

STIFF-SICKNESS OR STIJFZIEKTE IN CATTLE.

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THE term "stiff-sickness" or "stijfziekte" in cattle applies to a disease which has been known in South Africa for many years, and which is still found in certain parts of the Cape, Orange Free State, and the Transvaal. The same name has, within the last few years, also been applied to the disease known as "three days' sickness" on account of the presence of certain symptoms as may be surmised by the name. With the exception of the name, the two diseases are in no way connected with each other, the "three days' sickness" in particular being of a contagious nature, having had all the character of an epizootic which swept through the country, and disappeared again. Stiff-sickness proper is attached to certain farms, where it may occur as an endemic or in outbreaks of individual animals, and appears practically every year at more or less the same season.

Hutcheon, the late Principal Veterinary Surgeon of the Cape Colony, mentions in his earlier reports the presence of "stiff-sickness" in various parts of the Cape Colony, and collected the first evidence concerning the symptoms and the peculiar conditions under which it is met with. He formulated a theory as to the probable cause and, based on it, recommended a treatment which ever since has been largely made use of with varied results and has formed the subject of much discussion in farmers' circles. In his report, *Hutcheon* mentions stiff-sickness and lam-sickness frequently together, and even goes so far as to identify the two, considering the one, stiff-sickness, more as a chronic form, and lam-sickness as an acute form of the same ailment. Although we are no longer justified in holding this view, the fact remains that, in various parts of South Africa, both diseases are met with at the same time and on the same farms. Since the views of *Hutcheon* have, for the last twenty years, been those most frequently quoted and to a large extent adopted, I consider it advisable to repeat them here, inasmuch as the actual observations still hold good, although we do no longer interpret them in the same way. In his report of 1884, he writes about the occurrence and frequency of stiff-sickness as follows, and says:—

"Individual cases of the disease may appear at any time of the year, especially during a period of drought like that which was experienced in the territory of Griqualand West during the years 1882-83, but in ordinary seasons it is most prevalent during the early spring months after the grasses have shed their seeds and become withered and before fresh grasses have sprung up. It generally disappears after good rains. Animals of all ages and of either sex are subject to the disease, but young growing stock and cows either in calf or giving milk are by far the most liable to become affected. Full-grown oxen are seldom affected, and oxen in work are still more rarely attacked. Young heifers are said to be more frequently attacked than bullocks of the same age, and cows immediately before and immediately after calving are more subject to the disease than the same animals at any other period.

“ In ordinary seasons the mortality from ‘stijfziekte’ is not very great. In cases which terminate fatally, the animals that die do not succumb to the direct effects of the disease so much as to the poverty which is induced by the pain which the affected animals suffer in walking; this prevents them from travelling far in the search of food. The majority, therefore, die of debility and starvation ”.

It was found that, in the Western Cape, the disease was associated with a peculiar condition of the soil, and with regard to this character *Hutcheon* says:—

“ The disease manifests itself on different kinds of soil, but within the territory of Griqualand West it is most prevalent along that elevated plateau called the Kaap Range. On that tract of country the soil is principally calcareous, a sort of magnesian limestone, intermixed in some places with a red sandy loam. On many parts along the valleys of the Vaal and Harts Rivers, where the soil is more of a clay loam, the disease is rarely seen, and when animals which are infected with the disease are removed to such localities, all symptoms of the disease disappear rapidly. But on whatever character of soil the disease manifests itself, whether calcareous or red sandy loam, there are clear indications that the vegetation which grows upon such a soil during the prevalence of the disorder is deficient in one most essential ingredient of a complete food, viz., phosphates ”.

These observations, made by *Hutcheon*, led him to form his opinion of the nature of the disease as follows:—

“ This leads us to consider the nature of the disease. ‘Stijfziekte’ is what is termed an enzootic disease, that is, a form of disease which is confined to certain localities, and is due to some special conditions which are peculiar to the soil, food, or water of such localities. In this disease the enzootic influence is, in my opinion, a peculiarity of the soil which, in dry seasons, becomes incapable of supplying all the ingredients in their proper proportion which constitute a complete plant food. The soil may and does contain all the necessary constituents of plant food, but they exist in an unavailable form. There is often a great quantity of fertilizing matter in the soil, but not in a condition immediately available for the growth of plants. Thus phosphates exist often potentially in a dormant state in the soil in great abundance, but it is not until they have been brought into a soluble form that they are of any use as food of plants. The phosphates are highly important in an agricultural point of view; unless they are present no albumen or other azotized matter can be formed. Azotized matter cannot exist without the presence of phosphates ”. (*Balfour’s Botany*.)

Based on this deduction, *Hutcheon* then formulated the theory that “stijfziekte” is due to the want of phosphates in the food, and to the withdrawal of such by the growth of the calf both in utero and after birth, and in support of this theory he gives his reasons, which explain all the symptoms found in “stiff-sickness” both during life and after death.

“*First*.—By the intense craving for bones and all kinds of animal matter which the stock that are grazed on such pastures manifest; as already stated, on many farms along the Kaap Range, cattle were reported to have eaten the complete carcasses of lambs, whilst at Sputang not a vestige was left of the carcasses of about two hundred cattle. It is noticeable also that this craving for animal matter

increases as the disease becomes more prevalent and almost ceases when the disease disappears.

“*Second.*—By the nature of the disease, ‘stijfziekte’ being a congested and inflamed condition of the bones and articular cartilages of the fore legs due, in my opinion, to the want of sufficient phosphate of lime in their composition. In healthy bone this salt should form about 50 per cent. of its whole substance. It has also been shown by experiments conducted by *Chossat*, *Roloff*, and others that when animals are fed upon a diet deficient in phosphate of lime the bones lose more or less of their hardness and firmness and exhibit the lesions of osteomalacia and rachitis. Conversely, *Roloff* found that by administering phosphate of lime to a young rachitic dog it thoroughly recovered in three months. During my journey through the territory of Griqualand West, I saw several cases of typical rachitis in young animals. Two very aggravated cases were shown to me at Daniel’s Kuil, one of a young bullock belonging to Mr. Beadle, the other a young animal belonging to Mr. Ayton: the knees overlapped one another to a considerable extent, yet the legs of both animals were perfectly normal at birth. It is worthy to remark that calves while suckling do not become affected with the disease.

“*Third.*—By the fact that young growing animals and cows which are either nourishing a full-grown foetus in utero, or secreting a full supply of milk immediately after calving are the animals most liable to become affected with the disease. A good illustration of this fact was brought to my notice at Daniel’s Kuil. On the farm belonging to Messrs. Wilmore, adjoining Daniel’s Kuil, I was informed that one hundred full-grown oxen had been grazing there for eleven months, that they had not been inspanned nor once off the farm during the whole of that time, and that not one of them had become affected with either stijfziekte or lamziekte, whilst during the same period the Messrs. Wilmore lost seventy fine head of breeding stock, cows and young growing cattle, from these diseases. I heard of numbers of exceptions to this rule, but this did not alter the generally acknowledged fact that young, growing animals which require a greater proportion of phosphates in their food for ‘cell formation’ and nourishment for growing tissue, especially bones, and cows, the blood of which is being drained either to nourish the developing foetus in utero or to supply that nourishing fluid milk which forms the food of the growing tissues of the calf after birth, are the animals most liable to become affected with these diseases.

“*Fourth.*—By one of the successful measures which are adopted for the cure of stijfziekte, viz., active exercise. When an animal, either a bullock or a cow, becomes affected with the disease, if you inspan the animal at once, either to a wagon or a plough, the symptoms of the disease invariably become very much ameliorated. How is this? During active exercise there is increased tissue change produced in the organs employed, and one of the substances formed during this process of the disintegration of tissue is phosphoric acid, which would be acted upon by the carbonate of lime which is present in these districts in great abundance, and this forms the phosphate of lime required. This is making the animal manufacture phosphates for its own consumption. The active exercise would of itself produce healthy nourishment in the affected bones by increasing the circulation of the blood within their textures and relieving the tendency to congestion which always exists in these diseases.

“*Fifth.*—By the fact that the disease is most prevalent when the vegetation contains the least nourishment, such as a period of drought like what was experienced during 1882-83 and 1884, and in ordinary seasons during the winter and spring months after the grasses have ripened and shed their seeds and thus parted with a great proportion of their nitrogenous and flesh-forming substances. When the grass grows up luxuriantly after good rains, such as they were favoured with in the territory of Griqualand West during the first months in 1884, the disease suddenly disappears. As already stated, I had to travel over the whole territory before I could find a sufficient number of typical cases to enable me to form an opinion upon the nature of the disease. Further, the disease manifested itself during the recent drought on farms upon which it had not been observed before, and, as already mentioned, according to the old Griquas’ statements, it had carried off almost the whole of the cattle in the Griqualand West territory three times within the last hundred years; and each of these calamities occurred during a period of exceptional drought.

“*Sixth.*—By the fact that where the stock were supplied with mealie stalks, chaff, etc., mixed with common salt, the disease did not manifest itself amongst them. Mr. Leischman, on the Kaap Range, supplied me with information confirmatory of this fact.

“The above facts appear to me to indicate that the diseased condition, termed ‘stijfziekte’, is due to defective nutrition of the bones of the affected animal, and that this arises from the absence of a sufficiency of phosphates in the vegetation upon which the animal feeds. It may or may not be chemically deficient in the soil, but it is not available for plant food”.

SYMPTOMS OF STIJFZIEKTE.

Cattle which are contracting this disease show indications of it by frequently lying down, by labouring under difficulties when rising, and in taking a peculiar position when standing. It is frequently noted that the animals alternately raise their front legs, apparently indicating some inflammatory process in the feet. The front feet will be found placed slightly forward, and the hind legs underneath the abdomen; the back becomes arched. This position is distinctly pronounced when the animal is caused to move on. The hind legs are then placed well under the body, and the front legs are hurriedly moved forward and the weight is placed on the heels. Evidently much pain is felt when the weight of the animal comes fully down on the hoofs. Accordingly the walk of such an animal resembles that of a horse with laminitis.

In this stage the horn of the hoofs feels warm and even hot, and when of white colour a distinct reddish tinge can be observed through the transparent horn. The animal feels pain when the hoofs are compressed or sounded with a stone. When lifting up one leg at this stage, the animal can hardly stand on the other one, showing much pain. As the disease progresses the animal places all its weight on to the heels; these almost touch the ground, and the toes separate from each other and turn slightly up in front. The obtuse angle between the second and third phalanx becoming sharper, a fold of the skin being formed where the coronary bone joins on to the hoof. The horn of the hoof soon begins to grow longer; it is noticed that the inner toe grows as a rule more rapidly than the outer ones, its point over-reaching that of the outer one. The horn itself shows rings

round the coronary band which descend with the growth of the horn. In cases of some standing the toes grow out and completely turn up. This appearance resembles that found in cattle which are constantly kept in the stable and whose hoofs are never cut short, with the difference that, in stiff-sickness, the animal is down on its heel. If the horns are left untouched and the animals are put out to pasture, they finally are worn off and the hoof again presents a normal appearance. This is particularly the case when the cattle are removed out of the locality in which they contracted the disease.

When, however, the animal is kept under the conditions in which it contracted the disease and no change of pasture or food takes place, it may become unable to stand any more on its feet, but constantly lies down and is unable to seek its food. Finally it will die of starvation.

It is a noteworthy fact that this course of the disease is not characterized by any distinct rise of temperature or at least by any typical curve. The course of the disease is chronic if not attended to; restitution takes months.

THE CAUSE OF STIFF-SICKNESS.

The evidence brought forward by *Hutcheon* as to the cause of this disease is only of a circumstantial nature, and although the many facts might be explained in the light of a deficiency of phosphates, yet no actual proof has been given that such is the case. If it was so, we would undoubtedly be in the position to demonstrate it by a chemical analysis of the bones from an animal suffering from the disease.

Accordingly we lost no opportunity in submitting bones of diseased animals to the Government Chemist, and at the same time we also submitted bones of animals of which we were certain that they did not originate from animals either suffering from stiff-sickness or having come out of a stiff-sickness area.

The following is the report of the Chief Chemist:—

	Ox No. 543. Per cent.	Ox No. 563. Per cent.	Calf No. 568. Per cent.	Heifer No. 639. Per cent.
Moisture	6.60	9.10	10.00	9.24
Organic matter	39.06	35.86	35.34	38.24
Ash	54.34	55.04	54.66	52.52
The organic matter contained—				
Fat... ..	10.14	6.41	5.17	8.11
Nitrogen	4.06	4.33	4.34	4.29
The ash contained—				
Lime	30.00	30.74	30.48	27.76
Phosphoric acid ...	22.55	22.80	22.33	23.46
Silica	0.22	0.34	0.46	0.91

“ It will be observed that the percentage of ash does not vary greatly, and the differences are still less if the percentage in the dry ‘fat free’ bones is calculated, as will be seen from the following:—

Animal.	Percentage ash in “fat-free” bone.
543	65.2
563	65.0
568	64.4
639	63.6

“ Mr. Ingle found that the ratio of nitrogen to ash in the original bones was perhaps the best means of judging the health of the bones. Here, again, the results show no more variation than one would expect from the age of the animals :—

Animal.					Ratio of nitrogen to ash.
543	...	...	...	...	1:13.4
563	...	...	...	...	1:12.7
568	...	...	...	...	1:12.6
639	...	...	...	...	1:12.2

“ *A chemical examination of the bones therefore reveals nothing abnormal except perhaps the rather high ratio of phosphoric acid to lime in the bones of heifer 639.*”

The numbers 563 and 568 refer to animals suffering from this disease. The numbers 543 and 639 succumbed to other diseases. The analysis proves clearly that there is no deficiency in phosphates; as a matter of fact there is no difference in the chemical constitution between the bones of the various animals.

In March, 1908, Mr. Gray and myself paid a visit to Zeerust, in which neighbourhood the disease was known to exist, and the Government Veterinary Surgeon, at that time Mr. Evans, was able to show us a few acute cases which had only recently developed as well as some chronic cases of some standing. When we saw these acute cases for the first time, we were struck by the similarity of the symptoms with those of which we were familiar in a disease in horses called “ laminitis ”, in which the seat of the lesions are the laminae of the hoof. The advanced or chronic stages of stiff-sickness also corresponded, in our opinion, to the sequel of laminitis in horses.

Considering the fact that laminitis in horses, besides other causes, may be due to over-feeding with certain foodstuffs, such as barley, rye, beans, etc., whereby probably some specific toxin acts on the laminae causing an inflammatory condition, we did not hesitate to discard the theory of *Hutcheon*, and were inclined to look for the cause in the direction of some specific plant which would be found on these particular farms.

For many years stiff-sickness in the Transvaal has to some extent been connected by farmers with the plant *Crotalaria burkeana*, which plant was accordingly called the “ stijf-ziekte boschje ”. We at once thought that this plant may be the real cause, as undoubtedly at one time farmers have drawn their conclusions from actual observations.

This deduction, however, did not seem to have been universally accepted. It is perhaps of interest to note that, in the report of *Hutcheon*, no mention is made of this plant by the farmers of the Cape, a fact which, had it been there, would not have escaped *Hutcheon's* observations and annotation, and would have caused him to give the matter full consideration. Notwithstanding this, the opinions as to the cause of stiff-sickness in the Transvaal were also much at variance, as is the case with many other maladies. Accordingly, from our point of view, the question whether this particular plant is associated with stiff-sickness could only be settled by actual experiments.

Some years ago Mr. Johnston, then Government Veterinary Surgeon at Barberton, informed us of the presence of a disease in the neighbourhood of that town which was called stiff-sickness, and which he described as laminitis of cattle. No special notice was taken

at that time because it was not connected with any specific cause. Just previous to our visit to Zeerust, the late Mr. Turnbull, then Government Veterinary Surgeon at Barberton, drew our attention to the existence of stiff-sickness in the locality, and he connected the disease with the presence of *Crotalaria burkeana*, this plant being present in large quantities on the particular farms where the disease was existing.

Having decided to solve the question by experiments, we had the plant sent to us both from Zeerust and Barberton, and an animal was fed at the station on three successive days, and again for one day after an interval of twelve days, receiving an average of 6 lb. per diem. There could not be any doubt as to the identity of the plants, as samples were submitted to Mr. Burt-Davy, the Government Botanist, who verified the identification.

Having obtained but negative results from feeding the plants in this Laboratory, I decided to undertake the experiments in a different way, namely, by sending cattle from the Laboratory to both localities, Barberton and Zeerust, where they had to be stabled and fed with this plant daily; in case there was not sufficient of it to supply the needs of the animals, provision was made to supplement it with veld hay sent from Pretoria.

EXPERIMENT NO. 1.

The late Mr. Turnbull kindly superintended the experiment in Barberton, and the following are his notes on the subject:—

Cow 607.—Arrived in Barberton on the 17th March, 1910.

Date.	Temperature.		Quantity of <i>Crotalaria</i> eaten.	Remarks.
March.	Morning.	Evening.		
18	101·2	101·6	About $\frac{3}{4}$ lb	Refused to eat it except cut up with forage.
19	100·8	101·4	" 5 "	—
20	100·6	102·0	" 10 "	—
21	100·6	101·2	" 14 "	—
22	100·8	101·8	" 16 "	—
23	—	101·2	" 16 "	—
24	100·4	—	" 14 "	Mixed with veld-hay; tender on her feet.
25	99·8	—	" 10 "	—
26	100·6	—	" 10 "	—
27	—	—	" 11 "	—
28	101·0	—	" 19 "	—
29	101·6	—	" 11 "	—
30	101·0	101·2	" 11 "	—
31	100·0	101·4	" 18 "	—
April.				
1	100·2	101·8	" 18 "	—
2	102·2	102·4	" 18 "	—
3	101·4	102·2	" 18 "	—
4	101·4	102·0	" 24 "	—
5	100·8	101·6	" 24 "	—
6	100·2	101·8	" 24 "	—
7	101·0	101·8	" 28 "	—
8	—	101·8	" 20 "	—
9	101·0	—	" 15 "	Cow always lying down.
10	—	101·0	" 20 "	" "
11	—	102·0	" 15 "	" "
12	—	—	" 15 "	" "
13	101·4	101·8	" 15 "	" "
14	—	—	" 15 "	—
15	101·0	—	" 9 "	Constantly lying down; when made to stand, back arched, hind feet under body, alternately raising her fore feet as though in pain.
16	101·2	—	" 9 "	
17	—	102·6	" 9 "	
18	102·0	—	" 9 "	

Cow 624.—Arrived in Barberton on the 17th March, 1910.

Date.	Temperature.		Quantity of Crotalaria eaten.	Remarks.
	Morning.	Evening.		
March. 18	101.4	102.0	About 1 lb	Refused to eat it except cut up with forage.
19	101.4	101.2	" 6 "	Crotalaria mixed with forage.
20	101.2	102.0	" 11 "	" "
21	101.4	101.6	" 16 "	" "
22	101.0	101.6	" 17 "	" "
23	—	101.8	" 17 "	" "
24	101.2	—	" 15 "	Mixed with veld-hay; a little tender on feet.
25	101.6	—	" 17 "	Going very tender; digits widely separated.
26	101.2	—	" 12 "	—
27	Not taken.	—	" 16 "	—
28	101.4	—	" 15 "	—
29	101.8	—	" 16 "	—
30	102.6	102.6	" 16 "	—
31	102.2	104.0	" 18 "	—
April. 1	103.0	104.0	" 16 "	Took blood smear; Government Veterinary Bacteriologist reported negative.
2	104.2	104.6	" 16 "	Blowing a little.
3	104.4	104.8	" 16 "	—
4	104.4	104.6	" 20 "	—
5	104.0	106.0	" 5 "	Off her feed; lying down blowing; took smear; Government Veterinary Bacteriologist reported negative.
6	104.8	105.8	None.	Dull; not feeding; fed with hay and lucerne.
7	103.0	103.0	"	Feeding little; smears: Government Veterinary Bacteriologist reports "marginal points" (<i>Anaplasma marginale</i>).
8	—	104.0	"	Feeding; chewing cud.
9	103.0	—	"	—
10	—	102.4	"	Feeding well.
11	—	103.0	About 20 lb	—
12	—	—	" 14 "	Not feeding well.
13	102.0	101.8	" 10 "	" "
14	—	—	" 12 "	" "
15	101.2	—	" 10 "	" "
16	101.6	—	" 18 "	Feeding well.
17	—	103.8	" 18 "	" "
18	102.6	—	" 18 "	" "

Cows 624 and 607 were returned to Pretoria on the 21st April, when the following notes were made: "Condition fair; the signs of acute laminitis are pronounced, the animals placing their legs forward and leaning the weight on the heels, which almost touched the ground. The hind legs are placed much in advance. The action of walking appears to be very painful. The front and back hoofs appear longer than normal, the digits standing apart. The inner digits of front and hind feet are longer than the outer ones; the coronary portion is swollen. The horn of the hoof has a reddish appearance and feels warm to the touch. On lifting one leg the animal shows signs of great pain." It will be noted from Mr. Turnbull's remarks that cow 624, after one week's feeding, showed the first symptoms of

stiff-sickness, whereas in cow 607 these only began to appear after three weeks' feeding. Of the two cows, 624 showed the most pronounced symptoms.

Accordingly the disease corresponded with that observed by us in Zeerust and had to be identified as stiff-sickness.

EXPERIMENT No. 2.

Meanwhile a second experiment was started on the 8th April, when two animals, Nos. 580 and 868, were sent to Zeerust and stabled on the farm Kalkfontein. Mr. Webb, the present Government Veterinary Surgeon, looked after the interests of the experiment, and the following details are taken from his notes:—

“The two animals were constantly tied up and fed with *Crotalaria burkeana* daily. The average ration the animals received was about 4 lb. per head; they ate the plant well.

“On 29th April one of the cows (No. 868) showed the first symptoms of stiff-sickness. The following day the other animal (No. 580) had similar symptoms. Both animals were feeding well. On the 7th May cow 580 was suffering from apparent stiff-sickness; she had great difficulty in walking, and frequently laid down. In the other animal (No. 868) the disease did not develop more noticeably.”

The animals were returned to Pretoria on the 12th May, and were examined here when the diagnosis of stiff-sickness was confirmed.

EXPERIMENT No. 3.

This was undertaken for the purpose of producing a very severe attack of stiff-sickness, so that one of the animals could be killed in order to study the pathological anatomical lesions which would result from eating the plant.

On the 18th April, cows 843 and 845 were trucked to Barberton. Mr. Turnbull's notes are given hereunder:—

Cow No. 843.

Date.	Temperature.		Quantity eaten.	Remarks.
	Morning.	Evening.		
April. 19	—	—	About 3 lb	Arrived from Pretoria; condition good
20	101·2	—	” 18 ”	—
21	101·0	—	” 18 ”	—
22	—	—	” 18 ”	Lying down; lowering head turned to right flank; got up with difficulty stood with fore legs stretched out. Lying down most of day.
23	102·0	—	” 6 ”	—
24	102·4	103·5	” 9 ”	” ”
25	102·0	103·0	” 6 ”	” ”
26	101·8	102·8	” 9 ”	” ”
27	102·0	103·8	” 9 ”	” ”
28	102·2	103·2	” 9 ”	” ”
29	101·6	103·8	” 9 ”	Made to stand; did so with difficulty lowed, and kept alternately raising her feet.
30	101·8	103·4	” 12 ”	Lying down.

Cow No. 843—continued.

Date.	Temperature.		Quantity eaten.	Remarks.
May. 1	Morning. 101·6	Evening. 103·0	About 18 lb	Food given to her on the ground ; would get on to her knees and remain there.
2	102·6	103·5	" 9 "	Lying down.
3	102·2	103·0	" 18 "	"
4	102·8	103·0	" 18 "	"
5	101·2	103·0	" 18 "	No sooner on her feet than she was down again at once.
6	101·8	103·4	" 10 "	Lying down.
7	101·6	102·4	" 9 "	"
8	101·6	102·5	" 9 "	"
9	102·0	103·5	" 10 "	"
10	101·8	103·0	" 18 "	—
11	102·6	103·2	" 18 "	Lowng as though in pain.
12	—	—	" 18 "	Lying down.
13	—	—	" 18 "	"
16	102·0	—	—	—

“ From 14th-25th May was too busy to attend to the experiment, but cow received 18 lb. *crotalaria* daily. The native in charge stated she ate more of it. She was made to stand every day to allow her to void her urine. Returned to Pretoria on 26th May.”

Cow No. 845.

Date.	Temperature.		Quantity eaten.	Remarks.
April. 19	—	—	About 1 lb	Arrived; condition very poor.
20	99·8	—	" 3 "	—
21	101·8	—	" 18 "	—
22	—	—	" 18 "	—
23	101·4	—	" 9 "	A bit tender on her feet.
24	100·8	102·8	" 18 "	Lying down most of the day.
25	101·8	103·2	" 18 "	Lying down, but would get up to feed.
26	100·8	102·0	" 18 "	" " "
27	100·8	102·0	" 18 "	" " "
28	102·0	103·4	" 18 "	" " "
29	100·8	103·5	" 18 "	" " "
30	102·8	103·2	" 18 "	" " "
May. 1	101·2	102·6	" 18 "	Got up with great difficulty.
2	101·4	102·0	" 9 "	Down—fed off ground.
3	102·2	101·6	" 18 "	" "
4	101·4	101·8	" 18 "	" "
5	101·4	102·2	" 18 "	" "
6	101·2	102·2	" 15 "	" "
7	101·2	101·8	" 12 "	" "
8	101·4	101·6	" 12 "	" "
9	101·0	102·2	" 15 "	" "
10	101·4	102·4	" 18 "	" "
11	101·6	102·2	" 18 "	" "
12	—	—	" 18 "	" "
13	—	—	" 18 "	" "
14	101·4	—	" 18 "	" "

“ From the 14th-25th May too busy to attend to experiment. The native in charge stated this cow was always lying down, but ate most of her daily ration of *crotalaria*, which was 18 lb. daily. Returned to Pretoria on 26th May.”

On the 26th May both of these cows were returned to Pretoria, and the diagnosis of stiff-sickness was confirmed. It will be noted that the first symptoms in 843 appeared four days after feeding the plant, and four days in 845.

As cow 843 showed the disease in a more pronounced way than the others, she was killed on the 8th June, and the following notes were taken at the post-mortem by Mr. D. T. Mitchell: "Section of claws of the hind and fore feet show the presence of fibrous granular tissue a quarter of an inch thick separating horny and sensitive laminae, particularly marked near the toe and more pronounced in the hind than in the fore claws. The tissue around the coronopedal articulation is very much thickened and cutting hard (dense fibrous tissue). Articular surface of *os coronae* and *os pedis* show thickening and slight hyperaemia of the synovial capsule."

EXPERIMENT No. 4.

Towards the end of April, 1910, 12 lb. of *Crotalaria burkeana* were received from the Orange Free State and sent to the Laboratory by Mr. Burt-Davy with the request that experiments be conducted with the plant.

Accordingly, on the 3rd April, cow 911 was used for this purpose. Two gallons of tea were made with which the animal was drenched, and the plant was then mixed with the food and was readily eaten. No symptoms developed.

CONCLUSION.

1. The disease "stiff-sickness" in cattle resembles in all respects laminitis in horses, in fact it may be called "laminitis in cattle".

2. The experiments undertaken at two different places, Barberton and Zeerust, one in the eastern and one in the western part of the Transvaal under opposite climatical and tellurical conditions, show that *Crotalaria burkeana* is the cause of stiff-sickness. Referring to our earlier experiments and to Experiment No. 4, all of which were failures, we notice that under certain conditions *Crotalaria burkeana* does not cause stiff-sickness. This may be either due to the fact that (a) although a considerable quantity of the plant was given within a short period, the feeding was not continued long enough and not with a sufficient quantity of the plant to cause laminitis; or (b) the plant with which the feeding experiments were conducted at the Laboratory was always in a dry state, and that with which the animals were fed outside was always freshly cut.

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