

temperature was never above 102° F. after drenching. The microscopical examination of the blood gave negative results on 16.1.19.

*Diagnosis of the Disease:* Toxaemia (lamsiekte).

CONCLUSION.—The disease appeared three days after the drenching and was of a peracute nature (peracute lamsiekte).

(b) RED HEIFER 4297.—Arrived from Pretoria on the 5.12.18 and was stabled on 10.12.18. She received a blood transfusion from an animal suffering from lamsiekte on that date with negative results.

*Treatment:* 14.1.19: Drenched with 10 oz. of pycnosoma larvae from carcass of ox 2458 (a healthy animal that was slaughtered on the 9.1.19).

*Results:* 18.1.19: The heifer was noticed to be ill this afternoon. She showed a stiff gait, closely resembling that of lamsiekte and was lying frequently, but was still able to rise without assistance. She would only remain on the legs for a short while and then go down again. Paralysis of the jaw and tongue was subsequently diagnosed, and towards the evening the general muscular weakness became very pronounced. 19.1.19: The heifer was unable to rise. Towards evening she became very weak and was hardly able to maintain herself in the sterno-costal position. 20.1.19. The heifer died during the night. The temperature was normal, with the exception of the day after drenching, when it registered at 103.8° F.

*Diagnosis of the Disease:* Toxaemia (lamsiekte).

CONCLUSION.—The disease commenced four days after drenching and developed into a paralysis of the locomotor system as well as of the masticatory organs and lasted for two days. The impaired gait was typical of lamsiekte.

(c) BLACK AND WHITE HEIFER 3929.—Born at Armoedsvlakte on the 6.1.17 and stabled since 23.11.18. She had been used for a lamsiekte blood transfusion experiment on the 3.12.18 with negative results.

*Treatment:* 15.1.19: Drenched with seven oz. larvae from carcass of a healthy ox 2458 (an animal that was slaughtered on the 9.1.19).

*Result:* 17.1.19: The heifer was noticed to be ill this afternoon: she was salivating and moved the jaw, picking up pieces of hay, but was unable to take it in. Soon after a muscular weakness in the limbs and a stiff walk, resembling that noted in cattle suffering from naturally contracted lamsiekte could be observed. The heifer could rise with difficulty, but only walked a short distance when she went down again. 18.1.19: This morning the heifer was very weak. She died about 11 a.m. The temperature during the time of observation was normal. The examination of blood on the 18.1.19 gave negative results.

*Diagnosis of the Disease:* Toxaemia (lamsiekte).

CONCLUSION.—The disease appeared two days after drenching and developed as a progressive paresis and paralysis of the locomotor system and lasted for over twenty-four hours. The case was one of acute lamsiekte.

(d) BLACK AND WHITE HEIFER 4352.—Born at Armoedsvlakte on the 4.2.18 and stabled since 18.1.19.

*Treatment:* 18.1.19: Drenched with 1 oz. mature larvae from carcass of ox 2458 (a healthy animal that was slaughtered on the 9.1.19).

*Result:* 21.1.19, 6 p.m.: The heifer was noticed to be ill, the coat was staring. She was nibbling at food, but unable to take it in. She was salivating a great deal. The gait was stiff. Up to late in the evening the animal had no difficulty in rising. 22.1.19: The heifer was weaker this morning, but still able to rise, although with some difficulty. The gait was markedly stiff, and the heifer only remained on the legs for a short while, soon going down again. About midday the animal was unable to rise. The temperature was normal during the time of observation. 23.1.19: The heifer died during the previous night. Microscopical examination of blood on 23.1.19 gave negative results.

*Diagnosis of the Disease:* Toxaemia (lamsiekte).

CONCLUSION.—The disease appeared three days after drenching and developed as a paresis and paralysis of the locomotor system, terminating in death after a short course of twenty-four hours, thus taking the typical course of acute lamsiekte.

(e) RED HEIFER 4053.—Born at Armoedsvlakte on 9.10.17.

*Treatment:* 18.1.19: Drenched with 2 oz. mature pycnosoma larvae from carcass of ox 2458 (a healthy animal that was slaughtered on the 9.1.19).

*Result:* 23.1.19: The heifer was noticed to be ill this afternoon, walking stiffly and frequently lying down. She showed some difficulty in rising towards the evening, but was nevertheless able to rise without assistance. 26.1.19: The heifer was down and unable to rise, the head was turned to the flank. 27.1.19: The heifer was lying with the head turned to the flank, she was very weak and listless. Slight salivation was present. 28.1.19: The heifer appeared very ill; she was unable to retain the sterno-costal position. She died at 12 noon. The temperature during the time of observation was normal, with the exception of an exacerbation to 104.6° F. on the night previous to death. Microscopical examination of blood on 28.1.19 gave negative results.

*Diagnosis of the Disease:* Toxaemia (lamsiekte).

CONCLUSION.—The disease commenced five days after drenching and developed as a progressive paresis and paralysis of the locomotor system lasting for five days.

The case represents one of subacute lamsiekte.

(f) BLACK AND WHITE TOLLIE 3934.—Born at Armoedsvlakte on 11.2.17 and kraaled 14.12.18.

*Treatment:* 23.1.19: Drenched with 1 oz. mature pycnosoma larvae from carcass of ox 2458 (a healthy animal that was slaughtered on the 9.1.19).

*Result:* 26.1.19: The tollie was lying down and refused to get up. At 4 p.m. when lifted on its legs it refused to stand. Two hours later, after several futile attempts, it rose with difficulty. It was feeding. A slight stiffness was noted in the forelegs. 29.1.19 at 9 a.m.: The gait was typical of an animal suffering from naturally contracted lamsiekte. At 5 p.m. the tollie was unable to walk. It had a staring look. 31.1.19: The tollie died. The temperature was normal during the time of observation. Microscopical examination of blood on 31.1.19 gave negative results.

*Diagnosis of the Disease:* Toxaemia (lamsiekte).

CONCLUSION.—The disease appeared five days after drenching and developed as a progressive paresis and paralysis of the locomotor system lasting for five days. It represented a subacute case of lamsiekte.

(g) BLACK TOLLIE 3992.—Born at Armoedsvlakte on the 6.3.17 and stabled since 23.1.19.

*Treatment*: 23.1.19: Drenched with 1 oz. mature pycnosoma larvae from the carcass of ox 2458 (a healthy animal that was slaughtered on 9.1.19). The temperature was normal and regular during the period of observation (five weeks).

*Result*: Negative.

(h) RED HEIFER 4148.—Arrived from Pretoria on 10.1.19 and stabled on the same day.

*Treatment*: 23.1.19: Drenched with 1 oz. pycnosoma larvae from carcass of ox 2458 (a healthy animal that was slaughtered on 9.1.19).

*Result*: 2.2.19: The heifer was noticed to be ill. The look was staring, the eyes wide open, the head was carried low, the faeces were soft. 3.2.19: The gait was normal, the look still staring, the faeces were mucous. 4.2.19: The staring frightened expression was still present. The gait was normal, the heifer was down frequently but was able to rise of her own accord. 6.2.19: The heifer appeared to be losing condition. She was salivating. She was lying, but rose when disturbed. 8.2.19: The look was still staring. The head was carried low. 14.2.19: The heifer showed a normal expression. She was still lying more frequently than the other animals. The temperature was somewhat irregular in the commencement of the observation (after drenching), the evening excursion at times passed 103.0° F. and on one occasion 104.0° F. (30.1.19).

*Diagnosis of Disease*: Toxaemia (lamsiekte).

CONCLUSION.—The illness commenced ten days after drenching and lasted for about ten days. It was diagnosed as toxaemia, representing a mild case of subacute or chronic lamsiekte ending with recovery.

(i) RED HEIFER 127.—Arrived at Armoedsvlakte from Pretoria on the 30.3.19 and was stabled on 23.9.19.

*Treatment*: 27.9.19: Drenched with 6 oz. mature pycnosoma larvae in 2 litres of water. The larvae were collected on 25th September from the carcass of a full-grown calf of a cow that had died before calving (19.9.19). The carcass of the calf was not dissected but was exposed in the putrefaction camp, where it decomposed and numerous pycnosoma larvae were collected. These were washed before drenching. 30.9.19: The heifer was noticed ill this morning; she was frothing at the mouth and was standing. Examination of the mouth revealed the presence of much saliva. Subsequently the heifer went down. At noon, she could not be made to rise and took no notice even when pinched in the tail. When lifted on to her feet she was able to stand. She did not feed hay, but she had taken bran in the morning. The faeces were somewhat dry. In the afternoon the heifer was found in left sterno-costal position, and head was doubled back. The heifer was unable to rise and had to be carried into the shed. 1.10.19: The heifer died during the night. She was found stretched out and slightly tympanitic.

*Diagnosis of Disease*: Lamsiekte (*vide* post-mortem report in appendix, page 921).

(j) HEIFER 144.—The object was to ascertain whether this lot of larvae was toxic. Of the same lot a mass culture in organ bouillon

was made, which was to be tested as to its toxicity after the larvae had proved to be toxic. The larvae were collected from the carcass of a calf [*vide* Expt. 8 (*i*), Heifer 127].

*Treatment*: Drenched on the 27.9.19 with 4 oz. pycnosoma larvae.

*Result*: 2.10.19: The heifer showed symptoms of illness, not feeding well and lying down, but rising easily. At noon she was down and unable to rise. The muzzle was dry and the nostrils were filled with mucus. She was reported to have eaten a little and to have drunk the water. She had a small bolus in the mouth, but had not been masticating previously. Drenched with 20 grammes antipyrine in a litre of water. She was dosed a second time in the evening. 3.10.19: This morning she was found in sterno-costal position with head doubled back in left side. She had not been eating. Although ill she appeared to take notice when approached, and moved eyes and pricked the ears. In the evening at 5 o'clock the heifer was stretched out on her side. 4.10.19: The heifer was found dead this morning.

*Diagnosis of the Disease*: Lamsiekte (*vide* post-mortem report in appendix, page 924).

**CONCLUSION.**—The results of the five experiments prove the toxicity of the carcass. The calf could not have been infected via its elementary canal. It must thus be concluded that the carcass became infected from outside.

**RÉSUMÉ OF OBSERVATIONS.**—Eight head of cattle were drenched with pycnosoma larvae reared on the carcass of a healthy ox that had been killed for the purpose of these experiments. Two heifers were drenched with larvae from the carcass of a full-grown calf removed from the cow at the post mortem examination. The quantities of larvae used varied from 1 to 10 oz. Immature and mature larvae were used. The youngest larvae employed were collected ninety-six hours after death of the animal. Only one tollie (3992) did not contract the disease; it had received 1 oz. of a lot of larvae with which two others had been drenched as well. The failure in this one animal must be explained to be due to an exceptional tolerance for the toxin. One of the two companion animals, heifer 4148, recovered. The larvae used in this latter case had been collected fourteen days after slaughter of the ox, and were thus most likely in an advanced mature stage and perhaps no longer contained so much toxin as young growing larvae probably would contain. In this connexion it should be remembered that in former experiments the drenching of pupae did not give constant positive results. It was possible that in maturing, the larvae became innocuous by digesting the toxin.

The illness observed in the cases described appeared after an incubation period that lasted for from two to ten days. It was remarkable that the longest incubation periods (five to ten days) were noted in two heifers dosed with the smallest quantities of larvae (1 to 2 oz.). Two animals drenched with 1 oz. showed the disease after three days. In the case of the heifer that had received the largest quantity of larvae (10 oz.) the incubation period lasted for four days. With this one exception the larger doses (7 and 8 oz.) produced the disease after an incubation period of two to three days. Generally speaking it would appear that the smaller doses required a longer incubation

period than the larger ones. It is further worthy of note that the disease caused by the smaller doses lasted longer (five to ten days) than that caused by larger doses (a few hours to three days). Both incubation period and duration of the disease would thus stand in a certain relation to the quantity of toxin given. The symptoms observed were those noted in naturally contracted lamsiekte. These were particularly marked in the animal that suffered from a subacute disease. Whilst at one time there was some doubt as to whether the artificially produced toxaemia and the naturally contracted lamsiekte were really identical, this doubt can no longer be entertained. The experiments also show that lamsiekte as a necessary condition for the production of the toxin can be definitely excluded, since the larvae had been obtained from the putrid carcasses of healthy animals. It is evident, therefore, that any putrefied carcass of a bovine may produce the toxin that causes lamsiekte. In the case of the heifer that died after dosing with larvae collected from the carcass of a foetus it was concluded that the carcass required its toxicity after exposure in the veld.

#### GENERAL CONCLUSIONS FROM THE DRENCHING EXPERIMENT WITH PYCNOSOMA LARVAE COLLECTED FROM THE CARCASSES OF CATTLE.

*Pycnosoma* larvae collected from the carcasses of cattle that had died of experimentally produced toxaemia and from carcasses of animals of naturally contracted lamsiekte or were killed *in extremis* suffering from this disease, or from the carcass of a healthy slaughtered ox or of an ox that had died of internal hæmorrhage, or from the carcass of an unborn calf, all produced a disease in healthy cattle by drenching. This disease was diagnosed in the first instance as toxaemia and subsequently as lamsiekte since it proved to be identical with naturally contracted lamsiekte. The fact that larvae collected from the carcasses of cattle that were killed or died of causes other than lamsiekte produced typical cases of lamsiekte by drenching, shows distinctly that lamsiekte is not a specific factor in the artificial production of the disease. Sixteen head of cattle had been used for drenching with *pycnosoma* larvae. Of these fourteen died and one recovered. The minimal toxic quantity proved to be  $\frac{1}{2}$  oz., quantities up to 10 oz. having been used. Of the two animals that failed to contract the disease, one received 3 oz. of larvae from the ox that had died of malignant oedema, the other received 1 oz. of larvae collected fourteen days after the exposure of the carcass. It was thus evident that not all larvae were toxic and that older larvae might lose the toxicity. It was also noted that the rapidity and severity of the disease was not dependent on the quantity of larvae given, but probably on the degree of toxicity, since the smaller doses, in some instances, produced a disease of short duration. In some instances, however, smaller doses were succeeded by longer incubation and longer duration of the disease. The shortest incubation period was two days, the longest ten days, the average was under four days; in eight cases it was shorter than the average and in six cases longer. The duration of the disease was from a few hours to ten days, the long duration ended with recovery. The average period was just under two days, in seven cases it was shorter and in seven longer than this average. Comparing the results obtained by drenching of larvae with those obtained by drenching with pupae, it appears

that the larvae proved to be more toxic than the pupae. Out of seventeen drenching experiments, involving seventeen head of cattle, only two instances occurred where the larvae did not produce the disease. Of eighteen drenching experiments with pupae, involving fourteen head of cattle, seven were negative; these included six animals of which two succumbed to subsequent tests. It would thus appear that the pycnosoma pupae lose (digest) the toxin in the process of maturing. In the course of the experiments the conclusion was finally arrived at that the disease caused by the ingestion of pycnosoma larvae and pupae gives lamsiekte. To deduct from this interpretation that cattle contract lamsiekte by picking up pycnosoma larvae or pupae which they might find around a carcass would be erroneous, however. Observation to this effect showed that cattle do not eat pycnosoma larvae or pupae at all.

**EXPERIMENT No. 9.—DRENCHING OF CATTLE WITH LARVAE OF THE HOUSE-FLY REARED ON CARCASSES OF SLAUGHTERED HEALTHY CATTLE.**

**RED HEIFER 3717.**—At Armoedsvlakte since 7.5.17 and stabled since 27.11.18. She had been used in a previous (muscle injection) experiment on the 1.12.18 with negative results.

*Treatment:* 11.1.19: Drenched  $\frac{1}{2}$  oz. young larvae of the house-fly collected around the carcass of ox 2458 (a healthy animal that was slaughtered on 9.1.19). The larvae were about thirty-six hours old. The temperature was normal during the period of observation (five weeks).

*Result:* Negative.

**RÉSUMÉ OF OBSERVATION AND CONCLUSION *re* DRENCHING OF HOUSE-FLY PUPAE AND LARVAE.**—About equal quantities of house-fly pupae were used as in the experiments with pycnosoma pupae. This, however, was not the case with the drenching of house-fly larvae. The conclusion seems to be justified that the house-fly pupae are not toxic, although collected at the place where toxic carcasses had been lying.

**EXPERIMENT No. 10.—DRENCHING WITH PYCNOSOMA LARVAE FROM THE CARCASS OF A HEALTHY OX THAT HAD SHORTLY BEFORE BEEN INTRODUCED ON TO LAMSIEKTE VELD.**

It was thought possible that such a carcass might not be toxic. The ox arrived from Pretoria on 20.5.19 and was killed on 22.5.19. (The larvae were used for convenience sake.)

**BLACK Cow 3868.**—Received from Pretoria 25.11.16 and stabled since 3.5.19.

*Treatment:* 13.6.19: Drenched with 4 oz. pycnosoma larvae from the carcass of a healthy ox.

*Result:* 16.6.19: The cow was noted to be ill this morning, her behaviour was abnormal and particularly wild, she was easily frightened, and the eyes were staring. She had been eating her bran ration, and the muzzle and nostrils were soiled with it. She apparently had some difficulty in taking in the food with the tongue and was grasping it with the lips. Subsequently the cow was found salivating profusely, she moved the tongue backwards and forwards between the lips. At noon the mouth was kept somewhat open, the tip of the tongue just protruding. The cow was still salivating.

She was standing, but refused to feed. The intermandibular space appeared somewhat full. At 2 p.m. the cow was in sterno-costal position, the tongue stretched out. At 5 p.m. she was lying in a lateral position struggling with both hind and forelegs. She died early that night. The temperature was normal from the day of drenching.

*Diagnosis of Disease:* Lamsiekte (*vide* post-mortem report in appendix, page 920).

**CONCLUSION.**—The disease appeared three days after drenching and lasted for less than twenty-four hours. It showed itself as a paralysis of the deglutitive organs and as a paresis of the locomotor system. The larvae from the carcass of an ox recently introduced from a non-lamsiekte veld on to lamsiekte veld proved to be toxic. It thus appears that the toxicity of such a carcass is connected with the lamsiekte veld into which the animal was introduced.

#### EXPERIMENT NO. 11.—DRENCHING OF CATTLE WITH PUTRID FLESH.

It was concluded that the toxin which is contained in pycnosoma pupae and larvae is also present in the flesh of putrifying animals.

(a) **RED AND WHITE TOLLEY 4091.**—Born at Armoedvlakte on the 4.11.17. Kraaled 14.12.18 and stabled since 9.1.19.

*Treatment:* 9.1.19: Drenched with an emulsion of putrid muscle (2 lb.) from the carcass of heifer 4232 (an animal that had died on the 31.12.18 of malignant oedema).

*Result:* 25.1.19: 5 p.m. the tollie was noticed to be ill and inclined to lie down. It showed a staring, vacant expression. It passed mucous faeces. 26.1.19: The tollie died during the night. The temperature had been normal during the period of observation.

*Diagnosis of the Disease:* Toxaemia (lamsiekte).

**CONCLUSION.**—The disease appeared sixteen days after drenching and was of a very rapid course, resembling in this respect a peracute case of lamsiekte.

(b) **DUN COLOURED TOLLIE 4003.**—Born at Armoedsvlakte on the 4.6.17. Kraaled since 14.12.18.

*Treatment:* 14.1.19: Drenched with 1½ lb. emulsion of putrid flesh from the carcass of healthy ox 2458 slaughtered on 9.1.19 and the material collected five days later.

*Result:* 16.1.19: 9 a.m. the tollie was noticed to be ill and inclined to lie down showing a certain degree of uneasiness. Salivation was present. Later the tollie developed marked muscular weakness, only getting up with assistance. It could rise on its legs and walk a few yards, when it would go down. Marked paresis of the jaw and tongue muscles was present, the jaw being limp at about 1 p.m. The tollie died between 2 and 3 p.m. The temperature was normal during the time of observation. Microscopical examination showed that the blood was negative.

*Diagnosis of the Disease:* Toxaemia (lamsiekte).

**CONCLUSION.**—The disease commenced two days after drenching and was of a very short duration, only lasting for about five hours. Paresis of the locomotor system of the tongue and mandible were the striking symptoms.

**RÉSUMÉ OF OBSERVATIONS AND CONCLUSIONS.**—Two head of cattle were drenched with putrid flesh collected from the carcasses of cattle that had not been suffering from lamsiekte. In the first place, the flesh had been taken from a carcass nine days and in the

second instance five days after death. It is interesting to note that in the former instance the disease appeared as late as sixteen days after drenching, and in the second case already after two days. In both instances the disease was very short, but the symptoms observed were identical to those noted in the illness occurring after drenching with pupae and larvae, and also to those observed in naturally contracted lamsiekte. This experiment establishes the fact that the pycnosoma larvae derive their toxicity from the putrefying flesh. Although the disease which is caused by ingestion of putrid flesh from a carcass undergoing decomposition can be identified as lamsiekte, it cannot be concluded that under natural conditions cattle contract the disease from such relatively fresh carcasses. Observations show that they do not eat such carcasses.

**EXPERIMENT NO. 12.—DRENCHING OF CATTLE WITH CRUSHED PUTRID BONES OF BOVINE CARCASSES IN ORDER TO NOTE WHETHER SUCH BONES CONTAINED THE TOXIC SUBSTANCE THAT WAS PROVED TO BE PRESENT IN THE FLESH.**

The carcasses for this purpose were those of cattle that had died of lamsiekte or had been killed.

(a) **RED HEIFER 3869.**—Arrived from Pretoria on the 25.11.16 and was stabled on 27.12.18. She had been used with negative results in a previous experiment (muscle injection) on the 1.12.18.

*Treatment:* 10.1.19: Drenched with about 3 lb. crushed putrid bones from ox 2333 (an animal that had died of lamsiekte on 21.12.18).

*Result:* 12.1.19: The heifer was found to be lying down in the early morning and was unable to rise. She died at 8.30 a.m.

The temperature was normal during the period of observation.

*Diagnosis of the Disease:* Toxaemia (lamsiekte).

**CONCLUSION.**—The disease appeared two days after drenching and was of a very acute type, representing a case of peracute lamsiekte.

(b) **RED COW 3330.**—Received from Pienaars River, Pretoria District, on the 13.12.14 and stabled since the 27.11.18. She had been used for blood transfusion experiments from animals suffering from lamsiekte (on the 1.12.18 and 7.12.18) with negative results.

*Treatment:* 15.1.19: Drenched with an emulsion made from 1 lb. putrid crushed bones from the carcass of a healthy ox 2458 (an animal that was slaughtered on 9.1.19).

*Result:* 16.1.19: At 1 p.m. the animal still appeared to be in normal health. She was found dead at 3 p.m. The temperature was normal after drenching.

*Diagnosis of the Disease:* Toxaemia (lamsiekte).

**CONCLUSION.**—The disease appeared twenty-four hours after drenching and had an exceedingly rapid course representing a case of peracute lamsiekte.

(c) **BLACK HEIFER 4137.**—Arrived from Pretoria and stabled on the 10.1.19.

*Treatment:* 21.1.19: Drenched with 10 oz. crushed dry-bones from the carcass of cow 4185 (an animal that had died of lamsiekte on the 18.12.18).

*Result:* 22.1.19: Late in the evening the heifer was noticed to be unwell, not feeding normally and showing uneasiness. 23.1.19: Profuse salivation was noted in the morning. The heifer was down



most of the time, but was still able to rise. When walking, she showed a stiff gait. In the afternoon she remained down in sterno-costal position. Large quantities of saliva were running from the mouth. 24.1.19: The heifer died during the night. The temperature was normal during the period of observation. Microscopical examination showed that the blood was negative on 24.1.19.

*Diagnosis of the Disease:* Toxaemia (lamsiekte).

**CONCLUSION.**—The disease appeared twenty-four hours after drenching, and showed itself as a progressive paresis and paralysis of the locomotor system and lasted for about forty-eight hours. The case thus represents one of acute lamsiekte. The bones were thirty-four days old on the date of drenching.

(d) RED HEIFER 4532.—Arrived from Pretoria and kraaled on the 23.1.19.

*Treatment:* 8.3.19: Drenched with one ounce milled, old putrid bones emulsified in one litre of water. The bones were still moist and were obtained from carcasses over one month old. Some of the bones utilized were dry and rotten and others were moist and fatty, the former crumbled down in the mincing machine, the latter after passing the machine had the appearance of a pultaceous substance.

*Result:* Negative.

(e) RED HEIFER 4540.—Arrived from Pretoria and kraaled on the 23.1.19.

*Treatment:* 8.3.19: Drenched with 1 oz. milled, old dry, rotten bones emulsified in one litre of water. The bones were still moist. The carcasses were over one month old (*vide* heifer 4532 above). The temperature was normal during the period of observation (four weeks).

*Result:* Negative.

(f) BLACK HEIFER 4546.—Arrived from Pretoria and kraaled on the 23.1.19.

*Treatment:* 8.3.19: Drenched with 4 oz. milled, old, dry, rotten bones emulsified in one litre of water; the bones were still moist and had been collected from carcasses over one month old (*vide* heifer 4532 above). The temperature was normal during the period of observation (four weeks).

*Result:* Negative.

(g) BLACK HEIFER 4547.—Arrived from Pretoria on the 23.1.19 and was kraaled on the same day.

*Treatment:* 8.3.19: Drenched with 4 oz. milled, old, dry putrid bones emulsified in one litre of water. The bones were over one month old and still moist (*vide* heifer 4532 above).

*Result:* 15.3.19: The heifer was noticed to be ill. At 5 a.m. she was still on her feet. At 6 a.m. she was down. She rose without difficulty and walked about slowly; much salivation was present. When lucerne-hay was supplied she was noticed to feed, but the masticatory movements were very slow, and some difficulty was shown in the prehension of the food. About five minutes were required before one particular bunch of lucerne-hay was completely taken into the mouth. Clear urine was voided in a normal manner. 16.3.19: 6.30 a.m., the heifer was in sterno-costal position; when forced to rise, she did so somewhat reluctantly; and when on her feet, she staggered about. She was noticed to pick up some hay and masticate it, whilst much salivation was present. 1 p.m., the heifer was lying in costo-sternal position and was unable to rise. 3 p.m.,

the heifer was in the same position; she was ruminating. When forced to rise, she made a feeble attempt to do so; when lifted, she was able to stand and move about; the gait was somewhat staggering, however. 17.3.19: 6.10 a.m., the heifer was stretched out on one side and struggled occasionally with the legs; she was then put into costo-sternal position and was unable to maintain it. When forced to rise, she made no attempt to do so. When left alone, she commenced to ruminate. At 12 noon the heifer was again found on one side with neck and head stretched out. 6 p.m., the heifer was lying in costo-sternal position with the head doubled back on to the off side. When the neck was forcibly extended, she carried the head with a wobbling movement of the neck until the equilibrium had been regained. The surface of the body was still warm. 18.3.19: 6.20 a.m., the heifer was found on one side with the head stretched forward; after she had been placed in sterno-costal position she carried the head normally, but there appeared to be some weakness in the neck. The ears were drooping. 10 a.m., the heifer was again found stretched out on one side; she was placed back into the sterno-costal position, but she had difficulty in carrying the head; it was doubled back on to the off side. The heifer had not touched any food that day. 5 p.m., the heifer was in the same position as at 10 o'clock, with head doubled back; the ears were drooping and were never moved; the eyes were staring, and very rarely was any movement noticed. The heifer was observed to swallow saliva, and the movement of the liquid bolus down the jugular groove was distinctly visible. Loss of condition had become very marked. 19.3.19: 6.20 a.m., the heifer was found lying on one side. The respiration was quiet. No straggling of the legs was noticed. The eyelids were rarely moved. The surface of the body was still normally warm. An attempt was made to place the heifer into sterno-costal position, but head and neck doubled back immediately, and soon the animal slipped down on to one side. 3 p.m., the heifer was still found stretched out; she passed urine at the time of the visit. 20.3.19: 6.20 a.m., the heifer was stretched out on her left side, lying very quietly, and no marks of struggling were present. The respiration was somewhat laboured and was partly effected through the mouth. She was foaming at the mouth. 11 a.m., the heifer was killed by pithing. The temperature from the 8.3.19 until the 15.3.19 was normal; after this time it was subnormal and as low as 95° F. on the day preceding death. The microscopical examination of the blood on the 15th and 16th gave negative results.

*Diagnosis of Disease:* Lamsiekte (*vide* post-mortem report in appendix, page 919).

**CONCLUSION.**—Seven full days elapsed after drenching before the disease appeared. It lasted for five days and was characterized as a progressive paresis and paralysis of the locomotor system, typical of naturally contracted lamsiekte. The bones were over one month old. One hundred grammes (4 oz.) were sufficient to produce the disease.

(h) LIGHT RED HEIFER 4527 arrived from Pretoria on the 23.1.19; was kraaled on the same day.

*Treatment:* 8.3.19: Drenched with 1 lb. milled old, dry, rotten bones emulsified in three litres of water. The bones were taken from carcasses over one month old (*vide* Heifer 4532 above).

*Result:* 14.3.19: In the morning the heifer was not found to be her normal self. Contrary to her usually wild behaviour, she was comparatively quiet. She was standing and carried the head well. She had left some of the food in the manger; her muzzle was somewhat dry. 1 p.m., the heifer was unable to rise and was lying in costo-sternal position. During the examination she made two unsuccessful attempts to rise. She was able to place the hind legs more or less into position and to raise the hindquarters slightly, but was not able to raise the forequarters. The attempt to rise simply led to her shifting slightly forward. She did not feed, and a slight salivation was noticed. The faeces were somewhat clay-coloured. 15.3.19: 6.15 a.m., the heifer was found stretched out on one side, with the head under the manger and the leg caught in the chain. She was released and put into sterno-costal position and remained in it all morning and did not appear to be any worse. She still carried the head high and pricked the ears. The muzzle was somewhat dry. The faeces were pultaceous, clay-coloured, and contained mucus. An attempt to rise failed. It was carried out by a somewhat jerky movement; the weight was thrown on to the forequarters, which were resting on the flexed legs. Head and neck were brought down and stretched forward at the same time. The attempt resulted in a movement of the hindquarters, but they were not raised. Slight salivation was present. In the morning the heifer refused to drink out of a bucket; she drank later, and deglutition was performed normally. The liquid bolus could be seen moving down the oesophagus; the movements of the lips were somewhat slow. The animal did not feed or ruminate. The surface temperature of the body was slightly low. 5 p.m., no change apparent in the status. The heifer passed some urine. She nibbled at lucerne-hay and then doubled her head back on to the shoulder. 16.3.19: 6.30 a.m., the heifer was found dead. The temperature was normal during the time of observation. On the 15.3.19, in the morning, it was sub-normal, registering 97.2° F. Microscopical examination of blood-smears on 15.3.19 gave negative results.

*Diagnosis of Disease:* Lamsiekte (*vide* post-mortem report in appendix, page 919).

**CONCLUSION.**—The disease appeared six days after drenching and lasted for two days, showing the symptoms of a progressive paresis of the locomotor system typical of lamsiekte. As the post mortem revealed, the disease was complicated with pneumonia, probably due to drenching. During life no symptoms were noted to allow of the diagnosis of pneumonia.

(i) **BLACK HEIFER 3805.**—Had been at Armoedsvlakte since 6.12.17.

*Treatment:* Drenched on the 2.5.19 with 1 lb. crushed ribs taken from the heap of bones in the control camp. It was from the same heap of bones that cattle in the bone-feeding experiment were picking (*vide* later sub-section "Exposure of cattle in a paddock into which carcasses and bones had been deposited"). 7.5.19: At 11 a.m. the heifer showed profuse salivation; foam was hanging about the mouth and dripping to the ground. There were three boluses of food lying on the ground, showing that the animal was not able to swallow them. The heifer was on its feet and had a bright look about itself. Examined this morning, she was still in good health.

In the afternoon she was lying flat on the left side. When put up in sterno-costal position, she had difficulty to maintain it; the head and neck appeared unsteady and wobbling. Salivation was still present. Subsequently, she lay in sterno-costal position with the head doubled back on to the right shoulder.

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

(j) BLACK AND WHITE COW 4178.—Arrived at Armoedsvlakte on the 10.5.18 and had since then been running with the surplus cattle.

*Treatment.*—Drenched on the 16.5.19 with 1 oz. of bones obtained that day from the carcass paddock (*vide* bone-feeding experiment dated 16.5.19).

*Result:* Negative.

(k) BLACK BLAZE TOLLIE 4095.—Born at Armoedsvlakte on the 26.11.17.

*Treatment:* Drenched on the 3.6.19 with 1 lb. crushed bones obtained that day from the carcass paddock and belonging to the same lot as those used on cow 4178 (*vide* bone-feeding experiment dated 16.5.19).

*Result:* Negative.

(l) DARK RED HEIFER 181.—At Armoedsvlakte since 30.3.19 and had been running with the surplus cattle since the 4.4.19.

*Treatment:* Drenched on the 22.5.19 with 12 oz. crushed ribs collected from the heap of bones, to which the cattle in the bone-feeding experiments had free access (*vide* later).

*Result:* The temperature was recorded daily for one month and remained normal. No symptoms of illness developed.

(m) RED AND WHITE COW 3516.—Arrived at Armoedsvlakte from Pretoria on the 25.8.16 and had been running with the surplus cattle in Paddock C since the 25.2.19.

*Treatment:* Drenched on the 11.7.19 with 12 oz. dry, rotten flesh collected off bones in the control paddock.

*Result:* The temperature was recorded until the 14.7.19 and was found to be normal. No symptoms of illness developed.

(n) RED AND WHITE COW 2165.—In Armoedsvlakte since March, 1917. She had been used previously in drenching experiments, with negative results.

*Treatment:* 4.9.19: Fed with 8 oz. milled bones and flesh from three carcasses of cattle. The carcasses had been lying in the carcass camp II, and the parts used for feeding were dry (biltong).

*Result:* Negative.

(o) RED BULL 187.—Arrived from Johannesburg on the 15.6.19 and stabled on the 23.9.19.

*Treatment:* 27.9.19: Fed 1 lb. fresh, rotten bones from the carcass camp.

*Result:* 30.9.19: The bull was noted to be ill in the morning. He was lying in sterno-costal position and not eating. The muzzle was dry; the eyes appeared slightly sunken, and the lower margin of the socket was prominent. When forced to rise he reluctantly did so, but with some difficulty in getting on to his hind feet. He was able to stand. At midday he was down again. He was not salivating, and the mouth was empty; he did not feed. When forced to rise, he was still able to do so, but with greater difficulty than in the morning. In the afternoon he was down in right sterno-costal position, with head doubled back. He subsequently rose by himself

and walked about in the shed in which he was placed. He had a cud on the root of the tongue and was slightly salivating. The faeces were dry. The bull was drenched 28 grammes antifebrin. 1.10.19: The bull was in left sterno-costal position this morning; the head was doubled back, and the breathing was slow. The animal was semi-conscious. It was killed between 11 and 12 a.m.

RÉSUMÉ OF OBSERVATIONS *re* THE TOXICITY OF PUTRID BONES.—Fourteen head of cattle had been drenched with crushed bones and one with dried flesh obtained from either carcasses of cattle that had died of lamsiekte or had been killed *in extremis*, or of healthy cattle that were slaughtered and exposed to putrefaction, or from the heap of bones in the carcass camp. The quantities used varied from 1 oz. to 1 lb. One animal received 3 lb. The age of the material varied from six days to over one month. Most of the cattle that received large doses (1 lb. to 3 lb.) sickened and died of lamsiekte. The disease appeared from twenty-four hours up to three days after drenching and had a very rapid course. In the case of one animal that had received 1 lb., the incubation period lasted for six days. In this instance the carcass material was over one month old. Of six animals that had received 8 oz. or less, only one heifer sickened and was killed *in extremis*. She contracted the disease seven days after drenching; it lasted for five days. The minimum quantity of bones noted to be toxic was 4 oz. The disease in this case had the longest incubation period and the longest course (seven and five days respectively). It would appear that the quantity of putrid material given had an influence on the severity and duration of the disease. The symptoms noted were identical with those in the disease caused by drenching of flesh, pycnosoma larvae, and pupae. They were so typical of lamsiekte that no further doubts could be entertained as to the identity of the disease produced by the ingestion of bones and lamsiekte naturally contracted. Since cattle were noted to pick bones eagerly and were observed to chew them for some time and since as little as 4 oz. of toxic bones were required to produce a disease, it became feasible that under natural conditions cattle could contract the disease by eating putrid bones.

It appears from these experiments that not all putrid substances cause the disease, even when the material is taken from one and the same carcass. This is exemplified particularly well in the cases of the cattle that were drenched with bones taken from the carcass camp bone-heap.

EXPERIMENT No. 13.—DRENCHING OF CATTLE WITH CRUSHED BONES FROM WHICH ALL FLESH HAD BEEN REMOVED AT THE TIME OF THE POST-MORTEM. THE BONES HAD BEEN EXPOSED TO ATMOSPHERIC CONDITIONS FOR ABOUT TWO MONTHS AND WERE KEPT IN AN ENCLOSURE WHERE CARCASSES WERE EXPOSED TO PUTREFACTION.

(a) BLACK AND WHITE TOLLIE 3448.—Received from Pretoria on the 28.4.17. It had been drenched on the 11.4.19 with an emulsion of rotten flesh with negative results.

*Treatment*: 13.5.19: Drenched with 500 grammes crushed bones, the flesh of which had been removed directly after post-mortem thus while the flesh was still fresh. The bones had been exposed in the putrefactive paddock since the middle of March.

*Result*: Negative.

CONCLUSION.—This experiment established the fact that bones from which the flesh had been removed whilst still fresh did not prove to be toxic, the bones had apparently dried out and had not putrefied.

(b) RED AND WHITE HEIFER 3867.—Arrived from Pretoria on the 25.11.16. She had been running with the controls since 7.3.19.

*Treatment*: 13.5.19: Drenched with 500 grammes crushed bones, the flesh of which had been removed directly after the post-mortem thus while the flesh was still fresh. The bones were exposed in the putrefactive paddock from the middle of March. 16.5.19: Drenched with 1½ lb. crushed bones (as above). 22.5.19: Drenched with 2 lb. crushed bones (as above). The temperature was recorded since the 13.5.19 and remained normal all the time.

*Result*: Negative.

RÉSUMÉ OF OBSERVATIONS.—The two heifers which were drenched with crushed bones from which all flesh had been removed previously to the exposure, did not contract the disease. The quantity supplied would have been sufficient to produce the disease had the material been toxic. One heifer was drenched three times and with increasing quantities, but she remained healthy. The bones had dried out and were not putrid. The experiments thus show that bones in which no putrefaction has taken place are not toxic.

#### SUMMARY OF CONCLUSIONS FROM THE BONE-DRENCHING EXPERIMENTS.

Ten head of cattle had been drenched with quantities of dry putrid bones varying from 1 oz. to 3 lb.. Of these, six died or were killed *in extremis*. The minimal toxic quantity proved to be 4 oz. Exposure of the bones varied from six days to over a month. The incubation periods of the disease varied from one to seven days; the duration of the disease from a few hours to five days. In one instance the whole course was less than thirty hours. The largest doses produced a disease with a short incubation period and a short course, with the exception of one heifer, which contracted traumatic pneumonia and most likely had not received the full quantity. The symptoms observed and the course of the disease could be interpreted as those of peracute and acute cases of lamsiekte. Not all carcass material appears to be toxic or else not all animals are equally susceptible to the toxin.

It would appear that the bones from carcasses exposed up to thirty-four days contained toxin.

The bones of two carcasses from which the flesh had been removed at the post-mortem and which had been exposed on the veld for thirty and forty days respectively, did not produce the disease in the four attempts made. It thus appears that the toxicity of a bone is most likely due to the putrefaction of the flesh adhering to it, and subsequently putrefaction may take place in the bone itself.

#### EXPERIMENT No. 14.—DRENCHING EXPERIMENTS WITH INGESTA AND CONTENTS OF STOMACHS OF CATTLE THAT HAD DIED OF LAMSIEKTE AND TOXAEMIA OR WHICH HAD BEEN SLAUGHTERED FOR THE PURPOSE OF ASCERTAINING WHETHER SUCH INGESTA WOULD CAUSE LAMSIEKTE.

These experiments were partly a repetition of earlier ones, which had been undertaken with ingesta taken directly after death from the rumen of cattle that had died of lamsiekte. The ingesta in these

earlier experiments were given fresh or after they had been carefully dried in the sun or shade (*vide* Walker's and Mitchell's report on lamsiekte in the second report of the Director of Veterinary Research). In the experiments to be related here, some of the ingesta had been left in the carcasses undergoing putrefaction. The usual procedure adopted was to leave the ingesta in the rumen after the autopsy was finished and to expose them together with the rest of the carcass to putrefaction. The ingesta were collected at different intervals after exposure.

(A).—*Drenching Experiments with Ingesta from the Rumen of Cattle that had Died of Lamsiekte.*

(a) RED HEFFER 3880.—Arrived at Armoedsvlakte from Pretoria on the 25.11.16 and was stabled since 30.4.18.

*Treatment (First)*: 13.11.18: Drenched with 7 litres emulsion of ingesta taken from the rumen of cattle that had died of lamsiekte about one month previously.

*Result*: On 18.11.18 the cow was noted to be unwell; the illness was not diagnosed and soon passed over.

*Treatment (Second)*: 29.11.18: Drenched with 7 litres ingesta from the rumen of cattle that had died of lamsiekte about a month previously.

*Result*: Negative.

*Treatment (Third)*: 19.12.18: Drenched with 8 litres watery emulsion (sieved through mosquito-netting) of ingesta from the rumen of cow 4185 (an animal that had died of lamsiekte on 18.12.18). The contents were taken from the rumen one day after death.

*Result*: 29.12.18: The cow was noticed to be unwell, showing some restlessness; the head was carried low. 30.12.18: The cow was unable to rise, although she made attempts to do so. 31.12.18: The cow was able to walk a short distance after being placed on her feet. 2.1.19: The cow was unable to rise by herself. After being lifted on her feet she walked a short distance. The gait was very slow. 5.1.19: The cow rose occasionally, and an improvement became noticeable. 8.1.19: The cow still rose easily, but lay down rather frequently; the gait was still impaired. The appetite was returning. The temperature registered since drenching was practically normal.

*Diagnosis of the Disease*: Toxaemia (lamsiekte).

CONCLUSION.—Drenching with rumen-contents produced an illness that undoubtedly resembled lamsiekte. The cow recovered.

(b) BLACK AND WHITE Cow 3563.—At Armoedsvlakte since 22.10.16. She was stabled since the 30.4.18, and had been injected on 27.11.18 with an emulsion of muscles taken from an animal that had been suffering from lamsiekte.

*Treatment*: 23.12.18: Drenched with 11 litres ingesta from rumen of the carcass of cow 4185 (an animal that had died of lamsiekte on the 18.12.18). The ingesta were taken from the rumen five days after death and had been exposed in the carcass for this period.

*Result*: 28.12.18: The cow was noted to lie down rather frequently. 29.12.18: The gait was noticed to be rather stiff. 30.12.18: The cow was found lying stretched out in the morning. 1.1.19: The cow was lying flat, and when placed into sterno-costal position, was unable to retain it, even when propped up by a bale of

hay. The temperature was recorded since dosing, and during the first four days approached 103° F.; subsequently it dropped to sub-normal. The examination of blood gave negative results. The cow was killed in the morning, being *in extremis*.

*Diagnosis of the Disease:* Toxaemia (lamsiekte).

**CONCLUSION.**—The illness commenced five days after drenching and lasted for four days. The symptoms were those of lamsiekte.

(c) **RED HEIFER 3770.**—At Armoedsvlakte since 19.4.17 and stabled on the 27.11.18. She was previously used in experiment, with negative result.

*Treatment (First):* 22.12.18: Drenched with 8 litres emulsion of rumen ingesta of ox 2333 (an animal that had died of lamsiekte, 21.12.18). The ingesta were collected twenty-four hours after death.

*Result:* Negative.

*Treatment (Second):* 2.1.19: Drenched with about 8 litres (fresh) emulsion of ingesta from the rumen, reticulum, and abomasum of heifer 3485 (an animal that had died of lamsiekte on the same day).

*Result:* Negative.

(d) **HEIFER 3993.**—Born at Armoedsvlakte on the 13.3.17. Kraaled day and night since 14.12.18 and stabled since 9.1.19.

*Treatment:* 19.2.19: Drenched with 6 litres emulsion of fresh ingesta taken, one hour after death, from the rumen, reticulum, and abomasum of cow 3003 (an animal that had died of lamsiekte on the 19.2.19). The temperature after drenching remained normal.

*Result:* Negative.

(e) **RED HEIFER 4537.**—Arrived at Armoedsvlakte from Pretoria on the 23.1.19 and had been kraaled since the 23.1.19.

*Treatment:* 25.3.19: Drenched with 6 litres emulsion of fresh ingesta taken from rumen and abomasum of heifer 3908 (an animal that had died of lamsiekte the same day). The temperature after drenching was normal.

*Result:* Negative.

(f) **DARK BROWN HEIFER 4541.**—Arrived at Armoedsvlakte from Pretoria on the 23.1.19 and kraaled day and night since the 23.1.19.

*Treatment:* 27.2.19: Drenched with 6 litres emulsion of ingesta taken from the rumen of heifer 3908 (an animal which died of lamsiekte on 25.2.19). The ingesta had been removed from the rumen at the time of the post-mortem, and after being kept in the post-mortem room for twenty-four hours, were exposed for another twenty-four hours in the open. The ingesta were moist, and no pycnosoma larvae were noticed to be present.

*Result:* Negative.

(g) **BLACK HEIFER 4548.**—Arrived at Armoedsvlakte from Pretoria on the 23.1.19 and used in the experiment with cattle kraaled day and night since this date.

*Treatment:* 27.2.19: Drenched with 6 litres emulsion of ingesta from the rumen of heifer 3908 (an animal which had died of lamsiekte on 25.2.19). The ingesta had been kept in the rumen for twenty-four hours in the post-mortem hall and were afterwards exposed for twenty hours in the open. The temperature of the animal after drenching remained normal.

*Result:* Negative.

(h) **YELLOW HEIFER 4542.**—Arrived at Armoedsvlakte from Pretoria on the 23.1.19 and had been used in the experiment with cattle kraaled day and night since this date.



*Treatment*: 1.3.19: Drenched with 5 litres emulsion of ingesta from rumen of heifer 3908 (an animal which died of lamsiekte on 25.2.19). The ingesta had been removed from the rumen before the exposure of the carcass in the open and were sieved before drenching. The temperature of the animal after drenching remained normal.

*Result*: Negative.

(B).—*Drenching Experiments with Ingesta of Healthy Cattle*.

(i) BLACK COW 3153.—At Armoedsvlakte since 16.8.16. Stabled since 25.11.18. She had been used in a previous experiment, with negative results.

*Treatment*: 10.1.19: Drenched with 7 litres emulsion of ingesta taken from the rumen of the carcass of healthy ox 2458 twenty-four hours after death. (The ox was killed on 9.1.19.)

*Result*: 18.1.19: Early this morning the cow was found down in the stable and unable to rise. She died soon afterwards. The temperature after drenching was somewhat erratic, with a tendency towards sub-normal towards the end. The examination of the blood-smear gave negative results. She died on the 18.1.19.

*Diagnosis of Disease*: Toxaemia (lamsiekte).

CONCLUSION.—The cause of the disease was put down to lamsiekte. On post-mortem examination, the presence of a purulent hepatitis in the ventral portion of the liver was found.

(j) RED TOLLIE 3809.—At Armoedsvlakte since 25.1.17 and stabled since 27.11.18. It had been used in a previous experiment on the latter date.

*Treatment*: 12.1.19: Drenched with 7 litres ingesta from rumen of carcass of healthy ox 2458. (The carcass was seventy-two hours old. The ox had been killed on the 9.1.19.) The temperature after drenching was normal.

*Result*: Negative.

(k) BLACK HEIFER 4266.—Arrived at Armoedsvlakte from Pretoria on the 10.1.19 and was stabled on the same date.

*Treatment*: 14.1.19: Drenched with 7 litres ingesta from the rumen of the carcass of healthy ox 2458 (an animal that was killed on the 9.1.19. The ingesta were collected five days later. The temperature after drenching remained normal.

*Result*: Negative.

(C).—*Drenching Experiments with Ruminal Contents of Cattle that had Died of Diseases* (a) other than Lamsiekte, (b) of Toxaemia (Lamsiekte).

(l) WHITE AND RED COW 3659.—At Armoedsvlakte since the 8.10.16 and kraaled day and night since the 14.12.18.

*Treatment*: 23.1.19: Drenched with 5 litres ingesta from the rumen of heifer 4352. The ingesta were collected about fifteen hours after the animal had died of toxaemia (lamsiekte). The temperature records after drenching were normal.

*Result*: Negative.

(m) BLACK HEIFER 4006.—Born at Armoedsvlakte on 27.7.17. The heifer was in the experiment of alternative feeding and grazing since the 4.1.19. Since 23.1.19 she had been stabled.

*Treatment*: 23.1.19: Drenched with 3 litres ingesta from the rumen of heifer 4352 (the ingesta were collected fifteen hours after the animal had died of toxaemia). The temperature records after drenching were normal.

*Result*: Negative.

(n) RED HEIFER 4174.—Arrived at Armoedsvlakte from Pretoria on the 10.1.19 and was stabled on the same date.

*Treatment*: 21.1.19: Drenched with 7 litres watery emulsion of ingesta from the rumen of heifer 4297 (an animal that had died of toxæmia on the 20.1.19; the ingesta were collected 36 hours after death). The temperature records after drenching were normal.

*Result*: Negative.

(o) BLACK AND WHITE COW 2846.—At Armoedsvlakte since 5.9.15. She had been kraaled day and night since 14.12.18.

*Treatment*: 20.1.19: Drenched with 7 litres emulsion of ingesta from the rumen of cow 3153 (the ingesta were collected forty-eight hours after the cow had died of toxæmia).

*Result*: 23.1.19: This morning it was noticed that the cow had a stiff gait. She lay down rather frequently, but was able to rise. A fairly profuse salivation was noted. At 9.30 the cow was unable to rise. She was lying in sterno-costal position. During the afternoon she was found doubling the head back on to the flank. Salivation was less profuse. 24.1.19: The cow died during the night. The temperature since dosing was normal. The examination of blood-smears gave negative results.

*Diagnosis of the Disease*: Toxæmia (lamsiekte).

(D).—*Drenching Experiments with the Contents of the Small and Large Intestines from a Bovine that had succumbed to Toxæmia.*

(p) RED HEIFER 4529.—Arrived at Armoedsvlakte from Pretoria on the 23.1.19. Kraaled day and night since 8.3.19.

*Treatment*: 16.3.19: Drenched with 7 litres emulsion of all the contents of small and large intestines from the carcass of heifer 4527 (an animal that had died of toxæmia on the 16.3.19 after having been drenched with old putrid bones on 8.3.19). The temperature after drenching was normal.

*Result*: Negative.

#### SUMMARY OF OBSERVATIONS CONCERNING DRENCHING WITH INGESTA.

(A).—Eight head of cattle were drenched with the ingesta collected from the rumen of cattle that had died of naturally contracted lamsiekte. One heifer was drenched three times and one twice (3563, 3880). Two of the drenched animals contracted lamsiekte, of which one was killed *in extremis*. The ingesta in these two cases came from the same animal (4185) and had been collected twenty-four hours and five days after death and exposure of the carcass respectively. The majority of the experiments gave negative results. The ingesta utilized had been collected from one or a few hours to about thirty days after the exposure of the carcass. It would thus appear that the ingesta of only some animals are toxic. Toxicity can only be expected under certain conditions, viz., when the ingesta were so placed that they were percolated by the putrefactive products of the carcass or after the stomach wall itself had undergone putrefaction. The adjacent portions of ingesta would then be infiltrated with the putrefactive products. Under these conditions it was found that pycnosoma larvae invaded the ingesta. The presence of pycnosoma pupae was frequently observed. This happened when the larvae approaching the pupae stage were wandering to seek a hiding-place. It would perhaps be somewhat surprising to note that the ingesta in the rumen were toxic already after twenty-four hours.

In this case the disease produced was, however, of a mild type, appearing after an incubation period of ten days, lasting for another ten days and ending with recovery. A carcass, however, may already be toxic in less than twenty-four hours, as experiments (*vide infra*) have shown.

(B).—Of three head of cattle that had been drenched with ingesta from the carcass of a healthy ox killed for the purpose of the experiment, one contracted the disease and died. The ingesta in this instance had been taken twenty-four hours after exposure of the carcass, whereas ingesta from the same rumen that had been taken three days and five days respectively after death proved to be harmless. Also this paradoxical result finds an explanation. Not all the ingesta, although taken from the same rumen, are necessarily toxic. It all depends on where and how they had been in contact with putrefying products, so that, for example, a portion might be soaked with them, whilst the rest never came into contact.

(C).—Of four head of cattle that had been drenched with ingesta from bovines that had succumbed to toxæmia, one contracted the disease, viz., the one that had received the material after it had been exposed for forty-eight hours, whilst the material collected fifteen and thirty-six hours after death was harmless. The material was collected from the carcasses of different animals, and this might be an explanation of the different results.

(D).—One animal was drenched with all the contents of the small and large intestines, collected after death, of a heifer that had died of toxæmia caused by drenching with putrid material. It did not show any illness. It would thus appear that the toxic material was not retained in the intestinal canal of the drenched animal. The results of all the experiments prove that under certain favourable conditions the ingesta of cattle (pensmist) may be toxic, but the toxicity is not limited to the ingesta of cattle that had died of naturally contracted lamsiekte. The ingesta of any cattle that died of any other cause may prove to be toxic. The statement had been made by some farmers, that pensmist of cattle that had suffered from lamsiekte when eaten by other cattle produced lamsiekte, whilst other farmers denied it. In the light of the above experiments, the discrepancy of opinion finds an explanation. Ruminal contents (pensmist) is probably only toxic when eaten together with pycnosoma larvae and pupae or after the contents have been contaminated with putrefactive substances. The incubation period of the disease in the cases noted varied in length from three to ten days and the disease from a few hours to ten days.

EXPERIMENT No. 15.—DRENCHING OF CATTLE WITH THE SPLEEN FROM THE CARCASS OF A COW THAT SHOWED PRONOUNCED SIGNS OF DECOMPOSITION, PUTREFACTIVE BACTERIA BEING PRESENT IN THE PULP.

(a) DUN TOLLIE 4330.—Born at Armoedsvlakte on the 22.5.18.

*Treatment*: 17.6.19: Drenched with 6 oz. of spleen pulp of cow 3868 (an animal that had died the previous night; the spleen was removed about twenty hours after death; the blood of the cow showed the presence of putrefactive bacteria).

*Results*: 26.6.19: The tollie was reported to have been ill since last evening; it was neither feeding nor drinking. This morning it

ste its ration of bran and crushed mealies, but the prehension of food was very slow. Before noon the tollie was still standing, and saliva was hanging in strings about the mouth. It was frothing at the mouth, and the mandible was constantly moved as if masticating. It did not consume its ration of hay. 27.6.19: The tollie was standing this morning and eating from the trough. No salivation was noted, and the feeding appeared to be normal, the trough at the time of noticing being almost empty. The animal was brighter and more active than on the previous day. In the afternoon it was standing and eating lucerne-hay. It was, however, not quite as lively as its neighbours. 28.6.19: The tollie was noted to feed normally and to be lively. 11.7.19: Notwithstanding the temporary improvement of the animal during the last few days of June, the tollie did not behave as a normal healthy animal would do. Although eating daily and standing at the trough to take food, it was noted to be in sterno-costal position most of the time and to be very quiet and generally listless. It was subsequently placed into another shed by itself. 12.7.19: To-day it did not rise at all, even when the tail was pinched. It carried head and neck well and looked fairly bright. Feeding and drinking were reported. In the afternoon the tollie was lying stretched out on its left side. 13.7.19: It was placed in left sterno-costal position. It was moving the mandible as if chewing, but no deglutition was noted. The movements of the jaws were very slow, and salivation was present. In the left nostril was a white string of mucus. The muzzle was soiled with green débris. It was decided to treat the animal with an intra-jugular infusion of magnesium sulfuricum. It died soon after the infusion. The temperature was recorded since 17.6.19. The irregular exacerbations reached 102.2° F. at times. The evening remissions were as low as 97° F. in the beginning; later, the curve had a regular course. Examination of blood-smears gave negative results.

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

**CONCLUSION.**—This was a very protracted case of lamsiekte, and might be described as a chronic one. Symptoms of paresis of the pharynx in the beginning, and later paresis of the locomotor system were present. Death was probably hastened by the infusion.

**BLACK AND WHITE TOLLIE 4372.**—Born at Armoedsvlakte 28.5.18. It had been used in a previous experiment on the 20.5.19, with negative results.

*Treatment:* 25.6.19: Drenched with 6 oz. of spleen pulp of cow 3868 (*vide* tollie 4330). The spleen had been kept for eight days in a small bucket covered with gauze. The bucket was kept in the putrefaction paddock. The temperature of the animal was somewhat irregular, showing rather wide remissions at times. The maximum of 104° F. was only reached on one occasion (8.8.19). Towards the conclusion of the observation the temperature was more regular.

*Result:* Negative.

**SUMMARY OF OBSERVATIONS.**—Of the two head of cattle which were drenched with putrefactive spleen pulp, one contracted lamsiekte and died. In the case of the second animal drenched with the same pulp kept for 8 days, negative results were recorded. This