno-costal position in the morning, but when approached she rose immediately. In the afternoon she was again found in sterno-costal position and when approached she attempted to rise, but was unable to do so, just managing to lift the hindquarters slightly. She was not feeding in the afternoon. Subsequently salivation was noted. 27.4.19: The cow died during the night. Temperature was normal during the three days of observation.

Diagnosis of the Disease: Lamsiekte (*vide* post-mortem report in appendix, page 916).

CONCLUSION.—The disease appeared two days after drenching and lasted for about one day. This being a positive case, it proved that the material supplied to cow 2886 was rendered harmless by boiling.

RÉSUMÉ OF OBSERVATIONS CONCERNING THE DESTRUCTION OF THE TOXICITY OF PUTRID BONES BY BOILING.

Two experiments were made. The control animal of the first experiment that received 12 oz. of semi-putrid bones and flesh contracted lamsiekte and died and thus proved the toxicity of the material. The second animal, drenched with the same quantity of material, but steamed for half an hour in an autoclave and left during night, also succumbed. It would thus appear that steaming for half an hour is not sufficient to destroy the toxicity of putrid material. In the second experiment the control animal promptly succumbed after drenching and thus proved the toxicity of the material given. The same material steamed for half an hour did not cause the disease in the second animal. It would thus appear that in this instance the steaming was sufficient. These observations would indicate that by steaming the toxicity of putrid material can be destroyed, but that half an hour's steaming is not always sufficient.

GENERAL CONCLUSIONS *re* BOILING OF PUTRID BONES.—Steaming of putrid bones that had been proved to be toxic for cattle rendered these non-toxic after having been exposed to boiling for one hour. Half an hour's boiling was apparently not sufficient.

EXPERIMENT No. 26.—EXPERIMENTS TO DETERMINE WHETHER A DISEASE COULD BE PRODUCED IN SHEEP AND GOATS BY DRENCHING THEM WITH PUPAE AND LARVAE COLLECTED FROM CARCASSES OF CATTLE THAT HAD DIED (1) OF NATURALLY CONTRACTED LAM-SIEKTE, (2) THAT HAD BEEN KILLED FOR THE PURPOSE OF EXPERIMENTS, (3) THAT HAD DIED OF TOXAEMIA (LAMSIEKTE PRODUCED BY DRENCHING), AND (4) BY DRENCHING THEM WITH PUPAE OF THE HOUSE-FLY FROM CARCASSES OF ANIMALS THAT HAD DIED OF DISEASE OR WERE KILLED.

(1) *Drenching with Pupae Collected from the Carcasses of Animals that had died of Naturally Contracted Lamsiekte.*

(a) SHEEP 9486.—10.12.18: *Treatment (First):* Drenched with $\frac{1}{2}$ oz. whole pycnosoma larvae from the carcass of cow 2587 that had died of lamsiekte on 22.11.18. Temperature, since drenching, was normal.

Result: Negative.

18.12.19: *Treatment (Second):* Drenched with $\frac{1}{4}$ oz. dead fly pupae and empty shells from the carcass of cow 2587 that had died on the 22.11.18 of lamsiekte. Temperature, since drenching, was normal.

Result: Negative.

(b) SHEEP 7470.—10.12.18: *Treatment (First):* Drenched with $\frac{1}{2}$ oz. fly pupae from the carcass of cow 2587 that had died of lamsiekte on the 22.11.18. Temperature, since drenching, was normal.

Result: Negative.

18.12.18: *Treatment (Second)*: Drenched with $\frac{1}{2}$ oz. dead fly pupae and empty shells from the carcass of cow 2587 that had died of lamsiekte on the 22.11.18. Temperature, since drenching, was normal.

Result: Negative.

(c) SHEEP 9618.—10.12.18: *Treatment*: Drenched with $\frac{1}{2}$ oz. whole fly pupae from carcass of cow 2587 that had died of lamsiekte on the 22.11.18. The temperature was normal after drenching.

Result: Negative.

(d) SHEEP 9980.—10.12.18: *Treatment (First)*: Drenched with 1 oz. whole fly pupae from carcass of cow 2587 that had died of lamsiekte on the 22.11.18.

Result: From the day after drenching the temperature rose and reached a maximum on the evening of the 16th, viz., 105° F. It dropped to below 101° F. in the morning of the 18th.

18.12.18: *Treatment (Second)*: Drenched with 1 oz. dead fly pupae and empty shells from the carcass of cow 2587 that had died of lamsiekte on the 22.11.18.

Result: A temperature curve resulted with exacerbations passing 105° F. in the evening and 103° F. in the morning. It lasted until 2.1.19.

Remark.—The reaction was probably due to traumatic pneumonia from which the sheep recovered.

(e) SHEEP 9867.—10.12.18: *Treatment (First)*: Drenched with $\frac{1}{8}$ oz. whole fly pupae from carcass of cow 2587 that had died of lamsiekte on the 22.11.18. The temperature was normal after the drenching.

Result: Negative.

18.12.18: *Treatment (Second)*: Drenched with $\frac{1}{8}$ oz. dead fly pupae and empty shells from carcass of cow 2587 that had died of lamsiekte on the 22.11.18.

Result: The temperature, after drenching, was irregular, and both evening and morning temperatures between the 26.12.18 and 31.12.18 were high.

Remark.—The irregular temperature was probably due to a traumatic pneumonia.

(f) SHEEP 9850.—10.12.18: *Treatment*: Drenched with $\frac{1}{8}$ oz. fly pupae from the carcass of cow 2587 that had died of lamsiekte on the 22.11.18.

Remark.—The temperature rose after drenching and finally developed into a continuous fever.

Result: The sheep died on 7.1.19. The disease was diagnosed as gangrenous pneumonia.

(g) SHEEP 7201.—10.12.18: *Treatment (First)*: Drenched with $\frac{3}{4}$ oz. whole fly pupae from the carcass of cow 2587 that had died of lamsiekte on the 22.11.18. The temperature, after drenching, was normal.

Result: Negative.

18.12.18: *Treatment (Second)*: Drenched with $\frac{3}{4}$ oz. dead fly pupae and empty shells from the carcass of cow 2587 that had died of lamsiekte on the 22.11.18.

Result: After drenching an irregular fever commenced. The evening exacerbations during the last few days reached 105° F. The sheep died of pneumonia and pleuritis on the 28.12.18.

(h) SHEEP 9875.—7.12.18: *Treatment*: Drenched with 1 oz. whole fly pupae collected from the carcass of heifer 3804 that had died of lamsiekte on the 6.11.18.

Result: The temperature, after drenching, was normal.

9.12.18: The sheep was found dead in the morning.

Diagnosis: Toxaemia (lamsiekte).

(i) SHEEP 9643.—7.12.18: *Treatment*: Drenched with 1 oz. whole fly pupae collected from the carcass of heifer 3804 that had died of lamsiekte on the 6.11.18.

9.12.18: *Result*: In the morning the sheep was noticed to be ill. It lay down frequently. 10.12.18: The sheep was found stretched out on one side. It died soon afterwards. The temperature was normal after drenching.

Diagnosis: Toxaemia (lamsiekte).

(j) GOAT 12278.—7.2.18: *Treatment*: Drenched with 1 oz. fly pupae from the carcass of heifer 3804 that had died of lamsiekte on the 6.11.18.

10.12.18: *Result*: In the evening the goat was noted to lie down very frequently, but no other symptoms were noted. 11.12.18: The goat again showed a normal appearance. 19.12.18: The goat was unable to rise. 23.12.18: The goat was walking with difficulty and lying down most of the time. 27.12.18: The goat was visibly improving. The temperature was normal all the time subsequent to drenching.

Diagnosis: Toxaemia (lamsiekte).

CONCLUSION.—The goat developed lamsiekte that resembled the disease observed in cattle.

(k) GOAT 12280.—7.12.18: *Treatment*: Drenched with 1 oz. whole fly pupae from the carcass of heifer 3804 that had died of lamsiekte on the 6.11.18.

10.12.18: *Result*: The goat had been unwell since the previous day, lying down rather more frequently, and not feeding well. To-day it was lying down most of the time, and when rising, signs of stiffness could be noted. 11.12.18: The goat showed symptoms closely resembling those of lamsiekte as observed in cattle. It was lying all the time, but could still rise when forced to do so, although with difficulty. When walking marked muscular weakness was present; after walking for a few yards, it lay down again. It was killed in the afternoon.

Diagnosis: Toxaemia (lamsiekte).

CONCLUSION.—The disease which developed in the goat after drenching was identical to lamsiekte in cattle.

RÉSUMÉ OF OBSERVATIONS.—Eleven sheep were drenched with pycnosoma pupae collected from the carcass of cattle that had died of lamsiekte. Of these, two died rather suddenly, and the cause of the disease was diagnosed as toxaemia (lamsiekte). Two others died of pneumonia caused by drenching, and in another two the course of the temperature suggested the same diagnosis. Of the two goats that sickened subsequently to drenching, one was killed *in extremis*, and the disease was diagnosed as lamsiekte. The minimum quantity of pupae required to produce the disease in sheep, was 1 oz., and the same quantity had been given to goats. During the illness, the goats developed symptoms that closely resembled those of lamsiekte in cattle.

(2) (A) *Drenching with Pycnosoma Pupae from the Carcasses of Healthy Animals (Goats and Cattle), Killed for the purpose of the Experiments.*

(l) SHEEP 7139.—24.12.18: *Treatment (First)*: Drenched with $1\frac{1}{2}$ oz. fly pupae and empty shells from the carcasses of healthy goat 12274 and healthy heifer 3627, killed on 6.12.18 on account of an abdominal hernia. The temperature remained normal after drenching.

Result: Negative.

24.12.18: *Treatment (Second)*: Drenched with $1\frac{1}{2}$ oz. fly pupae and empty shells from the carcasses of healthy goat 12274 and healthy heifer 3627, killed on 16.12.18 on account of an abdominal hernia. The temperature remained normal after drenching.

Result: Negative.

(m) GOAT 12309.—23.12.18: *Treatment*: Drenched with $1\frac{1}{2}$ oz. fresh fly pupae from the carcass of a healthy goat 12274.

Result: The temperature was somewhat irregular for about three weeks after drenching and then returned to normal.

Remark: It was probable that the fever was due to a traumatic pneumonia.

(n) GOAT 12320.—23.12.18: *Treatment*: Drenched with $1\frac{1}{2}$ oz. fresh fly pupae from the carcass of the healthy goat 12274. The temperature after drenching was normal.

Result: Negative.

(o) SHEEP 9874.—11.1.19: *Treatment*: Drenched with about 450 blow-fly larvae from the carcass of healthy ox 2458, killed on 9.1.19. The larvae were thirty-six hours old.

Result: 14.1.19: The sheep was found dead this morning. The previous night it had appeared to be in normal health.

Diagnosis: Toxaemia (lamsiekte).

(p) GOAT 12304.—14.1.19: *Treatment*: Drenched with 200 larvae collected from the carcass of healthy ox 2458, killed on the 9.1.19. The larvae were three days old.

Result: The goat remained normal after drenching.

Summary of Observations: Two sheep and three goats were drenched with pycnosoma pupae and larvae collected from carcasses of healthy animals slaughtered and exposed to putrefaction for the purpose of the experiment. The result was positive in the case of one sheep that had received 450 pupae collected from the carcass of the ox. The sheep died suddenly and the disease was diagnosed as toxaemia (lamsiekte). Two-hundred pupae from the same carcass did not produce the disease in a goat. Pupae in the quantity of $1\frac{1}{2}$ oz. did not cause disease in two goats. The pupae had been collected from the carcasses of goats in two instances and from the carcass of a heifer and a goat in another instance. Thus it was evident that pupae from the carcasses of healthy cattle might produce a disease in sheep and goats, if given in sufficient quantities. The disease, to judge from analogy, with the results obtained in previous experiments (goats), was identified as lamsiekte.

(2) (B) *Drenching Sheep and Goats with Pycnosoma Larvae from the Carcasses of Healthy Cattle that were Killed for the Purpose of the Experiments.*

(q) SHEEP 7129.—12.1.19: *Treatment*: Drenched with $\frac{1}{2}$ oz. mature pycnosoma larvae from the carcass of ox 2458, killed on the

9.1.19. The temperature taken during the four weeks after drenching was normal.

Result: Negative.

(r) SHEEP 8030.—18.1.19: *Treatment*: Drenched with 1 oz. dead larvae from the carcass of ox 2458, killed on the 9.1.19. The temperature was normal after drenching.

Result: 20.1.19: The sheep was found dead this morning.

Diagnosis: Toxaemia (lamsiekte).

(s) GOAT 12304.—18.1.19: *Treatment*: Drenched with $\frac{1}{2}$ oz. mature larvae from the carcass of ox 2358, slaughtered on the 9.1.19. The temperature was recorded for about a month and was normal all the time.

Result: Negative.

Summary of Observations: Two sheep and one goat were drenched with pycnosoma larvae from the carcass of a healthy ox slaughtered and exposed to putrefaction for the purpose of the experiment. The quantities given were $\frac{1}{2}$ oz. for a sheep and a goat respectively, and 1 oz. for one sheep. This latter sheep died and the diagnosis toxaemia (lamsiekte) was made.

It is thus evident that also larvae from the carcass of a healthy ox may be toxic, and that death may ensue when a sufficient quantity is given. The disease so produced was identified as lamsiekte.

(3) *Drenching with Larvae from the Carcasses of Cattle that had Died of Toxaemia (Lamsiekte produced by Drenching)*.

(t) GOAT 12307.—18.1.19: *Treatment*: Drenched with 1 oz. dead larvae from the carcass of heifer 3869 that had died of toxaemia on the 12.1.19.

Result: 22.1.19: The goat was noticed to be ill this evening. It was lying most of the time, only rising with great difficulty. The gait was rather stiff and the goat soon lay down again. Slight salivation could be noted. 23.1.19: The goat was unable to rise. When lifted on to its feet it walked with a very stiff gait, and went down almost immediately. Salivation was rather profuse. A bolus of food was found in the mouth. 26.1.19: The goat died during the night.

Diagnosis: Toxaemia (lamsiekte).

(u) GOAT 12313.—23.1.19: *Treatment*: Drenched with $\frac{1}{2}$ oz. blow-fly larvae (washed) from the carcass of heifer 4217 that had died of toxaemia on the 16.1.19.

Result: 27.1.19: The goat was unable to rise, although it made attempts to do so. When put on to its feet it walked with great difficulty and soon lay down again. 28.1.19: The goat was found lying stretched out on one side. When put into sterno-costal position it was unable to maintain it, even when propped up with a bale of hay. It was killed in the afternoon.

Diagnosis: Toxaemia (lamsiekte).

(v) SHEEP 9092.—23.1.19: *Treatment*: Drenched with $\frac{1}{2}$ oz. mature blow-fly larvae (unwashed) from the carcass of heifer 4217 that had died of toxaemia on the 16.1.19.

Result: 25.1.19: The sheep was noticed to be very ill this morning; the respiration being very laboured and accelerated. The animal died at 3 p.m.

Diagnosis: Toxaemia and pneumonia.

* CONCLUSION.—In this case the toxaemia (lamsiekte) was complicated with a pneumonia of traumatic origin caused by drenching.

Summary of Observations: Two goats and one sheep were drenched with larvae collected from the carcasses of cattle that had died of toxæmia (lamsiekte produced by drenching). The quantities given were from 1 oz. in one case and $\frac{1}{2}$ oz. in two cases respectively. The animals died or were killed *in extremis*. In all three instances the diagnosis made was toxæmia (lamsiekte). In one instance the disease was complicated with traumatic pneumonia. The symptoms noted during life in the two uncomplicated cases were those of lamsiekte, as observed in cattle, and there was now no hesitation to declare it as identical.

(4) *Drenching Sheep and Goats with Pupae of the House-fly from Carcasses of Animals that had Died of Disease or were Killed.*

(w) SHEEP 8457.—13.1.19: *Treatment:* Drenched with 1 oz. house-fly pupae from the carcass of heifer 4232 that had died of malignant oedema on the 3.12.18. The temperature remained normal.

Result: Negative.

(x) GOAT 12314.—13.1.19: *Treatment:* Drenched with 2 oz. house-fly pupae from the carcass of cow 2894 that had died of toxæmia on the 1.1.19. The temperature remained normal.

Result: Negative.

(y) GOAT 12284.—13.1.19: *Treatment:* Drenched with 1 oz. house-fly pupae from the carcass of heifer 4232 that had died of malignant oedema on the 31.12.18.

Result: Subsequent to drenching the temperature was abnormal for about ten days, when it returned to normal. This reaction was probably due to a traumatic pneumonia from which the goat recovered.

(z) SHEEP 9878.—13.1.19: *Treatment:* Drenched with 2 oz. house-fly pupae from the carcass of cow 2894 that had died of toxæmia on the 1.1.19. The temperature remained normal.

Result: Negative.

• (aa) GOAT 12303.—23.1.19: *Treatment:* Drenched with 3 oz. house-fly pupae from carcass of tollie 3846 that had died of toxæmia on the 13.1.19. The temperature remained normal.

Result: Negative.

(bb) SHEEP 9871.—23.1.19: *Treatment:* Drenched with 3 oz. house-fly pupae from carcass of healthy ox 2458, killed on the 9.1.19. The temperature remained normal after drenching.

RÉSUMÉ OF OBSERVATIONS.—Three sheep were drenched with house-fly pupae collected from the carcass of either a heifer that had died of malignant oedema, or from the carcass of a cow that had died of toxæmia, or from the carcass of a healthy ox that had been killed and exposed to putrefaction for the purpose of the experiment. None of the sheep sickened. Three goats were drenched with house-fly pupae collected from the carcasses of cattle that died of malignant oedema and of toxæmia. One contracted a disease which was probably traumatic pneumonia, caused by drenching. The quantity of larvae given were 1, 2, and 3 oz. respectively. It would thus appear that the house-fly pupae are not toxic. This observation is identical to that made with house-fly pupae given to cattle.

CONCLUSIONS *re* DRENCHING SHEEP AND GOATS WITH PUPAE AND LARVAE OF *PHYCINOSOMA* ORIGINATING FROM PUTRID CARCASSES.—Thirteen sheep were dosed with quantities varying from a quarter of an ounce to one and a half ounce. One sheep received 450 larvae.

Of these, five sheep died. The disease appeared two or three days after drenching and lasted for a few hours. No definite symptoms were noted. Seven goats were drenched with quantities varying from half to one and a half ounce, and one goat received 200 larvae. Of these, three goats died or were killed *in extremis*, and one recovered. The disease appeared from two to four days after drenching, and lasted from one to two days, with one exception, viz., that in which the incubation time was twelve days, the duration of the disease eight days, finally ending in recovery. The disease showed symptoms similar to those noted in lamsiekte in cattle, and accordingly there was no difficulty to identify the two. It is evident, therefore, that the toxin produced in the putrefying carcasses also causes lamsiekte in sheep and goats.

GENERAL CONCLUSION RESULTING FROM DRENCHING EXPERIMENTS AT ARMOEDSVLAKTE.—Cattle which were drenched with material obtained from the carcasses of cattle that had died of naturally contracted lamsiekte or of diseases other than lamsiekte, or with material from the carcasses of healthy cattle that had been killed for the purpose of the experiments, or with material from carcasses of cattle that had succumbed to lamsiekte (toxaemia) produced by drenching, contracted in the majority of cases a disease formerly diagnosed as toxaemia. This disease resembled naturally contracted lamsiekte in all respects during life, so that in the course of the experiment the term "lamsiekte" was substituted for "toxaemia." The material that was used for drenching and that gave positive results consisted of pycnosoma pupae and larvae, putrid flesh and bones, organs and ingesta. The initial experiments were carried out with pupae and larvae, which had proved to be toxic in the dose of $\frac{1}{2}$ oz.; the final experiments were carried out with bones and the dry flesh of putrid carcasses, and the minimal quantity that proved toxic was 4 oz. Putrid material from horses, lambs, dogs, mierkat, ostrich, and fowl also produced the disease. It was thus shown that lamsiekte as such was not a specific factor in the production of that disease, but that the putrid material of various animals other than cattle proved equally toxic for cattle. The disease could also be produced in sheep and goats by drenching, for which purpose pycnosoma larvae and pupae had been used. The disease in sheep was acute, in goats subacute, and symptoms were noted that resembled those of lamsiekte in every respect. It was, therefore, concluded that these animals were also susceptible to lamsiekte. The illness produced lasted for a few hours in its shortest course and in its longest for eighteen days. In the majority of cases it averaged from two to three days. Recoveries occurred in five cases out of fifty-one, viz., 10 per cent. The minimal quantity of material that proved toxic did not produce the disease in all the drenched animals, indicating either a difference of susceptibility in the various animals or a variation in the toxicity of the material supplied. The putrid material was generally collected from the carcasses of animals that had been running on the veld at Armoedsvlakte prior to death, with the exception of one calf which was removed from the cow when post-mortem examination was made. The toxogenetic bacteria that were responsible for the toxicity in this latter case must be considered to have reached the carcass from outside, whereas in all the other cases they might have originated both

from outside or from the alimentary canal. In the case of one animal, whose spleen was drenched, producing lamsiekte, the infection could only have originated from the intestinal canal. The intestines of animals can thus carry the organisms that produce the lamsiekte toxin.

Under natural conditions cattle were not observed to eat pupae and larvae from rotten carcasses, and thus these pupae and larvae could not form a source of the disease, but cattle were noted to pick and chew bones. The minimal quantity of bones that produced the disease being only 4 oz., it became evident that lamsiekte could be contracted by eating bones. Not all bones and not all parts of a carcass and not all carcasses proved to be toxic. It would appear that the toxicity of bones is preliminarily dependent on the putrefaction of the flesh in which they are lodged. The production of the toxin can take place at an already early period of the putrefaction and organs can be toxic within twenty hours after death; it is also possible that toxic material in the course of further disintegration loses its toxicity. It would appear that carcasses exposed to the atmospheric conditions of the winter are less toxic than those exposed during summer, and this observation stands in relation to the absence or scarcity of blow-fly larvae, which are responsible for the rapid putrefaction of a carcass. The sterilization of toxic substances by boiling for at least one hour renders them innocuous.

APPENDIX TO SECTION 2.

1. **POST-MORTEM REPORT OF COW 3659.**—A six-toothed red and white cow in fair condition. She had died during the night. Rigor mortis was absent in front and present in hindquarters. The integument was intact. The mucosa of the anus was slightly turned out, and some blood had exuded, hanging to the perinaeum. The tongue was between the lips, and soiled liquid was running from the nostrils. There were no changes in the visible mucous membranes. The subcutaneous tissue in the caudal portion of both sides of the neck was injected and rich in blood. The blood was coagulated and the flesh was somewhat dark in colour and moist. The superficial cervical lymph-nodes were enlarged and diffusely haemorrhagic; those of the right side of the head were reddened and moist; those of the trunk showed no changes.

A small quantity of reddish liquid was present in the abdominal cavity. The rumen and part of the intestines were distended with gas. The serosa was smooth and glistening.

No foreign contents were noted in the pleural cavity. The serosa was smooth and glistening. Near the apex on ventral aspect of the tongue was a small papilloma. The tonsillae of the pharynx were rich in blood. The pharyngeal mucosa showed no changes. The parotid and submaxillary glands showed no abnormalities. In the mucosa of the larynx and of the cervical trachea were a few ecchymoses. The thyroidea showed no changes. The lungs were not completely contracted. The pleura of the apical and middle lobes was somewhat blue in colour, otherwise smooth, glistening, and transparent. The lung tissue was elastic everywhere, and on section, some blood escaped. The bronchi and the thoracic trachea contained some froth and some red stained mucus. In the mucosa some ecchymoses were seen.

Both pulmonary arteries and veins contained coagulated blood. The mediastinal and bronchial lymph-nodes were somewhat moist on section. The thymus was fairly large and easily cut.

The pericardium contained about 50 c.c. clear liquid. Under the pleura pericardii some fat was present. The parietal serosa was smooth and glistening. Both right ventricle and atrium were distended with a fairly firm clot; in the left ventricle only a small quantity of blood was found. A fair amount of fat was present in the coronary grooves of the heart. The endocardium of ventricles and atriums, the valves, and the intima of the vessels showed no changes. The myocardium was pale brown and shiny on section. The consistence was firm.

The periportal lymph-nodes showed no changes. The liver appeared of usual size and shape. The capsule was smooth and glistening. The colour of the organ was somewhat blue-brown. The gall bladder contained a fair amount of liquid yellow bile; its mucosa was slightly yellow. The ductus choledochus was open. The parenchyma of the liver on section was smooth; it was glossy-brown and of somewhat soft consistence. The pancreas was somewhat dark in colour, rich in blood, and some parts were diffusely stained. The dimensions of the spleen were 46 × 11 cm. The capsule was somewhat tense. On section, the pulpa appeared soft, the follicles were distinct, the trabeculae not. The suprarenal glands appeared somewhat small and the cortex was red.

The adipose capsule of the kidneys was rich in fat, the fibrosa stripped easily; the substance of the kidney was red-brown; on the surface was a fine reticular marking. On section, the intermediary zone of the right kidney appeared dark in colour. The consistence was somewhat soft. In the left kidney the intermediary zone was even darker, and the organ had a somewhat moist appearance. The rumen contained coarse ingesta. The submucosa behind the rumenoreticular fold was slightly reddened. The reticulum contained a small quantity of ingesta. The contents of the omasum were soft. The mucosa of all three parts was peeling. The contents of the abomasum in the pyloric region were somewhat nutaceous; in the fundus some mealie grains were present. The mucosa was pinkish and slightly injected near the pylorus. The mucosa of the duodenum and jejunum was reddish, and in some places diffuse haemorrhagic patches were noted. The mucosa of the caecum near the apex showed a red patch; that of the colon showed no changes; that of the rectum was partly reddened. The mesentery was rich in fat; the lymph-nodes were of usual size and appearance. The bladder contained a small quantity of clear urine. The mucosa showed no changes. In the left ovary was a corpus luteum. The brain was somewhat moist.

Pathological Anatomical Diagnosis: Gastro-enteritis catarrhalis. Hyperaemia of rumen. Oedema pulmonum. Echymoses in trachea. Hyperaemia of kidney and of liver.

Diagnosis of Disease: Lamsiekte.

2. POST-MORTEM REPORT OF TOLLIE 4087.—A red 9-month-old tollie in moderate condition. The autopsy was commenced half an hour after death. Rigor mortis was absent. The abdomen was relaxed. Mouth and anus were closed. The visible mucous membranes showed no changes. The blood was not coagulated and stained well. The flesh was somewhat pale. The subcutaneous tissue contained some fat; on off shoulder a thickening was present in this tissue with an oedematous and haemorrhagic infiltration. Near the left tuber ischii was an abscess with yellow pus. The left superficial cervical lymph-node was much enlarged and moist. All other external lymph-nodes showed no change in size and appearance.

The peritoneal cavity showed no foreign contents; the situs viscerum was normal; the serosa was smooth and glistening; the diaphragm was convex forward. In the pleural cavity was some clear liquid with soft flocculi. The tongue, pharynx, and oesophagus showed no abnormalities. The right parotid was red and somewhat harder than the left one. The submaxillaries showed no changes. The lungs were contracted. The consistence was elastic. The bronchi, as well as the trachea, contained a little froth; their mucosa showed no changes. The pleura was smooth and glistening. The pericardium contained about 100 c.c. clear liquid. The parietal serosa was smooth and glistening. The right heart was slightly distended with partly coagulated blood; the left one was contracted. Echymoses were present in the endocardium of the septum and of the right ventricle. Petechiae were noted in the epicardium, and fat was present at the base of the heart. The myocardium was pale red-brown and shiny on section. Some cysticerci bovis were present. The periportal lymph-nodes were somewhat enlarged and moist. The liver was slightly increased in size; the borders of the left lobe were bluish. The capsule was smooth, glistening, and transparent. The parenchyma was dark red-brown; on section, smooth and glossy; the consistence was firm. The gall bladder contained some dark green bile; the mucosa was injected and dark stained. Ductus choledochus was open. The pancreas was grey, somewhat rich in blood and of usual consistence. The dimensions of the spleen were 39 × 9 cm. The capsule was somewhat tense. The parenchyma was grey-brown and firm; the follicles were distinct, the trabeculae hardly visible. The cortex of the suprarenal glands was rather narrow and slightly yellow. The adipose capsule of the kidneys was fairly rich in fat. The fibrosa stripped easily. The parenchyma was dark red-brown, the intermediary zone was dark;