

Investigations into the Disease Lamziekte in Cattle.

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In December, 1909, the writer received instructions from the Government Veterinary Bacteriologist, Pretoria, to proceed to Christiana, Western Transvaal, and ascertain which farms would be suitable for an experimental station for the investigation of the disease known as Lamziekte. On arrival, several farms were visited, and the general opinion was found to be, that the mortality from the disease had been considerable on Schoonheid. On making enquiries from the occupier, I was informed that the percentage of losses from Lamziekte during the three previous years had amounted to, approximately, 11 per cent. yearly, and after inspecting the farm and taking the particulars furnished, and the proximity of the farm to Christiana railway station into consideration, it was decided to recommend "Schoonheid", which was finally selected.

Exposure Experiment.—In the beginning of January, 1910, I received instructions from the Government Veterinary Bacteriologist, Pretoria, as to the general outline of the experiments to be carried out, and proceeded to "Schoonheid" and made arrangements for the equipping of the laboratory, erection of cattle kraals, and securing of cattle for the experiment, and on the 18th February, 1910, the following cattle were taken over from A. York, Esq., Christiana, against an agreement whereby the owner was paid for their loan for the period of six months or longer, if required, and after being numbered, they were drafted into the following lots. Besides the above, 32 head were forwarded from a non-infected lamziekte area, viz., the Government Veterinary Laboratory, Onderstepoort, Pretoria, and after numbering, these were likewise drafted into lots as follows:—

	Dry Cows.		Cows with Calf.		Heifers.		Bulls.	
	A.	B.	A.	B.	A.	B.	A.	B.
<i>Lot No. 1.</i> —Constantly kraaled. Total including 3 calves, 18 fed on dry forage, and veld hay from a non-lamziekte area, and watered from Well A.	555	943p	942c 946c	941c	944p 945p 947p 948p 535 637 644 647	949p	950	
<i>Lot No. 2.</i> —Grazing lot. Total, including 10 calves, 47 watered at Pan A from the 18/2/10 to the 20/4/10 and subsequent to the latter date from Well A.	956p 957p 960p 962p 963p 964p 970 215 316 918	952p 959p	953cp 954cp 961cp 971cp 972cp 973c 974c	951cp 955c 976cp	958p 965p 966p 967 969p 570 597 606 643 648 651 839 840 836		975	968
<i>Lot No. 3.</i> —Muzzled lot. Total including 4 calves, 24. Fed on forage and veld hay from a non-infected Lamziekte area, watered from Well A.	981p 982p 649	977p 980p	979c 983cp 984c	978cp	986 987 988 990p 656 832 838 873 889	985	989	
<i>Lot No. 4.</i> —Experimental lot. Constantly kraaled. Fed on forage and veld hay from a non-infected Lamziekte area, watered from Well A. Total 10.	294				526 640 645 652 653 837 869 887	862		

- A. Animal that, according to the owner, never had the disease.
 B. Animal that, according to the owner, had the disease at least once.
 C. Calf not bearing the same number as the mother.
 P. Said to be pregnant.

Total number of cattle in experiment 99. Nos. 941 to 1,007, inclusive, York's lot. The remainder (with exception of 918 taken over from Lichtenburg District), Veterinary Laboratory, Onderstepoort, lot.

York's lot had been running on "Schoonheid" up till the previous 6 months, but owing to the heavy mortality from Lamziekte, the owner decided to remove them to a farm in a reputed healthy portion of the district, viz., Marokane Range, and they were brought back to "Schoonheid" for the experiment.

The experiment continued under the writer's supervision until the 19/9/10, but unfortunately only one animal contracted Lamziekte, viz., cow 954 (grazing lot).

Cases were, however, occurring rather frequently on some of the farms in the district.

Climatic conditions: a lower rainfall was a characteristic of the climatic conditions during the period the experiment was in progress. On the 18/4/10 a slight rain occurred. On the 26/4/10 the first frost was noted; on the 29/5/10 the first severe frost was recorded, the first heavy rain did not occur until the 8/9/10.

Up till the 2/4/10 lot No. 2 grazed over the same area; after that date they were grazed on a portion of the farm, south of the home-
stead.

Period animal grazed over the suspected area before the appearance of the Disease.

Cattle No.	Lot No.	Drafted into Lot.	Noticed Sick.	No. of Days grazing before the appearance of the Disease.	Remarks.
954	2	18/2/10	29/4/10	70	Recovered.

CONCLUSION: Only one animal contracted Lamziekte, viz., Cow 954 (grazing lot).

On the 19/9/10 the experiment was handed over to the charge of Mr. Mitchell, M.R.C.V.S., Assistant Government Veterinary Bacteriologist.

History.—When in charge of the experimental camp at “Schoonheid” the writer, wherever possible, collected particulars from farmers in the district and elsewhere, who had experience of Lamziekte, and by this means some important facts were recorded, viz.:—

1. *Origin.*—The disease has been known for some years in portions of the Transvaal, Orange Free State, Cape Province, as well as in Bechuanaland and West Griqualand. Some of the old residents in Griqualand West connect its appearance on certain farms there with the “March of the Expedition” under Sir Charles Warren in 1884.

From the particulars furnished by an old native who was about 18 at the time of Tshaka’s (King of the Zulus) death, it seems that cases occurred in the Langeberg, 60 years ago. In the Christiana District of the South Western Transvaal, the first outbreak is said to have been in the year 1896, on one of the now unhealthiest farms in the district, it is interesting to note that although the farm was not known to be infected until that year, the disease first appeared on the farm almost opposite on the Orange Free State side of the Vaal River as late back as 1878, in fact this latter farm is said to have been the first known to be infected in the Boshof district of that Colony.

2. *Season of year and climatic conditions as factors.*—Although on farms on which Lamziekte is prevalent, cases occur throughout the year, it was found to be the general concensus of opinion that the worst months are October, November, December and January, and the majority of owners connect a dry year with their heaviest losses, on the contrary some owners found the heaviest mortality was during a wet summer when there was abundance of grass, the year July, 1908-June, 1909, was in such cases referred to. During the first half of

that period, viz., July, 1908-December, 1908, it was particularly dry, but in January and February, 1909, heavy rains fell and feed was plentiful, some owners experienced heaviest losses during the months of January and February, 1909, whilst others were not so unfortunate. On making further inquiries from the former it was found that cases had also been occurring prior to the heavy rains. The following records show the total rainfall for several years, and on perusing Table No. 1, it will be noted that in some instances the mortality during the extremely wet season, January, 1909, was great, whilst in other cases, losses were insignificant.

3. *The occurrence of Stijfziekte on certain farms.*—Several instances were referred to in which Stijfziekte was only known in previous years on a farm, but on which Lamziekte now also occurs. Farms were also instanced on which Stijfziekte is common, but Lamziekte not known, and *vice versa*. The term Stijfziekte refers to that condition in which pathological changes are seen particularly in the feet of affected animals, although its nature was not then known, it was pointed out that *Crotalaria* (Stijfziekteboschje) grew on the farms on which this condition occurred, and this plant was recognised as the cause.

4. *Appearance of the different forms of the disease.*—Owners in many instances have noted that during earlier years the sub-acute form was only known, but during later years cases of the acute form were also common.

5. *Disappearance and re-appearance on certain farms.*—From the data furnished by owners (see Table I), Lamziekte may disappear from a farm for a year or more. An endeavour was made to associate the appearance and disappearance of the disease with climatic conditions, but this was not found possible owing to the fact that in many cases records of total yearly losses are not kept. In so far as the scarcity or otherwise of feed as a factor is concerned, the experiences of owners differ, in some instances during a wet season with abundance of grass, losses were heavy. On the other hand, in other cases the mortality was low. (See Table No. I).

6. *Length of period up to which cases occur amongst an affected herd after removal from an unhealthy farm to a known healthy farm.*—This was considered an important point, and considerable attention was paid to it, with the result that it was found that the longest period up to which cases occurred amongst an affected herd after removal to a healthy farm was 6 weeks.

7. *Length of period elapsing between removal of a herd which has been running for some months on a known healthy farm and amongst which no cases had occurred, and re-appearance of the disease amongst the herd after removal back to a badly infected farm.*—The shortest period known was 3-4 days, and the longest 3-12 months; possible mistakes in diagnosis must, however, be taken into consideration.

8. *Contagiousness and infectiousness.*—There appears to be no reason to doubt from the carefully kept records of some owners that on certain farms in a Lamziekte area Lamziekte never makes its appearance after the lapse of a certain time, approximately 6 weeks after the removal of an affected herd to the clean farm, and although the carcasses of Lamziekte animals have been left exposed on these

farms no further cases have occurred, and one is thus justified in concluding that the disease is neither infectious nor contagious.

9. Another important point was that, notwithstanding on some badly infected farms, two or more lots of cattle were grazed over the same area and were watered at the same pan, but kraaled separately at night, cases did not occur amongst all these owners cattle, one herd remaining clean.

Basing one's deductions on these facts, water does not appear to be a factor.

10. *Distribution of the Disease on a Farm.*—Lamziekte does not appear to be distributed over an entire farm, many owners contend that it is contracted in certain camps.

11. *The shortest period in which the disease appeared on a farm after cattle farming had been commenced was found to be approximately 6 weeks.*—Here the time of year cattle farming was commenced has to be taken into consideration, thus if cattle commenced to graze on a certain farm from November to January or February, or, in other words, when the disease was most prevalent, one would expect cases sooner than if the herd had commenced grazing on the farm when cases were not so prevalent, *e.g.*, during the winter months.

12. *Mortality.*—Once Lamziekte has become established on a farm with the exception of an abatement, may be for the period of a year or more, the mortality increases in many cases to such an extent that the owners have decided to abandon farming of cattle. Exceptionally one hears of a farm on which the disease is said to have disappeared, but the writer had not the opportunity of personally confirming this.

13. As the result of searching enquiries some important particulars, which were authenticated by several old residents, were obtained, and it seems to be an undisputed fact that Lamziekte spreads slowly.

In the south-western portion of the Christiana District the first case was observed in 1896, on one of the adjoining farms in 1906, and on the other in 1907, and on an estate in the close vicinity in 1910; on a property situated approximately 15 miles distant from the former, Lamziekte was not known until 1909, and it is a noteworthy fact that in some instances farms have remained free of the disease, although owners on the adjoining property have been experiencing losses for years.

From the data furnished, an endeavour was made to connect the origin on some farms with a particular movement of sick or healthy cattle, but without success.

On the contrary, as previously referred to, it has been found that Lamziekte never becomes established on certain farms, in spite of the fact that cases may occur up till a period of 6 weeks amongst infected herds which have been removed to these, the practical importance of this is recognised by some owners who insure against a heavy mortality by keeping in reserve a clean farm to which infected herds are removed should serious losses be anticipated.

Various theories have been advanced by owners as to the cause of Lamziekte, viz.:—

1. Vegetation.
2. Deficiency of something in the feed.

3. Disease occurs on soil of a lime-stone formation.
4. Transmitted by: winged insects.
5. " drinking water.
6. " bones of dead Lamziekte animals.
7. " carcases and skins of dead Lamziekte animals.
8. " ingesta of stomachs of dead Lamziekte animals, etc.

Nos. 6, 7 and 8 are not in accord with the results of the experiments carried out by the writer.

The observations recorded do not give support to theories 3, 4 and 5.

Although as stated above, an endeavour was made to ascertain precisely the number of cases which occurred yearly on certain farms during a period of years, for the purpose of comparing the prevalence of the disease with the rainfall, it was found that owners had not, in most cases, complete records. The particulars obtained are, however, shewn in the following table (No. 1).

The rainfall records during the seasons 1905-1910 are as follows, viz. :—

RAINFALL.

Season, 1905-1906.

Place.	Year.	Month.	Inches.	Days.	
Christiana	1905	July	Nil.	—	
		August	Nil.	—	
		September	0·21	1	
		October	Nil.	—	
		November	2·72	8	
		December	2·22	9	
	1906	January	3·04	11	
		February	2·24	6	
		March	3·83	8	
		April	0·45	3	
		May	0·26	3	
		June	Nil	—	
			Total ...	14·97	49

Season, 1906-1907.

Place.	Year.	Month.	Inches.	Days.	
Bloemhof	1906	July	Nil.	—	
		August	Nil.	—	
		September	0·56	2	
		October	2·19	6	
		November	1·70	15	
		December	3·45	10	
	1907	January	5·32	14	
		February	2·81	11	
		March	2·57	15	
		April	5·13	12	
		May	1·05	8	
		June	Nil.	Nil.	
			Total ...	24·48	93

Season, 1907-1908.

Place.	Year.	Month.	Inches.	Days.
Christiana	1907	July	—	—
		August	—	—
		September	1·61	4
		October	—	—
		November	—	—
	1908	December	3·12	10
		January	0·29	3
		February	1·71	10
		March	2·00	5
		April	0·16	2
		May	—	—
		June	—	—
			Total ...	8·89

Season, 1908-1909.

Place.	Year.	Month.	Inches.	Days.
Christiana	1908	July	0·60	3
		August	0·77	2
		September	2·12	3
		October	—	—
		November	—	—
	1909	December	1·29	8
		January	2·86	9
		February	8·03	15
		March	3·89	8
		April	1·28	6
		May	0·75	1
		June	—	—
			Total ...	21·59

Season, 1909-1910.

Place.	Year.	Month.	Inches.	Days.
Christiana	1909	July	—	—
		August	—	—
		September	1·31	3
		October	0·20	2
		November	1·00	2
	1910	December	0·71	5
		January	3·75	9
		February	1·72	6
		March	1·12	5
		April	0·54	3
		May	0·24	2
		June	—	—
			Total ...	10·59

TABLE I.—Table showing period which elapsed between date of cattle grazing on a farm and first case of Lamziekte and prevalence since.

No.	Name of Owner.	Name of Farm.	Date commenced farming cattle.	Date of first case of Lamziekte.	Prevalence since first outbreak.	Time of year most prevalent.	Remarks.
1	A.J.W.	H.	April, 1904 ...	November, 1908	Frequent since ...	Early summer and summer.	
2	J.B.	D.V.	1895	1899	1908 2 cases ... 1909 0 " ... 1910 2 " ...	Cases occurred, Jan., April, May, & Oct.	
3	S J.B.	D.V.	June, 1906 ...	October, 1906...	1907 1 " ... 1908 2 " ... 1909 1 " ... 1910 4 " ...	Cases occurred, Oct., May, Jan., & April.	
4	L.P.	C.	1899	1905	1906 cases ... 1907 " ... 1908 " ... 1909 "	
5	V.D.K.	J.I.T.	Some years previous to first outbreak	1896	1897 " ... 1898 " ... 1899 " ... 1900 " ... 1901 " ... 1902 no " ... 1903 " " ... 1904 " " ... 1905-1910 cases ...	Chiefly during the summer, when rains intermittent or when season dry.	Owner reports up till 1905 oxen did not die, and from that year till 1910 disease became more and more prevalent; affects cattle of all ages and sex.
6	F.	C.	1886	1903	1904 (?) 1905 cases ... 1906 no " ... 1907 " ... 1908 " ... 1909 " ... 1910 " ...	In 1909 cases occurred in June	Owner attributes prevalence of lamziekte to the fact that the rains do not now begin till December. In former years rains commenced earlier—namely, in October.
7	A.V.	K.	1904	1904, 7 months after arrival	1905 2 " ... 1906 7 " ... 1907 5 " ... 1908 23 " ... 1909 1 " ... 1910 1 " ...	Chiefly spring and early summer	No cases occurred when there was abundance of green grass, <i>e.g.</i> , year 1906. On the other hand cases have occurred when there was an abundance of green grass.
						August-February...	Cases occurred when there was abundance of green grass, and when veldt dry. Cases have also occurred during the winter and after severe frosts.

8	D.C.V.	K.	April, 1886 ...	November, 1897	1898 (?) ... 1899 (?) ... 1900 3 cases ... 1901-1902 no cases 1903 no cases ... 1904 " " ... 1905 " " ... 1906 " " ... 1907 " " ... 1908 3 " ... 1909 1 " October, November and December	From May, 1901-October, 1902, no cattle on the farm. From 1902-1906 owner had only 8 head of cattle: these were running with No. 7 lot, amongst which cases occurred. Cases occurred as late as May.
9	P.V.	K.	1907 ...	1908 ...	1909 no " ... 1910 2 " ...	?	
10	H.	K.	February, 1905	1907 ...	1906 no " ... 1907 3 " ... 1908 no " ... 1909 " " ... 1910 3 " ...	?	
11	L. senr.	Z.	February, 1906	December, 1906	1907 7 " ... 1908 3 " ... 1909 several ... 1910 " ...	Cases occur throughout the year	This owner moved his cattle frequently to other farms, on which losses also occurred, consequently difficult to say precisely time of year most prevalent on this farm. Owner's experience, good season, few cases; in dry seasons disease prevalent. Cattle frequently moved to other farms.
12	L. junr.	Z.	February, 1907	August, 1907...	1908 4 cases ... 1909 1 " ... 1910 3 " ...	Cases occurred August, April and May	
13	P.	Z.	March, 1906 ...	Nil. ...	1906 nil. ... 1907 " ... 1908 " ... 1909 " ... 1910 " ...	Nil ...	Cattle graze over same veldt and use same water as lots 11 and 12, but kraaled separately from lots Nos. 11 and 12.
14	A.	H.	1906 ...	Nil. ...	Nil. ...	Nil ...	Grazing over same veldt and using same water as Lot No. 1. Kraaled separately from lot No. 1.
15	T.	P.D.	July, 1906 ...	November, 1906	1907 cases ... 1908 " ... 1909 45 " ... 1910 cases very frequent	Cases occurred throughout the year; more prevalent from early summer to end of summer	Worst year, July, 1908-June, 1909; disease commenced dry portion of that season 27th July-December, 1908, and continued throughout wet season of 1909.

TABLE I.—Table showing period which elapsed between date of cattle grazing on a farm and first case of Lamziekte and prevalence since—(continued).

No.	Name of Owner.	Name of Farm.	Date commenced farming cattle.	Date of first case of Lamziekte.	Prevalence since first outbreak.	Time of year most prevalent.	Remarks.
16	J.	G.	June, 1906 ...	December, 1907	1908 no cases ... 1909 " " ... 1910 " " ...	December.	
17	P.W.L.	C.	February, 1908	Sept., 1908 ...	1909 1 case ... 1910 1 " ...	September, October, November, February	Commenced dying spring of 1908, dry season, and continued dying till February 1909, <i>i.e.</i> , up till shortly after heavy rains.
18	H.	P.g.	1892	1894	1894 cases ... 1895 " ... 1896 " ... 1897 " ... 1898 " ... 1899 " ... 1900 " ...	October, November, December, January; lately throughout the year cases occur, but less frequent than in the above months	Sub-acute cases of lamziekte have been common on P.g. for a number of years previous to 1894, but apparently not the acute form.
19	H.	P.n.	1896	1908	1902 few cases ... 1903 " ... 1904 " ... 1905 " ... 1906 " ... 1907 " ... 1908 frequent ... 1909 " ... 1910 "	Owner considers cattle contracted disease from 1902-1907, On the adjoining farm, viz., P.g., which is reputed very unhealthy, but since 1908 considers animals were infected on farm P.n., and is of opinion that P.n. is now equally as unhealthy.
20	L.	D.	Oct. 31, 1906 ...	Dec. 15, 1906 ...	1907 1908 1909 1910	Summer months, but lately disease known throughout the winter	During mild winter of 1906 no abatement. In particularly wet summer of 1909 disease was very prevalent.
21	L.	L.—V.	Sept., 1903 ...	November, 1903	1904 5 cases ... 1905 4 " ... 1906 no " ... 1907 " " ... 1908 15 " ... 1909 24 " ... 1910 no "	Running since 1903 under the same conditions and same veldt.

Symptoms, Duration and Course.—As stated above only one of the experimental animals contracted Lamziekte, viz., cow 954, and consequently an opportunity was not afforded of recording precisely the course of the disease in all its different manifestations, from inception to termination or recovery. As soon as final arrangements had been completed for the erection of the Experimental Camp on “Schoonheid,” owners in the district were requested to acquaint the writer should any cases occur on their farms, and whenever possible, arrangements were made to examine sick or dead animals. Unfortunately, owing to the distance of the farms from the experimental camp, it was not possible to keep sick animals under the same close observation as wished, and thus one could not follow daily the symptoms of the disease in each of the different forms. From the observations noted and particulars furnished by owners, Lamziekte may occur in the following forms, viz., per-acute, acute, and sub-acute. Frequently when the disease is prevalent all three may be observed on the same farm.

Per-acute form.—Reports were received from several farms on which cases were appearing frequently that cattle had died quite suddenly from suspected Lamziekte, and as the writer was anxious to exclude the possibility of the existence of Anthrax, arrangements were made with an owner to collect blood-smears from such cases, and forward them to the field Laboratory, in order that a microscopical examination of the blood could be made and an opportunity afforded of excluding or otherwise the existence of diseases, including Anthrax, which can be detected by the microscope.

It is the custom on the farm on which the smears were collected to kraal the cattle at night, or to bring them to the kraal early in the morning, and the owner, being a keen observer, and the natives, handling the cattle, being taught to report anything amiss, one is justified in concluding that any visible symptoms would have been noticed. It was noted in several instances that cows which were milked in the morning and turned out to graze, apparently healthy, were found dead later in the day, in such cases the microscopical examination of the blood was negative, and reasoning by a process of exclusion, it is reasonable to assume that death from Lamziekte does occur in some cases within a few hours with no premonitory symptoms.

Acute Form.—This was found to be the commonest. In the majority of cases, the earliest visible symptom is a stiffness of gait in the fore limbs, back more or less arched (a diminution in the supply of milk is said to be an indication in milking cows). The affected animal may leave the kraal apparently healthy, and later in the day is found standing by itself, or lying, rising with difficulty, when the herd is driven to the kraal the sick beast lags behind, being unable to keep up with the rest, and frequently lies down. On some farms it is not the custom to kraal the cattle. Usually in such a case the first indication is that the sick animal is found missing and is discovered in some secluded spot, and if able to rise, rises with difficulty. On examining the sick beast more closely, tremors of the muscles of the flanks and body and grinding of the teeth may be noted, sooner or later according to the course of the disease, usually

from a few hours to 24 hours, or even later, paralysis of the hind limbs appear, and the beast is unable to rise, and lies with the forelegs under the sternum, head retained in normal position or thrown back to the flank, death may occur later with the beast lying in this position, or lying in a comatose condition, head and neck extended on ground, legs outstretched hind limbs rigid, a rather frequent condition in the acute cases is paralysis of the tongue and muscles of deglutition. On seizing the tongue no effort is made to retract it. The bolus of food remains at the back of the mouth (paralysis of Pharynx and Oesophagus), and increased salivation is present. In one instance an affected animal showed the following symptoms, viz., loss of vision, at frequent intervals it would move several times in a circle, excessive reflex movements of muscles of jaws and eyelids were followed by spasm of muscles of mouth, mouth wide open. This condition lasted for a minute or two, and recurred at varying intervals. This form being known as *Malkop Lamziekte* amongst the farmers.

In the acute form Respirations have always been found to be accelerated 23—72 and *Pulse* notably increased 63—142. *Temperature*. No rise of temperature was recorded. In the later stages there was found to be a decrease (98° Fahr. average).

There is not the same inclination to *feed* as seen in a healthy animal, and as disease progresses the beast refuses food.

Faeces were generally found in the later stages firmer than normal and in pellets, and frequently coated with a muco-gelatinous looking material. A fluid condition was observed in one case, and in rare instances blood was noted on the external surface of the faeces.

Urine.—In all cases the urine appeared normal.

Sub-Acute Form.—Two types of the sub-acute form were observed, viz., (1) the Paralytic, and (2) the *Stijfziekte* type:—

(1) *Paralytic type*: The most constant premonitory symptom is here also stiffness of gait in the fore limbs, followed by paralysis of the hind limbs and inability to rise. The beast feeds fairly well, and if well cared for may recover. It is usual, however, to find such cases lying exposed on the veld, often some distance from a homestead, and the beast thus not receiving same attention as it would if close at hand, the chances of recovery are less. Animal may recover after some days or weeks, but more often it dies.

(2) *Stijfziekte type*: In this type the animal is first noticed walking stiff in front, it lies a good deal, feeds indifferently, and when rising, makes more effort than is seen in a normal animal. To a casual observer it may appear to have recovered after a few days, but on observing such cases very closely some symptoms may be detected for a number of days, e.g., muscular tremors of muscles of flanks, fore and hind quarters were noticed particularly in the morning, up till at least three weeks in one case (see Chart, Cattle 954). No notable increase of *pulse and respirations* was recorded. *Temperature* remained normal throughout.

Cow 954.—Symptoms observed.

1910.

April 29th	...	Not feeding : lying down a good deal ...	
„ 30th	...	Feeding indifferently : lying down a good deal.	
May 1st	...	Feeding indifferently : lying down a good deal.	Back slightly arched, legs brought well under body.
„ 2nd	...	Feeding indifferently : lying down a good deal.	Tail kept in motion and generally held away from body. Muscular tremors all over body in the morning. Faeces softish, and a little mucus between pellets of dung. Urine normal.
„ 3rd	...	Feeding better : not lying down	...
„ 4th	...	Feeding : not lying down	...
„ 5th to 12th	{	Feeding	...
„ 13th	...	Still slightly stiff.	
„ 22nd	...	Muscular tremors pronounced	...
May 5th to June 5th	{	Blood smears examined daily but with negative results.	Movements of Hind quarters stiff. Back slightly arched.

PATHOLOGY.

The farm on which the *per-acute* cases of lamziekte were occurring was some distance from the experimental camp, and by the time a message was received, post-mortem changes were advanced and an opportunity was not afforded of giving an exact and non-arbitrary account of the naked eye appearances presented in diseased conditions. This particularly applies to the stomach and intestines.

Acute Form.—This, as previously stated, was found to be the commonest. In most instances it was possible to keep the sick animal under observation, and arrangements were made with the owner, if the diagnosis was confirmed to have the beast destroyed so that a post-mortem could be made immediately after death, thus avoiding post-mortem changes.

The total number of post-mortems made of acute cases was 12. There were found to be no constant lesions (see following table No. 2). There was a more or less loss of condition. A serous infiltration of the subcutaneous tissues of those regions of the body which come into contact with the ground, when the animal is lying, e.g., hip, thigh, region of humero-scapular, articulation, elbow, sternum, fore-arm, etc. The extensiveness of this depended on the period the animal had been unable to rise. The most constant lesion noted was ecchymosis of the left endocard.

Pleural and Peritoneal cavities sometimes contained an increase of a straw-coloured fluid or, in three instances, in the pleural cavity a slightly blood-coloured fluid, and an increase of a clear fluid was found in the *pericard* in several instances.

Circulatory System.—Microscopical examination of blood smears shewed no pathological changes. Blood coagulates normal. It was usual to find heart cavities filled with a well-formed blood coagulum extending into the large vessels. As stated above ecchymosis of left endocard was present in nearly all cases. Rarely pathological changes were noted in right endocard. Epicard showed petechiae in three instances.

Respiratory System.—In some cases the M.M. of the septum nasi and air passages was found hyperaemic due, in the writer's opinion, to

stasis in the circulation induced by the dependent position in which the head is sometimes held in lamziekte cases, and sometimes a mucus discharge from nostrils occurred. The lungs shewed no constant changes. Hyperaemia was rarely noted. As a result of dosing, broncho pneumonia, with an infiltration of the interlobular tissues of the lungs, occurred in some cases. The fact of there being a paralysis of the pharynx and oesophagus and inability to swallow being overlooked by the owners when giving the dose.

Digestive Tract.—In two cases an infiltration of the mucosa and submucosa of the abomasus with a clear watery-like fluid was recorded. In two instances the M.M. of the abomasus presented a bleached, whitish appearance. Superficial erosions were sometimes present. Hyperaemia was noted only very rarely. No pathological changes were met with in the rumen, reticulum or omasus (in the latter the contents were occasionally drier than usually seen).

Small Intestines.—Jejunum contents usually bile-stained and a thickish mucus deposit was observed once. Hyperaemia of the M.M. was seen in two instances.

Ileum.—On two occasions a mucus deposit was present, and in three instances hyperaemia of the M.M. was noted.

Caecum.—Rarely any pathological changes were seen in the caecum. A blackish discoloration in stripes and slate colour of the M.M. was recorded,

Large Intestines.—Hyperaemia in one case and black discoloration in stripes in two cases was seen.

Mesenteric glands were oedematous in two instances.

Liver in 5 cases a greenish-yellowish or yellowish discoloration was met with apparently due to stasis of the bile, but otherwise no constant changes were met with.

Spleen.—No pathological changes were observed.

Urinary Tract Kidneys.—Hyperaemia was recorded in 4 cases.

Bladder.—A hyperaemia of the M.M. in one case and hæmorrhage in another was present.

Bones and articulations normal.

Bone Marrow.—Twice an oedematous condition was apparent and sometimes reddish spots and small reddish patches were seen on the surface of the marrow and in its substances.

Cancellated Tissue.—With the exception of one case in which the cancellated tissue was oedematous, no pathological changes were seen microscopically.

Brain and Meninges.—No constant changes were met with. In the majority of cases the brain and meninges were normal. In cases in which a post-mortem was held some time after death, the vessels of the pia were distinctly noticeable. In the case of post-mortem 4,185 there appeared to be an increase of fluid subdurally, but an oedematous condition of the lymphatic glands and some organs also occurred in this animal. From the writer's observations an increase of cerebrospinal fluid is not a constant feature in lamziekte, as shown in the following table of post-mortems. In one case the quantity of cerebrospinal fluid was measured and found to correspond with that found in a healthy animal, viz., 90 c.c. approximately.

No pathological changes were observed in the brain or spinal cord.
Sub-acute Form, Paralytic Type.—Two post-mortems were made.

Emaciation was pronounced. Flesh had a watery, sodden appearance, fat was replaced by a watery gelatinous material, blood pale.

Bone marrow—oedematous.

Cancellated Tissue of Bones—oedematous.

Sub-acute form Stijfziekte Type.—No post-mortems were held.

Sub-acute Case, Paralytic Type.—Post-mortem on R and W cow, age 7 years, 10/5/10.

Calf at foot, age about 3 months.

Not in calf.

Condition fair at outset, but emaciation pronounced at death.

History.—Noticed sick on 25th ultimo. Symptoms: Stiffness in movements, *unable to rise from the 27th* ultimo, feeding indifferently since the 30th ultimo and fed regularly with gruel up till date of death. On the 8th instant temp. 101.4., resp. 12, pulse 58. Up till 9th instant faeces solid. From then till date of death faeces fluid, *just prior to slaughtering*. Resp. 72, pulse imperceptible, temperature 102.

Killed for post-mortem.

Decubitus near elbow, near hip, near eye, off elbow and off hip, 150 c.c. Clear straw coloured fluid in *peritoneal* cavity. *Carcase emaciated* oedematous, pale in colour, fat very sparing, reddish yellow in colour, fat mostly replaced by a water gelatinous-looking material. *Heart*. *Left ventricle* almost empty on upper surface of left auriculo-ventricular valve, a cyst size of a pea, yellow in colour. On puncturing, a yellowish fluid escapes.

Left endocard—Ecchymosis.

Right ventricle almost empty.

Right Endocard.—Normal.

Myocard.—Normal.

Lungs in expirium.—Parenchyma normal.

Rumen, half full of ingesta.—M.M. normal.

Reticulum.—M.M. normal.

Omasus.—M.M. normal. Half full of ingesta.

Abomasus.—Pyloric portion erosions, size of a 3d. downwards. Irregular in outline M.M. palish, bleached appearance.

Duodenum, bile stained, mucus deposit.

Jejunum, bile stained, mucus deposit.

Ileum, bile stained, mucus deposit.

Caecum, contents fluid.

Colon, contents fluid.

Liver firm. On section glistening appearance, parenchyma normal. Gall bladder full of normal coloured bile.

Spleen.—On section pale, pulpa dryish, Trabeculae distinct.

Kidneys.—Left kidney, palish. Right kidney, reddish striae in cortex distinct.

Urine.—Normal colour. M.M. of Bladder a gelatinous patch, size of a 5s.

Mesenteric Glands.—Slight oedema, pale.

Body Lymphatic slightly oedematous, pale.

Bone Marrow of Femur oedematous, dirty yellowish-white colour.

Cancellated Bone Tissue.—Normal.

Spinal Canal.—Fat replaced by a watery-gelatinous material.

Spinal Cord.—Normal.

Brain.—Normal.

Cause of death.—Lamziekte.

TABLE NO. 2.]

CAUSE OF DEATH

P.M. Appearances.

P.M. No.	Date.	Appearance of flesh.	Pleural Cavities.	Pericard.	Peritoneal Cavities.	Lungs.	Heart.	Liver.	Spleen.
..	13/3/10	Normal	A few c.c. of liquid	Increase of fluid.	A few c.c. of clear fluid.	Right lung hypostases	Epicard petechiæ.	Normal ..	Normal..
..	20/3/10	"	200 c.c. of liquid blood colored	Normal ..	Normal ..	Broncho pneumonia and infiltration of interlobular tissue.	Epicard petechiæ left and right endocard A few hæmorrhages.	Swollen congested.	"
..	23/4/10	"	Normal ..	A few c.c. of clear liquid.	"	Normal ..	Left endocard Eechymosis.	Normal ..	"
..	21/3/10	"	250 c.c. of blood colored liquid.	Yellow fibrinous exudate.	"	Broncho pneumonia and infiltration of interlobular tissue.	Epicard petechiæ Right endocard petechiæ left endocard Eechymosis.	Yellowish in color throughout (Bile Stasis).	"
..	24/4/10	"	Exudate blood colored.	Normal ..	"	"	Right and left endocard Eechymosis.	P.M. changes on section pale yellowish.	"
..	31/4/10	"	Normal ..	"	"	Normal ..	Left endocard hæmorrhages.	Normal .. (Stasis of bile).	"
..	27/4/10	"	A few c.c. of clear liquid.	"	"	Left endocard Eechymosis.	Normal..	Normal ..	"
3948	18/6/10	"	"	A few c.c. of clear liquid.	"	Normal ..	Left endocard Eechymosis.	Pale yellow color.	"
*4012	3/7/10	"	Normal ..	Increase of clear fluid.	A few c.c. of liquid.	"	"	Yellowish Ochre color (Stasis of bile).	"
4123 †4185	15/8/10 4/9/10	" "	500 c.c. of clear fluid.	Normal .. Increase of clear liquid.	Normal .. 500 c.c. of clear fluid.	" Hyperæmia.	Normal .. Left endocard Eechymosis.	Normal .. "	" "
‡4216	11/9/10	"	50 c.c. of clear fluid.	Increase of liquid.	100 c.c. of clear fluid.	Hyperæmia & Oedema.	Left endocard Eechymosis myocard pale.	"	"

* 4012. Increase of
 † 4185. Increase of
 ‡ 4216. Bone marrow.

—LAMZIEKTE.

Acute Cases.

Abomasus.	Small Intestines.	Large Intestines.	Mesenteric Glands.	Kidneys.	Bladder.	Brain and Meninges	Internal Lymph Glands.	Remarks.
Normal. A few strongyli.	Hyperæmia in stripes & patches.	Hyperæmia.	Oedematous.	Normal	M.M. hyperæmia.	Normal	Normal	P.M. 3½ hours after death.
Normal ..	Jejunum & ileum mucus deposit	Normal ..	Normal	Hyperæmia	Normal	Vessels of Pia injected.	"	P.M. 1 hour after death. Broncho Pneumonia caused by drenching.
Mucosa infiltrated with a clear, watery fluid. A few superficial erosions.	Normal ..	"	"	Normal	"	—	—	P.M. immediately after death, destroyed for P.M.
Hyperæmia of M.M.	Jejunum hyperæmia of M.M. in stripes & patches, ileum mucus deposit	Cæcum slate color colon black longitudinal stripes.	"	Hyperæmia.	"	Vessels of Pia injected.	Normal	P.M. about 8 hours after death. Broncho pneumonia caused by dosing with paraffin.
Normal ..	Normal ileum contents slate color.	Normal ..	"	P.M. changes.	"	P.M. changes.	"	P.M. about 8 hrs. after death. Broncho pneumonia caused by dosing with Cooper's Dip.
M.M. pale.	Ileum hyperæmia in stripes.	Cæcum and colon black discoloration in stripes.	"	Normal	"	Normal	"	P.M. immediately after death.
Normal ..	Normal ..	Normal ..	"	"	"	"	"	P.M. immediately after death, destroyed for P.M.
"	"	"	"	"	"	"	"	"
M.M. Normal Pylorus erosions.	"	"	"	"	"	"	"	"
Normal .. Mucosa infiltrated with a clear, watery fluid hæmorrhages.	Ileum hyperæmia in stripes.	"	"	Hyperæmia.	"	Increase of fluid.	Oedematous.	"
M.M. pale a superficial hæmorrhagic stripe.	Normal ..	"	Oedematous.	Hyperæmia of cortex & medulla.	Hæmorrhages.	Normal	"	"

-subarachnoidal fluid. (?)
fluid, Brain, Bone marrow. Oedematous
Oedematous.

The histological appearances of the spinal cords of several lamiekte animals were studied on parafine sections (portions of the cord were fixed in Muller's Fluid) stained with Delafield's haematoxylin, Von Gieson and Giemsa. In one instance formalin 8 per cent. sol, osmic acid and the methods of Renaut, Ramon-y-Cayal and Martin were also employed. Frozen sections were in one instance examined after staining with Haematoxylin, Delafield's, Von Gieson, etc., and Giemsa.

To guard against the possibility of degenerative changes taking place the cord was removed and fixed immediately after death. As the result of a careful microscopical examination of portions of the cord from the cervical dorsal and lumbar regions no congested or oedematous condition was observed. The histological appearances were found to be normal.

A careful search was made in the cyloptasm of the ganglion cells of the cord, or their branches, or outside these for inclusions and for this purpose sections were made from cords of acute and sub-acute cases—with negative results. Sections were made from the following:—

No.	Material.	History.	Fixed in.	Remarks.
1	Cervical cord Dorsal " Lumbar "	<i>Sub-acute case.</i> Noticed sick 12.2.10 Destroyed 22.2.10	Muller's Fluid.	
2	Cervical Cord Dorsal " Lumbar "	<i>Acute case.</i> Noticed sick 25.4.10 Destroyed in extremis 27.4.10.	"	
3	Cervical Cord Dorsal " Lumbar "	<i>Acute case.</i> Noticed sick 1.7.10 Destroyed in extremis 3 7.10.	"	
4	Cervical Cord Dorsal " Lumbar " Sacral "	<i>Acute case.</i> Noticed sick 21.8.10 Destroyed in extremis 23.8.10.	"	
5	Cervical Cord Dorsal "	<i>Acute case.</i> Noticed sick Destroyed in extremis 20.3.10.	"	
6	Cervical Cord Dorsal " Lumbar "	<i>Sub-acute case.</i> Noticed sick 25.4.10 Destroyed in extremis 10.5.10.	"	
7	Dorsal Cord Axillary Nerve... ..	<i>Acute case.</i> Noticed sick 9.9.10 Destroyed in extremis 11 9.10.	Formalin. Renaut.	
8	Cervical Cord Dorsal " Lumbar " Sacral " Sciatic nerve	<i>Sub-acute case.</i> Noticed sick 7.6.11 Destroyed 5.7.11 " " " "	Osmic Acid. Ramon-y- Cayal. Muller's Fluid. Marebi.	

In the case of No. 8 (see above table) the cord was fixed and stained for the purpose of ascertaining whether degenerative changes had taken place in the various tracts of the cord, but the examination proved negative in this respect.

Taking into consideration that the affected animal makes, in some acute cases, a speedy recovery, and that in sub-acute cases an animal which has been unable to rise for a number of days, quickly recovers, and the appearance of the animal after such recoveries, it would seem that no organic lesion of the brain or cord occurs.

The writer is of opinion that degenerative changes of nerve tissue do not occur in lamziekte.

Transmission Experiments.—A number of experiments, for details see Table No. 3, were carried out for the purpose of noting the effects of ingestion and inoculation of healthy cattle by and with material collected from lamziekte animals.

TABLE NO. 3.—Details of Transmission Experiments.

Expt No.	Date of Expt.	No. of Animal used for the Expt.	Material used.	Material collected from	Name of Owner of Sick Animal.	Name of Farm.	Date collected.	History of case from which material was collected for the Expt.	Result.	Remarks.
1	21.2.10	H. 645	1½ lbs. Faeces (Drenched).	Cow ...	Mr. E.	R.	21.2.10	Noticed sick Lamziekte 12.2.10 and sick at time of collection.	Negative	...
2	22.2.10	C. 294	50 c.c. def. blood intravenously.	"	"	"	22.2.10	Noticed sick Lamziekte 12.2.10 and sick at time of collection.	"	
3	27.2.10	H. 640	5 c.c. blood subcutaneously.	2 Meercats caught on Schoonheid.	"	"	27.2.10	---	"	
4	16.3.10	H. 526	2 c.c. blood ...	Stink Muis Hond caught on Schoonheid.	"	"	16.3.10	---	"	
5	21.3.10	H. 887	10 c.c. sub. arachnoidal fluid subcutaneously.	Black Cow	Mr. L.	Z.	21.3.10	Died with Lamziekte 20.3.10.	"	
6	21.3.10	H. 887	Drenched with bone marrow.	Geel Cow ...	"	"	"	" "	"	
7	22.3.10	C. 294	Drenched with 3 tablespoons bone meal.	"	"	"	"	" "	"	
8	23.3.10	H. 887	Injected sub. 11 c.c. bone marrow.	Black Cow	"	"	23.3.10	" "	"	
9	24.3.10	C. 294	Drenched with 4 tablespoons bone meal.	"	"	"	24.3.10	" "	"	
10	24.3.10	H. 887	Drenched with 3 tablespoons bone marrow.	"	"	"	"	" "	"	
11	1.4.10	H. 640	Injected 5 c.c. subcutly. brainemulsion.	"	"	"	31.3.10	Destroyed 31.3.10 Lamziekte.	"	

12	2.4.10	H. 869	Drenched 1½ lbs. rumen of cow.	"	"	"	2.4.10	"	"	"
13	"	H. 526	Drenched 1½ lbs. rumen of cow.	"	"	"	"	"	"	"
14	25.4.10	H. 862	Injected 10 c.c. blood (intrajug.) and 50 c.c. subcutly.	Geel Ox ...	"	"	25.4.10	De-troyed	25.4.10 in extremis	Lamziekte
15	"	H. 640	50 c.c. blood subcutly.	"	"	"	"	"	"	"
16	"	H. 526	7 c.c. sub-emulsion in physiol. water mucu gelatinous exudate on faeces	Red Ox ...	"	"	"	Sick	25.4.10 with Lam-	ziekte.
17	"	H. 887	Drenched with 32 oz. faeces.	"	"	"	"	"	"	"
18	28.4.10	H. 653	5 c.c. sub-arachnoidal fluid intrajug.	B & W. C.	Mrs. B.	O. P.	27.4.10	Destroyed in extremis	Lamziekte	27.4.10
19	"	H. 645	Drenched with contents of 4th stomach.	"	"	"	"	"	"	"
20	"	H. 645	Drenched with portion of contents of small intestines	"	"	"	"	"	"	"
21	"	H. 645	Drenched with scrapings and mucus and sub-mucus coat small intestines.	"	"	"	"	—		"
22	2.5.10	H. 887	Drenched 70 ozs. faeces.	C. 954 ...	Expt. catle.	Schoonheid.	2.5.10	Animal sick with Lam-	ziekte.	"
23	"	H. 869	Injected 10 c.c. blood of hare (Lepus Capensis) subcutly.	Hare ...	—	"	"	—		Hare shot on Schoonheid Expt. farm.
24	3.5.10	H. 862	10 c.c. milk subcutly.	C. 954 ...	Expt. Cow.	"	3.5.10	Animal sick with Lam-	ziekte.	"
25	"	H. 862	50 c.c. defibrinated blood subcutly.	"	"	"	"	"	"	"
26	13.5.10	H. 869	5 c.c. Spring Haas blood subcutly.	Spring Haas	—	"	13.5.10	—		Spring Haas destroyed on Schoonheid Expt. farm.

TABLE NO 3.—Details of Transmission Experiments—*continued*.

Expt. No.	Date of Expt.	No. of Animal used for the Expt.	Material used.	Material collected from	Name of Owner of Sick Animal.	Name of Farm.	Date collected.	History of case from which material was collected for the Expt.	Result.	Remarks.
27	3.6.10	H. 645	Drenched with portion of jejunum.	Red Cow ...	Mr. L.	Z.	3.6.10	Animal died Lamziekte 3.6.10.	On the 9.6.10, noticed sick, lying, food retained, mouth salivating. Died 15.6.10.	Material was cut into small pieces and mixed with physiological water.
28	3.6.10	H. 869	Drenched with portion of contents of jejunum.	"	"	"	"	" "	Negative	
29	4.6.10	H. 645	Drenched with portion of abomasus	"	"	"	"	" "	On the 9.6.10, noticed sick, lying, food retained in mouth salivating. Died 15.6.10.	
30	"	H. 869	"	"	"	"	"	" "	Negative	
31	"	H. 837	Drenched with portion of jejunum and ileum.	"	"	"	"	" "	"	Material minced in meat mincer, bouillon added.
32	"	H. 294	Drenched with portion of contents of rumen.	"	"	"	4.6.10	" "	"	Contents mixed with water previously boiled and allowed to cool.
33	"	H. 526	Drenched with muscle tissue.	"	"	"	"	" "	"	Muscle minced in meat mincer and water previously boiled.
34	5.6.10	C. 294	Drenched with portion of contents of rumen.	"	"	"	5.6.10	" "	"	Contents mixed with water previously boiled and allowed to cool.
35	6.6.10	"	Ditto ditto ...	"	"	"	6.6.10	" "	"	" "
36	7.6.10	"	Drenched with portion of contents rumen.	"	"	"	3.6.10	" "	"	" "
37	8.6.10	"	"	"	"	"	"	" "	"	" "

38	9.6.10	"	"	"	"	"	"	"	"	"	"	"
39	10.6.10	"	"	"	"	"	"	"	"	"	"	"
40	11.6.10	"	"	"	"	"	"	"	"	"	"	"
41	13.6.10	"	"	"	"	"	"	"	"	"	"	"
42	12.6.10	H. 653	Bolus of food from mouth placed in mouth.	H. 645	...	Expt. Cattle.	Schoonheid.	12.6.10	Animal showing paralysis, of muscles of deglutition and mastication, salivating; was drenched on 3rd and 4th.6.10 with a portion of jejunum and abomasus of red cow, died Lamziekte 3.6.10.	"	"	"
									(See experiments Nos. 27 and 29).			
43	"	"	Fed with hay mixed with saliva from H. 645.	"	"	"	"	"	"	"	"	"
44	14.6.10	C. 294	Drenched with portion contents of rumen.	Red Cow	...	Mr. L.	Z.	3.6.10	Animal died Lamziekte 3.6.10.	"	"	"
45	"	"	Drenched with contents rumen.	"	"	"	"	"	"	"	"	"
46	15.6.10	H. 862	Drenched portion of abomasus and jejunum.	H. 645	...	Expt. Cattle.	Schoonheid.	15.6.10	Animal died with symptoms paralysis deglutition and mastication.	"	"	"
47	"	H. 887	Drenched with portion of brain and spinal cord.	"	"	"	"	15.6.10	"	"	"	"
48	18.6.10	H. 869	Drenched with portion of brain.	B. & W. C.		Mr.	"	18.6.10	Destroyed, Lamziekte, 18.6.10.	"	"	"
49	"	H. 837	Drenched contents of small intestines	"	"	v. d. H.	N.	"	"	"	"	"
50	"	"	Drenched portion of jejunum.	"	"	"	"	"	"	"	"	"
E 51	"	G. 2,747	Drenched with portion of brain.	"	"	"	"	"	"	"	"	Material minced in meat mincer and bouillon added.

TABLE NO. 3.—Details of Transmission Experiments—*Continued.*

Expt. No.	Date of Expt.	No. of Animal used for the Expt.	Material used.	Material collected from	Name of Owner of Sick Animal.	Name of Farm.	Date collected.	History of case from which material was collected for the Expt.	Result.	Remarks.
52	"	G. 2,744	Drenched with portion of 4th stomach.	B. & W. C.	Mr. v.d.H.	N.	18.6.10	Destroyed, Lamziekte, 18.6.10	Negative	Material minced in meat mincer and bouillon added.
53	"	C. 294	Drenched with portion of uterine membranes.	"	"	"	"	" "	"	" "
54	19.6.10	H. 869	Drenched with portion or brain and spinal cord.	"	"	"	"	" "	"	" "
55	"	G. 2,747	"	"	"	"	"	" "	"	" "
56	"	G. 2,744	Drenched with portion of abomasus.	"	"	"	"	" "	"	" "
57	21.6.10	G. 6	Drenched with portion of contents rumen.	"	"	"	"	" "	"	" "
58	22.6.10	"	"	"	"	"	"	" "	"	" "
59	23.6.10	"	"	"	"	"	"	" "	"	" "
60	24.6.10	"	"	"	"	"	"	" "	"	" "
61	25.6.10	"	"	"	"	"	"	" "	"	" "
62	26.6.10	"	"	"	"	"	"	" "	"	" "
63	28.6.10	"	"	"	"	"	"	" "	"	" "
64	29.6.10	"	"	"	"	"	"	" "	"	" "
65	30.6.10	"	"	"	"	"	"	" "	"	" "
66	1.7.10	"	"	"	"	"	"	" "	"	" "
67	3.7.10	H. 837	Drenched with portion of brain.	Black Cow	"	"	3.7.10	Destroyed, Lamziekte, 3.7.10.	"	Died Debility 13.7.10.
68	"	"	Injected 10 c.c. brain emulsion subcutly	"	"	"	"	" "	"	" "
69	"	H. 887	Drenched portion of abomasus.	"	"	"	"	" "	"	Material minced in meat mincer and physiological water added.
70	"	G. 2,745	"	"	"	"	"	" "	"	" "
71	"	G. 2,748	Drenched with portion of brain.	"	"	"	"	" "	"	" "

72	"	"	Injected 10 c.c. brain emulsion subcuty	"	"	"	"	"	"	"	Material made into emulsion with sterile bouillon.
73	4.7.10	H. 869	Drenched with portion of abomasus and small intestines.	"	"	"	"	"	"	"	Material minced in meat mincer and bouillon added.
74	"	C. 294	Drenched 170 c.c. uterine fluid.	"	"	"	"	"	"	"	
75	"	"	Drenched with portion of uterine membranes.	"	"	"	"	"	"	"	Material minced in meat mincer.
76	"	H. 526	Injected 10 c.c. subarachnoidal fluid subcutly.	"	"	"	"	"	"	"	
77	"	H. 652	Drenched with 100 c.c. of urine.	"	"	"	"	"	"	"	
78	"	G. 2,746	Drenched portion of abomasus and small intestines.	"	"	"	"	"	"	"	Material minced in meat mincer and bouillon added.
79	4.7.10	G. 2,747	10 c.c. spinal cord subcutaneously.	"	"	"	"	Destroyed, Lamziekt , 3.7.10.	"	"	" "
80	5.7.10	H. 869	Drenched portion of small intestines.	"	"	"	"	"	"	"	Material minced in meat mincer. Putrefactive changes well advanced in material.
81	6.7.10	"	"	"	"	"	"	"	"	"	Material mixed in meat mincer. Putrefactive changes well advanced.
82	24.7.10	H. 640	Drenched portion of intestines.	B. & W. C.	Mr. A. J. W.	H.	22.7.10	Died Lamziekte 22.7.10	25.7.10. Tip of tongue protruding from mouth. profuse salivation, paralysis of muscles of deglutition, eructations, food retained in mouth. Died 1 p.m., 25.7.10.	"	Material minced in meat mincer and physiological water added. Material decomposed.

TABLE No. 3.—Details of Transmission Experiments.—Continued.

Expt. No.	Date of Expt.	No. of Animal used for the Expt.	Material used.	Material collected from	Name of Owner of Sick Animal.	Name of Farm.	Date collected.	History of case from which material was collected for the Expt.	Result.	Remarks.
83	24.7.10	H. 862	Drenched with portion of abomasus.	B. & W. C.	Mr. A.J.W.	H.	22.7.10	Died Lamziekte 22.7.10	25.7.10. Uneasy 9 a.m. 25.7.10. 4 p.m. fed. prehension difficult, food retained at back of mouth, paralysis of muscles of deglutition, salivating profusely, continual movement of jaws Tongue protruding, lying and rising frequently, drinks slowly	Material minced in meat mincer and physiological water added. Material decomposed.
84	25.7.10	G. 2,748	Injected 2 c.c. blood subcutly.	H. 640	Expt. Cattle.	Nooitgedacht.	25.7.10	Died paralysis, muscles of mastication, etc. see expt. 82 25.7.10	26.7.10. found dead, 6 a.m. Negative.	
85	"	H. 887	Injected 2 c.c. blood subcutly.	"	"	"	"	" "	"	
86	"	H. 837	Drenched portion of small intestines.	"	"	"	"	—	"	Material minced in meat mincer, portion of contents of small intestines added and given mixed with above.
87	"	H. 294	Drenched with portion of abomasus.	"	"	"	"	—	"	Material minced in meat mincer, physiological water added.
88	"	G. 2,744	Drenched with portion of small intestines.	"	"	"	"	—	"	" "
89	"	G. 2,746	"	B. & W. C.	Mr. W.	H.	22.7.10	Died Lamziekte 22.7.10	26.7.10. Found dead, 6 a.m.	Material decomposed at time of drenching.
90	27.7.10	G. 2,747	"	H. 862	Expt. Cattle.	Schoonheid.	26.7.10	Animal died 26.7.10, see Expt. 83.		

91	2.8.10	C. 294	Drenched 4 table- spoonsful crushed bones.	Black Cow No. 1,102	Mr. v. d. H.	N.	—	Lamziekte, destroyed paralytic stage, acute case.	Negative	...
92	3.8.10	"	"	"	"	"	—	"	"	
93	4.8.10	"	"	"	"	"	—	"	"	
94	11.8.10	C. 947	10 c.c. blood subcutly	Hare ... (Lepus Capensis)	...	—	—	"	"	Hare shot on Schoonheid. Microscopical exam.: —blood of Hare= negative.
95	15.8.10	C. 294	Defibrinated blood 40 c.c. intra. prescapular lym- phatic glands.	Black Cow No. 1,119	Mr. L.	S.	15.8.10	Lamziekte case, acute noticed sick 12th, inst., unable to rise 13th inst.	"	Slight swelling at seat of inoculation near side, 16.8.10.
96	"	H. 837	Defibrinated blood 20 c.c. intra. prescapular lym- phatic glands.	"	"	"	"	"	"	
97	"	H. 869	20 c.c. spleen emul- sion intra. pres- capular lymphatic gland.	"	"	"	"	"	On the 26.8.10, unable to rise, weak, paralysis of muscles of deglutition. Tip of tongue protruding. Destroyed in extremis 26.8. 10.	16.8.10. Carries limb of inoculated side stiffly, swollen at seat of inoculation and contiguous parts. 17.8.10. Still carrying limb, and swelling increasing. 23.8.10. Swelling and stiffness almost gone, salivating, difficulty in prehension and deglutition, cannot swallow drinking water, urinates fre- quently. 24.8.10. Paralysis of mus- cles of deglutition. unable to drink, food retained back of mouth, salivating pro- fuse, lying a good deal, no stiffness ap- parent, frequent attempt to masticate constant movement of jaws, tip of tongue protruding.

TABLE NO. 3.—Details of Transmission Experiments.—Continued.

Expt. No.	Date of Expt.	No. of Animal used for the Expt.	Material used.	Material collected from	Name of Owner of Sick Animal.	Name of Farm.	Date collected.	History of case from which material was collected for the Expt.	Result.	Remarks.
98	15.8.10	C. 944	Drenched 2,400 c.c. contents of abomasus and small intestines.	Black Cow No. 1,102	Mr. L.	S.	15.8.10	Lamziekte case, acute noticed sick 12th inst., unable to rise 13th inst.	Negative	Material minced in meat mincer after washing with sterile physiological water.
99	"	H. 653	Drenched 800 c.c. of abomasus and jejunum.	"	"	"	"	"	"	
100	16.8.10	H. 652 & C. 941	Made abrasions on m. m. of posterior part of mouth and inoculated abrasions with scrapings from laryngeal mucous membrane.	"	"	"	16.8.10	"	"	
101	16.8.10	H. 526	Drenched 800 c.c. of contents of intestines.	"	"	"	"	"	"	
102	"	H. 652	Drenched with 800 c.c. mixture of abomasus and small intestines.	"	"	"	"	"	"	
103	"	C. 941	Scarified m. m. of mouth and inoculated with scraping of m. m. of larynx.	"	"	"	15.8.10	Lamziekte case, acute, noticed sick 12th inst. unable to rise 13th inst. Destroyed	"	
104	"	G. 2,747	Drenched portion of small intestines abomasus.	"	"	"	16.8.10	"	"	"
105	"	G. 2,748	"	"	"	"	"	"	"	"

106	23.8.10	C. 947	20 c.c. spleen emulsion intralymphatically.	R. & W. Ox.	Mr. E.	"	23.8.10	Destroyed, Lamziekte 23.8.10. Noticed sick 20.8.10, stiffness of gait.	"	25.8.10. A good deal of local swelling at seat of inoculation, carries limb of inoculated side stiffly.
107	"	C. 941	"	"	"	R.	"	" " "	"	25.8.10. Swelling at seat of injection, carries limb.
108	"	H. 887	20 c.c. spleen emulsion intralymphatic gland.	"	"	"	"	" "	"	25.8.10. Swelling at seat of inoculation.
109	24.8.10	H. 526	Drenched 2x800 c.c. bottles of intestinal contents of 800 c.c. of contents of abomasus	"	"	"	"	" "	"	Intestines were removed from abdominal cavity at the time of P.M., viz.: 23.8.10 contents then taken from small intestines and heifer drenched with these on the 24th.
110	"	G. 2,748	Drenched 400 c.c. of contents of small intestines.	"	"	"	"	" "	"	" "
111	"	H. 653	Drenched with portion of abomasus and ileum.	"	"	"	"	" "	"	Intestines removed from abdominal cavity on the 23rd and on the 24th washed in sterile water, minced, and physiological water added to material and drenched.
112	"	G. 2,744	Drenched with portion of abomasus and intestines.	"	"	"	"	" "	Died 30.8.10. Lung lesions, not due to drenching.	" "
113	26.8.10	C. 946	20 c.c. spleen emulsion intralymphatic gland.	H. 869	...	Exper. Animal.	26.8.10	Injected on the 15.8.10 with 20 c.c. spleen emulsion Red and White Cow No. 1,119. See Expt. 97.	Negative	
114	"	C. 944	10 c.c. spleen emulsions intralymphatic gland.	"	"	"	"	" "	"	27.8.10. Local swelling at seat of inoculation.

TABLE NO. 3.—Details of Transmission Experiments.—*Continued.*

Expt. No.	Date of Expt.	No. of Animal used for the Expt.	Material used.	Material collected from	Name of Owner of Sick Animal.	Name of Farm.	Date collected.	History of case from which material was collected for the Expt.	Result.	Remarks.
115	26.8.10	H. 837	10 c.c. spleen emulsions intralymphatic gland.	H. 869	Exper. Animal.	R.	26.8.10	Injected on the 15.8.10 with 20 c.c. spleen emulsion Red and White Cow No. 1.119. (See Expt. No. 97.)	Negative ...	27.8.10. Local swelling at seat of inoculation.
116	"	C. 942	Drenched portion of small intestines and abomasus.	"	"	"	"	" "	"	Material collected immediately after death minced in meat mincer and mixed with physiological water and drenched.
117	4.9.10	C. 947	Drenched portion of abomasus.	R. & W. C. No. 1,139	Mr. P.	C.	4.9.10	Acute Lamziekte case. Destroyed for material 4.9.10.	"	Material washed with physiological water, minced in mincer and drenched.
118	"	C. 652	Drenched with portion of small intestines.	"	"	"	"	" "	"	" "
119	"	C. 653	"	"	"	"	"	" "	"	" "
120	"	C. 941	Injected 10 c.c. mesenteric gland emulsion intralymphatic gland	"	"	"	"	" "	"	"
121	"	H. 887	Injected 20 c.c. brain emulsion intralymphatic gland	"	"	"	"	" "	"	"
122	"	C. 942	Drenched with 3,600 c.c. contents of small intestines.	"	"	"	"	" "	"	"
123	"	G. 2,748	Drenched with portion of abomasus	"	"	"	"	" "	"	Material washed in physiological water, minced in mincer and drenched.

124	5.9.10	C. 294	Drenched portion of ileum and jejunum.	"	"	"	"	"	"	"	"	"
125	"	G. 2,745	About 100 grammes.	"	"	"	"	"	"	"	"	"
126	11.9.10	C. 946	30 c.c. cerebro spinal fluid intra. lymphatic gland.	Black Cow	Mr. L.	S.	11.9.10	Acute Lamziekte case. Destroyed 11.9.10.	"	"	"	"
127	"	C. 941	Injection 20 c.c. spleen emulsion intra. spleenally.	"	"	"	"	"	"	"	"	"
128	"	H. 526	Injection 10 c.c. spleen emulsion intra prescapular lymphatic gland	"	"	"	"	"	"	"	12.9.10. Carcass limb stiffly, swelling at seat of inoculation.	17.9.10. Not carrying limb, swelling decreased.
129	"	C. 947	Drenched 800 grammes abomasus.	"	"	"	"	"	"	"	Minced in meat mincer and drenched.	"
130	"	G. 2,748	Drenched portion of abomasus.	"	"	"	"	"	"	"	"	"
131	"	G. 2,745	Drenched with portion of small intestines.	"	"	"	"	"	"	"	"	"
132	"	G. 2,747	"	"	"	"	"	"	"	"	"	"
133	"	C. 652	Drenched 800 grammes small intestines.	"	"	"	"	"	"	"	"	"
134	"	C. 653	"	"	"	"	"	"	"	"	"	"
135	"	C. 942	Drenched 1,200 c.c. contents of small intestines	"	"	"	"	"	"	"	"	"
136	"	C. 294	Drenched portion of small intestines.	"	"	"	"	"	"	"	"	"

C—Cow.

H—Heifer.

G—Goat.

RESUME OF TRANSMISSION EXPERIMENTS.

Total number of subcut. injections of blood of lamziekte cattle into healthy cattle	6
Total number of intravenous injections of blood of lamziekte cattle into healthy cattle... ..	1
Total number of intralymphal injections of blood of lamziekte cattle to healthy cattle	2
Total number of subcutaneous injections of blood of lamziekte cattle to goats	1
Total number of subcutaneous injections of blood of rodents into healthy cattle	4
Total number of subcutaneous injections of sub-arachnoidal fluid of lamziekte cattle into healthy cattle	2
Total number of intrajugular injections of sub-arachnoidal fluid of lamziekte cattle into healthy cattle	2
Total number of subcutaneous injections of blood of lamziekte animals to goats	1
Total number of drenching experiments with bonemeal from lamziekte cattle to healthy cattle	6
Total number of subcutaneous injections of brain of lamziekte cattle into healthy cattle	2
Total number of intralymphal injections of brain of lamziekte cattle into healthy cattle... ..	1
Total number of drenching experiments with brain of lamziekte cattle to healthy cattle	2
Total number of drenching experiments with brain of lamziekte cattle to healthy goats	2
Total number of subcutaneous injections of brain of lamziekte cattle to healthy goats	1
Total number of drenching experiments with spinal cord of lamziekte cattle to healthy cattle	2
Total number of drenching experiments with spinal cord of lamziekte cattle to healthy goats	1
Total number of drenching experiments with uterine membranes of lamziekte cattle to healthy cattle	2
Total number of drenching experiments with uterine fluid of lamziekte cattle to healthy cattle	1
Total number of drenching experiments with faeces of lamziekte cattle to healthy cattle	3
Total number of drenching experiments with bone marrow of lamziekte cattle to healthy cattle	2
Total number of experiments with subcutaneous injections of bone marrow of lamziekte cattle to healthy cattle	1
Total number of experiments with subcutaneous injections of milk of lamziekte cattle to healthy cattle	1

Total number of drenching experiments with muscle of lamziekte cattle to healthy cattle	1
Total number of intralymphal injections of mesenteric gland to healthy cattle	1
Total number of experiments rubbing scrapings from M.M. and larynx and mouth of lamziekte cattle into scarifications made in the mouth of healthy cattle	2
Total number of subcutaneous injections of mucus and gelatinous exudate on faeces of lamziekte cattle into healthy cattle ...	1
Total number of drenching experiments with contents of rumen of lamziekte cattle to healthy cattle	13
Total number of drenching experiments with contents of rumen or lamziekte cattle to healthy goats	10
Total number of intrasplenic injections of spleen pulp of lamziekte cattle to healthy cattle	1
Total number of sub-dural injections of sub-arachnoidal fluid from lamziekte animals to healthy cattle	1
(Results negative.)	
Total number of experiments with portion of intestines in which <i>putrefactive changes were advanced</i> , collected from lamziekte animals and fed to healthy cattle (result, death, expt. No. 82)	1
Total number of experiments with portion of abomasus and jejunum of lamziekte cow in which <i>putrefactive changes were advanced</i> and fed to healthy animal (result, death, expt. No. 27)	1
Total number of experiments with portion of abomasus of lamziekte cow in which <i>putrefactive changes were advanced</i> and fed to healthy animal (result, death) (experiment No. 83) ...	1
Total number of drenching experiments with small intestines of lamziekte cattle in which <i>putrefactive changes were advanced</i> , fed to goat (result, death)	-
Total number of intralymphal injections of spleen of lamziekte cow into healthy beast H. 869, Experiment No. 97 (result, death)	1
To note the effect of drenching healthy cattle and goats with portion of intestines, abomasus and contents of alimentary canal of lamziekte cattle in which <i>putrefactive changes were not apparent</i> :—	
Experiments with contents of abomasus to cattle... .. .	2
,, with contents of small intestines to cattle	7
,, with contents of small intestines to goats	1
,, with scrapings of mucus and submucus to cattle	1
,, with small intestines to healthy cattle	13
,, with small intestines to healthy goats	3
,, with abomasus to healthy cattle	2
,, with abomasus to healthy goats	5
,, with abomasus and jejunum to healthy cattle	4
,, with abomasus and jejunum to healthy goats	4
,, with abomasus and ileum to healthy cattle... .. .	1

Results: Negative.

Experiments: To note the effect of intralymphal injections of spleen pulp of lamziekte cases of healthy cattle 9

Results: Negative.

To note the effect of drenching with portion of small intestines of H. 862 which died from the effects of drenching with portion of alimentary canal of lamziekte animal in which putrefactive changes were apparent:—

Goat 2,747 drenched with portion of small intestines of H. 862:

Result, negative.

To note the effect of drenching healthy cattle with portion of alimentary canal, brain and spinal cord, of H. 645 which died from the effects of drenching with portion of alimentary canal of lamziekte animal in which putrefactive changes were advanced:—

H. 862 drenched with portion of abomasus and jejunum of H. 645:

H. 887 drenched with portion of brain and spinal cord of H. 645:

Result, negative.

To note the effect of injecting and drenching material to healthy cattle and goats collected from H. 640 which died from result of drenching with portions of alimentary canal of a lamziekte animal in which putrefactive changes were advanced:—

Goat 2,748 injected subc. 2 c.c. blood of heifer 640.

H. 887 injected subc. 2 c.c. blood of heifer 640.

H. 837 drenched with portion of small intestines of H. 640.

u. 294 drenched with portion of abomasus of H. 640.

G. 2,744 drenched with portion of small intestines of u. 640.

Result: Negative.

CONCLUSIONS OF RESULTS OF TRANSMISSION EXPERIMENTS.

The following material, blood, faeces, sub-arachnoid fluid, bone marrow, bonemeal, brain, spinal cord, contents of rumen, mucus and gelatinous exudate on faeces, contents of abomasus, contents of small intestines, scrapings of mucus and sub-mucus of small intestines, milk, small intestines, abomasus, muscle, uterine membranes, uterine fluid, urine, spleen, scrapings of M.M. mouth and pharynx, mesenteric glands collected from Lamziekte animals when injected or drenched to cattle, did not transmit Lamziekte.

Portions of small intestines and abomasus of cattle in which putrefactive changes were advanced caused death of cattle and goats (Experiments No. 82, 83, and 89), with symptoms of paralysis of muscles. of deglutition of muscles of tongue and profuse salivation.

Blood and portion of intestines of cattle which died from the result of drenching with portions of intestines and stomach of Lamziekte cattle in which putrefactive changes were advanced, when drenched or injected to healthy cattle caused no ill effects.

The intralymphal injection of spleen pulp of Lamziekte cow into healthy cow caused death with symptoms of profuse salivation, inability to swallow and masticate, paralysis of tongue, eructations of gas from rumen. The material was partly decomposed at time of injection (Experiment No. 97).

9. *Intralymphal injections of fresh spleen pulp* caused no ill effects.

Transmission experiments with Cultures of Material collected from Lamziekte Animals.

A number of cultures were made, for details see Table No. 4, and injected or drenched to healthy cattle.

TABLE No. 4.—Transmission Experiments with Cultures.

Expt. No.	Date.	Number of the Animal used in the Experiment.	Material Inoculated.	Culture made from.	Grown on.	Animal from which material was collected to make cultures.	Name of Owner of Sick Animal.	Farm.	History of Case.	Result.	Remarks.
1	12.3.10	H 869	19 days old culture, 5 c.c. subcutaneously	Contents of Jejunum	Bouillon Aerobic	Black Cow	Mr. E.	R	Animal sick since 12.2.10 with Lamziekte, destroyed 22.2.10	Nil.	
2	25.3.10	H 653	5 days old culture, 5 c.c. subcutaneously	Mesenteric Gland	Bouillon Aerobic	Black Cow	Mr. L.	Z	Animal died 20.3.10 of Lamziekte, P.M. 1 hour after death	Nil	
3	25.3.10	H 652	12 days old culture, 5 c.c. subcutaneously	Mesenteric Glands	Bouillon Aerobic	Red Cow	Mr. V. D. H.	N	Animal died of Lamziekte, P.M. 2 hours after death	Nil.	
4	27.3.10	H 862	20 days old subculture, 5 c.c. subcutaneously	Contents of Intestines	Bouillon Aerobic	Black Cow	Mr. E.	R	Destroyed Lamziekte 22.2.10	Nil.	
5	27.3.10	H 837	20 days old culture, 5 c.c. subcutaneously	Contents of Intestines	Bouillon Aerobic	Black Cow	Mr. E.	R	Sick with Lamziekte, destroyed 22.2.10	Nil.	
6	27.3.10	H 645	14 days old culture, 5 c.c. subcutaneously	Contents of Intestines	Bouillon Aerobic	Red Cow	Mr. V. D. H.	N	Animal died Lamziekte, P.M. made 2 hours after death	Nil.	
7	3.4.10	H 653	14 and 9 days old culture, equal parts, 5 c.c. subcutaneously	Mesenteric Gland	Bouillon Aerobic	Black Cow	Mr. L.	Z	Animal died Lamziekte 20.3.10, cultures made 1 hour after death	Nil.	Slight swelling at seat of inoculation.
8	3.4.10	H 652	21 and 7 days old culture, equal parts, 5 c.c. subcutaneously	Intestines	Bouillon Aerobic	Red Cow	Mr. V. D. H.	N	Animal died of Lamziekte, P.M. 2 hours after death	Nil.	Slight swelling at seat of inoculation.
9	8.4.10	H 869	8 and 5 days old cultures equal parts, 4 c.c. subcutaneously	Mesenteric Glands	Bouillon Aerobic	Black Cow	Mr. L.	Z	Animal destroyed Lamziekte 31.3.10, cultures made immediately after death	Nil.	
10	8.4.10	H 887	8 days old culture 4 c.c. subcutaneously	Brain of Cow	Bouillon Aerobic	Black Cow	Mr. L.	Z	Animal destroyed Lamziekte 31.3.10, cultures made immediately after death	Nil.	Secondary infection.

11	20.4.10	H 652	20 days old culture, 1 c.c. intrajugularly	Mesenteric Gland	Bouillon Aerobic	Black Cow	Mr. L.	Z	Destroyed Lamziekte 31.3.10, cultures made immediately after death	Nil.	
12	20.4.10	H 869	20 days old culture, 5 c.c. subcutaneously	Mesenteric Gland	Bouillon Aerobic	Black Cow	Mr. L.	Z	Destroyed Lamziekte 31.3.10, cultures made immediately after death	Nil.	
13	28.4.10	H 837	5 days old culture, 5 c.c. subcutaneously	Mesenteric Glands	Bouillon Aerobic	Geel Ox	Mr. L.	Z	Animal destroyed Lamziekte 23.4.10, cultures made at time of P.M. P.M. immediately after death	Nil.	
14	28.4.10	H 837	5 days old culture, 5 c.c. subcutaneously	Mesenteric Gland	Bouillon Anaerobic	Geel Ox	Mr. L.	Z	Animal destroyed Lamziekte 23.4.10, cultures made at time of P.M. P.M. immediately after death	Nil.	Swelling at seat of inoculation.
15	28.4.10	H 837	5 days old culture, 5 c.c. subcutaneously	Mesenteric Gland	Bouillon Aerobic	Geel Ox	Mr. L.	Z	Animal destroyed Lamziekte 23.4.10, cultures made at time of P.M. P.M. immediately after death	Nil.	
16	28.4.10	H 837	5 days old culture, 5 c.c. subcutaneously	Sub mucus Stomach Exudate	Bouillon Anaerobic	Geel Ox	Mr. L.	Z	Animal destroyed Lamziekte 23.4.10, cultures made at time of P.M. P.M. immediately after death	Nil.	Swelling at seat of inoculation, 28.10, and suppurating.
17	28.4.10	C 294	3 days old culture, 5 c.c. subcutaneously	Intestinal mucus and Gelatinous Exudate of Faeces	Bouillon Aerobic	Red Ox	Mr. L.	Z	Animal sick with Lamziekte, when material collected 25.4.10	Nil.	Swelling at seat of inoculation.
18	28.4.10	C 294	3 days old culture, 5 c.c. subcutaneously	Intestinal mucus and Gelatinous Exudate of Faeces	Bouillon Anaerobic	Red Ox	Mr. L.	Z	Animal sick with Lamziekte, when material collected 25.4.10	Nil.	Swelling at seat of inoculation.
19	30.4.10	H 652	3 days old culture, 5 c.c. subcutaneously	Contents of Ileum	Bouillon Aerobic	Black and White Cow	Mrs. B.	O.P.	Killed in extremis 27.4.10 Lamziekte	Nil.	Swelling at seat of inoculation.
20	30.4.10	H 652	3 days old culture, 5 c.c. subcutaneously	Mucus scraping Jejunum	Bouillon Aerobic	Black and White Cow	Mrs. B.	O.P.	Killed in extremis, Lamziekte 27.4.10	Nil.	Swelling at seat of inoculation.
21	30.4.10	H 652	3 days old culture, 5 c.c. subcutaneously	Mesenteric Gland	Bouillon Aerobic	Black and White Cow	Mrs. B.	O.P.	Killed in extremis, Lamziekte 27.4.10	Nil.	Swelling at seat of inoculation.
22	5.5.10	H 526	Sub-culture, 5 c.c. subcutaneously	Mesenteric Gland	Bouillon Aerobic	Geel Ox	Mr. L.	Z	Died Lamziekte 23.4.10, P.M. some time after death	Nil.	
23	14.5.10	H 887	4 days old culture, 10 c.c. subcutaneously	Fourth Stomach	Bouillon Aerobic	Black and White Cow	Mrs. B.	O.P.	Died Lamziekte 10.5.10	Nil.	Swelling at seat of inoculation.
24	14.5.10	H 887	4 days old culture, 10 c.c. subcutaneously	Fourth Stomach	Bouillon Anaerobic	Black and White Cow	Mrs. B.	O.P.	Died Lamziekte 10.5.10	Nil.	Swelling at seat of inoculation.

TABLE No. 4.—Transmission Experiments with Cultures—(continued).

Expt. No.	Date	Number of the Animal used in the Experiment.	Material Inoculated.	Culture made from.	Grown on.	Animal from which material was collected to make cultures.	Name of Owner of Sick Animal.	Farm.	History of Case.	Result.	Remarks.
25	18.5.10	H 640	3 days old culture, 10 c.c. subcutaneously	Mesenteric Gland	Bouillon Aerobic	Black and White Cow	Mrs. B.	O.P.	Died Lamziekte 10.5.10	Nil.	Swelling at seat of inoculation.
26	18.6.10	H 526	15 days old culture, drenched	Scraping of M M of Jejunum	Bouillon Aerobic	Red Cow	Mr. L.	Z	Died Lamziekte 3.6.10	Nil.	
27	18.6.10	H 526	3 days old culture, drenched	Scraping of M M of Jejunum	Bouillon Aerobic	H 645	Experiment Cattle	Schoonheid	Died 15.6.10 with symptoms of paralysis of muscle deglutition and mastication, etc.	Nil.	
28	28.6.10	H 640	10 day old culture, 10 c.c. subcutaneously	Brain	Bouillon Aerobic	Black and White Cow	Mr. V. D. H.	N	Destroyed Lamziekte 18.6.10	Nil.	
29	28.6.10	H 652	10 days old culture, 10 c.c. subcutaneously	Spinal Cord	Bouillon Aerobic	Black and White Cow	Mr. V. D. H.	N	Destroyed Lamziekte 18.6.10	Nil.	
30	29.7.10	H 869	Sub-culture, 10 c.c. subcutaneously	Abomasus	Bouillon Aerobic	Red Cow	Mr. L.	Z	Died Lamziekte 3.6.10	Nil.	Swelling at seat of inoculation. Swelling almost disappeared, 4.8.10.
31	29.7.10	H 526	Sub-culture, 10 c.c. subcutaneously	Scraping M M Intestines	Bouillon Aerobic	Black Cow No. 1102	Mr. V. D. H.	N	Destroyed Lamziekte 3.7.10	Nil.	Swelling at seat of inoculation.
32	1.8.10	H 869	13 days old sub-culture, 20 c.c. subcutaneously	Scraping Mucosa Intestines	Bouillon Aerobic	Black Cow No. 1102	Mr. V. D. H.	N	Acute case of Lamziekte noticed sick 22.7.10	Nil.	1½ hours after injection heifer trembling, muscular tremors; resp. 34, pulse 54, temp. 102; frequent micturition, head held low, swelling at seat of inoculation; swelling almost gone on the 4.8.10.
33	1.8.10	H 887	Sub-culture, 30 c.c. subcutaneously	Abomasus	Bouillon Aerobic	Black Cow No. 1102	Mr. L.	Z	Acute case Lamziekte, destroyed 3.6.10	Nil.	Swelling at seat of inoculation; swelling almost gone on the 4.8.12.
34	27.8.10	Cow 294	36 days old culture, 10 c.c. subcutaneously	Scraping of M.M. of Ileum	Bouillon Anaerobic	Cow	Mr. W.	H	Died Lamziekte 22.7.10, cultures made 24.7.10	Nil.	One hour after injection trembling, etc., followed later by difficulty in prehension, mastication and deglutition and increased salivation; symptoms disappeared 29.8.10.

35	2.9.10	Goat 2747	Sub-culture, 10 c.c. subcutane- ously	Scraping of M. M. of Intestines	Bouillon Aerobic	Cow	Mr. W.	H	Died Lamziekte 22.7.10, cultures made 24.7.10	Nil.	Two hours after injection pulse 120, resp. 38, temp. 104.8.
36	2.9.10	H 526	Sub-culture, 15 c.c. subcutane- ously	Scrapings of M.M. of Intestines	Bouillon Aerobic	Cow	Mr. W.	H	Died Lamziekte 22.7.10, cultures made 24.7.10	Nil.	Two hours after injection pulse 68, resp. 64, temp. 103, moaning, respirations, walks occasionally; sal- ivating, watery discharge eyes, body tucked up, head held low, not feed- ing, coughing; 24 hours after lying frequently, muscular tremors, not feeding; 3.9.10 lying a good deal, not feeding, muscular tremors, swell- ing at seat of inoculation; 4.9.10 feeding indiffer- ently.

The following is "a resumé" of the experiments with cultures of material collected from Lam-ziekte animals :—

- Number of experiments with bouillon aerobic cultures, mesenteric glands of Lamziekte animals, subcutaneously injected—Total, 10.
- Number of experiments with bouillon anaerobic cultures, mesenteric glands of Lamziekte animals, subcutaneously injected—Total, 1.
- Number of experiments with bouillon aerobic cultures, mesenteric glands of Lamziekte animals, intravenously injected—Total, 1.
- Number of experiments with bouillon aerobic cultures, contents of jejunum of Lamziekte animals, subcutaneously injected—Total, 1.
- Number of experiments with bouillon aerobic cultures, mucosa abomasus of Lamziekte animals, subcutaneously injected—Total, 3.
- Number of experiments with bouillon anaerobic cultures, mucosa abomasus of Lamziekte animals, subcutaneously injected—Total, 2.
- Number of experiments with bouillon aerobic cultures, contents of intestines of Lamziekte animals, subcutaneously injected—Total, 4.
- Number of experiments with bouillon aerobic cultures, mucosa jejunum of Lamziekte animals, subcutaneously injected—Total, 1.
- Number of experiments with bouillon aerobic cultures, mucosa jejunum of Lamziekte animals, drenched—Total, 2.
- Number of experiments with bouillon aerobic cultures, exudate on faeces of Lamziekte animals, subcutaneously injected—Total, 2.
- Number of experiments with bouillon aerobic cultures, brain (secondary infection), subcutaneously injected—Total, 2.
- Number of experiments with bouillon aerobic cultures, spinal cord (secondary infection), subcutaneously injected—Total, 1.
- Number of experiments with bouillon aerobic cultures, contents ileum, of Lamziekte animals—Total, 1.
- Number of experiments with bouillon aerobic cultures, scrapings mucosa intestines subcutaneously injected—Total, 1.

Results were negative.

In the following experiments symptoms of a Toxæmia were produced as a result of inoculation.

- 20 c.c. of a 13 days old bouillon aerobic subculture (2nd generation) of scrapings mucosae intestines, subcutaneously injected. Experiment No. 32.
- 10 c.c. of a 36 days old bouillon aerobic culture (1st generation) of scrapings mucosae ileum, subcutaneously injected. Experiment No. 34.
- 15 c.c. of a 13 days old bouillon aerobic subculture (2nd generation) of scrapings mucosae intestines subcutaneously injected. Experiment No. 36.
- 10 c.c. of a 13 days old bouillon aerobic subculture (2nd generation) of scrapings mucosae intestines subcutaneously injected. Experiment No. 35.

The material from which original cultures were made, Expts. Nos. 34, 35, and 36, was collected from an animal in which putrefactive changes were advanced.

Conclusions, cultures made from mesenteric glands, contents of intestines, mucosa of intestines, brain and cord (secondary infection), of Lamziekte animals when injected to healthy animals produced no ill effects.

Subcultures from intestinal mucosae of a Lamziekte animal in which putrefactive changes were advanced when injected subcutaneously produced symptoms of a Toxæmia in cattle and goat (portion of the material from which cultures were made when drenched to healthy animals caused death. See Table No. 3, Expts. Nos. 82, 83, and 89).

Material from lamziekte animals did not always produce a growth in the media employed.

In the following instances the media remained sterile:—

- (1) Bouillon aerobic and anaerobic inoculated with material from mesenteric glands sub-arachnoidal fluid from acute case lamziekte, 27/4/10.
- (2) Bouillon anaerobic mesenteric gland and bouillon aerobic sub-arachnoidal fluid. Chronic case, 10/5/10.
- (3) Bouillon aerobic, sub-arachnoidal fluid, Bouillon aerobic, spinal cord, agar aerobic, spinal cord.
Material collected from acute case Lamziekte 18/6/10.
- (4) Bouillon aerobic sub-arachnoidal fluid. Gelatine aerobic sub-arachnoidal fluid. Agar aerobic sub-arachnoidal fluid. Material from acute Lamziekte case, 3/7/10.
- (5) Bouillon aerobic prescapular gland, Agar aerobic prescapular gland. Material from chronic Lamziekte case. Paralytic type (living animal).

Conclusions:

Media as above inoculated with portion of mesenteric gland, sub-arachnoidal fluid. Spinal cord from Lamziekte animals destroyed for post-mortem and media inoculated immediately after death remained sterile.

Media as above inoculated with portion of prescapular lymphatic gland of living Lamziekte case, paralytic type, remained sterile.

SEROLOGICAL RESEARCH.

In the Journal of Comparative Pathology and Theurapeutics Vol. XXI, No. 3, September, 1908, page 195, Spreull records having isolated an organism of the Pasteurella type which was considered to be the casual agent of Lamziekte and in Vol. XXIII, No. 3, September, 1910, page 229 of the Journal Robertson records having isolated an organism of the Pasteurella type which was thought to be, from the symptoms produced after inoculation of a culture, specific for Lamziekte.

On my return from leave and prior to proceeding to Grahamstown Veterinary Laboratory, I received instructions as to the general outline of serological work to be carried out in connection with the disease ‘Lamziekte.’

This comprised experiments for the purpose of ascertaining,

- (1) Whether the serum of Lamziekte animals caused the re-action of the fixation of the complement using as antigen an emulsion of the Pasteurella organism.
- (2) Whether the serum of Lamziekte animals caused the re-action of the fixation of the complement using as antigen an extract of organs of a Lamziekte animal.
- (3) Whether the serum of Lamziekte animals agglutinated the Pasteurella organism.

Independent of the above I was instructed to make a study of the characters of the organism.

On arrival at Grahamstown Mr. Robertson kindly placed at my disposal a culture of the organism which produced symptoms resembling Lamziekte and which for convenience is hereafter described as the organism "P."

COMPLEMENT DEVIATION.

The following is a short description of the technique used, the components employed, and the manner of preparation of these.

(4) *Technique*: The titre of the hæmolytic serum in the presence of a dose constant of the complement of the Guinea Pig (1 cc of a 1-19 per cent. soln.), was first ascertained in order to determine what was the minimum quantity of amboceptor which sufficed to dissolve 1 cc of a 5 per cent. solution of washed sheep corpuscles. 0.2 cc of the serum to be tested, increasing doses of the antigen and 1 cc of the 1-19 per cent. solution in physiological water of the complement, were then put in a series of test tubes, and 1-2 cc of normal saline solution added to each tube, and the tubes incubated for 1 hour at 36 C—37 C; the hæmolytic dose of amboceptor and one cubic centimetre of a 5 per cent. emulsion of washed sheep corpuscles were then added and the tubes incubated for another hour at 37° C. and the results noted. The tubes were then kept at room temperature for 12-15 hours and results read, when hæmolysis was complete in tubes 4, 5, 6, 7, and 8 of the following table. (Table No. 1.) Tube No. 9, containing amboceptor and no complement was used as control.

TABLE NO. I.

Tube No.	Serum inactivated.	Extract of organism "P."	Comp. 1-19.	Phy. Water.	Amb. 1-100.	5 % washed sheep corp.	Result	
							Serum Active.	Serum Inactive.
1	0.2	0.3	1	1.5	1	1	Zero	Complete
2	0.2	0.4	1	1.4	1	1	Zero	Complete
3	0.2	0.5	1	1.3	1	1	Zero	Complete
4	0.2	—	1	1.8	1	1	Complete	Complete
5	—	—	1	1.7	1	1	Complete	Complete
6	—	0.3	1	1.6	1	1	Complete	Complete
7	—	0.4	1	1.5	1	1	Complete	Complete
8	—	0.5	1	2	1	1	Complete	Complete
9	—	—	—	2	1	1	Zero	Zero

1 hour at 37° C.

1 hour at 37° C.

The serum was considered active when there was no hæmolysis in tubes 1, 2, and 3 and hæmolysis in tubes 4, 5, 6, 7 and 8. In the majority of instances the serum of a visibly affected animal which had been inoculated with organism "P" (e.g. Ox No. 55), which caused a deviation of the complement and agglutinated this organism and the serum of a healthy animal were used as controls. The tests were carried out in one stage only, e.g. the preliminary or orientation test, and agglutination tests were made simultaneous with, or before or after, the complement deviation tests.

Components employed:—

1. The serum (Lamziekte animal).
2. The Antigen (Extract of organism "P").
3. The complement (Guinea Pig serum).
4. The hæmolytic serum for sheep's corpuscles.
5. The Emulsion of washed sheep's red blood corpuscles (5 per cent. in Physiol. water).

The components of the test were prepared as follows, viz.

1. *The Serum:—*

This was collected from cattle sick with Lamziekte and from the control animals as follows, viz.:—The blood was taken sterile in test tubes, the tubes were then placed for $\frac{1}{4}$ hour at 36° C, and after detaching the coagulum the test tubes were placed in the ice-box overnight and the serum removed the following morning and put into small brown bottles and kept on ice and used within at most two or three days later. No preservative was added, previous to use the serum was inactivated by heating for half an hour in a water bath at 56° C.

2. *The Antigen:—*

An extract of the organism "P" was prepared as follows:—Twenty-four hours old cultures on agar were washed off with physiological water containing 0.5 per cent. carbolic acid; the cultures were killed at a temperature of 60° C., the liquid was then shaken for 3 days at room temperature, kept on ice several days and the extract used in varying doses.

2 (A). *Extract from Lamziekte organs:—*

Portions of the various organs were, after cutting into small pieces and drying in vacuo over sulphuric and calcium chloride, triturated in a mortar and 30 c.c. of physiological water added to one gramme of the powder and allowed to macerate some hours and then centrifugalised, the centrifugalised liquid being used as antigen.

3. *The Complement:—*

Only fresh Guinea Pig serum was made use of in the tests. The animal was bled to death, the blood collected in sterile test tubes, placed in the incubator for fifteen minutes and the coagulum detached from the sides of the test tubes and the tubes then put on ice. The serum was carefully collected and placed in small brown bottles and used within at least 48 hours after. In every instance a test was made the efficacy of the complement was tested, and the minimum effective quantity used.

4. *The Hæmolytic Serum—Amboceptor.*

The rabbit serum used was prepared by injecting rabbits intraperitoneally with washed sheep corpuscles in increasing doses at intervals from a week to 9-10 days; after receiving several injections

extending over some weeks, blood was collected from the ear and the serum tested for hæmolytic properties and if found to be hæmolytic, the carotid vessels were severed, after chloroforming the animal, the blood collected and the serum pipetted off and stored in the ice chest in small brown bottles, and prior to use, inactivated at a temperature of 56° C. for $\frac{1}{2}$ hour.

5. *The Red Blood Corpuscles* :—

Blood corpuscles of a healthy sheep were washed in a centrifuge until the water used for washing was quite clear (three or four washings sufficed usually) and a 5 per cent. emulsion in sterile physiol. water made and used within at most two days.

The tests carried out and results were as follows, viz. :—

SERUM OF OX No. 71. HEALTHY ANIMAL. EXTRACT OF ORGANISM "P."

Test No. 1. 4/9/11.

No. of Tube.	Serum Inactivated.	Extract of Organism "P."	Complement 1-19.	Physiological water.	Amboceptor 1-100.	5% washed sheep corpuscles.	Result.
1	0.2	0.3	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	Complete Hæmolysis. " " " " " " " " Zero.
2	0.2	0.4	1 c.c.	1.4 c.c.	1 c.c.	1 c.c.	
3	0.2	0.5	1 c.c.	1.3 c.c.	1 c.c.	1 c.c.	
4	0.2	—	1 c.c.	1.8 c.c.	1 c.c.	1 c.c.	
5	—	0.3	1 c.c.	1.7 c.c.	1 c.c.	1 c.c.	
6	—	0.4	1 c.c.	1.6 c.c.	1 c.c.	1 c.c.	
7	—	0.5	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	
8	—	—	1 c.c.	2 c.c.	1 c.c.	1 c.c.	
9	—	—	—	2 c.c.	1 c.c.	1 c.c.	
1 hour at 36° C.					1 hour at 36° C.		

SERUM OF OX No. 55 (Inoculated Pasteurella, 11/8/10).

4/9/11.

No. of Tube.	Serum Inactivated.	Extract of Organism "P."	Complement 1-19.	Physiological water.	Amboceptor 1-100.	5% washed sheep corpuscles.	Result.
1	0.2	0.3	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	Zero. " " Complete Hæmolysis. " " " " Zero.
2	0.2	0.4	1 c.c.	1.4 c.c.	1 c.c.	1 c.c.	
3	0.2	0.5	1 c.c.	1.3 c.c.	1 c.c.	1 c.c.	
4	0.2	—	1 c.c.	1.8 c.c.	1 c.c.	1 c.c.	
5	—	0.3	1 c.c.	1.7 c.c.	1 c.c.	1 c.c.	
6	—	0.4	1 c.c.	1.6 c.c.	1 c.c.	1 c.c.	
7	—	0.5	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	
8	—	—	1 c.c.	2 c.c.	1 c.c.	1 c.c.	
9	—	—	—	2 c.c.	1 c.c.	1 c.c.	
1 hour at 36° C.					1 hour at 36° C.		

SERUM OF OX No. 53 (Inoculated Pasteurella, 11/8/10).
4/9/11.

No. of Tube.	Serum Inactivated.	Extract of Organism "P."	Complement 1-19.	Physiological water.	Amboceptor 1-100.	5 % washed sheep corpuscles.	Result.
1	0.2	0.3	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	Zero.
2	0.2	0.4	1 c.c.	1.4 c.c.	1 c.c.	1 c.c.	"
3	0.2	0.5	1 c.c.	1.3 c.c.	1 c.c.	1 c.c.	"
4	0.2	—	1 c.c.	1.8 c.c.	1 c.c.	1 c.c.	Complete Hæmolysis.
5	—	0.3	1 c.c.	1.7 c.c.	1 c.c.	1 c.c.	"
6	—	0.4	1 c.c.	1.6 c.c.	1 c.c.	1 c.c.	"
7	—	0.5	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	"
8	—	—	1 c.c.	2 c.c.	1 c.c.	1 c.c.	"
9	—	—	—	2 c.c.	1 c.c.	1 c.c.	Zero.
1 hour at 36° C.				1 hour 36° C.			

SERUM OF OX No. 70. NATURAL LAMZIEKTE CASE.

4/9/11.

No. of Tube.	Serum Inactivated.	Extract of Organism "P."	Complement 1-19.	Physiological water.	Amboceptor 1-100.	5 % washed sheep corpuscles.	Result.
1	0.2	0.3	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	Complete Hæmolysis.
2	0.2	0.4	1 c.c.	1.4 c.c.	1 c.c.	1 c.c.	"
3	0.2	0.5	1 c.c.	1.3 c.c.	1 c.c.	1 c.c.	"
4	0.2	—	1 c.c.	1.8 c.c.	1 c.c.	1 c.c.	"
5	—	0.3	1 c.c.	1.7 c.c.	1 c.c.	1 c.c.	"
6	—	0.4	1 c.c.	1.6 c.c.	1 c.c.	1 c.c.	"
7	—	0.5	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	"
8	—	—	1 c.c.	2 c.c.	1 c.c.	1 c.c.	"
9	—	—	—	2 c.c.	1 c.c.	1 c.c.	Zero.
1 hour 36° C.				1 hour 36° C.			

SERUM OF NATURAL CASE LAMZIEKTE. Dated 20/8/11.

4/9/11.

No. of Tube.	Serum Inactivated.	Extract of Organism "P."	Complement 1-19.	Physiological water.	Amboceptor 1-100.	5 % washed sheep corpuscles.	Result.
1	0.2	0.3	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	Complete Hæmolysis.
2	0.2	0.4	1 c.c.	1.4 c.c.	1 c.c.	1 c.c.	"
3	0.2	0.5	1 c.c.	1.3 c.c.	1 c.c.	1 c.c.	"
4	0.2	—	1 c.c.	1.8 c.c.	1 c.c.	1 c.c.	"
5	—	0.3	1 c.c.	1.7 c.c.	1 c.c.	1 c.c.	"
6	—	0.4	1 c.c.	1.6 c.c.	1 c.c.	1 c.c.	"
7	—	0.5	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	"
8	—	—	1 c.c.	2 c.c.	1 c.c.	1 c.c.	"
9	—	—	—	2 c.c.	1 c.c.	1 c.c.	Zero.
1 hour at 36° C.				1 hour at 36° C.			

SERUM OF OX DATED 18/8/11. NATURAL LAMZIEKTE CASE.
4/9/11.

No. of Tube.	Serum Inactivated.	Extract of Organism "P."	Complement 1-19.	Physiological water.	Amboceptor 1-100.	5 % washed sheep corpuscles.	Result.
1	0·2	0·2	1 c.c.	1·6 c.c.	1 c.c.	1 c.c.	Hæmolysis.
2	0·2	0·3	1 c.c.	1·5 c.c.	1 c.c.	1 c.c.	"
3	0·2	0·4	1 c.c.	1·4 c.c.	1 c.c.	1 c.c.	"
4	0·2	—	1 c.c.	1·8 c.c.	1 c.c.	1 c.c.	Distinct Hæmolysis.
5	—	0·2	1 c.c.	1·8 c.c.	1 c.c.	1 c.c.	"
6	—	0·3	1 c.c.	1·7 c.c.	1 c.c.	1 c.c.	"
7	—	0·4	1 c.c.	1·6 c.c.	1 c.c.	1 c.c.	"
8	—	—	1 c.c.	1·8 c.c.	1 c.c.	1 c.c.	"
9	—	—	—	2·0 c.c.	1 c.c.	1 c.c.	Zero.
1 hour at 36° C.					1 hour at 36° C.		

SERUM OF OX 60 (inoculated with Organism "P," 20/ 8/11).
8/9/11.

No. of Tube.	Serum Inactivated.	Extract of Organism "P."	Complement 1-19.	Physiological water.	Amboceptor 1-100.	5 % washed sheep corpuscles.	Result.
1	0·2	0·3	1 c.c.	1·5 c.c.	1 c.c.	1 c.c.	Zero.
2	0·2	0·4	1 c.c.	1·4 c.c.	1 c.c.	1 c.c.	"
3	0·2	0·5	1 c.c.	1·3 c.c.	1 c.c.	1 c.c.	"
4	0·2	—	1 c.c.	1·8 c.c.	1 c.c.	1 c.c.	Hæmolysis.
5	—	0·3	1 c.c.	1·7 c.c.	1 c.c.	1 c.c.	"
6	—	0·4	1 c.c.	1·6 c.c.	1 c.c.	1 c.c.	"
7	—	0·5	1 c.c.	1·5 c.c.	1 c.c.	1 c.c.	"
8	—	—	1 c.c.	2·0 c.c.	1 c.c.	1 c.c.	"
9	—	—	—	2·0 c.c.	1 c.c.	1 c.c.	Zero.
1 hour at 36° C.					1 hour at 36° C.		

SERUM OF OX 23 (Inoculated Pasteurella Organism, 20/11/09).
8/9/11.

No. of Tube.	Serum Inactivated.	Extract of Organism "P."	Complement 1-19.	Physiological water.	Amboceptor 1-100.	5 % washed sheep corpuscles.	Result.
1	0·2	0·3	1 c.c.	1·5 c.c.	1 c.c.	1 c.c.	Zero.
2	0·2	0·4	1 c.c.	1·4 c.c.	1 c.c.	1 c.c.	"
3	0·2	0·5	1 c.c.	1·3 c.c.	1 c.c.	1 c.c.	"
4	0·2	—	1 c.c.	1·8 c.c.	1 c.c.	1 c.c.	Hæmolysis.
5	—	0·3	1 c.c.	1·7 c.c.	1 c.c.	1 c.c.	"
6	—	0·4	1 c.c.	1·6 c.c.	1 c.c.	1 c.c.	"
7	—	0·5	1 c.c.	1·5 c.c.	1 c.c.	1 c.c.	"
8	—	—	1 c.c.	2·0 c.c.	1 c.c.	1 c.c.	"
9	—	—	—	2·0 c.c.	1 c.c.	1 c.c.	Zero.
1 hour at 36° C.					1 hour at 36° C.		

SERUM OF OX 55 (Inoculated Pasteurella Organism, 11/8/10).
8/9/11.

No. of Tube.	Serum Inactivated.	Extract of Organism "P."	Complement 1-19.	Physiological water.	Amboceptor 1-100.	5 % washed sheep corpuscles.	Result.
1	0.2	0.3	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	Zero.
2	0.2	0.4	1 c.c.	1.4 c.c.	1 c.c.	1 c.c.	"
2	0.2	0.5	1 c.c.	1.3 c.c.	1 c.c.	1 c.c.	"
4	0.2	—	1 c.c.	1.8 c.c.	1 c.c.	1 c.c.	Hæmolysis.
5	—	0.3	1 c.c.	1.7 c.c.	1 c.c.	1 c.c.	"
6	—	0.4	1 c.c.	1.6 c.c.	1 c.c.	1 c.c.	"
7	—	0.5	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	"
8	—	—	1 c.c.	2.0 c.c.	1 c.c.	1 c.c.	"
9	—	—	—	2.0 c.c.	1 c.c.	1 c.c.	Zero.
1 hour at 36° C.				1 hour at 36° C.			

SERUM OF OX. NATURAL CASE OF LAMZIEKTE. Owner T.
8/9/11.

No. of Tube.	Serum Inactivated.	Extract of Organism "P."	Complement 1-19.	Physiological water.	Amboceptor 1-100.	5 % washed sheep corpuscles.	Result.
1	0.2	0.3	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	Hæmolysis.
2	0.2	0.4	1 c.c.	1.4 c.c.	1 c.c.	1 c.c.	"
3	0.2	0.5	1 c.c.	1.3 c.c.	1 c.c.	1 c.c.	"
4	0.2	—	1 c.c.	1.8 c.c.	1 c.c.	1 c.c.	"
5	—	0.3	1 c.c.	1.7 c.c.	1 c.c.	1 c.c.	"
6	—	0.4	1 c.c.	1.6 c.c.	1 c.c.	1 c.c.	"
7	—	0.5	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	"
8	—	—	1 c.c.	2.0 c.c.	1 c.c.	1 c.c.	"
9	—	—	—	2.0 c.c.	1 c.c.	1 c.c.	Zero.
1 hour at 36° C.				1 hour at 36° C.			

SERUM OF CATTLE 71. NORMAL ANIMAL.
8/9/11.

No. of Tube.	Serum Inactivated.	Extract of Organism "P."	Complement 1-19.	Physiological water.	Amboceptor 1-100.	5 % washed sheep corpuscles.	Result.
1	0.2	0.3	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	Slight Hæmolysis.
2	0.2	0.4	1 c.c.	1.4 c.c.	1 c.c.	1 c.c.	"
3	0.2	0.5	1 c.c.	1.3 c.c.	1 c.c.	1 c.c.	"
4	0.2	—	1 c.c.	1.8 c.c.	1 c.c.	1 c.c.	Distinct Hæmolysis.
5	—	0.3	1 c.c.	1.7 c.c.	1 c.c.	1 c.c.	"
6	—	0.4	1 c.c.	1.6 c.c.	1 c.c.	1 c.c.	"
7	—	0.5	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	"
8	—	—	1 c.c.	2.0 c.c.	1 c.c.	1 c.c.	"
9	—	—	—	2.0 c.c.	1 c.c.	1 c.c.	Zero.
1 hour at 36° C.				1 hour at 36° C.			

SERUM OF CATTLE No. 1, Owner, Mr. P. (Inoculated with P. Culture,
June, 1910).

17/9/11.

No. of Tube.	Serum Inactivated.	Extract of Organism "P."	Complement 1-19.	Physiological water.	Amboceptor 1-100.	5 % washed sheep corpuscles.	Result.
1	0.2	0.1	1 c.c.	1.7 c.c.	1 c.c.	1 c.c.	Slight Hæmolysis.
2	0.2	0.1	1 c.c.	1.7 c.c.	1 c.c.	1 c.c.	"
3	0.2	0.1	1 c.c.	1.7 c.c.	1 c.c.	1 c.c.	"
4	0.2	—	1 c.c.	1.8 c.c.	1 c.c.	1 c.c.	Hæmolysis.
5	—	0.1	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	"
6	—	0.1	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	"
7	—	0.1	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	"
8	—	—	1 c.c.	2.0 c.c.	1 c.c.	1 c.c.	"
9	—	—	—	2.0 c.c.	1 c.c.	1 c.c.	Zero.
1 hour at 36° C.					1 hour at 36° C.		

SERUM OF CATTLE No. 2. (Sick with Lamziekte 18 months
previous, Owner, Mr. P.)

17/9/11.

No. of Tube.	Serum Inactivated.	Extract of Organism "P."	Complement 1-19.	Physiological water.	Amboceptor 1-100.	5 % washed sheep corpuscles.	Result.
1	0.2	0.1	1 c.c.	1.7 c.c.	1 c.c.	1 c.c.	Hæmolysis-
2	0.2	0.1	1 c.c.	1.7 c.c.	1 c.c.	1 c.c.	"
3	0.2	0.1	1 c.c.	1.7 c.c.	1 c.c.	1 c.c.	"
4	0.2	—	1 c.c.	1.8 c.c.	1 c.c.	1 c.c.	Distinct Hæmolysis.
5	—	0.1	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	"
6	—	0.1	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	"
7	—	0.1	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	"
8	—	—	1 c.c.	2.0 c.c.	1 c.c.	1 c.c.	"
9	—	—	—	2.0 c.c.	1 c.c.	1 c.c.	Zero.
1 hour at 36° C.					1 hour at 36° C.		

SERUM OF CATTLE No. 3 (Inoculated with Organ. "P," June, 1910.

17/9/11.

No. of Tube.	Serum Inactivated.	Extract of Organism "P."	Complement 1-19.	Physiological water.	Amboceptor 1-100.	5 % washed sheep corpuscles.	Result.
1	0.2	0.1	1 c.c.	1.7 c.c.	1 c.c.	1 c.c.	Hæmolytic.
2	0.2	0.1	1 c.c.	1.7 c.c.	1 c.c.	1 c.c.	"
3	0.2	0.1	1 c.c.	1.7 c.c.	1 c.c.	1 c.c.	"
4	0.2	—	1 c.c.	1.8 c.c.	1 c.c.	1 c.c.	"
5	—	0.1	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	"
6	—	0.1	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	"
7	—	0.1	1 c.c.	1.5 c.c.	1 c.c.	1 c.c.	"
8	—	—	1 c.c.	2.0 c.c.	1 c.c.	1 c.c.	"
9	—	—	—	2.0 c.c.	1 c.c.	1 c.c.	Zero.
1 hour at 36° C.					1 hour at 36° C.		