

to the low market value of the land itself that it can hardly be regarded as a practical proposition. Incidental manuring will of course slowly occur through continued phosphatic feeding.

10. Mineral constituents other than phosphorus are apparently present in adequate amount in the veld vegetation. Administration of salts containing calcium, magnesium, sodium, potassium, iron chloride, and sulphur, do not reduce osteophagia, whereas pure phosphoric acid alone does reduce it very rapidly.

11. Semi-starvation and sickness of any description decrease the degree of osteophagia shown by an animal.

(For tables to this section see pages 1307 to 1361.)

## SECTION 7.—SYMPTOMATOLOGY OF LAMSIEKTE.

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A.—SYMPTOMATOLOGY AND COURSE OF LAMSIEKTE IN CATTLE CAUSED BY THE INGESTION OF PUTRID MATERIAL (PYCNOSOMA LARVAE AND PUPAE. FLESH AND BONES, AND RUMINAL INGESTA).

*Introduction.*—For the purpose of a description of the symptoms of experimentally produced lamsiekte caused by drenching, the records of seventy-nine head of cattle were analysed and classified. Of these seventy-one died of the disease or were killed *in extremis*. Amongst this number was one animal that recovered from the first attack and died of a second one. There were five animals, including the one mentioned, that recovered from one attack. In all these cases the period that elapsed between drenching and the appearance of the first symptoms, and which in analogy to that mentioned in infectious diseases, has been called "the incubation period" could be accurately determined. In the case of three animals that period could not be determined exactly; the drenching was repeated several times at certain intervals, so that an accurate datum was not obtainable.

According to the duration of the disease, the following grouping was accepted: Peracute, acute, subacute, and chronic.

As peracute cases were considered those that lasted half a day or less. They numbered twenty-four of the cases that died or were killed *in extremis* (31 per cent.). As acute cases were considered those that had a duration of one to two days; there were thirty-two cases in this group (40 per cent.). As subacute were considered those that lasted three to seven days; they included fourteen cases (18 per cent.). All cases lasting longer, were called chronic. There were four such cases recorded (5 per cent.). These animals were killed, so that the natural duration of the disease could not be determined exactly. Recoveries 6 per cent.

*Recoveries:* Of the five cases that recovered, two could be considered to have had an acute course; one case in which the animal subsequently recovered from a second attack lasted one day, and the other lasted two days. All the remaining cases, including the second recovery of the case first mentioned, were chronic.

The incubation period was of particular interest in the cases resulting in death. It varied somewhat in the different groups. It was the shortest in the peracute cases, slightly longer in the acute cases, still longer in the subacute cases, and the longest in the chronic cases. In the first three groups a few periods of longer duration were noted, in the last group, however, more of shorter duration.

In the cases that recovered, the incubation periods most frequently corresponded to those of the chronic cases that succumbed.

The symptoms observed can conveniently be grouped into two classes:—

- (1) Indicating an affection of the locomotor system.
- (2) Indicating an affection of the masticatory and deglutitive organs. In this latter case paresis and paralysis of the tongue, of the mandible, and of the pharynx were frequently noticed.

The common feature applying to all groups was the absence of fever, and in all cases microscopic examination of blood-smears

showed the absence of any definite lesions or parasites in the blood. Sensitiveness of the skin and reflex action of the eyes was in all cases maintained until the comatous stage was reached.

#### THE PERACUTE LAMSIEKTE.

The incubation period recorded in the cases that died (twenty-five) lasted three days in three instances, two days in six cases, seven days, eight days, and sixteen days respectively. Of the cases in which the animals recovered, the periods were five and sixteen days respectively. In one case the incubation period could not be determined. In some cases where animals were found dead in the morning, no symptoms of illness had been noted on the occasion of the last inspection late the previous evening.

In these cases the duration of the disease might still have been from several hours to half a day, but this probably escaped our notice. That death might be very sudden was, however, instanced in the case of one animal (3330) that, two hours previous to death, still appeared healthy. This was a case in which the incubation period only lasted one day. Considering both incubation period and duration of illness together, the case in question is the shortest one in our records. In another case the incubation period only lasted half a day, and the animal was found dead next morning.

In most cases symptoms were observed. The animals when noted to be ill were either found standing, or they were lying down. Illness was noted by a change in their behaviour, most frequently also by more or less definite symptoms. There was, in the animals still on their feet, a peculiar impairment of the gait in the forelegs, which were generally described as stiff. Most of these animals had the tendency to lie down soon, and when disturbed, to rise and to lie down again soon afterwards. The difficulty to rise gradually increased until finally the animals were no longer able to rise, and remained down. Similarly some of the animals that were found lying in the morning were still able to rise voluntarily, or did so when forced, but after a while rising also became difficult, and finally was no longer possible. They then remained down. There were other animals that were found in sterno-costal position and unable to rise, or they were already lying on one side stretched out and *in extremis*. Animals found in sterno-costal position for some hours were still able to carry their heads well in normal position, almost up to the time they went down on one side, or they were found doubling their heads back on to the flank, unable to lift it, or unable to carry it when placed into position.

Whilst the above set of symptoms was constantly present and running the same course whether the incubation period was as short as one day, or as long as sixteen days in one case, symptoms of the masticatory and deglutitive organs were not so constant.

Salivation was found in most animals; it was in several instances the first symptom to be noted. Salivation was slight or profuse, being in the former instance sometimes only a slight frothing at the mouth, or a slight and constant dribbling, or then frequently running very profusely, saliva being discharged in large quantities.

In some of these animals symptoms were noted that had to be interpreted as paresis, and even paralysis of the mandible and tongue. Both organs were frequently affected at the same time. The animal kept the mouth slightly open, the mandible somewhat hanging, and

the tip of the tongue lying on the incisors, or even protruding. Preceding the paralysis of the tongue in one case, it was noted that the organ for some time was moved backwards and forwards. In one case of paralysis of the tongue the animal was noted to make an attempt to take in food, but it had great difficulty to do so, prehension had become impossible, and the animal gripped the food with the lips, putting the nose into the food, which, being bran and maize-meal, stuck to the nostrils. Where paralysis of the tongue was well marked, the intermandibular space usually appeared filled and stood out prominently.

Other symptoms noted were anorexia, which was present in most cases; the animals refused to feed and also to drink. The flanks were soon sunken. One animal, contrary to the general behaviour, showed, from the beginning of the disease, a state of general excitement, with staring eyes, wild appearance and attitude, and was easily frightened. Most animals died without any agony, either quietly in costolateral or lateral position, respiration never being increased. Only in a few instances did death overtake an animal in lateral position after much struggling with the hind and forelegs, and only in a few cases was death preceded by accelerated and laboured respiration. Occasionally a dying animal would be groaning. Struggling and groaning were also noted to be present at the same time. There were no recoveries noted amongst the peracute cases.

#### ACUTE LAMSIEKTE.

The disease lasted from one to two days. There were thirty-one animals in this category that died. The incubation periods were one day in one instance, two days in three, three days in twelve, four days in eight, five days in four, six and seven days respectively in one, and eight days in two instances. In one case the period could not be determined. Included in this number is one animal (3654) that had previously recovered from a chronic attack of the disease. There were two recoveries from acute lamsiekte; one after an incubation period of five days (3380) and a second one after an incubation period of sixteen days. The former animal subsequently contracted a second and chronic attack, also from drenching putrid material, from which it recovered again.

The symptoms recorded in the animals that died did not vary much from those observed in the peracute cases. In the cases that lasted two days, the evolution of the symptoms was generally more striking. The animals, when noted ill, were either still standing and noticed to be uneasy, or they were in sterno-costal or stretched out in lateral position. The latter observation was, however, a rare one. When found standing, the animals were still able to walk; the gait was in all cases an impaired one, and described as stiff or sluggish. All these animals had the tendency to lie down soon, and whilst in the beginning they were able to rise with more or less difficulty, this difficulty suddenly or gradually increased until the animal was no longer able to rise, and remained in sterno-costal position.

Sometimes an animal that could no longer rise was unable even to stand when put on to its feet, and invariably it would go down again. Some animals that were in costo-lateral position occasionally made an attempt to rise without being forced, or did so when forced. It was then noted that an attempt to raise the hindquarters brought

down head and neck in the effort to shift the weight of the body on to forequarters. The attempt only succeeded in raising the hindquarters slightly. Occasionally the animal moved slightly forwards. When in sterno-costal position most animals were able to carry the head normally for some hours or even on the first and part of the second day. But almost invariably they doubled the head back on to the flank. Some could no longer support the head when placed into position, others glided gradually or suddenly into the lateral position. When placed back into sterno-costal position, some were able to maintain it, others not, although propped up with bales of hay.

The symptoms indicating impaired mastication and deglutition were in almost all cases more or less markedly pronounced. They began with salivation, which was slight or profuse, saliva being present sometimes in large quantities. Paresis and paralysis of the mandible became evident in the beginning, or in the course of the first or second day. The mouth was kept slightly open, sometimes masticatory movement preceded the paralysis. Paresis and paralysis of the tongue were noted about the same time or soon after. The tongue was placed on the incisors, or was hanging out to even a considerable extent. It was noticed that the tongue could be drawn back, in some cases, but it dropped again. The intermandibular space in cases of complete paralysis was usually filled.

Deglutition was in some cases impaired or impossible where the mastication and movement of the tongue were not affected. In one such case it was noted that an animal continued to chew the cud for a considerable length of time without even an attempt being made to swallow it, and when finally examined after mastication had stopped, the bolus was found at the root of the tongue. This was also noted in an animal in which salivation was not recorded. Where deglutition of water was still possible, it was noted that the animal drank only slowly and only small quantities passed down the oesophagus.

Another symptom noted was anorexia, the animals refusing all food from the beginning. In others prehension of food was difficult. These animals made attempts to take in food, but being unable to grip it with the tongue, tried to do so with the lips, and in so doing soiled muzzle and nostrils. The food supplied was usually a ration of bran and maize-meal.

Some animals were dull and depressed from the beginning, some, that were naturally wild, became tame and manageable whilst others remained bright even when down. Some showed a hanging head, staring eyes, anxious look, drooping ears, rough coat, dry and caked muzzle, and also the presence of mucus in the nostrils. The faeces in many cases were observed to be dry and coated with mucus. Sometimes they were pellet-like; this was particularly the case in animals that showed a prolonged incubation period; in other cases clay-like evacuations were seen.

Death supervened the animals in sterno-costal or lateral positions. Most frequently the animals were lying quiet, no movement of ears, eyes, or legs were noted, or only rarely. Struggling was absent or only found in a few animals. The respiration was not or only rarely disturbed. In one case nasal inspiration and buccal expiration were well marked. Groaning in a semi-comatose condition was rare.

Of the two animals that recovered, one showed an illness of one day after an incubation period of five days. This incubation period

was decisive to consider the illness which did not show any definite symptoms as a very mild attack of lamsiekte. In the second instance where the disease appeared sixteen days after drenching, and lasted two days, the symptoms were not well marked, and without the definite history of drenching the diagnosis "lamsiekte" would not have been possible.

#### SUBACUTE LAMSIEKTE.

The disease lasted from three to seven days. There were sixteen cases in this group. Fifteen of the animals died or were killed *in extremis*. One recovered. Of the animals that died, one had an incubation period of less than one day, two of two days, two of three days, one of four days, two of five days, two of seven days, and four of eight days. In one case the incubation period could not be determined. The animal that recovered had an incubation period of ten days.

The symptoms in the subacute cases differed from those of the acute cases only in degree and in the length of time required for their evolution; the shorter the duration, the closer the resemblance. The animals, when noticed ill, were still on their feet, or when down, were able to rise, usually without being forced or without assistance. In some cases the animals were unable to rise, but when lifted on to their feet, were able to stand and even to walk about; in two cases the animals were unable to rise and remained in sterno-costal position. One died on the third day, the other one after being in the lateral position for four days.

All animals that were able to stand and walk showed marked symptoms of stiffness in the forelegs, or a sluggish or staggering walk. Some animals dropped suddenly when they attempted to walk. One animal, when lifted on to its legs, made an attempt to charge, and in doing so collapsed. It did so twice in succession. All animals had a tendency to lie down and remain down for some time. Rising became gradually more and more difficult, until the animal was no longer able to rise. In some animals this inability to rise became evident in the course of the first day, in others after two, three, or nine days, according to the length of time the subacute attack lasted; in some cases it became evident only on the day before the animal died during the subsequent night. Attempts to rise voluntarily were soon given up.

When in sterno-costal position some of the animals were able to carry their heads all the time until they collapsed into lateral position. They all doubled the neck back, the head resting on the flank. Some were unable to lift the head from this position or only did so with difficulty. The neck was wobbling whilst the head was raised. Some animals that were unable to lift the head were able to carry it when put into position, but the carriage was an unsteady one. Some animals were no longer able to carry the head even after it had been placed into position.

The animals died either in lateral or in sterno-costal position. In most cases death supervened slowly, the animals remaining quiet, not carrying out any movements. Struggling of legs was noted, but very rarely; the respiration was usually normal and only rarely were these symptoms of dyspnoea preceding death, such as increased or laboured respiratory activity, accompanied by buccal expiration.

The symptoms indicating paresis or paralysis of the masticatory and deglutitive organs were not present in all cases. Where noted they commenced with salivation and frothing at the mouth. The increased salivation was in some instances already seen on the first day, in others it appeared during the subsequent days.

In some cases it was profuse and in one particular instance so profuse, that a large pool of saliva collected at the place where the animal was lying, the saliva running actually in streams.

Paresis and paralysis of the mandible were also recorded in some cases, but were not so marked as in the former two groups and were usually accompanied by paresis of the tongue. This symptom was, however, not present in the beginning of the disease but only subsequently. It was noted that the tongue was kept moving backwards and forwards for a time; finally resting on the incisors or hanging out. These symptoms were, however, by no means so marked as in the acute and peracute cases. In most cases anorexia was present from the onset of the disease, also adipsia was in some instances complete. Some animals made attempts to feed but were unable to prehend the food, or only did so slowly and with great difficulty. In other cases the animals were noted to masticate, but did so very slowly and salivating much at the same time. Some of the animals were noted to be able to swallow the saliva, and some partook of water during the whole time they were ill.

Other symptoms recorded in some animals were: A dull appearance, progressive loss of condition, sunken flanks, sunken eyes, staring coat, staring look, dry, caked, or soiled muzzles and nostrils, drooping ears and increased discharge in nostrils.

Some animals passed large amounts of faeces, well formed in some cases, and soft in others.

The one animal that recovered (4227) had an incubation period of ten days. The symptoms noted were a dull appearance, staring coat, and marked salivation on the first day. Salivation decreased during the second day but increased again during the third day. The animal was frequently lying down. After five days rapid improvement was noted.

#### CHRONIC LAMSIEKTE.

The disease lasted eight days and longer. There were nine animals in this group, of which four were killed *in extremis*, one died of shock subsequent to an infusion with drugs, four recovered from the attack, including one that had recovered from a former attack (3388), this attack having been an acute one, lasting one day after five days incubation. One died subsequently of a second acute attack (3654). Of the animals that were killed *in extremis* or that died of shock, one had an incubation period of eight days; it died of shock on the eighteenth day. Three had an incubation period of nine days; of these one was killed on the eighth day, the second one on the eighteenth day, and the third one on the twenty-third day. One animal had an incubation period of ten days; it died on the eleventh day. Of the animals that recovered, one had an incubation period of ten days and the disease lasted ten days; the second one had an incubation period of seventeen days and the disease lasted eleven days. The animal that had had an acute attack sickened for the

second time after ten days incubation and had a ten days' duration of the disease. The animal that subsequently died of the second attack recovered from the first attack after ten days incubation, and eight days duration of the disease.

It will thus be noted that the shortest incubation period was eight days, and the longest nineteen days.

When the animals that were subsequently killed were noted to be ill, they were still standing, or, when down, they were still able to rise, although with some difficulty. In one instance the animal went down as late as the sixth day and was then unable to rise; in the second instance as late as the sixteenth day. The animals went down into sterno-costal position and remained in this position most of the time. Lateral position before death was also recorded.

The animals that were picked out as ill, were noted not to feed well, having a tucked up appearance and a staring coat.

Salivation was noted to be present, but not always from the beginning, appearing in one case as late as the eighth day and lasting to the end (eleventh day). In another case salivation was noted already on the first day. This animal refused to feed and drink on this day, but did so the next day. The prehension of food was very slow. Subsequently it fed normally, until it finally went down on the sixteenth day, on which day paralysis of the pharynx was noted, constant chewing was present, but no deglutition took place.

The animal that was killed on the twenty-third day was treated with Amm: carbonate, and for a time showed signs of improvement. It had gone down on the second day, being unable to rise by itself nor to stand when lifted. Gradually, however, conditions became worse, the animal going over from sterno-costal position to lateral position on the eleventh day. The animal lost considerably in condition, and was killed on the twenty-third day.

The animals that recovered did not show alarming symptoms. In one case all that was noted was frequent lying down, but the animal could easily rise. In a second case the animal lay down on the third day and rose without any difficulty. In a third case (3880) the animal went down already on the second day, and was unable to rise, making several futile attempts to do so. It remained in sterno-costal position for eight days when it rose again. In a further case the animal also went down on the second day, and rose with difficulty; it lay in sterno-costal position most of the time even after nine days.

Anorexia was noted during the first few days, and subsequently salivation. The latter appeared in the two cases recorded on the third and fifth day of illness. Paresis of mandible and tongue was absent. Deglutition was possible in all cases, since all animals during the whole time ate a little and drank water. Loss of condition became noticeable during the course of the disease; sunken eyes, raised coats, and staring looks were also recorded.

One animal showed profuse diarrhoea during the course of the illness, a symptom that was otherwise not noted, and gave rise to some doubt as to the correctness of the diagnosis in this particular case (3818).

## B.—SYMPTOMATOLOGY AND COURSE OF LAMSIEKTE IN CATTLE THAT HAD BEEN FEEDING BONES FROM A TROUGH.

Sixteen animals fell ill out of a lot of forty-five that were selected as bone-eaters for the purpose of this experiment, viz., to study the effects of toxic bones when eaten voluntarily. All the animals that sickened had a previous history of bone-eating.

The time that elapsed between the date the animal was noted to pick and chew bones, and the subsequent onset of the disease, varied from five days in the shortest instance to seventy-six days in the longest. In this period must be included the incubation period of the disease, the shorter intervals probably coinciding with it. It would be wrong to interpret the longer intervals as incubation periods, since the interval was calculated from the day on which the animal commenced to eat bones. The first bones eaten were either not always toxic or a cumulative effect was necessary before sufficient toxin was absorbed, and it must be recollected that all the cattle did not eat bones every day. Intervals elapsed where bone-eating temporarily ceased. The period during which bone-eating was noted before the animal showed symptoms of illness was 5 days in two cases, 6 days in one case, 7 days in two cases, 12 days in one case, 13 days in two cases, 18 days in one case, 19 days in one case, 20 days in one case, 21 days in two cases, 24 days in one case, 35 days in one case, 76 days in one case. In nine cases bone-eating had stopped before the disease marked itself, and only in one case it stopped on the day the disease appeared.

Of the sixteen cases under discussion, seven recoveries were noted. These included one animal that subsequently contracted a second attack and died of the disease. Ten animals died (including the one that recovered in the first attack). In nine cases death was due to lamsiekte, and in one case to pneumonia subsequent to an attack of lamsiekte. The description of the disease will also be considered under the headings of peracute, acute, subacute, and chronic lamsiekte.

One peracute case was noted lasting less than half a day (4005), and four acute ones lasting one to two days (4183, 3854, 101); four were fatal and one recovered. [The animal subsequently died of lamsiekte (142).] There were two subacute fatal cases, both lasting five days (2650, 142), the rest were chronic cases, ten in all, lasting from eight to forty days. Out of these cases three animals died of lamsiekte, viz., one after eight days (2181), one after nine days (3004), one after forty days (3000), and one died of pneumonia after thirty days (4181). Thus there remained six recoveries, in which instances the duration of the disease lasted twelve days (3826), fourteen days (3898), twenty days (3821), twenty-three days (148), twenty-nine days (2790), and thirty-nine days (3853) respectively. The temperature of all these animals had been regularly taken as soon as the disease appeared, and in no instance was there any disturbance noted that could be interpreted as fever. In all cases blood-smears were examined and no pathognomonic conditions relative to lamsiekte could be found.

## PERACUTE LAMSIEKTE.

The one case noted (4005) related to an animal that had been sent out the previous day to graze with the herd and no report was received about any illness during that day. When the herd was brought in early in the morning the animal was missed, and the herdsman reported that it was lying stretched out on its side. It died before it could be brought in by wagon that was sent out for this purpose. A blood-smear that was made gave negative results, thus excluding anthrax, and the disease was diagnosed as peracute lamsiekte.

## ACUTE LAMSIEKTE (4183, 3854, 101).

Of the animals that were grazing during the night, two did not return in the morning (4183, 3854). They had left the kraal the previous day in apparently good health, but they were reported by the herdsman to have shown symptoms already during the course of the day, not feeding, lying down frequently, and one was unable to rise. When sent for to be brought in both were unable to rise. The one animal that was unable to rise on the previous day was found in sterno-costal position, with the hind legs drawn in and placed somewhat backwards, thus indicating that an attempt to rise had previously been made but failed. Several such attempts must have been made during the night, since the animal had dragged itself for a short distance, leaving behind a trail in the sand and several evacuations of faeces. This animal died whilst being brought to the kraal in a scotch cart. The second animal that was still able to rise on the previous day, when approached, made a futile attempt to rise when carried into the stable. It remained in sterno-costal position with head doubled back. It turned over on to one side. A third animal (101) that had returned with the herd when noted ill was still able to walk. It showed a peculiar gait and was not sent back to the veld again. During the night it also went down into lateral position.

Once the animals were in lateral position they were unable to assume the sterno-costal one without assistance, and when placed into this position were able to maintain it for a while only and doubled the head back to the shoulder.

Symptoms affecting the mastication and deglutition were also noted. In one case, saliva was seen to run freely from the mouth and to collect in a large quantity on the soil (4183), whilst the tongue was slightly protruding. In one case (101) before death the tongue was noted to hang out, and foaming at the mouth and nose was also present. These symptoms, in this case, indicated dyspnoea, the animal stretching the head at the same time.

Other symptoms noted were anorexia and a wild look.

In the acute case of recovery (142) the animal was noted not to return with the herd in the morning. The herdsman reported that the previous afternoon it had been lying down frequently. When sent for, it was able to walk home, but after arrival lay down immediately. It rose when approached and took up a defiant position. The following day this animal showed a marked improvement, and in the evening behaved like a healthy animal. [This animal died of lamsiekte later (142).]

## SUBACUTE LAMSIEKTE.

There were two cases recorded (2650, 142). Both lasted five days. One animal returned in the morning with the herd and on arrival was picked out as ill, it having been noted salivating and showing lumpy

swellings on both sides of the chest behind the shoulders (2650). The second animal (142) was found in sterno-costal position and unable to rise, several attempts having been made during the night, to judge from the disturbances in the soil and the droppings that were left in the trail. All further attempts to rise proved futile. The animal remained down all the time, and only went over into lateral position in the morning before death. Also, the animal that had walked home (2650) was noted to lie down soon afterwards, and when subsequently disturbed showed some difficulty in rising. Subsequently, when sent out to graze, after walking a short distance it remained behind and lay down. It no longer rose voluntarily, and only did so when forced but went down again. On the third day the same animal was found stretched out on one side. When placed into sterno-costal position it was able to maintain it. When put on to the feet it was able to stand for a while, but went down again into sterno-costal position. This position was kept during the night, and on the fourth day was changed into the lateral one. The animal was now unable to maintain sterno-costal position when placed into it. On the fifth day, in another attempt to restore the sterno-costal position, the animal swayed neck and head, which doubled back. The animal died on the following night. Both animals during the first two or three days of observation had shifted their places during the night, probably in an attempt to rise.

Symptoms affecting the digestive organs were also recorded. Eating and rumination was noted in both cases for the first two or three days, normal faeces were evacuated, and urine was voided, but in the course of the next day the faeces became dry, black, almost turf-like, spiral-shaped masses. Complete anorexia and adipsia were present from the fourth day. Rumination in one instance (142) was abnormal on the third day. The animal masticated for an unusually long period at a time. This did not seem to come to an end; even after three hundred movements had been counted, no deglutition was observed; the bolus during this time was changed from one side of the mouth to the other. In this case much salivation was present and a pool of saliva collected in the bedding at the animal's head. These observations were again made the next day. Other symptoms noted in both animals were loss of condition (which from the third day became visible), sunken flanks, staring coat, sunken eyes, collection of mucus in the nostrils, dry and caked muzzles which were also soiled with food débris.

#### CHRONIC LAMSIEKTE.

The cases will be divided into two groups, one in which the animals died or were killed (2181, 3004, 4181, 3000) and the second in which they recovered (3826, 3898, 3821, 148, 2790, 3853).

In the former group a further distinction must be made, viz., one for cases of animals that succumbed or that were killed early, viz., on the eighth and ninth day (2181, 3004), and the second one in which the animals died late, viz., on the thirtieth and fortieth day (4181, 3000). Since the classification into subacute and chronic cases was determined by an arbitrary time-limit, the former might equally well be considered as subacute cases.

In the two cases of comparatively short duration the animals returned in the morning with the herd and were picked out as ill after arrival, both going down immediately into sterno-costal position. Both were able to rise voluntarily. In the one case (2881)

the animal was kept back on the second day and allowed to graze in an adjacent paddock. This animal soon went down, but rose when forced to do so, standing with the front legs slightly spread. When walking, some stiffness in the movements was apparent. It subsequently remained in recumbent position most of the time, doubling the head back at times. In the afternoon of the third day difficulties in rising were noted. On the fourth day the animal was found in lateral position, and when placed into sterno-costal position was able to maintain it. It was, however, unable to rise. When on the fifth day the animal was placed on its feet it sagged in every time assistance was withdrawn, and was only able to maintain the sterno-costal position when propped up. On the evening of the same day a slight improvement was noted, the animal being able to maintain the sterno-costal position. Subsequently it remained in this position until the end of the seventh day, when it was found stretched out and showing dyspnoea. It was then killed (2881).

The second animal (3004) under discussion was able to walk to the veld on the second day, but returned on the third day. It lay down soon afterwards, but went out again to the veld the same day, and on the fourth day when returning nothing abnormal was noted. The same record was made on the fifth, sixth, and seventh days. On the eighth day the animal did not return with the herd. According to the report of the herdsman it had been down almost all the previous afternoon. The animal was, however, still able to rise when sent for and walked into the kraal. The walk was heavy and clumsy, the head nodding with every step, and the front legs were placed in slight abduction. In the afternoon of the same day the animal was unable to rise; it had made several futile attempts during the day. It died the same night. The case in question was not a clear one, and could also be explained as one in which two acute attacks supervened within eight days.

Symptoms in the digestive organs were recorded only in the case of the first-mentioned animal (2181), viz., slight salivation on the first day, but not subsequently. The animal was feeding for the first few days, and on the fifth day constipation was recorded. In the second case (3004) rumination was present up to the last day, and eating of bones was continued, and only ceased on the day before the animal finally went down. It was thus quite possible that the two attacks were caused by two different sets of putrid bones, the animal recovering from the first mild attack.

In the two cases with a prolonged duration of the disease (4181 and 3000) the animals were noted ill by their changed conduct when returning from the veld. They lay down soon afterwards, but were able to rise again. One did so only reluctantly, however (4181), and after standing did not stretch itself. Another, a cow (3000) with a suckling calf, permitted the calf to drink. Both animals were returned to the veld with the herd the same day. One (4181) was not able to follow the herd and lagged behind, and finally lay down. The walk of this animal was sluggish and clumsy. On the second day the one animal (3000) that had gone out with the herd returned with it and lay down immediately after arrival. According to the report of the herdsman it had been lying down most of the previous afternoon. It did not accept the calf this day. On milking but little milk was obtained. The animal that had remained behind (4181), after having been placed in the stable, was found in recumbent position but able

to rise, and when standing carried out all movements in a sluggish manner. It placed the forelegs in slight abduction. On the third day the conditions in both animals were about the same. They were able to rise and walk, but the gait remained sluggish in the one instance (4181).

On the fourth day no further changes were recorded in one case, but a difficulty to rise in the second one became evident. On the fifth day the animal (4181) was unable to rise; it was able to flex and draw in the hind-legs, but unable to raise the hind-quarters. It subsequently remained down in sterno-costal position, making occasional attempts to rise, which only resulted in shifting slightly from the place where it lay. Occasionally it moved the legs. On the eleventh day an attempt was made to place this animal on the feet, but it was unable to put the legs into position nor to support itself; another attempt on the twelfth day succeeded in so far that the animal was able to stand for a while and then suddenly sagged in. On the nineteenth day a further attempt was made, but the animal was unable to stand; on the twentieth day it was able to stand for a while, when it was noted that the forelegs were kept flexed at the knee, thus standing on the tip of the toes. In an attempt to walk it suddenly collapsed. On the twenty-second day, when lifted on to its feet, it was able to stand, and even to walk and to turn round when assisted. On the twenty-third day a similar observation was made. In an attempt to lie down it dropped suddenly, knocking the mandible on the floor. No further changes were marked during the next four days until the twenty-eighth day, when the animal was decidedly distressed, showed marked abdominal breathing and a groaning noise with each inspiration, moving the nostrils markedly. It was evident that the animal was suffering from pneumonia, from which it died on the thirtieth day.

The first animal that turned out with the herd daily (3000) was reported to be lying down frequently in the veld, and did so every time it entered the kraal, until the twenty-second day, when it remained in the veld unable to rise. It made several attempts to do so but failed, and was finally brought home in the wagon. The animal subsequently remained down in sterno-costal position; it made occasional attempts to rise, which only resulted in shifting from the place at times. On the thirty-seventh day the animal was found stretched out on one side, the head doubled back on to the shoulder. When placed into sterno-costal position it was able to maintain it. On the thirty-eighth and thirty-ninth days similar observations were made. The animal died on the last-mentioned date. Whilst it was in recumbent position it carried head and neck very well.

No symptoms indicating disturbances in the masticatory and deglutitive organs were noted in these two animals. Both were noted to feed and to drink when in recumbent position, rumination was present, also eating of rotten bones was not completely suspended in one instance (3000). Urine was passed normally; faeces were also passed, but in the course of time the latter became dry, pellet-like, and spiral-shaped lumps covered with mucus. At another time they were unusually copious and soft in one instance (4181). Another symptom noted was a change of temperament, the one animal naturally very wild became very quiet.

Loss of condition was also apparent, the eyes sunken, the coat rough and staring at times, the muzzle dry and caked, and an occasional grinding of the teeth was heard.

Decubitus became evident at an early time in the animal that died subsequently of pneumonia (4181).

#### CHRONIC LAMSIEKTE ENDING IN RECOVERY.

Six cases which can conveniently be classed into three groups were observed. In the first group the disease lasted ca. twelve and fourteen days (3826 and 3898) respectively, the second one ca. twenty, twenty-three, and twenty-nine days (3826, 148, 2790) respectively, and the third one ca. thirty-nine days (3853).

#### SYMPTOMS OBSERVED IN THE FIRST GROUP.

Both animals returned with the herd from the veld and lay down soon after arrival. When disturbed they rose immediately and without any difficulty, but soon lay down again. Both showed a complete change in their temperaments, having become very quiet. The animals were sent out to graze, one into the veld (3898) and the other one into an adjacent camp (3826). The one sent into the veld did not return the next morning (second day), when it was found in sternal position. It was able to rise and walk back, but the gait was decidedly abnormal. Returned to the kraal, it lay down. It was subsequently turned into the camp, where it remained in recumbent position most of the time, although still able to rise. The second animal (3898) when brought into the kraal also lay down; it had a very distressed appearance.

On the third day both animals were still able to walk; the walk was clumsy and head and neck were carried somewhat low. They lay down frequently, but were still able to rise with comparative ease.

On the fourth day the condition was much the same; the animals were still able to rise; one animal (3898) when approached took up an aggressive attitude and showed a distinctly wild look.

On the fifth day no further changes were noted. The animals were still lying down frequently. On the sixth day an improvement in both animals became noticeable.

On the seventh day the improvement continued, the animals were brighter and livelier. These improvements continued during the next four days, although the animals lay down more frequently than usual; but from the eleventh and twelfth days they could be considered as having recovered from the disease, although, in the one case, slight stiffness was still noted after these dates.

The symptoms in the digestive organs were absent, or at least not alarming. In the case of one animal (3898) slight salivation was noted one day. Feeding, drinking, and also rumination were observed during the whole time. The faeces, however, became dry and spiral-shaped. Other symptoms noted were changes in temperament and staring coats at times.

#### SYMPTOMS OBSERVED IN THE SECOND GROUP.

The symptoms in one animal of this group (3821) must be considered apart, since they differed from those usually noted by the comparatively mild disturbances in the locomotor system and were only present at the beginning of the attack.

The herdsman had noted that this animal, during the afternoon previous to picking it out as ill, had been standing and not feeding. It returned with the herd next morning and was found frothing at the mouth. Subsequently it went down into sterno-costal position, with the hind-legs straddled backwards. It was slightly tympanitic, and increased respiration was recorded. Nothing abnormal was found in the mouth. When the animal was drenched with Glauber salts, notwithstanding great care being taken, some of the liquid escaped into the pharynx and produced coughing. The animal was then immediately released and the liquid escaped through the nostrils under symptoms of great distress. The animal was subsequently noted to stand. On the second day it was found in sterno-costal position, slightly grunting. It rose by itself, picked and chewed some food, and foamed at the mouth. It refused to drink water from the bucket and from the trough. The salivation increased in the course of the day. When again brought to the water-trough it made attempts to drink, but no bolus was noted to pass down the oesophagus and water mixed with saliva and food returned through the mouth. It was evident that a paralysis of the oesophagus was present, and masticated food was also found on the floor where the animal was standing.

Until after the fourteenth day the animal showed no improvement. It was standing most of the time, moving about freely. Practically every time water was supplied it made an attempt to drink, but was unable to swallow it. In one instance water was seen to return through the nostrils. The animal picked food and masticated, but the bolus was thrown out and found on the floor. During this period frothing at the mouth and salivation were always present. The animal lost visibly in condition, the eyes were sunken, sometimes the flanks were hollow, whilst at other times they were slightly blown.

On the fourteenth day the animal ate some bran and crushed maize, and subsequently drank some water and was able to swallow it. This improvement continued during the next few days: eating bran and crushed mealies every day and drinking water. On the eighteenth day hay was again partaken of, and on the nineteenth day it fed very well. On the twentieth day it was turned out into the veld with the herd. It had completely recovered.

The two remaining animals of this group (148, 2790) showed symptoms mainly affecting the locomotor system. One animal (148) did not return with the herd one day, but when fetched was able to walk home. After arrival in the kraal both animals went down, but were able to rise. On the second day, already, both animals at times showed some reluctance to rise. Soon after rising they lay down again. Subsequently they rose voluntarily and were able to move about. During the next few days a marked improvement was noted in the one animal (148), and it was considered to be recovering when, on the tenth day, it was unable to rise and remained in sterno-costal position. On the sixteenth day, when lifted on to its feet, the animal was able to stand and to walk. On the eighteenth day it rose by itself. It was able to rise again on the nineteenth day, and stood most of the time on the twentieth day. It was discharged on the twenty-third day as recovered. During this period the animal made several attempts to rise, having shifted the place occasionally. It