

fed and ruminated. At one time, however, the prehension and mastication of food were slow. The faeces became very dry, otherwise they were well formed. Loss of condition became apparent and the eyes were sunken.

The second animal (2790) was turned out with the herd on the fourth day but did not reach the veld. When walking it showed a clumsy walk. It remained behind. From the following day it turned out daily until the ninth day, when it did not return. It rose, however, and was able to walk home, but went down after arrival and subsequently refused to rise, but rose on the following day, when the tail was pinched. During the previous days every time after arrival in the kraal the animal went down into sterno-costal position. On the twelfth day it was again unable to rise, but able to walk when put on to its feet. It rose on the sixteenth day without assistance, remained down on the seventeenth and eighteenth days, and rose again by itself on the nineteenth day. During the course of the next days the condition remained much the same; one day the animal would rise, another day it would remain down. Finally, on the twenty-ninth day, the improvement was so marked that it was returned to the veld. The animal was feeding and ruminating practically all the time; the look was always bright. No disturbances in the masticatory and deglutitive organs were noted, and the faeces passed were of normal consistence and appearance. The animal had lost considerably in condition, however.

SYMPTOMS OF THE THIRD GROUP.

In this group was one animal (3853) that was discharged as recovered after thirty-nine days of illness. The symptoms mainly indicated a disturbance in the locomotor system.

The animal, when grazing in the veld one afternoon, was observed by the herdsman to show signs of illness, having been down twice. It returned to the kraal next day, when it refused its ration. Subsequently it lay down. The walk was somewhat clumsy. On the second, third, and fourth days the animal was down most of the time, but was able to rise when forced. The walk was slow and clumsy. On the fifth day the animal was unable to rise, remaining in sterno-costal position, but shifting about a good bit, having made several attempts to rise. After one such attempt the hind legs were found flexed under the abdomen and pushed backwards slightly. Later, the head was doubled back, and the animal went over into lateral position, but when placed into sterno-costal position, was able to maintain it. On the sixth day the animal was in lateral position and unable to maintain the sterno-costal one when placed into it. On the eighth day when placed into sterno-costal position it was able to maintain it, but soon doubled back the head; later it carried the head stretched straight forwards. In the course of the next two days the condition remained much the same; the animal was found in lateral position in the morning, and when subsequently placed into the sterno-costal one, doubled back the head. On the twelfth day the animal was found in sterno-costal position and remained in this position over night. It slipped again into lateral position the next day, but could easily be put back into the sterno-costal one. On the fourteenth and fifteenth days the animal was somewhat brighter; it was able to maintain the sterno-costal position, but the head was doubled back. An attempt

to put it on its feet on the sixteenth day failed since the animal was unable to support itself. Another attempt the next day succeeded for a moment, but the animal sagged in as soon as the support was withdrawn. On the following days the animal was either in lateral or sterno-costal position. On the twenty-second day, after a further attempt to put it on its feet, the animal was able to stand for a while, but then suddenly sagged in. On the twenty-third day this attempt was repeated. The animal was not able to stretch the front legs, and when trying to walk, knuckled over and sagged in. During the subsequent days the animal was again in sterno-costal position, dragging itself about a good bit. On the twenty-seventh day, when lifted on to its feet, it was able to stand for a while with legs widely spread. When attempting to walk, the legs were stretched with difficulty. It knuckled over and finally sank on to the knee. The animal was unable to raise itself out of this position. In the evening of the same day the animal was able to stand when lifted; it walked for a short distance, but was not able to fully extend one front leg.

During the succeeding days the animal was put on to its feet daily, and on the thirtieth day was able to stand for a short while, as long as half an hour. On the thirty-first day the animal rose with a little assistance. On the morning of the thirty-second day it still experienced some difficulty in maintaining itself on the feet, but subsequently rose unassisted and walked about. On the thirty-third day it was standing, and when the temperature was recorded had to be caught. It walked freely, but with the front legs in wide abduction. From the thirty-fourth day onwards the conditions finally improved. The animal walked about, was turned out to graze, but the walk still remained somewhat abnormal, even on the thirty-ninth day, when it was dismissed from this experiment.

There were no serious disturbances in the digestive organs. The animal was feeding practically all the time, although less than normally. It was also drinking normally. The prehension and also the mastication of food at one time were slow. Rumination never stopped completely. The faeces became dry and hard, small black balls or pellets that were coated with mucus being evacuated.

The animal lost condition fairly rapidly. The nostrils at one time were crusted and dry, or soiled with dust and dirt. The respiration was practically always normal.

There was a period, about one week after onset of the first symptoms, in which the animal was distinctly ill; it coincided with the period when it went down into lateral position and was unable to maintain the sterno-costal one. At this time it refused to feed. Subsequently an improvement was noted, and when the animal fed again the strength gradually returned.

C.—SYMPTOMATOLOGY AND COURSE OF LAMSIEKTE IN CATTLE THAT WERE FEEDING ON BONES SCATTERED IN A Paddock.

The number of animals consisted primarily of twenty-two heifers and tollies; of these, seven at one time or another showed symptoms of lamsiekte. One bull, and still later, five more heifers and tollies were subsequently added. Of these, three sickened. The total number of animals thus observed was twenty-eight, of which

ten developed the disease. All these animals had a record of continuous bone-eating, repeated even at the time when they were already ill. It would not be possible to determine in these cases the length of the incubation period, although in one or two instances this might be done approximately. The deaths noted did not occur amongst the first selected lot of animals, but amongst those that were subsequently added (2600, 172, 169, the last two being killed). Recoveries were noted amongst the first lot selected. Some of these recoveries were remarkable, in so far as the disease took an unusually mild turn and was of an extremely short duration, or it showed a certain relapsing type (3910, 3930, 2968, 3905, and 3856).

Of the three fatal cases one lasted one day (acute case). In the other two cases the animals were killed *in extremis* on the ninth and eleventh days respectively (sub-acute chronic cases).

Acute Lamsiekte.

The subject was a bull (2600). On the day the animal was placed in the experiment it was noted to pick and eat bones, both in the morning and afternoon, and again on one subsequent day. It sickened six days after it had been noted to eat bones for the first time, and this period may in this case represent the incubation period.

When reported ill in the morning, it was found in sterno-costal position and unable to rise, having separated from the herd of cattle to which it belonged. Subsequently it was able to rise, its gait was very clumsy, and it walked only a short distance before it lay down. This animal received an injection of blood from a recovered animal. Subsequently it rose again, walked a short distance and lay down again. It died the same night.

Sub-acute Chronic Lamsiekte.

The subjects of observation were two animals (172, 169); both were killed *in extremis*.

One of the animals when found ill (169) was noted to be restless, frequently moving both the hind and the front legs, and showing a clumsy walk, with the front legs placed in abduction. It soon lay down, but was able to rise and even to walk to the homestead on the first day. The second animal (172) was found lying down and unable to rise. Futile attempts to rise had previously been made, to judge by the semi-circular trail left in the ground, and the faeces deposited on it. Further attempts were made, which, however, only succeeded in slightly raising the hind quarters and slightly moving the animal forwards. On the second day the first animal (169) was down and unable to rise, the hind legs were pushed backwards and flexed. Traces of previous futile attempts were also noted. Both animals subsequently remained in the sterno-costal position. The one (172) went over on the side on the seventh day, the other one (169) finally on the eighth day, having been in that position two days previously. The former remained in this position until it was killed on the tenth day. When in lateral position the animal remained quiet, not moving any limb at all, breathing normally, and only rolling the eye-ball slightly when approached. In the case of the other animal (172) the conditions were much the same, until the day before the animal was killed, when the respiration was found to be accelerated. Symptoms in the digestive organs were present. The animals at times refused

to feed, and when masticating, the movements were slow. The faeces were dry, black, and spiral-shaped in one case (169), and black and soft in the other case (172), and subsequently dry and spiral-shaped. 169: Slight salivation was noted on the fifth day. Mucous discharge in the nostrils, mucus in the canthi of the eyes, and dry and scaly muzzles were also noted. Towards the end froth was also present in both nostrils.

Recoveries from Lamsiekte.

To remain within the accepted classification of the disease, the cases observed might be grouped as acute, sub-acute, and chronic, but under the understanding that they were in all respects very mild cases, and in some instances cases as these, under the condition of the practice, would probably have been overlooked. The animals were observed daily, sometimes once a day, at other times twice, and even more times a day, so that the behaviour of each individual became well known, and any deviation from it was accordingly immediately noted. All these animals were bone-eaters, and the number of times bones were picked and eaten, was duly recorded.

The Acute Lamsiekte.

Two animals (3583, 3903) might be considered under this heading. One was noted to lie down on two successive days after arrival in the kraal. This fact was so striking and in contrast with the previous conduct of the animal, that it appeared unusual and abnormal, and could be interpreted as an exceedingly mild case of the disease. The other animal (3903) showed the same peculiar conduct on two days, going down after arrival. It went down a second time after an interval of seven days. In this case also the observation was so unusual and striking, that no doubt was ever experienced that it also was a case of lamsiekte.

To Subacute Lamsiekte might be attributed the case of four animals (3910, 3930, 2968, 3905) which was of an intermittent or remittent type. It was advisable to consider these cases somewhat in detail. In one animal (3910) the disease was diagnosed, when after arrival in the paddock, it immediately went to lie down. A string of saliva was hanging from the mouth. The animal was licking lips and nostrils, and carried the head and neck slightly stretched out. Two days later the animal lay down again, rose when disturbed, but immediately went down again. On the fourth day it also lay down. In the morning of the fifth day, when the herd arrived at the paddock, this animal lagged behind and showed a stiff gait. The sixth day, when the herd went to be watered, it remained behind in recumbent position at the trough. It was able to rise and when walking showed a forced gait. The seventh day the animal did not turn up at all with the herd. It remained in the veld where it had been seen last the previous night. It was able to rise and to walk, and was brought to the paddock, where it lay down. After being watered the animal did not turn out to the veld. Its faeces were chain-like cakes, covered with offensive-smelling mucus. Subsequently the animal followed the herd again, but showed a stiff gait. When returning to the paddock it lay down again on two different occasions. Also, when no longer lying down, this animal for some time showed a clumsy walk, and kept away from the herd at times.

It had lost considerably in condition. During the first days of the illness, it had continued to eat bones, but discontinued to do so later.

A second animal (3930) was first noted to be ill since it lagged behind when the herd was brought into the paddock. After entering the paddock it lay down but was able to rise again. The same observations were made two days later. Subsequent to this date, the animal gave no further indication of illness until nine days later, when it was again noted to lie down soon after arrival. It continued to do so for the next nine days. It was always able to rise easily, but whenever forced to rise went down again. One day it was also noted to be slightly salivating: a mucus string was seen hanging from the mouth. Again there was a period of five days when the animal appeared normal, but subsequently it lay down occasionally. This animal also picked bones practically all the time it was unwell.

In the third case the animal (2968) was one day seen lying down soon after arrival of the herd in the paddock. It did so again two days later and again after two days. The fifth day it was lagging behind the herd, and when the herd was hurried up, it turned to one side. After entering the paddock and also during the following three days it behaved normally. The sixth day it was again noted to be the first animal to be down after arrival in the kraal. No other symptoms were noted thereafter.

In the fourth case (3905) the malaise commenced by lying down one day after arrival of the herd in the paddock. This was done again two days later. Then followed a period of thirteen days, when no further symptoms were noted. On the fourteenth day, it again lay down after arrival and did so for two days in succession. After an interval of another three days, during which it behaved normally, the animal again went down, and subsequently after a further interval of two days, it again lay down for two days. Subsequently the animal behaved normally.

Chronic Lamsiekte. (Recovery.)

There was one case to be interpreted as such (3856). The first symptom noted was lying down directly after the arrival of the herd in the paddock. Two days later the animal went down suddenly; it dropped into the sterno-costal position. It was slightly salivating on the same day. After another two days, the animal upon arrival in the paddock separated from the herd and lay down; and when forced it rose, but soon went down again. After the herd had been watered, it did not follow, but remained behind in sterno-costal position. Subsequently it rose and went to graze. The sixth day the animal was found in the veld where it was last seen the previous night. It was standing; subsequently it went down, but rose again. After entering the paddock, it lay down, rising when disturbed, but lying down soon afterwards. The seventh day the animal was found near the paddock, where it had probably been lying since the previous day. It rose and entered the paddock with the herd and then lay down. The eighth day the animal remained behind when the herd was watered; subsequently it was driven with the herd into the paddock, where it went down immediately after arrival. When disturbed, it rose, but lay down again. The ninth day the animal was found lying in the veld, but it followed the herd into the kraal, again lying down. This was

also noted the tenth day. The eleventh day the animal did not turn up with the herd, and had to be fetched. It had a clumsy walk and lay down after arrival. Some reluctance to rise was noted on the twelfth day, and when left alone it immediately lay down. The thirteenth day the animal remained in the veld. It rose when forced to do so and joined the herd, but lagged behind all the time, walking with some difficulty, nodding head and neck whilst walking. The fourteenth day the animal returned with the herd and stood for a while before going down. The fifteenth day it was found in recumbent position, but it rose when approached and entered the paddock, where it lay down. Things now seemed to improve, the animal not going down on the sixteenth day. Subsequently the animal was noted to go down after arrival in the kraal on some days and not on others. Finally it recovered. Also this animal during the course of the illness was noted to pick and eat bones.

D.—SYMPTOMATOLOGY AND COURSE OF LAMSIEKTE IN CATTLE THAT CONTRACTED THE DISEASE IN THE VELD (NATURALLY CONTRACTED).

There were eleven cases that came into consideration, all in cattle that were grazing, and not submitted to bone-feeding. They were acting as controls for the various experiments. There were four heifers, one tollie, three cows, and three oxen. Of these animals ten died of the disease, or of shock after treatment, or were killed *in extremis*; one recovered.

The course of the disease according to the classification adopted, will be considered under the headings of acute, subacute, and chronic.

There were five animals in the acute group in which the disease lasted from one to two days. One animal was ill for one day only (3908), whilst in the case of the other four the disease lasted for two days (3159, 122, 115, 2267). All five died. In the subacute group in which the disease lasted from three to seven days, three animals were included, one in which the disease lasted for three days, ending lethally (2598), one for five days (3870), and one for seven days (3660). The last two were killed *in extremis*. In the last group, that of the chronic disease, three animals were included [one in which disease lasted eight days (4373), and one for eleven days (2641)]. The former succumbed after an intravenous infusion; the latter died. The one animal that recovered had a duration of the disease of over twenty days. In practically all cases, the temperature was recorded from the onset of the disease, and was found to be normal. Blood-smears were also made, and no changes were found in the blood.

Anamnesis.

With the exception of a few there was a history of bone-eating. The animals were noted to pick bones when submitted to the bone-eating test, or were observed to pick and eat bones in the veld.

Acute Lamsiekte.

There was one animal in which the course of the disease lasted less than one day (3908). This animal had already a week previously shown certain symptoms that rose the suspicion of approaching

lamsiekte; these, however, had passed over. One afternoon the animal was reported ill, and was immediately placed into the shed, where it lay down. Examined a few hours later, it did not appear to be very ill, carrying head and neck well. The animal died the same night. It was a craver, as was revealed by the autopsy, small pieces of wire and coal being found in the reticulum.

This case might also be described as a peracute case since it lasted less than a day. In the four cases lasting two days, the animals were picked out whilst still walking in the morning, returning with the herd to the kraals. It was the walk, which was clumsy or stiff, that aroused suspicion. The animals went down soon afterwards.

In one case (2267) salivation was noted; one animal (122) showed the tail soiled with faeces, and carried it in abduction. In all instances the animals were placed into a shed for the night, and in every case on the second day they were found in sterno-costal position and unable to rise. In one instance (122) the animal did not rise when forced to do so, but when the thermometer was placed into the anus, it rose with a jerk, but dropped again almost immediately into the sterno-costal position; a second attempt to rise failed. Another animal (3159) was able to stand for a while and even to walk about when lifted up. Salivation was noted in a second case (115). One animal developed tympanitis (3159) and a troicart was applied. The animals remained in sterno-costal position during the day, some even ruminating and looking fairly bright (2267); even feeding was observed (122), and some still showed a moist muzzle (115, 122). Soft faeces were noted in one case (122).

Of these four animals one died shortly after sunset on the second day (2267), two died during the night (122, 3159). The other one (115) was found stretched out in lateral position on the second day, and died subsequently.

Subacute Lamsiekte.

The case that lasted three days (2598) had a record of bone-eating in the tests. When the animal returned to the kraal from the veld it was picked out as ill by its stiff gait. It was kept back and went down soon afterwards. In the morning of the second day it was found in sterno-costal position; it rose with some difficulty, but went down again. In the afternoon of the same day it was unable to rise. On the third day it was found stretched out on one side and when placed into sterno-costal position, was unable to maintain it. On the fourth day it was in the same position, showing symptoms of dyspnoea, froth was present in mouth and nostrils, and the tongue was slightly protruding. Placed into sterno-costal position it was unable to maintain it. It died the same day. This animal on post-mortem had a cattle tooth in the reticulum.

There were no symptoms pointing to disturbances in the digestive organs.

The case in which the disease lasted for five days before the animal was killed *in extremis*, was one of which no record of bone-eating was obtained.

The animal, when found ill, did not return with the herd; it was lying in the veld. When approached it rose, but lay down again. It did not rise a second time. It was carted to the home-stead. On the same day it was found in sterno-costal position.

The nose was dry; the coat staring. In the afternoon it was found on one side, stretched out. It passed soft faeces covered with mucus. On the third day the animal was found in sterno-costal position; later it went over into the lateral one. On the fourth day it was stretched out on one side, grunting faintly. On the fifth day it was found in the same position, lying quietly. The respiration was shallow and slow, the eyes were staring, the ears drooping. The skin was still warm. On the sixth day the animal was in the same position; froth was present in the nostrils. It was then killed.

The case that lasted for seven days, before the animal was killed *in extremis*, was that of an animal that had been noted to be an eager bone-eater (3660). When picked out as ill, it appeared dull and was slightly salivating. On the second day it was grazing in the veld, it showed a clumsy gait and subsequently lay down. It was observed to ruminate. On the third day the animal was in sterno-costal position and rose only when forced. It was able to walk, but showed a clumsy gait, with front legs widely spread and head and neck carried low. The walk to the homestead was interrupted by lying down at intervals. When subsequently turned out into the veld, the animal lay down in the shade of a bush. Later, when forced to rise, it made an attempt to do so, but was only able to raise the hind quarters, then dropped back immediately. On the fourth day the animal was found in sterno-costal position behind the same bush. It had shifted its position slightly during the night, and also made several futile attempts to rise during the day, the animal moving around in a circle. The ears were drooping. The faeces were dry.

On the fifth day the animal was in the same position and in the same place. It still carried the head well. The ears were drooping. On the sixth day the animal was found stretched out on one side. When placed into sterno-costal position it was able to maintain it. After it had been carted into the shed, it was noted to feed. Subsequently it rolled over into the lateral position. It was unable to gain the sterno-costal one, but maintained it when placed into it. It was unable to stand when lifted on to its legs.

On the seventh day the animal was again found stretched out in lateral position, and when placed back into sterno-costal one, maintained it only with difficulty. Subsequently it went over into lateral position, and doubled the head back on to the shoulder. It showed a dry muzzle and a hurried respiration. On the eighth day the animal was lying on one side, and breathing with great difficulty. It was then killed.

There was no symptoms noted that revealed a disturbance in the digestive organs.

Chronic Lamsiekte.

There were three cases in this group: two deaths and one recovery. One of the animals (3473) died as the result of an intra-jugular infusion of a drug on the eighth day; one died on the eleventh day (2641), and in the third case recovery occurred after twenty days' illness.

The animal that died after the infusion made on the eighth day (3473), when noted ill, was showing symptoms of stiffness in front legs when brought into the stable. On the second day it was found in sterno-costal position, but had no difficulty in rising. In the morning of the third day, the animal after rising, was chased; it fell down.

Subsequently it rose, but went down later and was unable to rise. When lifted on to its feet it succeeded to stand.

On the fourth day the animal appeared slightly better. When lifted on to the feet, it was able to stand and walk about. On the fifth day the animal was down and remained down until the eighth day, when it died subsequent to an intrajugular infusion of a drug.

No symptoms were noted indicating a disturbance in the masticatory and deglutitive organs.

In the case of eleven days' (2641) duration, the animal was lying down when found ill. On the second day it was standing and feeding, and subsequently went down into sterno-costal position. It passed black, dry faeces. On the third day it was still in sterno-costal position and feeding. The prehension and mastication of food were slow. Subsequently it lay down, the head stretched out and resting on the mandible. On the fourth day the animal was found stretched out on one side. When placed into sterno-costal position, it was able to maintain it for a while and then fell over into lateral position, struggling with the legs. When put back into sterno-costal position a second time, it was able to maintain it. In the afternoon of the same day, it again turned over on to the side, lying quietly and breathing normally. On the fifth day the animal remained stretched out in lateral position. On the sixth day it was in the same position. When propped up into sterno-costal position, it was unable to carry the head, but stretched it out, resting it on the mandible. It remained in this position all morning. The presence of froth on both nostrils was noted. On the seventh day a slight improvement appeared to have taken place. The animal was in sterno-costal position, taking in food and masticating. On the eighth day the animal was still in sterno-costal position, resting the head on the mandible. Froth was again present in the nostrils. On the ninth day the animal was in the same position and refused to eat and to drink. On the tenth day the animal was in lateral position, frothing at both nostrils. In the afternoon the symptoms took a more alarming turn; the respiration was laboured, abnormal, and accompanied by movements of the nostrils, and signs of struggling were present, the bedding having been pushed on to one side. Otherwise the animal was quiet, only occasionally moving the eye-lids, and the tail later on one or two occasions. On the eleventh day the animal was in the same position and in the same place as on the previous day. The flanks were deeply sunken. On this day the temperature was subnormal. The animal died during the night.

There were no symptoms noted that showed an interference with the deglutitive organs. The animal was noted to eat at times, although prehension of food and mastication were slow.

Chronic Lamsiekte ending with Recovery (4341).

When the animal was noted ill, it was lying down. Although able to rise, it did so reluctantly when forced. In the afternoon it was unable to do so.

On the second day it was in sterno-costal position. It made occasional attempts to rise, but was only able to raise the hind quarters slightly. It dropped down immediately, shifting slightly forwards. It refused all food and water during the day.

On the third day the animal was found in sterno-costal position. It had shifted its place during the night. It did the same in the afternoon, apparently in an attempt to rise. The animal was noted to ruminate, and looked somewhat brighter than before.

On the fourth day the animal had again shifted its position. It was masticating some food, the movements of the mandible lasting for an unusually long time. Over a hundred movements were counted before deglutition took place.

On the fifth day the animal was found stretched out on one side. When put back into sterno-costal position it was able to maintain it.

On the sixth day the animal was in sterno-costal position. It was feeding and masticating. A general improvement was noted.

On the seventh day the same position was held by the animal; it was feeding and drinking. The faeces were of liquid consistence.

On the eighth day the animal was lifted on to its feet, but was unable to stand, and did not even attempt to do so.

On the ninth day the animal was still in sterno-costal position. It made an attempt to rise, and in doing so, brought the head forcibly down, so that the mandible struck the floor; it was unable to lift the hind quarters.

On the tenth day the sterno-costal position was still held. The animal was looking brighter.

From the eleventh to the eighteenth day the conditions remained very much the same, the animal was constantly in sterno-costal position, it carried the head well, occasionally doubling it back. It was also feeding, drinking, and ruminating. In this respect it resembled an animal that was resting. The faeces were at one time recorded to be black and dry.

On the nineteenth day in the morning, the animal rose voluntarily and without any assistance, and then walked for a short distance. It soon went down again.

On the twentieth day the same observations were made. The animal was feeding well. It had lost somewhat in condition.

The animal subsequently improved daily, and was discharged a few days later.

E.—SYMPTOMATOLOGY OF LAMSIEKTE IN CATTLE INJECTED OR DRENCHED WITH TOXIN.

In one instance the toxin was obtained as a blackish substance from the carcass of an ox. This substance on microscopical examination contained, in addition to indistinct débris, numerous bacterial spores (4191). In all other cases the toxin was obtained from cultures that were made by placing intestinal contents of pycnosoma larvae, squashed pycnosoma larvae, or putrid flesh and bones in suitable media. The standard medium used was minced cattle liver. The liquid used for subcutaneous injections was filtered and unfiltered. Filtered toxin was obtained as a clear liquid by means of a Berkefeld. The minimal lethal dose of this filtrate amounted to 0.0001 c.c. per kilogram live-weight of cattle. There were eleven animals drenched with cultures, only one of which recovered (156). The rest of the animals (44) were injected subcutaneously with varying quantities for various purposes.

Of the fifty-six animals that came into consideration, only six recovered. Three of these were subsequently reinjected with toxin and succumbed. Fifty-nine different applications of toxin ingestion or injection were therefore made. The symptomatology and the course of the disease will be treated under the four different headings: (1) Peracute lamsiekte; (2) acute lamsiekte; (3) subacute lamsiekte; (4) chronic lamsiekte.

SYMPTOMATOLOGY OF PERACUTE LAMSIEKTE.

There were nineteen cases in this group. Of these, eighteen died naturally or of shock whilst treated (196, 188, 190, 4727). Only one recovered (3659).

The incubation period lasted one day or less in two cases (4805, 4008); one and a half to two days in seven cases (196, 4663, 189, 230, 4701, 4660, 4191); two and a half to three days in nine cases (309, 188, 190, 3901, 4704, 4692, 4764, 3659, 4550), and three and a half days in one case (4727).

Symptoms of the disease were not noted in all cases, the animals sickening during the night and found dead the next morning (4008, 4663, 4701, 4660, 309, 3901, 4704).

The symptoms recorded in the animals that were noted to be ill were as follows:—They were found lying down in the morning, some in sterno-costal position, some stretched out; one was able to rise unassisted. Most of them were unable to rise, and when put on to their feet they were unable to stand. When in sterno-costal position difficulty to carry the head was observed; the head was then doubled back. Some of the animals that were in sterno-costal position went over into lateral position, lying stretched out flat on the ground.

Only one animal was found standing when noticed ill. It was not inclined to move, and went down soon afterwards, the same course as above being observed. When down only one of the animals was noted to be grunting, another one was bellowing and kicking. One showed dyspnoea, the rest remained quiet, appearing completely paralysed in all their limbs. Salivation was present in several animals; it was either slight or profuse, the saliva running from the mouth.

Paralysis of the tongue was present in a number of cases, the tongue hanging out. When pulled out of the mouth it could not be drawn back. Paralysis of the mandible was indicated by the open mouth. In one case only the first indication of the disease was preceded by excitement, the animal running about in the stable. Muscular spasms were subsequently noted in the same animal. Tympany was also recorded in one instance. In one case it was observed that the heart was beating slowly, only forty beats per minute being counted. Involuntary passage of urine and faeces was also noted.

Some of the animals were treated by intrajugular infusion of drugs. The majority died during the infusion or shortly after. Death was explained to be caused by shock. The case that recovered was one of an animal that had been injected subcutaneously with a culture. The symptoms noted were anorexia and salivation; they soon passed over. This animal when subsequently drenched with putrid material again developed lamsiekte and died.

SYMPTOMATOLOGY OF ACUTE LAMSIEKTE.

There were eighteen animals in this group. Of these sixteen died from the disease or of shock whilst treated (4834) and two recovered (146, 4686). The disease lasted from one to one and a half days in the case of thirteen animals and from two to two and a half days in the case of five animals.

The incubation period varied from one and a half to thirteen days. It lasted one and a half days for one animal (218), with one day duration of disease, two days for four animals (4834, 2658, 4839, 3904), with one day duration of disease; two and a half days for two animals (3320, 1936), with one day duration of disease; three days for two animals, with one of one day duration (150) and one of two and a half days' duration (194) of disease; one of four days and one day duration of disease (156); three of five days, the duration of the disease in one case being one day (4686) and in the other cases two days (149, 120); two of six days, the disease lasting one to one and a half days (4847, 4737); one of seven days, the disease lasting two days (4572); two of eight days, the disease lasting one day in one case (3708) and two and a half days (2886) in the other.

The symptoms recorded in the disease lasting from one to one and a half days were as follows:—

The animals when noted ill were down. Some rose easily, some had difficulty in rising or were noted to lie down frequently or, when down, only rose when forced to do so or made futile attempts to rise. Some when lifted were able to stand for a while, but soon went down again, while others were entirely unable to rise when forced to do so. Some, when walking, showed a stiff gait, carrying the head low.

Most of the animals were lying quietly and remained quiet. Only rarely were violent movements of the legs noted. In all cases that did not recover the condition rapidly became worse. Finally the animals were unable to move at all, remaining in sterno-costal or lateral position, most of them dying without any agony.

Salivation was present in most animals, slight in some, profuse in others. Saliva was either dripping from the mouth or hanging in strings, or a pool of saliva collected on the ground. Where salivation was but slight in the beginning, it increased in the course of further events. Mucous discharge from the nostrils was also seen.

Deglutition was also impossible. When exploring the buccal cavity a bolus was found at the root of the tongue in some animals.

Paralysis of the tongue and of the mandible was recorded, the tongue hanging out and the mouth being kept open; also inability to prehend food was noted. Most of the animals refused to feed and some even to drink.

Rapid and superficial or laboured respiration were seen in some cases, and coughing was present in one.

The animals that lived for from two to two and a half days after the first illness was noted showed the same symptoms in the beginning. When down, they made futile attempts to rise. They were able to lift the hindquarters slightly or to rise when forced to do so; when on their feet they had a wobbly gait, or when standing they went down, being unable to rise again. Some doubled the head back when in recumbent position. Some were able to maintain the sterno-costal position when placed into it after they had been lying

flatly stretched out. Complete paralysis overtook all the animals in the course of the next two days, and they died in sterno-costal or lateral position without any agony. Quivering of the muscles in the flanks and gluteal region was noted in one case. Profuse salivation was noted in most cases.

Where feeding was noted the mastication was slow, and difficulty of deglutition was seen in the case of an animal that was drenched with a drug. Complete anorexia and adipsia were present either from the beginning or were noted towards the end of the disease.

The two animals that recovered showed an incubation period of four and five days respectively. One had been drenched with a bouillon culture (156), and one had received a subcutaneous injection of toxin.

A symptom noted in both cases was marked salivation, lasting for about one to two days. During this time the animal did not go down. It remained standing, and fed all the time.

SYMPTOMATOLOGY OF SUBACUTE LAMSIEKTE.

Eighteen cases of the disease were taken into consideration in analysing the symptoms which were observed in sixteen animals, two of these having had two attacks of the disease and both dying of the second attack (218, 3932). Of the remaining animals two died of shock when under treatment (181, 4354) and three were killed *in extremis* (128, 4152, 249). The rest of the animals died of the disease.

The incubation period varied from three to thirteen days. The latter was observed in a case that recovered (218). The following incubation periods were recorded:—

Three and a half days in one case in which the disease lasted for four and a half days (4354); four days in three cases in which the disease lasted for four and a half days (267), five days (4740), and six days (3932) respectively; four and a half days in one case in which the disease lasted for five days (4361); five days in three cases, the disease lasting for three days (4632); four and a half days (3906) and six and a half days (4842) respectively; five and a half days in two cases, the disease lasting for six days in the one case (249) and seven days in the other (3932) (recovery); seven days in two cases, both of four days' illness (4152, 2315); seven and a half days in one case in which the disease lasted for three days (4376); eight days in three cases, the disease lasting for three days in two cases (181, 203) and for five days in the other one (128); nine days in one case in which disease lasted for five days (266) and thirteen days in one case, the disease lasting for three days (recovery) (218).

It will be noted that the disease lasted for three days in five cases, four to four and a half days in five cases, five days in four cases, six to six and a half days in three cases, and seven days in one case.

The animals when noted ill were standing and dull. In one case an aggressive attitude was taken up. Some showed weakness in the limbs whilst standing. When walking the gait was stiff in the front legs, and the head was carried low. One animal made an attempt to escape but broke down. Another, attempting to charge, suddenly collapsed, whilst others again were found lying down in sterno-costal position. Some were attempting to rise, but were only

able to raise the hindquarters slightly. These attempts were sometimes repeated in the course of the same day or on subsequent days. Some of the animals that were lying down were able to stand when lifted and to walk a short distance before lying down again. When down they were able to maintain the sterno-costal position; others were doubling the head back, being unable to support it. Some of the animals that were able to stand remained on their feet for one day only and then went down; others were able to rise for two or three days before finally going down. When in sterno-costal position most animals remained quiet with head doubled back; they were listless, not taking any notice of what happened. When down they neither moved eyes nor ears. Some of the animals that could not rise by themselves were able to stand when placed on their feet. Some were able to walk for short distances even a few days after they had gone down.

In most cases symptoms affecting the masticatory and deglutitive organs were noted, the most conspicuous one being salivation. It was present from the beginning, froth and saliva hanging from the mouth or saliva collecting on the ground at the animal's head.

The prehension of food was slow in some cases whilst in others it was either very difficult or impossible. Paralysis of the tongue was also noted, the tongue protruding from the mouth. When mastication was observed it was slow. In one case the mandible was constantly moved. Mastication in some instances was accompanied by much salivation. When deglutition was noted it was slow. In some animals it was impossible. A bolus of food could be found at the root of the tongue, the animal trying to remove it by turning back the tip of the tongue. Drenching with drugs was difficult, since the animals were coughing. When drinking water only small quantities were noted to pass down at a time. A dry muzzle, soiled with foodstuffs, was recorded in some cases. Anorexia was noted to be present from the beginning in most cases, in others again it appeared during the further course of the disease. In some cases, however, feeding was noted even up to the last. The pulse rate in some cases was increased, and palpitations of the heart were marked.

In most cases the respiration showed no changes; in some the rate was increased however, the movements being deep and laboured. In one case breathing through the mouth was observed. Loss of condition was noted, sometimes from the beginning, at others during the course of the disease.

One of the animals that recovered (218) when noted ill had some difficulty in rising. This was the only symptom noted; it disappeared gradually. The other animal (3932) when noted ill was salivating profusely, and showed a slight prolapsus of the tongue. After a few days it had some difficulty in rising. This passed over soon, and disappeared about the same time as salivation did.

SYMPTOMATOLOGY OF CHRONIC LAMSIEKTE.

Four cases were observed in this group, two of which ended fatally. One animal was killed *in extremis* (4883) and one recovered (3507). One of the animals that died had previously recovered from an attack of acute lamsiekte (4686).

The incubation periods noted in these cases were as follows:—

One day in the case where the disease lasted for twenty days; four and a half days in the case in which the disease lasted for eight

and a half days; seven and a half days in the case where the disease lasted for ten days, and eight days in the case where it lasted for eight days (recovery).

The animals were down when noted ill. An attempt was made to rise by one animal when approached, but it was futile. It was able to stand when lifted, and even to walk, but the gait appeared stiff. A second animal was lying down, being unable to rise. It remained down the whole time. A third animal was lying down, but it was able to rise when forced to do so. It was weak in the fetlocks when standing.

In the course of further events all the animals remained down, either in sterno-costal position or stretched out flat on the ground. When placed back in sterno-costal position they were unable to maintain it, being completely paralysed.

Symptoms affecting the digestive organs were also noted. Salivation was noted in one animal, but not in the others. Anorexia was also present, and when feeding was observed the prehension of food was slow. Loss of condition became evident in the course of the disease. The animals remained in lateral position the greater part of the time, and slowly died without any agony. One was killed, it being in a hopeless condition.

The animal that recovered was salivating, but feeding when picked out as ill. When masticating its food it was frothing at the mouth. At one time it showed inability of deglutition, the bolus of food being ejected and found on the ground. The animal, although lying down most of the time, was always able to rise. It never stopped feeding.

F.—DISCUSSION OF THE SYMPTOMATOLOGY AND COURSE OF LAMSIEKTE IN CATTLE THAT CONTRACTED THE DISEASE EXPERIMENTALLY AND NATURALLY.

Lamsiekte has been defined as a specific disease that under natural conditions is caused by the ingestion of putrid material containing a specific toxin.

Experiments undertaken to prove this were carried out in different ways, (1) artificially, by drenching the cattle with material originating from decomposing carcasses, or by the parenteral injection of toxin obtained in cultures; and (2) naturally, by allowing the cattle to pick and eat bones of decomposed cadavers. The symptoms and the course of the disease were separately recorded for the various groups of animals treated in a similar way. Further, the opportunity was taken, whenever it occurred, to note carefully the symptoms and course of the disease in cattle that contracted it in the veld at the time the experimental cases were produced. This was done with the primary object of comparing the symptoms observed in cases that naturally contracted the disease with those experimentally produced, and also in order to ascertain whether there was any difference in the course of the disease in the various groups of animals. We had distinguished a peracute, an acute, subacute, and a chronic course of the disease, and this description had been applied to all groups.

From the experimental aetiological point of view we might place these animals into three groups.