

mouth. The flanks were fallen in. Some masticated grass was found on the ground. In the afternoon it was noticed to release large quantities of mucus from the mouth; when driven to the water-trough it refused to drink.

8.4.19: The condition was very much similar as found on previous day. The animal was standing most of the time and when approached moved away. Loss of condition had become markedly pronounced. Salivation was still noted. In the afternoon the tollie was again led to the water. After a while all returned through the mouth together with a lot of mucus. It then gave up all attempts to drink and turned away.

9.4.19: The animal was standing and moving about freely. It appeared hollow in the flanks and loss of condition was marked. It was frothing at the mouth. When brought to the water in the afternoon it took some in, but all returned via the mouth and a considerable quantity of saliva and ingesta with it.

10.4.19: The animal was found lying down this morning, but rose subsequently. It was brought to the water in the afternoon, it took some and apparently was able to retain some, since only a small quantity was returned.

11.14.19: The tollie was frothing much at the mouth and much masticated grass was found on the ground. The lips appeared to be somewhat swollen. The animal was fairly lively and moved about freely.

12.4.19: The animal was found standing and subsequently moved about freely; it was still salivating. Masticated grass was strewn about on the ground. When led to the water in the afternoon, the animal appeared to be very thirsty. Several attempts were made to swallow water and it appeared that some went down, a movement of the oesophagus having been seen, the larger portion, however, returned through the mouth, the first portion was mixed with ingesta. In the evening the flanks were somewhat blown.

13.4.19: The tollie was found standing this morning and in front on the ground was a fair quantity of masticated grass and saliva. The flanks were still slightly blown. In the afternoon as soon as the gate was opened the tollie ran to the water-trough and immediately commenced to drink. The water subsequently returned through the mouth mixed with saliva, some returned through the nostrils. There was a thick, white mucous discharge in the nostrils. The animal licked the nostrils frequently. It would not leave the trough, and when turned away it came back every time attempting to drink. The left flank was slightly blown, the right one was hollow. The animal was still very lively and poked other cattle in the stable.

14.4.19: The tollie was frothing at the mouth and masticated grass was lying about. In the morning and again in the afternoon it was injected subcutaneously with 2.5 grammes camphor in 25 c.c. of 50 per cent. alcohol.

15.4.19: The animal was very lively and anxious to get at the water-trough. It was taking in water, but the water returned subsequently mixed with ingesta and saliva. It would appear that some water was retained. It received another injection of 2.5 grammes of camphor in 25 c.c. of 50 per cent. alcohol.

16.4.19: The tollie was noted to chew. Masticated grass was lying about. Grinding of the teeth was noted. Swallowing of water still appeared to be impossible.

17.4.19: This morning no ingesta were noted lying on the floor as on the previous days. The animal was then given a quantity of bran and crushed mealies and fed on it, eating almost the lot. In the afternoon it fed on hay, mealies, and bran. It drank about a third of a bucket full of water, retaining all. The animal was lively and ran away when attempts were made to catch it. At 4 p.m. it was injected subcutaneously with 2.5 grammes camphor in 25 c.c. of 50 per cent. alcohol.

18.4.19: The tollie was noted to feed a little on bran, mealies, and green grass. No ingesta were dropped during the day. A little water was taken and retained. It was injected subcutaneously with 2.5 grammes of camphor in 25 c.c. 50 per cent. alcohol at 6 p.m.

19.4.19: The animal was found standing. The loss of condition had markedly increased, the flanks were hollow. The face appeared slightly swollen, particularly the lips. Hippobosca had collected in great numbers on the neck and the dewlap, the animal making repeated attempts to chase them away. When water was supplied it drank readily and the water was noted to run in rythmetical order down the oesophagus. None returned. The animal was feeding a little. At 10 a.m. it was injected with 2.5 grammes of camphor in 25 c.c. 50 per cent. alcohol. In the afternoon the animal was noted to eat bran and mealie meal; it was very lively and not much troubled by the flies. At times a slight cough was noted. It was reinjected at 1 p.m. with 4 grammes camphor in 40 c.c. of 50 per cent. alcohol.

20.4.19: The tollie had been feeding well and consumed almost the whole ration of bran and mealie meal. A slight cough was again noted at times.

21.4.19: This morning the tollie refused the ration of lucerne hay and mealies. Subsequently it was noted to eat the veld hay. It still looked poor in condition and hollow in the flanks.

22.4.19: The tollie fed well this morning.

23.4.19: The tollie consumed the ration of veld hay and mealies, the swelling of the face and the lips had disappeared. It was turned out with the herd into the veld.

24.4.19: The animal returned this morning with the herd. It appeared to have completely recovered.

*Temperature Records:* The temperature of this animal was daily recorded from the 4.4.19 to 23.4.19. During the first ten days the morning records were at or near 101° F., the evening records rarely reached 103° F. Towards the end of the observation period the exacerbations were somewhat irregular and the morning records were higher than before.

*Epicrisis:* Tollie 3821 was picked out as a bone-eater and placed in the rotten-bone experiment. It was noted to pick and chew bones on four different days. It developed a disease that could be diagnosed as paralysis of the pharynx. A similar paralysis is met with in some cattle that are suffering from lamsiekte. This case was diagnosed as one of lamsiekte in which the muscles of the locomotor system were not involved. The animal for a period of about twelve days was not able to swallow food or water. It recovered. The case probably was complicated with bronchitis or slight traumatic pneumonia, part of the glauber salt entering the respiratory tract when first dosed and before the paralysis of the throat had been diagnosed.

13. BLACK HEIFER 148.—Arrived at Armoedsvlakte on 30.3.19. On 23.4.19 the heifer was submitted to the rotten-bone test and found to be a bone-eater. She was accordingly selected for the experiment with rotten bones. She was noted to pick and chew bones on the 24.4.19 and 26.4.19.

12.5.19: The heifer did not return with the herd. She was subsequently found and allowed to walk home. She appeared weak, refused to feed, and lay down. Temperature 101.4° F. Examination of a blood-smear gave negative results.

13.5.19: The heifer was down in sterno-costal position, and did not rise when approached, but did so when forced. She went down again, and then showed some difficulty when rising. In the evening the heifer was placed in the stable. She walked there freely, and after arrival immediately commenced to feed. The case was considered to be suspicious for lamsiekte.

14.5.19: This morning the heifer was standing and feeding well.

15.5.19 to 20.5.19: The heifer was left in the stable, and was seen feeding and moving about freely, and was considered to be recovering.

21.5.19: In the afternoon the heifer was lying down, and the native attendant stated that she had been down since the morning. She was unable to rise, and had to be carried to a better place. The diagnosis of lamsiekte was now definitely made.

22.5.19: In the morning the heifer was found in left sterno-costal position, as she had been placed the previous evening. She was eating, but the prehension and mastication of food was carried out very slowly. She was attentive.

23.5.19: The heifer was found in the same place and in the same position as yesterday. The faeces were somewhat dry; the eyes were noted to sink, and the skin below the eyes seemed to be slightly swollen and bulging. She was eating and feeding fairly well.

24.5.19: The heifer was unable to rise. She was ruminating. The faeces to-day were well formed.

25.4.19: No changes in the condition of the heifer were noticeable.

26.5.19: Similar records to yesterday.

27.5.19: The heifer had moved from her former place during the night. She was still in sterno-costal position, and apparently quite comfortable. The muzzle and nostrils were moist, and head and neck were carried well. The animal appeared to be hungry, and took the food fairly eagerly. The faeces were somewhat dry. In the afternoon the heifer received a subcutaneous injection of 0.01 grammes apomorphine. Subsequently she made an attempt to rise, but did not succeed. When lifted, she was able to stand and to walk about.

28.5.19: The heifer was found in right sterno-costal position. She had shifted from her former place during the night, and had placed herself uncomfortably near the railings, hanging the head between two of them. She

was put in a more comfortable place, and she then carried head and neck well and commenced to feed almost eagerly. She was again injected, this time with 0.02 apomorphine. Soon afterwards she appeared to be easily frightened and alarmed when approached, and at times made attempts to rise which failed. She landed, however, in sterno-costal position, with both hind legs extremely flexed and placed under the abdomen.

29.5.19: This morning the heifer was found in right sterno-costal position, and at times doubled the head back on near shoulder. Subsequently she was carrying the head well and was noted to eat lucerne-hay. In the afternoon she rose by herself and fed from the ground. She was noted to walk about.

30.5.19: The heifer was found at one end of the stable in right sterno-costal position. She was feeding, and carried the head well. She was standing in the afternoon, and feeding from the ground.

31.5.19: To-day the heifer was standing most of the time. At intervals she lay down, but had no difficulty in rising.

1.6.19 and 2.6.19: The heifer was standing and moving about freely and feeding normally.

3.6.19: This morning when the gate was opened the heifer attempted to escape. She was discharged as recovered and placed back with the herd.

*Epicrisis:* Heifer 148 was seen on only two occasions to pick and chew bones, viz., on the 24th and 26th April. Since then she left them alone and was not seen to pick and chew bones in the veld. Eighteen days after she had been seen first picking bones, she was noted ill. The symptoms were those of a paresis of the locomotor and masticatory apparatus. The illness was recognized as a mild degree of lamsiekte, from which the animal recovered. In this case it is of interest to note the apparently small quantity of bones picked and the long period it took before the disease developed.

14. RED HEIFER 101.—Arrived at Armoedsvlakte on 30.3.19. She was selected as a bone-eater, and transferred to the rotten-bone experiment on 23.4.19. She was subsequently noted to be picking rotten bones on 24.4.19, 27.4.19, 30.4.19, 1.5.19, 3.5.19, 5.5.19, 6.5.19, 7.5.19, 8.5.19, 9.5.19, 10.5.19, and 12.5.19.

On 12.5.19 she was seen chewing a bone in the veld.

15.5.19: This morning the heifer did not appear to be quite well, having a somewhat peculiar gait. Temperature, 99.6° F. The examination of a blood-smear revealed a slight anisocytosis. She was retained in the hospital camp.

16.5.19: This morning the heifer was found stretched out on her right side. When placed into sterno-costal position, she appeared to have a limp neck, which doubled back immediately. She was, however, able to remain in this position. The ground around the heifer was somewhat disturbed, as she had apparently made some futile attempts to rise during the night. Dry droppings were present. The heifer was then brought into the stable and placed in sterno-costal position. She now appeared to be able to support herself. Subsequently she was found in this position with the head stretched out, showing dyspnoea. The tongue was hanging out, and she was foaming at the mouth and nose. She died in the afternoon. The diagnosis lamsiekte was made.

*Post-mortem Examination of Heifer 101:* The autopsy was made about two hours after death. Rigor mortis was absent. The condition was good. The integument was intact. The abdomen was not distended. The mouth was open and the tongue hanging out. The visible mucous membranes showed no changes. The blood was well coagulated and stained well. The adipose tissue of the subcutis contained fatty deposits. The flesh showed no change in colour. The parotid glands appeared to be somewhat harder. The submaxillary was of usual consistence. The superficial cervical lymph nodes and those of the head, particularly the retropharyngeals, appeared to be enlarged and unusually moist. The tongue, pharynx, and oesophagus showed no peculiarities. The abdominal cavity showed no foreign contents. The situs viscerum showed no changes. The visceral and parietal serosa was smooth and glistening. The convexity of the diaphragm was forwards; some ecchymoses were present in the ventral muscular region. There were no foreign contents in the pleural cavity. The pleura costalis was smooth and glistening. The mediastinal and bronchial lymph nodes showed no changes in size and consistence. The trachea thoracis and the bronchi were filled with white froth; their mucous membranes showed no changes. The parenchyma of the lungs was elastic, fairly rich in blood, and on section appeared somewhat moist. The pleura was smooth and transparent, except in the main lobe, where it was rather whitish. The pulmonary blood-vessels showed no changes. The pericardium contained 95 c.c. straw-coloured

liquid, with a few fibrinous flocculi. The parietal serosa was smooth and glistening. The right atrium and ventricle were much distended with well coagulated blood. The left ventricle was somewhat contracted and contained a small quantity of coagulated blood. Ecchymoses were found on the epicardium of the right ventricle, on the endocardium of conus arteriosus, and of the septum of the right ventricle near the apex. The left endocardium showed no changes, neither did semi-lunar and atrio-ventricular valves. The myocardium had a somewhat opaque appearance. The periportal lymph nodes were slightly enlarged and moist. The liver appeared slightly increased in size. The capsule was smooth, glistening, and transparent. The parenchyma was dark-red, brown, and rich in blood. The cut surface appeared smooth; the consistence was firm. The gall-bladder was half filled with a liquid yellow-greenish bile. The ductus choledochus and the bile ducts were open; their mucous membrane showed no changes. The pancreas showed no change in colour or consistence. The atrial glands were somewhat enlarged. The spleen (44 by 12 cm.) was somewhat thickened. The capsule was fairly tense, the parenchyma somewhat greyish-red, due to the enlarged follicles. The consistence was soft. The suprarenal glands were rather small. The cortex was narrow and dark-brown. A fair amount of fat was present in the adipose capsule of the kidney. The fibrosa stripped easily. The parenchyma was dark red-brown in colour and moist on section. The zones were distinct; the intermediary zone was rather dark. The rumen contained coarse ingesta. The reticulum was almost empty. About half a dozen pieces of bones were present. The omasum was distended with hard and dry ingesta. The contents of the abomasum were liquid. The mucus membrane showed no changes. The mucosa of the small intestine was reddened in its whole length. Particular parts of the jejunum were deeply reddened and swollen; other parts showed red cross stripes. The mucosa of the caecum was reddened, also that of the ansa proximalis of the colon. There were some petechiae in the distal portions. The mesenteric lymph nodes were somewhat enlarged and moist. A fair amount of fat was present. The urinary bladder was empty. The mucosa showed no changes. The sexual organs showed no peculiarities. The brain and its membranes appeared normal.

*Pathological Anatomical Diagnosis:* Ecchymoses in endocardium and epicardium. Enteritis catarrhalis. Tumor splenis. Hyperaemia of the liver. Induration of the parotis. Lymphadenitis acuta.

*Diagnosis of Disease:* Lamsiekte.

*Epicrisis:* Heifer 101 was noted to pick rotten bones on twelve occasions. She developed an acute disease, viz., a paralysis of the locomotor system and of the tongue. This was diagnosed as lamsiekte, and the diagnosis was supported by the negative result of the blood-smear examination and particularly by those of the autopsy. Bones were present in the reticulum. The anisocytosis and the tumor splenis cannot be put to the account of lamsiekte, but were probably the sequel of a previous piroplasmosis or anaplasmosis. The heifer before its arrival at Armoedsvlakte had passed through Pretoria, and amongst the herd to which it belonged a few cases of both diseases had been diagnosed after the arrival of the cattle in Armoedsvlakte.

15. BLACK AND WHITE HEIFER 3853.—At Armoedsvlakte since 15.4.18. She was in the loogas and rooibrak experiment from 24.4.18 until 6.8.18.

On the 5.3.19 she was submitted to the craving test with bleached bones, and found to be a bone-eater. She was then selected for the rotten bone-feeding experiment.

On 8.3.19 she was noted to pick and chew rotten bones. Subsequently she was not seen to pick any more until the 24.3.19. She was then noted to pick bleached bones on four consecutive days, 27.3.19, 28.3.19, 29.3.19, and 30.3.19. She then discontinued eating for a while, but started again on the 11.4.19.

Subsequently she was noted to pick and chew bones on the following dates: 11.4.19, 12.4.19, 13.4.19, 14.4.19, 15.4.19, 16.4.19, 17.4.19, 18.4.19, 20.4.19, 21.4.19, 23.4.19, 24.4.19, 25.4.19, 26.4.19, 27.4.19, and 2.5.19, 3.5.19, 5.5.19, 7.5.19, 10.5.19, 15.5.19, 16.5.19, 17.5.19, and 19.5.19.

On 20.5.19 the heifer was transferred to a mealie-meal feeding experiment. 23.5.19: This morning the native herdsman reported that during the previous afternoon the heifer had shown signs of illness, having been down twice. She returned with the herd, and was placed into the mealie-meal feeding kraal. To-day she refused to eat the meal, and lay down. The temperature was 101° F. An examination of a blood-smear gave negative results. The heifer was kept back, and in the afternoon was lying in the shade and ruminating. When approached she rose voluntarily and took a somewhat defiant attitude. Subsequently she was turned out into the hospital camp.

24.5.19: The heifer walked from the hospital camp into the kraal, and after arrival she lay down. Her walk was somewhat clumsy. She remained down all morning. In the afternoon, when forced to rise, she only did so reluctantly. She remained in the kraal during the night.

25.5.19: The heifer was found in left sterno-costal position. She was not noted to feed, and appeared somewhat dull. She did not rise when approached. When forced to rise, she did so. Subsequently she walked into the hospital camp.

26.5.19: This morning the heifer was returned into the kraal. She went to a box with mealie-meal and consumed some of it. She soon lay down. Her walk was slow and clumsy. When down, she had a somewhat dejected appearance, carrying the head low and the ears drooping. In the afternoon she was found in the same position, and when forced to rise was unable to do so. The muzzle was dry, the nostrils were crusted with a dry substance. The respiration was normal. The faeces were dry. An attempt to rise had probably been made to judge by the disturbed ground around the hindquarters of the animal.

27.5.19: The heifer was found in sterno-costal position. She had shifted from her former place during the night, and was now lying uncomfortably amongst stones. An attempt to rise had been made before. The heifer was lying in sterno-costal position with both hind legs flexed under the abdomen and somewhat pushed backwards, as if in the attempt to lift the hindquarters she had sagged in. She carried the head somewhat low, the ears were half drooping, and the muzzle was dry and the nostrils crusted. The region below the lower eyelid appeared somewhat prominent. The eyes were slightly sunken. The faeces were somewhat dry. The heifer was unable to rise. She was carried into the stable and placed comfortably in right sterno-costal position. Subsequently she was noticed to be feeding. The prehension of food was very slow, and only small quantities were taken in at a time. The mastication was also markedly slow. In the afternoon she received a subcutaneous injection of 0.1 gramme apomorphine. Subsequently she was found in left sterno-costal position, with head doubled back, and at times she gradually slipped into costal position with the head still bent back. She made some attempts to lift herself back into sterno-costal position, and finally succeeded. The respiration was normal and quiet. The nostrils were still crusted, but a small stream of serous fluid was trickling from the medial corner.

28.5.19: The heifer had shifted from her former place during the night, and was now in right sterno-costal position, with the head doubled back on near shoulder. When approached she raised the head, and carried it hanging down. The animal had markedly lost in condition. The muzzle was dry, the nostrils were crusted, and the faeces were dry, and formed small, black balls. She was not noted to feed. She received a subcutaneous injection of 0.02 gramme apomorphine. Subsequently she was noted to turn from the sterno-costal position into the costal one, and finally lay stretched out with all four legs extended. When put back into sterno-costal position, she was unable to maintain it. The heifer had not been eating during the day, but water was taken in. The dry pellet-like faeces were covered with mucus.

29.5.19: This morning the heifer was found stretched out on the right side and lying quietly. When placed into sterno-costal position she was unable to maintain it. She looked very weak. The flanks were hollow. She did not feed. In the nostrils was a mucous discharge mixed with dust and dirt. In the afternoon the heifer was drenched with 50 grammes sodium salicylate. In the evening she was found in sterno-costal position, with head stretched straight out and eating very slowly.

30.5.19: In the morning the heifer was found lying on the right side. placed into sterno-costal position, she was able to maintain it, but soon doubled the head back. The muzzle was dry. The nostrils were covered with dust and grass débris. The respiration was normal; the abdomen was sunken. The faeces were formed in small dry balls covered with mucus. She was drenched with 100 grammes sodium salicylate. In the afternoon she was lying on the right side most of the time. When lifted she was able to remain in sterno-costal position for a while. She then stretched the head straight forward, and in this position attempted to feed. Prehension and mastication of food were very slow.

31.5.19: The heifer was found fully stretched out on the right side, lying quietly, and no marks of struggling were present. The respiration was slightly abdominal. She was placed in sterno-costal position, and remained in it. She looked very dull and apathetic, never moving the eyes, eyelids, ears, or tail. The faeces were black, and formed dry balls.

1.6.19: Again the heifer was found stretched out. She was placed in sterno-costal position, and with difficulty maintained it. She carried the head very low. In the afternoon she was drenched with 50 grammes potassium bromide.

2.6.19: The heifer was lying in sterno-costal position with head doubled back. When the head was put into normal position it swayed for a while and again doubled back. Subsequently she was noted toprehend food in this position, slowly stretching the tongue at the lucerne placed near the head. At times she lay down on one side. When placed back into sterno-costal position she stretched the head straight out and slowly took in food and masticated it.

3.6.19: The heifer was found in right sterno-costal position with the flexed hind leg somewhat placed backwards. She was feeding slowly.

4.6.19: The heifer was in sterno-costal position and feeding slowly. At times she went over to the lateral position, but could easily be put back again into the sterno-costal position.

5.6.19: The heifer was in sterno-costal position, and appeared somewhat brighter, looking up when approached. The muzzle was scaling off. The faeces were dry, covered with yellowish mucous flakes. Subsequently she was found with the head stretched forwards to the right, describing with the muzzle a circle in the bedding, from which the grass had been pushed away.

6.6.19: The heifer was in sterno-costal position, the near hind leg was flexed and pushed backwards. The head was doubled back behind the near shoulder. The animal raised it when approached. Subsequently she was feeding.

7.6.19: The heifer was in sterno-costal position, with head doubled back. She was able to raise it, but it soon bent back again. An attempt was made to put the animal on its feet, but it was unable to stretch the legs, and after these were placed into position it was unable to stand, going down immediately.

8.6.19: The heifer was in sterno-costal position, looking fairly bright. She was lifted, but similar difficulties were noticed as on the previous day. The front legs were not stretched, but, after being placed into position, the animal could stand for a moment, but sagged in as soon as support was withdrawn.

9.6.19: The heifer was in the same place and position in which she was left the previous morning. She was feeding, but mastication was very slow. The loss of condition had become more marked, and the eyes were sunken to a greater extent. The faeces were dry and covered with yellow mucus.

10.6.19: The heifer was found lying on the right side fully stretched out. After she had been placed back into sterno-costal position she maintained it. She had a bright look and was feeding rather well.

11.6.19: The heifer was in sterno-costal position, bright, and feeding.

12.6.19: This morning the heifer was flatly stretched out. After being put into sterno-costal position she commenced to feed and had a bright look.

13.6.19: The heifer was found in sterno-costal position. She had shifted from her former place during the night and had moved forwards about two yards. An attempt was made to lift her. She had difficulty in placing the front legs and they sagged in when the weight of the body had to be supported. She was nevertheless able to stand for a short while but then suddenly dropped. She was put into sterno-costal position and noted to feed well. The movements of the mandible were carried out fairly energetically.

14.6.19: The heifer was still in sterno-costal position, fairly bright, and feeding well. When lifted she was not able to stretch the front legs completely and in the attempt to stand and walk she knuckled over in the fetlocks, stood on the fetlock, and soon sagged in.

15.6.19: The heifer was found in the same place as yesterday. She was bright and feeding.

16.6.19: The heifer had been dragging herself about during the night to judge from the disturbance in the bedding and the deposits of droppings in various places.

17.6.19: The heifer had been dragging herself during the night over a distance of about three yards, leaving at some places considerable quantities of dry faeces formed in pellet-like balls. She was bright and feeding.

18.6.19: The heifer had dragged herself about during the night. When put on the feet she was able to stand but could not stretch the off front leg. As soon as she attempted to walk, placing the weight on this leg, it gave in and the heifer fell. Rubbing the fetlock and legs with camphorated spirits was prescribed. In the afternoon another attempt was made to lift the heifer. She was able to stand a while with the front legs widely spread apart and

placed forwards. When she attempted to walk she had difficulty to stretch the off front leg, it knuckled over in the fetlock, and the heifer went down on the knee. She tried to rise from this position but did not succeed without assistance. In the evening a third attempt was made to put her on her feet. This time she was able to stand for a while; she then walked for a short distance, but was not able to fully extend the off front leg; it knuckled over.

19.6.19: The heifer was in sterno-costal position and looking bright. The off front leg was extended. She was lifted on her legs and was able to stand. She walked for a short distance, when the front legs suddenly gave in and after a while the animal tumbled over on the side. She was placed into sterno-costal position.

20.6.19: This morning the heifer was lifted on to her feet. She was able to stand for a while with the forelegs widely spread. She did not attempt to move, and subsequently sagged in.

21.6.19: The heifer was put on her legs and was able to stand for quite a while, about 30 minutes. She did not move and placed no weight on the off front leg which was placed slightly forward.

22.6.19: The heifer rose when assistance was given. She attempted to move, but dropped down after a few steps had been made. In moving she did not stretch the front leg and hurriedly brought the near front leg forward to relieve the weight on the flexed right leg.

23.6.19: The heifer was lifted on to her feet again and stood a while. In attempting to lie down she was not able to control the movements of the front legs and came down head foremost, she dropped into sterno-costal position. Subsequently she was noted to rise unassisted and stood for some time. In the afternoon she was noted to walk about and to lie down and rise. The off front leg was still a little weak but was no longer flexed when the weight was put on to it.

24.6.19: The heifer was standing this morning. When the temperature was recorded she had to be caught, and she walked fairly freely but with front legs in wide abduction. The off front leg was freely used and was stretched in the fetlock.

25.6.19: The heifer was standing and feeding from the trough. The faeces were still formed in balls, but were no longer black and hard. She was subsequently turned out, and noted to be feeding around the hay stack. At times she lay down. She rose by herself, and walked afield grazing. The walk was peculiar and somewhat clumsy. She moved the legs in abduction and placed them widely apart. It would appear that the right front leg was, so to say, sharply thrown when the fetlock was extended. The presence of superficial decubitus in the skin of the pastern of both hind legs could be noted.

26.6.19: The heifer was turned into the hospital camp.

27.6.19: The heifer returned in the morning and was feeding from the box. Subsequently she was again sent to the hospital camp.

28.6.19: The heifer had stayed in the hospital camp during the night. When returning this morning she was noted to walk slowly and occasionally stumbled with the right front foot. When walking she carried the front legs in a semi-circle, placing them in abduction. She carried head and neck low, the gait appeared clumsy, and the shoulder blades standing high.

29.6.19: The abnormal gait was still very marked; the front quarters were, so to say, falling from one leg to the other; head and neck were distinctly nodding.

30.6.19: The heifer was standing this morning and feeding from the box. The faeces were better formed and had a greenish tint. When standing she still carried head and neck fairly low and was curved in the back. The animal was transferred to the carcass camp experiment, where she remained under observation.

*Epicrisis:* Heifer 3853 was not a regular bone-eater. After she had been selected for the experiment she was noted to chew bones only on one occasion. She then discontinued for sixteen days. Subsequently again she picked bones and on one occasion for four consecutive days, when she discontinued for another twelve days. There was a third period of bone-eating, lasting sixteen days, with two interruptions. It was succeeded by a fourth period, in which the eating was very indifferent. This disease was of a chronic nature and affected mainly the locomotor system. It was diagnosed as lamsiekte. The animal finally recovered.

16. BLACK AND WHITE HEIFER 142.—Arrived at Armoedsvlakte on 30.3.19. On 4.4.19 she was noted in the veld chewing a bone. She was selected on 23.4.19 for the rotten-bone experiment. She was observed to eat rotten bones

on 24.4.19, 25.4.19, 26.4.19, 27.4.19, and on 1.5.19, 2.5.19, 3.5.19, 6.5.19, 7.5.19, 8.5.19, 9.5.19, 16.5.19, 20.5.19, and 21.5.19.

29.5.19: The heifer did not return with the herd. The native herdsman reported that on the previous afternoon she had been down frequently. She was sent for and walked home. She was then placed in the hospital camp. The gait was free. She soon lay down but rose immediately when approached and took up a defiant position. In the evening she was placed in the stable and drenched with 50 grammes of potassium bromide in a bottle of water.

The diagnosis lamsiekte was made.

30.5.19: The heifer was standing and feeding, and when the temperature was recorded she escaped and had to be caught with a certain amount of difficulty. In the afternoon she was quite lively, eating eagerly, and, when approached, escaped.

31.5.19: The heifer was lively, feeding well, and jumping about in the shed. In the afternoon she was turned out into the hospital camp.

1.6.19: The heifer was standing in the camp and grazing. It would appear that the gait was not quite free in front. She was returned to the experiment. Subsequently she was noted to chew bones on the following dates: 16th, 17th, 18th, 19th, 20th, and 21st of the month.

22.6.19. The heifer was transferred to the carcass camp experiment. Then she was not noted to pick bones whilst under observation.

26.6.19: The heifer was found this morning outside the carcass camp in right sterno-costal position. She was apparently unable to rise. To judge from the disturbance in the ground and the droppings scattered about she must have been making several attempts to rise. When forced to rise she made an attempt to do so, but was not able to raise the hindquarters. In this attempt she brought the head down to the ground and tumbled over into the right costal position. She was then placed back into sterno-costal position and was able to maintain herself. She was somewhat poor in condition, but not so poor as to explain the inability to rise. The examination of a blood-smear gave a negative result.

*Diagnosis:* Lamsiekte.

She was drenched the same afternoon with 50 grammes potassium bromide dissolved in water. She was put in the stable, where she was noted to feed and drink, but she was unable to rise.

27.6.19: The heifer was in sterno-costal position, carrying the head well, and looking fairly bright. She had shifted from her former place during the night. The faeces were black turf-like masses, partly spiral shaped. The heifer remained in recumbent position all day long and was reported to drink well.

28.6.19: In the afternoon the heifer was observed to ruminate, but on watching her for a while the masticating movements did not seem to come to an end and no deglutition took place, three hundred uninterrupting movements were then counted, and still no deglutition was observed. The bolus was, however, occasionally changed from one side of the mouth to the other. There was much salivation present, it was beaten to foam around the mouth and a small pool had collected in the bedding below the head. The nostrils were dry and dirty, grass and dust were sticking to them, and they contained some fairly thick mucus.

29.6.19: The heifer was in about the same position. Behind her was a considerable quantity of black turf-like droppings. The heifer had apparently made an attempt to rise, the off hind leg being flexed and pushed backwards. Like yesterday, continuous masticatory movements were noted and no deglutition. The movements were very slow and feeble. There was, however, no collection of saliva at the mouth or on the ground. The mucus in the nostrils was more copious than on the previous day. The eyes were sunken and some mucus was present in the medial canthi. Loss of condition had markedly increased. Late in the afternoon the heifer was found stretched out on the right side, lying very quietly.

30.6.19: The heifer died during the night.

*Post-mortem Report on Heifer 142:* The condition was rather poor. Rigor mortis was present in the hind legs and not complete in the front legs. The integument was intact, the abdomen not distended. The apex of the tongue was between the lips, and some liquid (ingesta) was running from the nostrils. The visible mucous membranes were somewhat pale. The blood was coagulated and stained well. The flesh had a somewhat pale and dry appearance. The subcutaneous tissue of the sternal region showed a gelatinous infiltration; also on the right shoulder and on the right side of the thorax some hæmorrhagic



suffusions were noted. The submaxillary glands showed no changes. Of the parotids, the right one appeared to be harder than the left one. The subiliac lymph nodes and the superficial cervicals were somewhat moist and embedded in watery connective tissue; those of the head were somewhat enlarged, moist, and fairly rich in blood. The pharynx showed no changes. The first part of the cervical portion of the oesophagus and the last part of the thoracic portion contained loose ingesta. The situs viscerum was normal; the jejunum was slightly distended with gas; no liquid was present in the peritoneal cavity, the serosa was smooth and glistening. The diaphragm was convex forward. No foreign contents were present in the pleural cavities. The parietal pleura was smooth and glistening. The lungs were slightly enlarged; the right one more so than the left one. The pleura of the right apex and of the middle lobe was reddish discoloured, that of the main lobe was bluish discoloured. The lungs on section showed a fair amount of blood, and a considerable quantity of froth escaped, which also filled the bronchi, the mucous membrane of which in some places showed a few ecchymoses. Some bronchi contained ingesta. The parenchyma was elastic and turgescens. The bronchial lymph nodes were slightly enlarged. The pericardium contained a small amount of clear liquid. The parietal serosa was smooth and glistening. The right ventricle and atrium were distended with well coagulated blood and some gas; the ostium atrio-ventriculare was open for four fingers. The left ventricle and atrium were contracted, and contained only a small quantity of blood. The ostium atrio-ventriculare was open for three fingers. Both endocardium and valves showed no changes. The epicardium of the left auricle was diffusely hæmorrhagic, and ecchymoses were present at the base of both ventricles. The myocardium was firm, and on section moist and glistening. The periportal glands were moist. The liver showed no change in size or shape, the colour was bluish; under the capsule of the left side small yellow spots were seen irregularly outlined. The capsule was smooth, glistening, and transparent. The parenchyma was of brown colour, and appeared smooth on the cut surface. The yellow spots described before were also seen on the cut sections. The gall-bladder contained a small quantity of yellowish bile that stained the mucosa of the gall-bladder diffusely yellow. The bile ducts were filled with it and likewise stained. The ductus choledochus was open. The pancreas was of usual consistence and pale brown in colour. The spleen (42 by 14 cm.) was somewhat thickened. The parenchyma on section was dark brown. Trabeculae and follicles were faintly visible. The pulpa was soft and somewhat protruding. Both suprarenal glands showed the cortex distinctly yellow. The adipose capsule of the kidney was poor in fat and somewhat watery. The fibrosa stripped easily. The kidney was red-brown, and on section all three zones were distinct. The rumen contained coarse ingesta that were slightly dry; there were pieces of bones amongst them in both the dorsal and ventral sack. On both sides of the rumeno-reticular fold was a number of amphistomas. The reticulum contained quite a number of pieces of coal and bones, also some metal pieces and a piece of glass. The meshes of the mucosa were filled with sand. The omasum was half empty, and the ingesta were soft. The abomasum contained some liquid ingesta, which in the pyloric region were somewhat dryer. The mucous membranes were slightly discoloured, and the blood-vessels of the folds were injected, and alongside were some ecchymoses. In the mucosa of the duodenum and jejunum were red patches, otherwise the colour was slate-blue. In the first portion of the colon was a red patch, and on the surface of the mucosa some blood coagula were adhering. Otherwise there were no abnormalities; neither in the caecum. The mesentery was devoid of fat, the glands showed no changes in size and consistence. The bladder was empty; the mucosa showed no changes.

*Pathological Anatomical Diagnosis:* Foreign bodies in rumen and reticulum. Gastro enteritis catarrhalis and hæmorrhagica. Oedema of the lungs. Ecchymoses of epicardium. Icterus of the liver. Tumor splenis. Cachexia. Parasites in rumen.

*Diagnosis of Disease:* Lamsiekte.

*Epicrisis:* Heifer 142 was an irregular bone-eater. She developed a slight disease, which was diagnosed as lamsiekte. She recovered from it, and continued to pick and chew bones, when for a second time she developed lamsiekte, and this time succumbed to it. It is of interest to note that the disease observed the second time appeared five days after the heifer had discontinued picking and chewing bones. Numerous bones were, however, still present in the reticulum and rumen. The case was a typical one of sub-acute lamsiekte with paralysis of the pharynx.

*SUB-SECTION C.—EXPOSURE OF CATTLE IN A PADDOCK INTO WHICH CARCASSES AND BONES HAD BEEN DEPOSITED. (THE PRIMARY OBJECT WAS TO STUDY THE CRAVING OF CATTLE FOR BONES, AND TO SEE WHETHER CATTLE CONTRACT THE DISEASE LAMSIEKTE WHEN EATING THESE BONES.)*

INTERPRETATION OF EARLIER EXPERIMENTS WHICH HAD BEEN CARRIED OUT IN THE PADDOCK USED FOR THE EXPERIMENT UNDER DISCUSSION.

Amongst the grazing down experiments (*vide* 5th and 6th Report of the Director of Veterinary Research, pages 267 to 272), some experiments are reported which deserve special attention. Not understood at that time, they now find an explanation when compared with the results obtained in the bone-feeding experiments.

EXPERIMENT No. 3 (page 268) was commenced on 3rd January, 1916, when eight head of cattle were placed in sub-division II of paddock C, about thirteen acres in extent. In one corner of this paddock a large number of carcasses of cattle which had died from lamsiekte and other causes had been deposited, and the cattle had free access to them.

*Result:* Two cases of lamsiekte occurred. Heifer 3610, on 1.3.16, viz., two months after having been placed in the paddock: She recovered. Calf 3614, on 1.3.16: It died the same night. This calf was four months old; although unweaned, it grazed about like a full-grown animal. The experiment was discontinued on 16.5.16.

The cattle after having grazed down the pasture had to be fed on extra ration, which was supplied from 16.11.16.

Of particular interest is the observation that the two animals sickened on the same date. The animals were not noticed to interfere much with the carcasses. No special attention was, however, paid to the craving of the cattle at this particular stage of the investigations.

The outbreak of the disease occurring on the same date in two head of cattle shows that most likely these two animals together partook of the carcasses. No definite observation to this effect was made, however, (Experiment No. 2, page 268.)

In sub-division I of the same paddock eight head of cattle were running since 2.11.15 until 6.5.16. No cases of lamsiekte occurred. The cattle originated from a non-lamsiekte area. These experiments might be looked upon to act as a control to the above and thus to show that in a paddock not containing carcasses the disease lamsiekte did not occur. However, it could not be definitely stated that sub-division I was devoid of carrion, and since the cattle came from a non-lamsiekte area, they might not have been bone-eaters, and thus escaped the disease, but no attention was paid to this possibility at the time.

EXPERIMENT No. 4 (page 269).—On 6.5.16 sub-division II of paddock C was enlarged by removing the fence between the two sub-divisions and the cattle, formerly separated into two paddocks, now were running together. From the commencement of this experiment the cattle had to receive supplementary rations, because the pasture

was already much grazed down. Three cases of lamsiekte occurred; the first on 17.6.16 (cow 3614: she died the next day); the second one on the same date (heifer 3610: she died the next day); and the third one (heifer 3606) three days later, on 20.6.16: she recovered. Heifer 3614 had had the disease in Experiment 3 (*vide supra*); the second attack was thus within three and a half months from the first. The mortality from lamsiekte amongst the cattle exposed in paddock C was very high when compared to that occurring in cattle running in other paddocks. It is again of particular interest to note that the disease broke out in two animals on the same date and in one three days later, which facts point to the interpretation that the disease was picked up at about the same time. Again no observations were made whether the cattle that died had been eating bones.

EXPERIMENT No. 5 (page 270).—On 2.7.16 the paddock C was freshly divided up into four divisions. The place where the carcasses now came to lie was in sub-division IV. One of its fences abutted on one side to the new paddock II which did not contain any carcasses. In this sub-division fourteen animals were placed on this date. Two cases of lamsiekte occurred amongst these cattle. The first in heifer 3593, on 10.6.16: she died two days later; the second in heifer 3591, on 15.6.16, and she also died two days later. Both cases thus occurred within fourteen days, viz., eight and thirteen days respectively after the new sub-divisions were made. It is possible that the disease was contracted before this time, but it is more likely that bones had been scattered about previously by the cattle or by dogs or jackals. It had not been searched or cleaned before the cattle were put in. Not taking this possibility into consideration, the result might be interpreted that lamsiekte occurred in a paddock which did not contain carcasses, which conclusion, of course, would be erroneous.

EXPERIMENT No. 7 (page 271).—In order to settle the question whether the presence of carcasses was somehow connected with the occurrence of lamsiekte, a new experiment was planned to be carried out in sub-division IV of paddock C which contained the carcasses of the cattle that had died of lamsiekte and other causes. The area was only a small one, comprising about four acres. The experiment was commenced on 25.8.16 with eight head of cattle and was continued until 16.12.17. The animals received supplementary rations from the beginning. In order to ensure picking up of bones, ingesta, etc., the remains of the carcasses were scattered about. No cases of lamsiekte occurred. There was, however, no record that the animals ever consumed any bones, and in the light of subsequent events in the same camp (March, 1919, to June, 1919), it was not likely that they ever did. No attention had been paid to the presence or absence of craving. It is possible, and very likely, that the cattle used for this experiment were not bone-eaters at all, and thus would not contract the disease. The necessity of an animal to be a bone-eater in order to contract the disease was not realized at that time.

CONCLUSION.—At the time the conclusion was drawn that it is doubtful whether the disease would be contracted by animals consuming bones and other remains of animals which had died from lamsiekte. In the light of our present knowledge all the experiments now find an explanation and can be referred to as supporting the correctness drawn from other evidence, although the observations made

at the time were not complete. All the grazing down experiments can now be satisfactorily explained, including Experiment 1 (page 268) in paddock B, in which four animals contracted the disease between the 14.8.15 and 23.9.15, and Experiment 6 (page 270) in paddock D, in which one case occurred. These paddocks were close to the carcass paddock, and carrying about of bones by dogs and jackals had to be admitted; indeed, on a close search being made, bones were subsequently found, thus proving that they were scattered about by some means.

REPETITION OF THE EXPERIMENTS (Carcass Experiment).—Exposure of cattle to carcasses that had died of lamsiekte and other diseases was recommenced on 9.12.18 in sub-division IV of paddock C with ten head of cattle. They came from the alternate grazing and feeding lot A (*vide* 5th and 6th Report, page 287), and had just finished a period of twelve days grazing in the veld, having previously been kraaled and fed on a ration. The following cattle were utilized:—

- (1) Red and white cow 3168: At Armoedsvlakte since 16.8.16.
- (2) Red cow 2620: At Armoedsvlakte since 27.8.15.
- (3) Red cow 938: From Bestersput; arrived 11.8.16.
- (4) Black, white-faced cow 2306: At Armoedsvlakte since 22.10.16.
- (5) Red cow 2482: At Armoedsvlakte since 16.8.16.
- (6) Red and white cow 3598: At Armoedsvlakte since 8.3.17.
- (7) Red bull 3721: At Armoedsvlakte since 6.2.16.
- (8) Dun cow 3097: At Armoedsvlakte since 1.3.17.
- (9) Black heifer 3578: At Armoedsvlakte since 1.3.17.
- (10) Black heifer 3801: At Armoedsvlakte since 15.7.17.

CONTROLS.—In the adjacent paddock, lying to the west, and which had previously been halved for other purposes, sub-division III of paddock C, nine head of cattle, also from the alternate grazing and feeding lot, were placed as controls; these cattle had been grazing for twelve days previously, *viz.*:—

- (11) Red cow 2598: From Bestersput; arrived 11.8.16.
- (12) Red cow 4175: From Grahamstown; arrived 10.5.18.
- (13) Black tollie 3806: At Armoedsvlakte since 25.1.17.
- (14) Red heifer 2914: At Armoedsvlakte since 1.3.17.
- (15) White and black heifer 3716: At Armoedsvlakte since 14.4.17.
- (16) Red heifer 2859: At Armoedsvlakte since 22.10.16.
- (17) Black and white tollie 3899: Born at Armoedsvlakte on 25.11.16.
- (18) White and red heifer 3802: At Armoedsvlakte since 25.1.17.
- (19) Red heifer 3516: In Armoedsvlakte since 25.8.16.

*Result:* By 25th February no cases of lamsiekte had occurred amongst these cattle. Both paddocks had been grazed down closely and the animals had been supplied with rations. The conclusion might thus again be drawn that exposure to carcasses is not followed by disease. Observations concerning the importance of craving by this time had been made. It was absent in this lot of cattle, and this fact would explain the absence of the disease. On 25th February it was noted that the cattle in the carcass paddock (sub-division 4)

were never found near the bones, but mainly collected at the gate where the food was supplied. It was then thought possible that these cattle had no craving for bones, the craving having either not existed when they were placed into the paddock, which is most likely the case, or having disappeared whilst they were there, due to the feeding on rations.

*Investigations into Craving for Bones.*—In order to study craving under as natural conditions as possible it was decided to bring a new lot of cattle into the sub-division of this paddock. These cattle were known from previous observation to pick and eat bones. (They were to be called bone-eaters.)

In order to maintain the craving the cattle would receive no additional ration, but would have to run in the veld. In the adjacent control paddock (sub-division III, paddock C), the same number of cattle, also selected bone-eaters, had to remain during the same period as controls. Both lots would graze together. The old cattle already in the carcass paddock would remain and, not being bone-eaters, would serve as additional controls in the same paddock, whilst those hitherto running in the control paddock (C, sub-division III b) could be disposed of.

3.3.19: The twenty-two head of cattle selected for these experiments were taken from amongst those that since 25th February had been noticed picking and chewing bones in the veld, around the homestead, in the kraal, or in the stable.

4.3.19, 9.30 a.m.: The cattle were put into the paddocks (sub-division IV, paddock C), viz. :—

- (1) Red cow 2968: At Armoedsvlakte since 1.3.17. (Last in sun-kraal experiment.)
- (2) Blue schimmel cow 3146: At Armoedsvlakte since 16.8.16. (Last in shade-kraal experiment.)
- (3) Red and white cow 3583: At Armoedsvlakte since 22.3.17. (Last in shade-kraal experiment.)
- (4) Black and white tollie 3818: At Armoedsvlakte since 15.4.18. (Last in loogas and rooi brak experiment.)
- (5) Red heifer, white-faced, 3874: From Pretoria; arrived 25.11.16. (Last in sun-kraal experiment.)
- (6) Black heifer 3900: Born at Armoedsvlakte 4.12.16. (Last in surplus lot.)
- (7) Red tollie 3903: Born at Armoedsvlakte 11.12.16. (Last in loogas and rooi brak experiment.)
- (8) Black heifer 3905: Born at Armoedsvlakte 16.12.16. (Last in shade-kraal experiment.)
- (9) Red and white heifer 3906: Born at Armoedsvlakte 18.12.16. (Last in loogas and rooi brak experiment.)
- (10) Red heifer 3936: Born at Armoedsvlakte 24.2.17. (Last in loogas and rooi brak experiment.)
- (11) Dun tollie 4023: Born at Armoedsvlakte 14.8.17. (Last in surplus lot.)

In the control paddock were placed (sub-division III, paddock b of C):—

- (12) Red cow 2844: In Armoedsvlakte since 8.3.17. (Last in sun-kraal experiment.)
- (13) Red ox 3621: In Armoedsvlakte since 31.12.16. (Last in shade-kraal experiment.)

- (14) Red and white cow 3333: In Armoedsvlakte since 28.12.16. (Last in loogas and rooibrak experiment.)
- (15) Black heifer 3856: In Armoedsvlakte since 6.12.17. (Last in loogas and rooibrak experiment.)
- (16) Red heifer 3875: From Pretoria; arrived 25.11.16. (Last in shade-kraal experiment.)
- (17) Red heifer 3910: Born at Armoedsvlakte 27.12.16. (Last in surplus lot.)
- (18) Red heifer 3911: Born at Armoedsvlakte 29.12.16. (Last in shade-kraal experiment.)
- (19) Black tollie 3930: Born at Armoedsvlakte 11.1.17. (Last in loogas and rooibrak experiment.)
- (20) Red heifer 3998: Born at Armoedsvlakte 15.5.17. (Last in surplus lot.)
- (21) Dun tollie 4029: Born at Armoedsvlakte 29.8.17. (Last in sun-kraal experiment.)
- (22) Black and white tollie 4106: Born at Armoedsvlakte 16.12.17. (Last in loogas and rooibrak experiment.)

In sub-division IV of paddock C the bleached bones had been collected into a heap in the north-west corner of the enclosure and the more recent carcasses were scattered along the northern fence. Soon after their arrival in the carcass paddock cattle picked up bones which they found near the gate and by 10.45 a.m. eight of the eleven were busy chewing bones. The old cattle that had been there since 9.12.18 were standing near by and looked on. All the eleven bone-eaters were then driven to the heap of bleached bones in the north-west corner of the paddock; all eleven readily collected around the heap within a few minutes and commenced to pick and chew bones. This picking and chewing was maintained during the half-hour the observation lasted. In order to observe the attitude towards the decomposing or putrified carcasses the cattle were then driven to them and left alone. As soon as they saw their way clear to the bleached-bone heap all eleven returned and recommenced the consumption as eagerly as before. One cow (2968) was noted to have a preference particularly for ribs and to chew them from the sternal soft end to about the angle and then to drop the rest, the hardest portion. Three ribs were eaten in this manner by this cow within half an hour.

This chewing of bones was an extraordinary sight. The animals were standing with stretched neck and head, the nose raised in the air, eagerly and rapidly masticating and showing a certain amount of excitement. A crackling noise could be heard at a distance. As soon as the rest of a bone was dropped another one was picked up. Meanwhile the cattle were standing quiet and near the heap. A blue schimmel cow (3146) was noted to have a preference for vertebrae, of which she chewed the processes with apparently great relish. At noon the bone-eating cattle were turned out, whilst the old lot were left behind.

They were sent to be watered at the homestead, and on leaving the camp seven head were noticed to continue chewing. It was thus evident that the cattle selected were confirmed bone-eaters, and the bleached bones formed a great attraction for them.

*Alteration in Experiment.*—In order to see whether the bone-eaters would go for rotten bones when bleached bones were no longer available, the bone heap was moved over the fence, but in close proximity to the latter.

5.3.19: At 9 a.m. the cattle were driven into the carcass paddock and the spectacle of yesterday was repeated. The ten old remaining cattle were driven together with the eleven bone-eaters to the bone heap. All the new cattle immediately picked bones and were busy chewing without loss of time. None of the old cattle were seen to touch any of the bones and gradually, one by one, cleared away and left the new cattle alone picking and chewing. After about half an hour some of the bone-eaters, apparently tired of masticating, left the heap, whilst the remainder stuck to it. One of them was noted to lie down and to continue the chewing in the recumbent position. It was thus evident that the old cattle, placed in the carcass camp on 10th December, 1918, had no craving for bones, and it is doubtful whether they ever were bone-eaters when they were first placed into the camp. The absence of grass in the paddock and the supply of rations both were conducive to prevent the onset of craving for bones.

6.3.19: At 9 a.m. the bone-eaters were turned into the carcass camp. Again the spectacle of the previous day was repeated; after a few minutes all cattle had bones except the dun tollie (4023). It only sniffed at the bones. The observation was carried through until 10.15 a.m. During this time the cattle continued chewing. Of the old lot of cattle none were seen to pick bones. When at 9 a.m. the bone-eaters were entering and hurriedly making for the north-western corner, some of the old cattle joined up and walked with them to the corner, but none were noted to even sniff at a bone. At 11.45 a.m. four head of cattle were still seen chewing, viz., heifer 3874, tollie 3903, heifer 3906, heifer 3905. The tollie (3903) was in recumbent position and chewing bones. Of the remainder of the cattle some were standing and ruminating, some were resting. At noon the cattle were driven out and joined the control lot of the adjacent paddock; both lots were then driven to the water-troughs. On arriving there one control ox (3621) was noted chewing a bone, which apparently had been dropped by one of the bone-eaters after leaving the carcass camp.

7.3.19: Shortly after 9 a.m. the cattle were driven into the paddock and soon all except the dun-coloured tollie (4023) were noted to chew bones. On this occasion a black heifer of the old lot (3801) was noted to pick a bone. She soon dropped it, however, and went grazing. At 10 a.m. the cattle were still chewing bones.

8.3.19: The cattle entered the kraal at 10.20 a.m. Soon all the cattle were seen picking and chewing bones. Tollie 4023 was the first to discontinue. The observation to-day only lasted 20 minutes, during which time all the cattle except the tollie continued masticating bones.

9.3.19: At 9 a.m. the cattle were turned into the paddock and, with the exception of the tollie (4023) and the old cow (2968), all went straight to the north-west corner and commenced the concert of bone chewing. Subsequently the cow joined in, whilst the tollie was examining the feeding-boxes of the old cattle.

In the adjacent control paddock (III b of C) one heifer (3910) was noted to chew a bone. It is most likely that the bone was picked up outside the paddock and dropped by one of the animals from the carcass paddock when the cattle returned from the water-troughs.

The old cattle in the carcass paddock stood or were lying down practically all this time near their feeding-boxes.

10.3.19: The cattle were driven into the paddock at 9 a.m. and observed at 9.30 a.m., when all cattle were seen chewing bones. Heifer 3906 and tollie 4023 were standing by themselves; the little herd of nine was in the bone corner very busy with the bones, the crackling noise being heard at a distance.

11.3.19: The herd was put into the paddock as usual and all, with the exception of tollie 4023, collected in the bone corner and commenced chewing the bones.

In the adjacent paddock (III b of C) two control animals were busy masticating bones (heifer 3911 and heifer 3856), which they apparently had picked up returning from the water-troughs.

12.3.19: At 9.30 all cattle were chewing bones. In the adjacent control camp by this time all cattle were lying down, and most of them were ruminating. All of the old cattle in the carcass paddock were near the gate and none had joined the procession to the bone corner.

13.3.19: This morning three animals were not seen chewing bones: cow 3146, heifer 3936, and cow 2968; they were ruminating.

14.3.19: At 9.30 a.m. all animals were seen chewing bones except heifer 3936, a heifer which was in oestrus and kept in the company of the bull belonging to the old cattle. The bone-eaters and the old cattle were to-day again driven together into the bone corner. The bone-eaters remained in the corner, busy chewing; the old cattle stood between them, never picking any bones, and one by one they trailed away, leaving the bone-eaters behind. It would thus appear that bone-eating is not a vice that animals acquire by imitation.

In the control paddock ox 3621 was noticed to chew a bone for a while. The control cattle were grazing all over the paddock, and this picture differed strikingly from the one above: all cattle standing with their noses in the air and moving their mandibles quickly.

15.3.19: At 9.30 a.m. all cattle, except cow 3146 (the blue schimmel) and the heifer 3936, were seen chewing bones. The former stood at a distance from the bones and to-day did not look so lively as usual. She was not seen feeding or ruminating during the time of observation. The heifer 3936 still kept to the bull.

16.3.19: As on previous days the cattle, except cow 3146, collected in the north-west corner and were busy picking and chewing bones. After entering the paddock she left the herd and stood alone at one side of the paddock, quietly and disinterested and not feeding or ruminating.

17.3.19: The little herd, with the exception of the blue schimmel cow (3146), assembled in the bone corner and immediately took up the bone-eating occupation. The blue schimmel cow kept aloof in the opposite corner. She then went down to the feeding-boxes and was noted to lick in the salt-box, after which she walked to the opposite side of the paddock, away from the bones and cattle.

In the adjacent control paddock one cow (3333) was busy chewing a humerus of a calf, one end being partly eaten off; also the young ox 3621 was busy with a bone.

18.3.19: All cattle except three were in the bone corner and all were chewing except tollie 4023 and heifer 3874; the latter was ruminating. To-day the blue schimmel cow went to the corner; she was noticed to pick a bone, but soon dropped it. She then took up a disinterested attitude and finally left the place.



19.3.19: The blue schimmel cow (3146), the tollie (4023), and the old cow (2968) were not noticed to eat bones, but all the rest were busy. To-day a fresh supply of salt was put into the salt-box, but none of the animals were attracted by it.

In the adjacent control camp cow 2844, which was in recumbent position, was seen chewing a bone.

20.3.19: All cattle were eating bones except the blue schimmel cow. She kept aloof and was in recumbent position. She had never before been seen lying down during the time observations were made. When approached she rose easily and stood for a while. Subsequently she visited the salt-box. Heifer 3900 was also noted at one time at the salt-box. The bone-eaters were decidedly not so eager as during the first days of the experiments.

*Remarks:* The foregoing notes indicate that the bone-eaters were only picking and chewing old bleached bones. Never were they seen to interest themselves in any of the carcasses still in process of putrefaction in the same camp. These carcasses had supplied the bones for the bone-eating experiment from troughs and their consumption produced typical cases of lamsiekte. It was, therefore, *evident that if bone-eating cattle have the choice of bones, they apparently do not pick the rotten bones by preference to old bleached bones.*

*Experiments to note whether Craving Cattle with no access to Old Bleached Bones would eat Rotten Bones.*—For this purpose the control cattle of the adjacent paddock (b of C III) were selected and two supplies of rotten bones were put in separate places in the camp, viz.: —

- (1) Bones from carcass of cow 3327 which had died on 14.3.19 and was undergoing rapid decomposition. (New rotten bones.)
- (2) Bones collected in the carcass enclosure and putrefaction paddock. (Old rotten bones.)

20.3.19: The experiments with the control lot were carried out to-day for the first time. As soon as the fresh rotten bones were scattered about, the control cattle were attracted and they hurried up to inquire. They sniffed at the bones and withdrew immediately. Subsequently the old rotten bones were scattered about and again the cattle went to sniff at them, but left them alone. The bones were then left behind, but so arranged as to find out if any of them should have been touched during the recess of observations.

21.3.19: Since none of the controls had been picking any of the bones, it was decided to see how the bone-eaters in the carcass paddock would behave. It was further decided to study likewise the behaviour towards fresh (green) bones and towards cooked bones. The fresh bones had been collected the day before from the carcass of a heifer obtained after post-mortem examination had been made and the cooked bones were returned by natives, to whom the carcass of a dead animal had been handed over for consumption.

Both lots of cattle were turned into the control camp and first confronted with—

- (a) the new rotten bones. Three animals were noted to pick bones which were, however, soon dropped, viz., heifer 3936, cow 2844, and heifer 4106; the first belonged to the bone-eaters of the carcass paddock lot, the latter two to the control cattle;

- (b) the old rotten bones. None were seen to pick any;
- (c) the fresh green lot. None were seen picking;
- (d) the cooked bones. Three animals were seen to pick and eat, viz., heifer 3856, heifer 3910, and cow 3333.

In order to observe the behaviour towards the old bleached bones, both lots were then driven into the carcass paddock and the old spectacle of a bone concert commenced at once. Out of the twenty-two animals assembled, only three were not picking bones, viz., tollie 4029, heifer 3910 (*vide supra*), and the blue schimmel cow 3146, which again stood aloof.

It was thus quite evident that *whilst the majority of bone-eaters had a craving for a certain kind of bone, which may be called a sweet bleached bone, only a few picked rotten bones, which they soon dropped, and none were seen to pick fresh green bones. Even cooked green bones did not seem to be favoured.*

22.3.19: The experiment of the previous day was repeated to-day with the control lot alone in exactly the same manner, and the results were as follows:—

- (a) Of the new rotten bones, only one animal was seen to pick one, viz., tollie 4106, but it dropped it soon afterwards.
- (b) Of the old rotten bones, none were picking any.
- (c) Of the fresh green bones, two animals were picking, viz., heifers 3856 and 3910, but again they soon dropped them.
- (d) Of the cooked bones, three animals were picking, viz., heifer 3910, 3856, and tollie 4106.

Subsequently the controls were transferred to the carcass paddock, where the first lot of cattle were already busy eating bones, and all joined in a common feast of bone-eating, except the blue schimmel cow that again was keeping aloof. She took no notice of her companions and was seen to lie down.

The conclusion from these observations was that bone-eating cattle were particularly fond of one type of bone only, partially so to another type. Apparently the rotten bones were not the ones which were liked by the majority of cattle.

*Alteration of Experiment.*—It was decided to continue this experiment for some time in order to observe whether and when finally the bone-eaters will pick any of the unpalatable bones, which kind, and after what time. It could be reasonably expected that in time the unpalatable bones would be palatable to the cattle.

23.3.19: Before the experiment with the control lot commenced, four cattle were seen to be chewing bones, viz., heifer 3910, tollie 3930, ox 3621, cow 2844. Heifer 3910 was noted to chew a bone and when chased she dropped a green fresh bone that had been left behind and was found this morning by the heifer.

The results of the observations concerning the test bones were as follows:—

- (a) Of the new rotten bones, none were picked.
- (b) Of the old rotten bones, none were picked.
- (c) Of the fresh green bones, heifer 3910 was seen to pick and to chew.
- (d) Of the cooked bones, one heifer (3856) was picking and eating and one heifer (3911) dropped a bone after picking.

The control cattle were not brought over to the carcass camp. This was done with the object to exclude any possible psychological factor. It was thought that the cattle might gain the experience that after refusal of unpalatable bones they would be supplied with palatable sweet bones, of which they were so fond. The cattle of the carcass paddock, except the blue cow 3146, were chewing bones as usual.

24.3.19: The experiment with the control lot was repeated, and the following observations were made:—

- (a) Of the new rotten bones, one tollie (3930) was noted to pick a bone and chew for a while.
- (b) Of the old rotten bones, heifer 3910 picked a bone and retained it.
- (c) Of the fresh green bones, heifer 3910 picked a bone and chewed it.
- (d) Of the cooked bones, three animals picked and chewed, viz., heifer 3856, cow 3333, and tollie 4106.

*Removal of Two Animals.*—Heifers 3874 and 3875 were transferred to a bonemeal experiment on 24.3.19.

*Observation in the Carcass Paddock.*—The cattle had been in this paddock for 1½ hour before observation commenced. At the time only two were seen chewing, viz., heifers 3900 and 3906.

Since these cattle had never touched any of the carcasses still strewn about in this paddock, having sufficient palatable bones at their disposal, it was thought advisable to observe their behaviour towards these carcasses after all the palatable sweet bones had been removed. Accordingly the bleached bones were collected and removed and the carcasses were piled up into small heaps.

*Note.*—It must be borne in mind that material collected from these carcasses had supplied the material for the trough experiments and had produced typical cases of the disease. The cows belonging to the old non-bone-eating lot were removed from the carcass paddock and only the bull was left; he was also removed the next day. It was quite evident that these cattle were not bone-eaters at all, and hence it could not be expected that the experiment for which they had been selected would give positive results.

25.3.19: The results of the bone-eating tests with the control cattle were as follows:—

- (a) None of the animals picked any of the new rotten bones.
- (b) Of the old rotten bones, heifer 3910 picked one, but dropped it after a while. She subsequently picked another one and chewed it.
- (c) Of the fresh green bones, tollie 4106 picked one and chewed it.
- (d) Of the cooked bones, three animals were seen picking and chewing, viz., tollie 3930, heifer 3856, and cow 3333.

26.3.19: The cattle in the carcass paddock were still finding bones. Since the 24.3.19 the paddock was cleaned daily, but the cattle collected on the old place and were able to pick up small bones, which they munched. Cow 3146 still kept aloof.

Testing of the control lot gave the following results:—

- (a) New rotten bones were picked by cow 3333, but soon dropped.
- (b) Old rotten bones by tollie 3930 and also dropped.

- (c) Fresh green bones were picked and chewed by heifer 3910, which retained the bone for a long while.
- (d) Cooked bones were taken by heifer 4106, cow 3333, tollie 4029, heifer 3856, and tollie 3930.

Heifer 3911 carried a bone in the mouth when she entered the paddock.

27.3.19: The cattle of the carcass paddock were driven into the enclosure at the usual hour, after a search for bones had been previously made and no more bleached bones had been found. The carcasses still undergoing decomposition had been collected into various small heaps. The cattle, however, could find bleached bones. Heifer 3936 found a digit. Heifer 3906 was observed to chew a white stone, which she subsequently dropped. Cow 3583 in passing a bone heap found a palatable bone which she chewed until the conclusion of the observation. The rest of the cattle did not approach the carcass heaps, but returned to the gate and settled down. The old blue schimmel cow stood aloof as usual.

The control cattle in the adjacent paddock were again submitted to the bone test and the results were as follows:—

- (a) Of the new rotten bones, two animals, heifer 3910 and tollie 4106, were seen to pick and chew.
- (b) Of the old rotten bones, one picked a bone and chewed it (tollie 4029) and one (heifer 3856) picked a bone, but dropped it again.
- (c) Of the fresh green bones, two picked and chewed (heifer 3910 and tollie 4106).
- (d) Of the cooked bones, four animals were picking and chewing (heifer 3910, tollie 3930, tollie 4029, heifer 3856.) Cow 2844 had picked up a bone outside and chewed it in the paddock.

28.3.19: Carcass Paddock Experiment.—There were still three animals that had found something to pick and chew. One heifer (3905) was seen to pick up a stone, which she soon dropped, however. The red tollie (3903) was investigating one of the piled-up rotten carcass heaps, but did not pick a bone.

Control Paddock.—In the bone tests of this morning the following observations were made:—

- (a) Of the new rotten bones, no animals were seen to pick any.
- (b) Of the old rotten bones, three animals picked and chewed them, viz., heifer 3910, tollie 4029, tollie 4106.
- (c) Of the green fresh bones, one picked a bone (tollie 4029).
- (d) Of the cooked bones, two animals picked bones (tollie 3930, heifer 3910).

31.3.19: Carcass Paddock Experiments.—There were no other bones to be found in the paddock except those from the piled-up heaps of carcasses which were beyond the stage of putrefaction. These bones could still be smelt and had dry, rotten flesh, skin, and sinews adhering to them. The cattle did not seem to be attracted by these bones. They still went to the old bone corner where the ground had been swept to remove the small pieces of bones. The cattle were seen to lick this place and in this way picked up small splinters which they eagerly munched. Except the blue cow all cattle finally had something to chew; one cow was chewing the sole of a shoe.