

Notes on Some of the Symptoms Produced in Healthy Cattle by the use of Certain Alkaloids.

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In the following paper there are detailed some of the symptoms produced in healthy cattle following the administration of Arecoline, Veratrine, Strychnine and Cocaine, both separately and in combination with each other. These drugs were selected for experiments which were carried out at the request of Dr. Theiler, as it was thought that they might prove useful for the treatment of Gal-Lamziekte and other diseases of cattle where the digestive tract is involved.

Both Arecoline and Veratrine are drugs which have now been in use for some time for the treatment of certain forms of obstinate constipation and impaction of the alimentary tract of cattle, and in the following experiments such nerve stimulants as Strychnine, which is believed to exert a marked effect on the peristaltic movements of the bowel, and also Cocaine, which in large doses is a general nervous stimulant, were added to the before-mentioned drugs in order to see if they exerted any effect either in counteracting some of the depressing effects produced by the use of Arecoline and Veratrine, or in increasing the degree of the action of these latter drugs.

The cattle used in the experiments varied in age between one and a half to two years, and a list of their weights is appended :

No. 1664	...	...	...	225 kilos.
No. 1742	...	...	...	261 kilos.
No. 1748	...	...	...	275 kilos.
No. 1750	...	...	...	285 kilos.
No. 1751	...	...	...	215 kilos.
No. 1752	...	...	...	211 kilos.
No. 1822	...	...	...	190 kilos.
No. 1828	...	...	...	155 kilos.
No. 2216	...	...	...	210 kilos.
No. 2224	...	...	...	236 kilos.

Owing to the fact that handling of the animals produced marked excitement which disturbed the pulse rate to a marked degree, no record of the pulse is given in most of the experiments as it was thought that it would not furnish useful information as to the conditions of the animals during the experiments.

In cases where the animals died as the result of the injections the records of the autopsies have been omitted, since, as was to be expected, they exhibited no characteristic lesion which might indicate the cause of death.

The following is a list of the experiments made:—

EXPERIMENTS MADE WITH ARECOLINE HYDROBROMIDE.

(1) *HEIFER 1,752.*

Received 2 grains of Arecoline hydrobromide in solution subcutaneously on 25/11/11 at 11.47 a.m.

11.49 a.m. The animal is slightly restless, and a slight grunting sound accompanies the respirations. Slightly marked contractions of the abdominal muscles are evident at the same time as the root of the tail is raised. In other words, symptoms of slight tenesmus or "straining" are present.

11.50. Grunting noise, noted accompanying the expirations. When the animal moves a few steps the movements of the limbs are inco-ordinate, and this is more marked in the case of the fore than in the hind limbs. Small jets of urine are passed at very short intervals. The head hangs down as if too heavy for the neck to support it. There is a quivering of the skin and muscles of the lower part of the neck and also of the regions of the shoulder and arm. The animal is "straining" and when it walks a few steps round the box the fore legs seem too weak to support the body and the animal goes down rather heavily. When lying down the position is normal save that the head and neck are outstretched with the chin resting on the ground. A slight grunt accompanies each expiration. Respirations 36 per minute. There is some salivation present and a slight serous nasal discharge.

12 a.m. The animal rises on approaching it, and when it first rises has difficulty in standing owing to the fact that it seems temporarily unable to keep the right fore fetlock joint extended ("knuckling over" of the fetlock joint). It walks very cautiously with the head hanging, the skin and muscles of the shoulder and arm region quivering, the fore-legs appear too weak to support the body and the hindquarter of the right side is rested against the wall. The movements of the animal are inco-ordinate and "tottering" in character. Straining movements are also noted. The animal again goes down and adopts the same position as before with the head and neck outstretched and the chin resting on the ground. Respirations equal 40. Grunting sound accompanies the expirations. Straining still present.

12.5. The animal rises, stands with head hanging down, grunting sound still present. The skin and underlying muscles of the shoulders, arms, flanks and hind quarters (gluteal and thigh regions) show a quivering movement. Straining present. Animal appears weak on its legs, and after walking in an awkward manner once around the box, and straining at the same time, it again lies down in the same attitude as before.

12.10. Animal rises on opening the door of the box. Quivering of skin and muscles of shoulder and neck region and neck still present. Still very weak on its legs and props its off hind quarter against the side of the box. It now, after straining, passes a small quantity of faeces which are more fluid in character than usual. It attempts to

walk, but there is a swaying movement of the hind portion of the body present, and the animal again rests the posterior part of the body against the wall and stands with the head down.

12.15. Standing with head hanging. Quivering of skin and underlying muscles of the hind quarters. Straining.

Since 11.50 the expression on the face is rather tired and anxious, and the animal is restless.

12.17. Passes small quantity of faeces which are very slightly more fluid than normal.

12.18. Standing with head down, grunting slightly and straining. Respirations 40.

12.21 Still standing with the head held down; straining is less marked, quivering of muscles of hind quarters still present. This movement well seen in posterior portion of thigh. Walks a few steps in cautious but surer manner than last time. Grunting noise is heard at intervals, accompanying four or five expirations at a time.

12.26. Strains slightly and passes a small quantity of liquid faeces.

12.30. Still slightly straining, standing with head down. Respirations, 52. Quivering of the dewlap region noted.

12.40. Straining slightly. The head is raised and not hanging as before. The animal is dull-looking and makes a couple of yawning movements at 12.45.

12.50. The animal appears to have recovered, stands in normal position with the head raised, straining has ceased, respirations, normal, and animal looks brighter, the quivering movements of the skin and muscles have disappeared, and the animal is attentive to its surroundings, twitching the panniculus to remove the flies on the skin, though previously their presence was disregarded. Walks with co-ordinated movements.

The rapid onset and disappearance of the symptoms are to be noted.

The animal fed in the afternoon and appeared normal in the evening.

(2) HEIFER 1,742.

Received 2 grains of Arecoline hydrobromide in solution subcutaneously on 26/11/11 at 10.4 a.m.

10.9 a.m. Quivering of skin and muscles of hind quarters, flanks, and sides of the body noted, slight straining also noted. The root of the tail is raised so that the tail hangs down in a straight line at few inches distant from the hind quarters.

10.14. Slight salivation appears and the animal lies down, but rises again in about a minute.

10.21. Stands with head held in usual position, anxious expression on face, quivering of crural regions and dewlap. Root of tail raised. Respirations, 68 per minute.

10.25. The animal is down, straining slightly, and grunting slightly at intervals.

10.32. The animal has risen to its feet. Respirations still frequent and hurried. Quivering of crural and flank regions still noted.

10.35. Passes a fairly large quantity of faeces (about the usual amount voided during ordinary defaecation) without much straining. First portion of faeces is of usual consistency, latter portion more fluid in character than usual.

10.40. Stands in normal position. Quivering of skin and muscles of shoulder region, and the forelegs tremble slightly. The root of the tail is raised, the animal strains and passes some liquid faeces.

10.45. Quivering of skin and muscles of shoulder region still present.

10.50. Slight twitching of the tensor vaginae femoris muscle and overlying skin. Animal is licking its muzzle.

10.55. The animal is quieter-looking and the quivering of the muscles, and overlying skin has disappeared.

11.5. The animal is still quiet and seems to be slightly dull in appearance.

11.15. The animal appears to be normal and fed later in the afternoon.

(3) *HEIFER 1.751.*

Received 2 grains of Arecoline hydrobromide in solution subcutaneously on 26/11/11 at 10.7 a.m.

10.9 a.m. The animal is restless, and walks with slightly uncertain movements which are not completely co-ordinated. Salivation is present, and the tip of the tongue projects from the mouth. Respirations hurried and 40 per minute. There is a slight grunting noise accompanying the expirations. The root of the tail is raised and slight straining is present.

10.15. In walking the gait is of a slightly staggering nature, and the animal "knuckles over" at the fetlock joints of the fore limbs.

10.20. Stands with head held in usual position, and the root of the tail raised, straining slightly. Respirations, 51 per minute.

10.25. Stands in same position, with anxious expression on the face. Quivering of the skin and muscles of the shoulder regions. Respirations, 36 per minute and abdominal in character. After slight straining passes a small quantity of faeces which are not very much more fluid than usual.

10.32. Stands with root of tail raised, strains slightly and passes small quantity of faeces of same consistency as before.

10.43. Stands with head hanging and root of tail raised.

10.45. Inclined to be slightly excited and aggressive, raising head and charging attendant entering the box.

10.46. Slight straining and passage of small quantity of liquid faeces.

10.53. After very slightly marked straining passes copious faeces of more fluid character than usual.

10.55. The animal is quieter-looking and more interested in its surroundings. Respirations almost normal, but an occasional grunt is heard at intervals.

11.5. Animal looks bright, stands in normal position and tosses the head on approaching it, the grunting noise and the quivering of the muscles and overlying skin have disappeared. No straining movements present.

11.7. Urinates, and strains slightly after doing so, on a couple of occasions, the root of the tail being held in a raised position for about a minute or so.

11.10. Animal appears normal, except that it makes a noise by grinding the incisor teeth against the incisor pad at intervals.

11.15. The animal appeared to be normal and showed no further symptoms. It fed in the afternoon and appeared normal in the evening.

(4) *HEIFER 1,742.*

Received 3 grains of Arecoline hydrobromide in solution subcutaneously on the 27/11/11 at 11.47 a.m.

11.50 a.m. The animal is restless and salivating. Stands in the normal position, but the base of the tail is raised and the animal strains very slightly, making a grunting noise at the same time. There is also to be seen a quivering of the muscles and overlying skin of the regions of the shoulders and hind quarters.

11.54. The animal lies down. Respirations, 27 per minute.

11.55. The animal rises. Stands with an anxious expression on the face, salivates, and holds the base of the tail raised. Its legs seem weak.

12.0. Animal stands in same position and place, straining. The quivering of the muscles and skin of the shoulders, hindquarters and flanks is very marked. Respirations, 60 per minute.

12.7. Quivering of muscles and skin of shoulders and hindquarters still marked, and same condition noted in the region of the dewlap. Grunting noise still present. Base of the tail still kept raised. Slightly straining.

12.14. Same condition of the muscles and skin and straining as at 12.7. Anxious look on face and the tip of the tongue projects between the lips.

12.21. Animal stands with head slightly depressed, dull-looking, salivating, and grunting. There is a trembling movement of the limbs present and quivering of muscles and skin over shoulder regions and hindquarters. The animal strains slightly with the root of the tail raised and passes a very small quantity (about 6 ozs. approximately) of faeces.

12.35. Animal still salivating, muzzle is dry. Quivering of muscles and skin of shoulders, hindquarters, flanks and tail. Strains and passes a quantity of faeces about the same in amount as passed during a normal defaecation.

12.50. Animal quieter-looking. The base of the tail is raised, and the animal strains at intervals. The quivering of the muscles and skin is not seen, except in the case of the tail. The animal gradually recovered and appeared normal at 2 p.m. It fed in the afternoon and appeared quite normal the same evening.

(5) *HEIFER 1,751.*

Received 1 grain of Arecoline hydrobromide in solution subcutaneously on the 27/11/11 at 11.53 a.m.

11.56 a.m. Animal seen to raise tail at base and hold it in this position.

12.10. Animal standing with tail slightly raised and straining slightly and grunting at intervals. Passes quantity of faeces of about the same amount and consistency as during normal defaecation. Salivation also seen.

12.18. Animal still straining slightly, and grunting, with tail held in same position, passes some faeces in smaller quantity than before and more fluid in character.

12.25. The animal is brighter-looking, and only strains occasionally and then but slightly. A grunting noise accompanying the expirations is only heard at intervals.

12.30. The animal at this time appeared normal. No further symptoms were noted. The animal was quite normal in appearance in the afternoon and evening.

(6) *HEIFER 1,752.*

Received 1 grain of Arecoline hydrobromide in solution subcutaneously on 27/11/11 at 11.50 a.m.

11.56. Animal standing with head hanging and tail slightly raised at the base, is restless, appears as if the legs were weak, "knuckles over" on the right hind fetlock joint, and makes a grunting noise which is not very marked, but accompanies each expiration.

11.59. Still restless, straining slightly. It is also noted that the grunting sound is replaced by a sound which is more like a moan.

12.9. The animal stands with the head and neck hanging down and the tail raised as before. Slight straining is noted and the animal in the interval between two straining movements turns its head round and licks the hair on the left flank in the same way as a perfectly healthy animal does.

12.10. Still straining slightly and also making a slight grunting sound. Passes faeces in quantity and consistency the same as seen during a normal defaecation.

12.16. Still straining slightly and stands with head and neck hanging and the tail held as before.

12.24. Passes faeces as before.

12.27. Animal is same as at 12.16.

12.45. Animal still looks a little dull, but generally appears to be quieter than before. Straining only noted at intervals, though tail still held raised at base. Licking hair of body.

1.5. Animal appears quiet and almost completely recovered.

2. Animal quite normal in appearance, and has not passed any more faeces in the interval. No further symptoms were noted to appear, and animal was quite normal in appearance when seen in the evening.

(7) *HEIFER 1,751.*

Received $\frac{1}{2}$ grain of Arecoline hydrobromide in solution subcutaneously on 4/12/11 at 3.9 p.m.

3.15 p.m. Animal stands with head down and at times, with short intervals between, raises the root of the tail.

3.17. Uneasy look is noted on face. Animal stands in same position and strains slightly.

3.19. Still straining and uneasy-looking.

3.23. Salivation is noted to occur. Otherwise the animal is the same as at 3.17.

3.30. Animal appears better, straining very slight and only occurs at intervals, a single movement being then made.

3.55. Animal stands in normal position, but tail still held raised at the base. Straining movements have practically ceased.

4.30. The animal appears quite normal and feeds.

10 p.m. Animal quite normal in appearance.

(8) *HEIFER 1,751.*

Received $\frac{1}{2}$ grain of Arecoline hydrobromide in solution subcutaneously on the 4/12/11 at 3.10 p.m.

3.15 p.m. Animal appears normal, save that it raises the base of the tail at short intervals.

3.16. The animal is uneasy-looking, the tail is held raised at the root, strains slightly and urinates.

3.19. Animal standing with head down. Otherwise the position assumed is the same as at 3.16.

3.30. The animal does not strain, but still holds the tail as before.

3.40. Same as at 3.30.

3.50. The animal lies down, but rises again in one minute (at 3.51).

3.54. No straining noted and tail held in normal position.

3.58. Animal appears slightly restless and uneasy-looking; otherwise the appearance is normal.

4.3. Slight straining movement and raising of tail.

4.30. The animal appears to be quite normal, and no further symptoms were seen up to 10 p.m. that evening.

(9) *HEIFER 1,742*

Received 1 grain of Arecoline hydrobromide in solution subcutaneously on the 5/12/11 at 2.47 p.m.

2.48. A slight quivering of the muscles and overlying skin of the hindquarters is noted.

2.52. Animal appears the same as at 2.48, but the tail is also held, raised at the root.

2.53. A marked straining movement is made, the contraction of the abdominal muscles being spasmodic in character. The same straining movement is noted at 2.53 $\frac{1}{2}$ and 2.54, and the animal assumes a look of uneasiness and anxiety.

2.55. The animal strains and passes urine in several successive small jets.

2.56. There is a marked quivering movement of the muscles and overlying skin of the hindquarters. Slight salivation is also seen and the tail is held continuously in the same manner as described in the other cases.

2.58. Animal stands with the head held down. Strains and passes a jet of urine. Respirations, 40 per minute.

3.1. Animal stands in same position as at 2.58. A quivering of the hindquarters and tail is to be seen, and the latter is still held in the position before described. A straining movement occurs, but only

some urine is passed which is very small in quantity and dribbles away.

3.4. Animal strains slightly, but only passes a jet of urine. Respirations, 42 per minute.

3.5. Straining movement is noted.

4.21. When seen at this time the animal appeared bright-looking, and was standing in a normal attitude, and had defaecated once in the interval. The faeces were the same in quantity and consistency as those of a normal defaecation. No further symptoms were noted during the evening. The animal fed in the evening, and was ruminating when seen at 9.45 p.m.

(10) *HEIFER 1,742.*

Received $1\frac{1}{2}$ grains of Arecoline hydrobromide in solution subcutaneously on 6/12/11 at 2.38 p.m.

2.40 p.m. The animal stands with the head held hanging down, and an anxious expression on the face. There is a quivering of the muscles and overlying skin of the hindquarters present. Slight straining is also to be noted, and the root of the tail is raised at intervals.

2.48. The animal appears as it did at 2.40, but there is salivation present, in addition to the other symptoms.

2.55. The symptoms are the same, save that the quivering movements of the hindquarters is more marked. The straining movements are slightly more pronounced.

2.59. The animal strains and passes a jet of urine.

3.5. The quivering of the hindquarters is still present, and the tail is held raised at the root.

3.20. The animal stands in the normal attitude, the quivering movement of the hindquarters having disappeared and the straining movements having ceased. The tail is carried in the usual manner. The animal still seems slightly dull in appearance.

4.7. The animal appears normal and passes faeces of very fluid character and in larger quantity than seen during normal defaecation. No further symptoms noted during evening, and the animal appeared quite normal at 8.30 p.m.

(11) *HEIFER 1,664.*

Received $1\frac{1}{2}$ grains of Arecoline hydrobromide in solution subcutaneously on the 29/12/11 at 2.56 p.m.

3.1 p.m. The animal wears a very uneasy, anxious look on the face.

3.7. The animal appears to be very sick, and stands with head and neck outstretched, grunting with each expiration. Its legs appear to be weak. The tail is held raised at the root, and slight straining movements are noted.

3.10. The animal lies down and makes a grunting noise with each expiration. Respiration, 32 per minute. The animal lies in normal attitude, except that the neck and head are held in an outstretched position, and at intervals the chin is rested on the ground.

3.14. The animal rises, but the legs appear to be very weak when the animal walks, the hind legs being dragged along behind. It stands with the head hanging down, and strains slightly at intervals.

3.20. Lying down with the head and neck outstretched, the lower jaw resting on the ground. The root of the tail is still raised, and a groaning sound accompanies each expiration. Respirations, 28 per minute.

3.21. The animal rises, stands with the head hanging down, the root of the tail raised, and grunting with each expiration. Slight straining can be noted.

3.48. Quieter-looking and appearance not so distressed as before, though still slightly dull in appearance.

3.55. The animal still appears to be slightly dull, makes a grunting sound and grinds the incisor teeth against the incisor pad at intervals. At times with long intervals between the animal raises the root of the tail and strains slightly. The animal gradually became normal, and at 5.30 p.m. was ruminating. No further symptoms were seen up to 10 p.m.

(12) *HEIFER 1,822.*

Received $1\frac{1}{2}$ grains of Arecoline hydrobromide in solution subcutaneously on the 29/12/11 at 2.55 p.m.

3 p.m. The animal is restless and uneasy. Stands with the head and neck slightly depressed, the root of the tail raised, and a distressed look on the face. Its legs appear to be markedly weak and not properly able to support the weight of the body. Respirations are 60 per minute.

3.5. Animal attempts to walk round the box, but the movement of the limbs are inco-ordinated, and it can only stagger a few steps, eventually going down on the ground. When down the animal lies on the sternum, the body being in the usual resting posture, save at intervals when the animal momentarily falls slightly to one side, but it then makes an effort and regains its former position. There is salivation present and a moaning sound accompanies the expirations. Respirations are 54. The head and neck are outstretched, and the lower jaw rests on the ground. Attempts are made to hold the head and neck up, but apparently the animal is unable to do so. Straining is present.

3.7. It rises and stands with the head hanging and a very anxious look on the face.

3.19. Animal stands in same position. There is a quivering movement of muscles and overlying skin of the flanks and hindquarters. The tail is raised at the base and straining is noted. Respirations, 68.

3.41. Animal appears as at 3.19, save that the quivering movement of the muscles and skin is not noted. Straining is not so marked. Salivation still present. Respirations, 63.

3.58. The animal is still slightly dull, and there is raising of the base of the tail, straining at long intervals. Respirations, 45.

Seen at 5.30, the animal had not defaecated, and was ruminating, appearing to be quite normal, and was normal in appearance later in the evening,

(13) *HEIFER 1,822.*

Received 1 grain of Arecoline hydrobromide in solution subcutaneously on 16/1/12.

12.35. The animal is dull in appearance. Stands with the base of the tail raised, straining slightly. Urinates, the urine being passed in jets which are ejected in a "spasmodic" fashion.

12.37. Animal still has a dull look on the face, and strains slightly, keeping the root of the tail raised, and a slight quivering of the skin and underlying muscles of the lower part of the flank regions is seen.

12.50. The animal still appears slightly dull, but otherwise appears to be normal in condition.

2. Still dull-looking and has defaecated once since 1 p.m.

2.25. The animal is still slightly dull in appearance and makes a noise by grinding the incisor teeth and pad together a couple of times, on occasions with long intervals between, but otherwise it appears to be normal.

3.45. The animal is apparently normal.

5. The animal is apparently normal and lying down. Seen at 12.30 a.m., 17/1/12, the animal appeared to be quite normal.

EXPERIMENTS MADE WITH VERATRINE.

(14) *HEIFER 1,664.*

Received 1 grain of Veratrine in solution subcutaneously on 27/11/11.

The result of this experiment was negative, no symptoms which could be attributed to the action of the drug being noted.

On the 28/11/11 the same animal was injected subcutaneously with a solution of the same drug at 2.22 p.m. The dose on this occasion was 3 grains.

2.28. The animal is restless and paws the ground with the right fore foot.

2.30. The same conditions noted as at 2.28.

2.31. The animal lies down quickly.

2.34. The animal has risen to its feet and is restless and excited, pawing the ground with each forefoot alternately. The urine is dribbling from the labiæ vulvæ at intervals and the animal makes a peculiar movement at short intervals, falling on its knees and flourishing its head at the beast in the neighbouring stall, sometimes striking the bars, and then rising again quickly. This movement is repeated a few times. Sometimes it rests on one knee and paws sideways with the other foot which describes an arc of a circle in its movements. It lies down quickly at 2.36.

2.37. Rises again, still restless-looking and an uneasy look on the face. Urinates, the urine being clear.

2.39. A very slight salivation is noted.

2.40. The animal lies down, very marked straining efforts are made, and following this, the animal vomits. The material vomitted consists mainly of liquid containing finely-chewed hay in suspension in it, and also of small boluses or masses of finely-chewed hay. In vomitting the head and neck are outstretched, a spasmodic contraction of the abdominal muscles, which causes a jerky forward movement of the body, is made, and the material vomitted is forcibly ejected from the mouth. The ears hang down or "droop," and the expression on the face is one of marked distress and nausea. The respirations are hurried and more frequent than normal. During the next half minute five attempts to vomit are made without result.

2.40½. The animal rises and vomits on two occasions in quick succession and a quivering of the muscles and skin of the shoulder regions is noted.

2.50. Marked straining movements and salivation are present.

2.51. Animal restless and a quivering of the muscles and skin of shoulders, region of dewlap, flanks and hindquarters is noted.

2.56. Lying down. Still salivating.

3. Rises again and is restless. A moaning sound accompanies each expiration. Passes a few small jets of clear yellow urine in quick succession.

3.3. The animal is making marked straining movements, and there is eructation of gas on a couple of occasions.

3.4. Animal is still slightly excited, making attempts to butt the beast in the neighbouring stall and striking the iron dividing bars in its attempts. There is a moaning expiratory sound heard at intervals, and salivation is still present. The quivering of the muscles and skin is not so marked.

3.9 and 3.13. Still restless, salivating, groaning slightly, but still attempting to butt its neighbour.

3.11. Lies down, respirations frequent, lies in normal attitude for about half a minute and rises again.

3.16. Lies down.

3.18. Rises, is restless and strains markedly. Passes a couple of jets of urine.

3.30. The animal again vomits. The salivation is not so marked as it was previous to this time. The ears still droop. The animal is very weak after vomitting.

3.35. The lumbar region appears to be very weak and the animal goes down, almost falling in doing so, the hindquarters being apparently very weak and the hindlegs unable to support the body.

3.40. The animal, lying down, makes a moaning expiratory sound, and can only rise with great difficulty after having made some preliminary struggles to gain its feet.

4.15. Lying down and not inclined to rise.

4.25. Rises after many struggling efforts to do so. Hind legs are very weak. The animal looks very distressed and ill, and stands with the ears drooping.

5. Still looking very dull and distressed and the ears drooping.

7. Looks brighter, lying down, but rises quickly on inducement to do so. The ears still droop.

11. Appears normal, save that it has a slightly dull expression on the face. This animal appeared to have quite recovered on the following morning.

(15) *HEIFER 1,822.*

Received 1 grain of Veratrine in solution subcutaneously on the 27/11/11 at 11.45 a.m.

The result of this experiment was negative.

On the 28/11/11 this same animal was injected in the same manner with the same drug. On this occasion the dose was 3 grains and this quantity was injected at 2.25 p.m.

2.30 *p.m.*: At this time the animal was slightly restless, but otherwise normal in appearance.

2.39. Urinates freely, passing clear colourless urine.

2.51. Animal very slightly restless.

2.56. Animal appears as at 2.51, but at long intervals barely perceptible straining movements are seen. The animal showed no apparent symptoms, though seen at short intervals between 3 and 4 p.m.

4.20. At this time the animal is vomiting. The animal stands with the head and neck hanging down slightly, the ears drooping. The respirations are more frequent than normal, and there is a groaning sound heard at intervals. Salivation is also present.

5. Animal is lying down, still salivating and with a very dull and sick expression on the face. The ears still droop and occasionally the head is turned round to one side so that the nose rests in the flank for short periods.

7. Still lying down. The head and neck are outstretched, the lower jaw resting on the ground. A very dull, distressed look is present on the face, the ears drop and the salivation is present. The animal refuses to rise.

11. The animal is better-looking, though still a little dull, and not inclined to rise.

Seen on the next day the animal appeared to be normal.

EXPERIMENTS MADE WITH VERATRINE HYDRO-
CHLORATE.

(16) *HEIFER 1,822.*

Received $1\frac{1}{2}$ grains of Veratrine hydrochlorate in solution subcutaneously on the 19/12/11 at 3.53 p.m.

4.1. *p.m.* At this time the animal appears to be very uneasy. Salivation is present, the respirations frequent and marked tenesmus is seen. On each occasion that the animal makes a straining movement, the back is markedly arched and the tail raised, the hind legs being drawn forward under the body, and this position is maintained for about half a minute. On some occasions when the animal strains, it passes a few jets of urine.

4.5. The head and neck are outstretched, and an uneasy look is present on the face. Some food is quickly regurgitated and mixed with saliva drops from the mouth. One could not note any perceptible contraction of the abdominal muscles, nor was the material expelled from the mouth ejected forcibly as in vomiting.

4.7. Stands with the head hanging down, straining and a very uneasy look on the face. The ears hang down in a drooping position. Respirations are frequent.

4.10. The animal is still making straining movements, but only passes some jets of urine. Some more of the food is regurgitated and expelled from the mouth mixed with saliva. The manner of ejecting this material is the same as that noted on the previous occasion.

4.13. The hind legs seem to be very weak, as is also the lumbar region, so that the animal can stand only with very great difficulty, and on a few occasions almost falls down, but quickly makes an effort to recover its equilibrium. The eyes are very dull, the ears droop, salivation is seen and straining is present. Urine is passed in small jets during some of the straining movements.

4.17. The muscles and overlying skin of the shoulders and hind-quarters are quivering, and the hind legs seem to give way under the animal. A quick effort at recovery is made, and with difficulty the standing position is regained and maintained. The animal seems now to be uneasy and somewhat excited.

4.20. The animal becomes wildly excited, butting the iron rails separating it from its neighbour in the adjacent stall, and pulling back on the chain attached to the neck strap, then rushes forward into the iron partition over the manger separating the stall and the feeding passage. In doing this, it almost falls down on several occasions, but makes a struggling movement to recover. Eventually after about a minute it quietsens down, but stands with the head down as if about to charge and an excited look in the eyes.

4.23. Animal is again very excited and behaves as before, then quietsens and stands straining.

4.28. Excited look still present on the face, and straining is well marked.

4.30. The animal is quieter in appearance and only slight straining is present. The quivering of the muscles and skin of the shoulders and hindquarters has ceased. Salivation is not so marked as previously.

4.35. The animal again looks uneasy; the ears droop: the eyes are retracted; salivation is present, and the animal makes movements as if to vomit, but does not eject any food.

4.45. Straining movements are noted, but only jets of urine are passed at times. The respirations are more frequent than usual but the salivation is not so marked as it was at 4.35.

4.47. The animal is straining slightly and regurgitating food and expelling it mixed with saliva in the same manner as on the two previous occasions. Respirations are 44 per minute.

6.30. At this time the animal is lying down and appears to be very ill. The eyes have a dull expression and the ears are still hanging in a drooping fashion. It is unable to rise and in attempting to do so the hind legs and quarters and lumbar region do not seem to be under the proper control of the animal.

8.15. The animal is standing but still has a dull appearance, the ears are hanging in a drooping fashion. The other symptoms have disappeared.

12. Still standing up and appears normal.

7.30. *a.m.* 20/12/11. Seen at this time the animal appeared to be in normal health.

(17) *HEIFER 1,664.*

Received $1\frac{1}{2}$ grains of Veratrine hydrochlorate in solution subcutaneously on the 19/12/11 at 3.55 p.m.

4.1 *p.m.* The animal is uneasy and stands with the head and neck slightly depressed.

4.6. Slight excitement is apparent, the animal falls on its knees and quickly rises again, flourishes its head and strikes the iron bars of the stall separating it from its neighbour in the next stall with its horns.

4.15. The animal is uneasy looking, restless, and salivating. Slight tenesmus is present but only urine, which is passed in jets, is voided.

4.20. The animal is groaning slightly with each expiration. Straining movements, and profuse salivation are noted. These symptoms are followed by vomiting. The ears still droop and the animal appears to be extremely ill.

4.22. Vomiting is again noted following movements of straining. The animal is still restless, grunting at intervals and salivating.

4.23. Vomiting occurs again at this time.

4.28. The animal lies down but rises again at 4.30.

4.32. The animal sinks quickly on to its knees, but quickly rises again to standing position and stands with the head and neck extended. Movements are made as if to vomit, but vomiting does not occur.

4.45. Restlessness, slight straining, and salivation are still present. Attempts to vomit are made by the animal.

4.49. The same conditions as at 4.45, save that no efforts to vomit are made, and the animal again falls to its knees but rises again at once.

6.30. The animal at this time is standing, salivation is still present and the ears are drooping. A very small quantity of firm dry faeces is passed.

8.15. Still appears to be slightly restless. The animal is standing up and salivating very slightly.

12. The animal looks much brighter and apparently normal.

20/11/11, 4.30 *a.m.* The animal appears to be normal.

(18) *HEIFER 1,664.*

Received 1 grain of Veratrine hydrochlorate in solution subcutaneously on 22/12/11 at 4.3 p.m.

4.8 *p.m.* The animal is uneasy looking, restless, and paws the ground with each fore foot alternately.

4.15. Animal urinates.

4.30. Stands with the head and neck in an extended position with a dull expression on the face, the ears drooping, and a stringy saliva dribbling from the mouth. Respirations are 36 per minute.

4.31. A slight grunting sound accompanies each expiration. The animal lies down but rises again immediately.

4.35. The animal is dull looking, salivates, and strains slightly. The grunting sound is still present and the respirations are 34 per minute.

4.40. The straining is still present and the animal vomits a fairly large quantity of liquid containing in suspension small pieces of hay which have apparently been derived from the food which has undergone comminution during rumination.

5. Slight straining occurs at intervals and the grunting sound is replaced by a sound more like a groan in character. A stringy saliva hangs about the mouth. The animal is still uneasy looking and restless and the ears droop.

8. The animal is still dull looking.

10.50. At this time the only abnormal appearance which the animal presented was that it was slightly dull looking, but on the next day it appeared to have returned to a normal condition as far as could be determined.

(19) *HEIFER 1,822.*

Received 1 grain of Veratrine hydrochlorate in solution subcutaneously on the 22/12/11, at 4.5 p.m.

4.15 p.m. The animal has a dull appearance, the ears droop, and the respirations are 56 per minute.

4.30. The same conditions exist as at 4.15 p.m., save that the respirations are increased in frequency to 66 per minute.

4.45. The animal is still very dull in appearance, strains at intervals and is also salivating. At times the head and neck are quickly extended, and it seems as if the animal was about to vomit, but it does not do so.

4.55. The same symptoms are seen as at 4.45.

5.5. The animal vomits, and afterwards wears a distressed nauseated expression on the face, the ears droop and the eye is dull. The animal still stands in the same place with the head and neck slightly depressed, except when they are raised during the act of vomition.

8. The animal has not vomitted since 5.5 p.m.

10.55. Still slightly dull looking, but stands in normal position and appears to be almost normal. Seen on the 23/12/11, the animal appeared to be normal.

(20) *HEIFER 1,751.*

Received 1 grain of Veratrine hydrochlorate in solution subcutaneously on the 22/12/11 at 4.4 p.m.

4.8 p.m. The animal has a dull appearance, stands with the head and neck depressed and salivates slightly. Slight straining is also seen, but only a jet of urine is passed. Respirations are 52 per minute.

4.20. The animal is salivating, straining and vomiting. A large quantity of material is vomitted, and a groaning, expiratory sound is made. The animal also appears to experience some irritation of the nasal mucosa causing it to make a snorting or sneezing noise on a few occasions.

4.25. Marked straining is present at this time.

4.20. The animal stands with the back arched, straining and defaecates. It makes attempts to vomit, but does not do so.

4.31. The animal is straining and groaning continually. The tail is kept raised at the base, and salivation is still present.

4.40. The straining is only seen at times and then is marked. Groaning is heard also at intervals. The animal still stands with the back arched and salivates.

4.55. Still groaning and straining at intervals. Salivation is still present.

5.5. The same condition is noted as at 4.55.

8. The animal has not vomitted or defaecated since 5 p.m. It still has the very dull appearance of the eye, and the ears droop. It is still uneasy.

10.55. Lying down, the ears drooping, the head is turned round so that the nose touches the flank, and the head is maintained in this position during rest. When attempts are made to make the animal stand up, it refuses to rise, the hind quarters and legs seem to be weak.

Seen, however, on the next day it seemed quite normal in condition and it fed in the morning of this day.

(21) *HEIFER 1,822.*

Received $\frac{1}{2}$ grain of Veratrine hydrochlorate in solution subcutaneously on the 26/12/11 at 11.25 p.m.

11.35 p.m. The animal is dull in appearance and stands with the head slightly depressed and the ears drooping.

11.45. The animal shows dull appearance of the eye; the ears droop; the respirations are 60 per minute. Otherwise it appears to be normal.

11.52. The animal lies down. Respirations 66 per minute.

12.5. Still lying down, dull in appearance and making a grunting expiratory sound at times. The incisor teeth are ground against the pad at times. Respirations 58 per minute.

12.17. The animal still lies down, and occasionally grinds the incisor teeth against the pad. Respirations 56 per minute.

12.45. The animal is standing up and appears to be normal, save for a slightly dull appearance of the eye.

3. Seen at this time the animal appears to be normal. The ears no longer droop, the eye is bright and the animal is feeding. It has defaecated but not vomitted in the interval since the time when it was last seen. The faeces passed were normal in quantity and consistency.

During the evening the animal still remained in the same normal condition, and also appeared to be in a state of normal health when seen on the next day (27/12/11).

(22) *HEIFER 1,664.*

Received $\frac{1}{2}$ grain of Veratrine hydrochlorate in solution subcutaneously on the 26/12/11 at 11.30 a.m.

11.45. The animal appeared to be very slightly uneasy.

11.50. Defaecation occurs, the faeces being normal in quantity and consistency.

11.55. Strains, arches the back and raises tail and stands for a while as if about to defaecate or urinate, but does neither. Then the animal paws the ground with the right fore foot, after which it stands in the same place, but appearing to be slightly uneasy.

11.57. Grinds the incisor teeth and pad together at intervals, appears uneasy and lowers the head and neck, making a single grunting sound.

12.4. The animal stands with the head and neck slightly extended. It strains and passes a jet of urine.

12.9. The animal is slightly restless and uneasy, walking slowly round the box. It grinds the teeth occasionally and the respirations are 57 per minute.

12.20. The uneasiness and grinding of the teeth are still present. A grunting sound is made at intervals. At times the animal walks round the box for a few steps then stands and extends the head and neck slightly, then allows them to return to their usual position and walks another few steps, when the previous movement is repeated. At other times the animal stands with the head and neck slightly depressed.

12.45. The same condition prevails as at 12.20 p.m.

3 p.m. At this time the animal is bright and attentive to its surroundings. It has not vomitted but has defaecated and fed since last seen at 12.45 p.m. The animal remained normal during the evening, and the same condition was noted on the following day (28/12/11).

(23) HEIFER 1,751.

Received $\frac{1}{2}$ grain of Veratrine hydrochlorate in solution subcutaneously on the 29/12/11 at 2.58 p.m.

3.50. Up to this time the animal showed no symptoms, save that it appeared to be slightly more dull than usual.

3.55. The animal urinates. It appears to be normal in condition.

5.30. At this time the animal was apparently normal, and had not defaecated or vomitted since the time when last seen, but had fed.

(24) HEIFER 1,742.

Received $1\frac{1}{2}$ grains of Veratrine hydrochlorate in solution subcutaneously on the 29/12/11 at 3 p.m.

3.9 p.m. The animal is uneasy and salivating freely. It defaecates, and after the act, holds the tail raised for several minutes and strains slightly.

3.10. The animal vomits, sneezing each time it does so. The material vomitted is very forcibly ejected as a quantity of gas seems to be eructated and to assist the expiratory air in expelling the food from the mouth. The neck is slightly arched during vomiting.

3.16. The animal stands with the tail raised and the back arched and strains several times.

3.21. The same conditions are noted as at 3.16, and the animal salivates freely.

3.41. The animal presents the same appearance as when last seen.

3.55. The animal is still slightly uneasy looking, salivating, and groaning slightly at intervals.

5.30. The animal appears to be slightly dull, but otherwise seems to be normal in condition. It has not defaecated or vomitted since last seen.

(25) *HEIFER 1,742.*

Received 1 grain of Veratrine hydrochlorate in solution subcutaneously on the 16/1/12 at 12.13 p.m.

12.15 p.m. The animal is restless, pawing the ground and flourishing the head at times. It urinates.

12.30. The animal is still restless and defaecates normally.

12.50. The animal has shown no symptoms, save a slight dullness, since 12.30.

2. The animal is normal in appearance. It has defaecated and urinated since 1 p.m.

The animal showed no further symptoms during the evening, and appeared to be quite normal on the following day.

EXPERIMENTS MADE WITH ARECOLINE HYDROBROMIDE AND VERATRINE HYDROCHLORATE IN COMBINATION.

(26) *HEIFER 1,751.*

Received 1 grain of Arecoline hydrobromide and 1 grain of Veratrine hydrochlorate in solution subcutaneously on the 16/1/12, at 12.11 p.m.

12.15 p.m. At this time the animal appears to be uneasy and slightly restless.

12.30. The animal wears an anxious expression on the face, the ears droop, salivation is present, and a grunting sound is made with each expiration.

12.35. The animal stands with the head and neck slightly depressed. A nauseated expression is present on the face. It salivates freely, the grunting expiratory sound is replaced by a groaning one. The root of the tail is held in a raised position.

12.40. At this time the animal vomits and strains markedly.

12.48. The animal again vomits. The straining is very marked, the back being arched, the hind legs brought forward under the body and the tail outstretched and raised. Faeces in quantity about the same as is usually passed during a normal defaecatory act, but more fluid in consistency than usual, are passed. The eyes are dull looking, the ears droop, salivation is still present and a groaning sound accompanies each expiration.

7. The straining movements and the groaning sounds still occur at intervals.

2. At this time the animal stands with the head and neck somewhat depressed, and the tail raised at the base. Salivation is still present and the ears droop. It has defaecated and vomitted since 1 p.m.

2.25. The animal stands with the head and neck slightly outstretched, the ears drooping slightly, the eye dull looking and the tail raised at the base. Salivation is still present and the groaning sound is heard at intervals.

3.45. At this time the appearance of the animal is almost normal. At 5 p.m. it has apparently completely recovered and is feeding. Seen at 12.30 a.m. (17/1/12) it appeared to be perfectly normal.

(27) *HEIFER 1,664.*

Received 1 grain of Arecoline hydrobromide and 1 grain of Veratrine hydrochlorate, in solution subcutaneously on 16/1/12, at 12.9 p.m.

12.18 p.m. The animal appears uneasy and the root of the tail is held in a raised position.

12.30. At this time the animal is uneasy, straining, and has a dull appearance though flourishing its head at, and striking the dividing bars of the stall in which it stands.

12.40. The animal still appears to be dull and stands with the head and neck slightly extended. Straining is also noted.

12.50. The same condition is noted as at 12.40, and in addition very slight salivation is seen.

1. Still dull looking and standing in the same place since 12.30. The straining movements are still seen and the root of the tail is held in a raised position. At times the head and neck are extended and the animal makes a deglutitory movement, appearing to swallow some of the saliva.

2. The animal is still dull and uneasy looking and grunts slightly at intervals. Slight straining is still seen at intervals and the animal has vomitted twice, and also urinated since 1 p.m.

2.25. At this time the animal is bright-looking and normal in appearance. It defaecates in a normal fashion.

Seen at 3.45 and 5 p.m. the animal was normal in appearance and had fed during the afternoon.

(28) *HEIFER 1,742.*

Received $1\frac{1}{2}$ grains of Arecoline hydrobromide and $1\frac{1}{2}$ grains of Veratrine hydrochlorate, in solution subcutaneously on the 19/1/12, at 11.39 a.m.

11.50 a.m. The animal has an anxious expression on the face, the root of the tail is raised and there is a marked quivering movement of the muscles and overlying skin of the hind quarters. Respirations are 62 per minute.

11.59. The animal appears to be very dull and stands with the head and neck slightly depressed. There is marked quivering of muscles and skin of the hind quarters and flanks and the tail is raised at the base. Straining is present and the respirations are 70 per minute.

12.8. The symptoms seen are the same as those noted on the last occasion, but in addition there is tympany and marked salivation present. A grunting sound accompanies the expirations, and at this time the quivering movement of the muscles and skin is seen to be present in the shoulder regions also.

12.15. The same symptoms are seen as were noted at 12.8.

12.21. The tympany is more marked and the grunting sound is replaced by one which is more like a moan and is only heard at times. The quivering of the hind quarters and the tail is marked.

12.30. The animal is still dull. The quivering of the muscles and overlying skin of the shoulders, flanks, hind quarters, and tail is very marked. The tail is still held in a raised position at the base, and straining is present. Tympany is still marked, slight salivation is present. At times the incisor teeth and pad are ground together.

12.50. At this time the animal is still dull looking. After slight straining, faeces are passed which are normal in quantity and consistency. The straining is seen at intervals after the defaecation. The quivering of the muscles and skin has disappeared, but the root of the tail is still kept in a raised position. Salivation and tympany are still present.

2.15. The animal is still dull looking. Salivation is no longer present. The tympany has almost disappeared. Respirations are normal and no vomiting has occurred since 12.50.

2.30. Defaecation occurs, the faeces being normal in quantity and consistency.

5. The animal is apparently normal and is feeding.

10.30. The animal is normal in appearance.

(29) *HEIFER 1,822.*

Received $1\frac{1}{2}$ grains of Arecoline hydrobromide and $1\frac{1}{2}$ grains of Veratrine hydrochlorate in solution subcutaneously on the 19/1/12, at 11.37 a.m.

11.41. The animal is uneasy looking, stands with the head in a corner of the box and the root of the tail raised. The respirations are frequent and hurried and are 84 per minute. Urination occurs.

11.50. At this time the animal stands with the head and neck slightly depressed. The ears droop and salivation is seen. Straining movements occur at intervals.

11.51. The animal stretches the hind legs out backwards in the position sometimes seen in an animal suffering from torsion of the uterus and a marked straining movement occurs.

11.55. At this time it is noted that the animal is standing with the head and neck depressed, but it has been resting the forehead against the manger, which in this case is on a level with the head when the latter is held in the normal position. Marked salivation is present, and at times the hind legs are stretched out backwards and marked straining movements are made. Respirations are 55 per minute.

12.5. The animal now appears to be timid, a slight sound starting it and an anxious expression is present on the face. The muscles of the skin of the shoulder and hind quarters quiver and the root of the tail is held in a raised position. The legs appear to be weak, and at times the hind legs are stretched out behind and straining occurs. Occasionally a mucous r le produced in the larynx can be heard.

12.8. The animal is very timid and strains markedly at intervals. The head and neck are outstretched, salivation is profuse and a r le is heard in the region of the larynx accompanying each inspiration and expiration.

12.11. At this time the appearance of the animal is the same as at 12.8, except that the râles are louder. The respirations are 51 per minute.

12.25. The quivering movement of the muscles and skin of the before mentioned regions has ceased. The salivation is very profuse and the animal appears to be very ill. The râles are still loud, but disappear for short time after the animal coughs, which it does at intervals. The coughing probably results from the irritation due to some saliva passing down into the trachea. The saliva forms a frothy white mass around the lips.

12.30. The animal makes efforts to vomit, extends the head and neck, this movement being followed by a contraction of the abdominal muscles, but nothing is vomitted. Respirations are 64 per minute, and at times the incisor teeth and pad are ground together.

12.50. Straining is noted, and the root of the tail is still maintained in a raised position. The legs are very weak and seem to be unable to properly support the body weight. Salivation is still present, and the grinding of the teeth occurs at intervals.

12.57. Unsuccessful attempts to vomit are made.

2.15 p.m. At this time the animal is quieter, and the salivation is no longer present nor is straining or raising of the base of the tail noted. No vomiting has occurred in the interval. A dull appearance is still present, and at intervals the grinding of the incisor teeth and pad is heard.

5. The appearance of the animal is quite normal.

10.30. The animal appears to be in normal health.

EXPERIMENTS MADE WITH ARECOLINE HYDROBROMIDE AND STRYCHNINE SULPHATE IN COMBINATION.

(30) HEIFER 1,742.

Received $1\frac{1}{2}$ grains of Arecoline Hydrobromide and $\frac{1}{2}$ grain of Strychnine sulphate in solution subcutaneously on 7/12/11 at 3.9 p.m.

3.11 p.m. The base of the tail is raised so that the tail hangs down in a straight line at some distance from the hind quarters.

3.14. The animal looks uneasy and is restless. The head and neck hang down and a very slight grunting sound is heard at times. The muscles and skin of the shoulders, flanks and hind quarters quiver. Straining movements are seen at times and slight salivation is present.

3.17. At this time the uneasiness, restlessness, and grunting is still present, as is also the quivering of the muscles and skin. The legs tremble and the muscles of the hind limbs are slightly more rigid than usual. Salivation is very pronounced.

3.20. Three marked clonic contractions of the muscles of the hind quarters and limbs occur, which cause the hind feet to be slightly raised off the ground on each occasion. The lumbar region is slightly arched when the spasms occur.

3.20½. Clonic spasms of the same muscles again occur. A grunting sound accompanies the expirations, and the respirations are 66 per minute.

3.22. Marked general clonic spasms of the muscles occur. The animal falls down and lies on the right side with the back arched, the head and neck turned to the left side and the legs outstretched. The muscles in general are now rigidly contracted.

3.24. A few spasmodic contractions of the muscles of the fore and hind limbs occur. The animal is very hypersensitive. The respirations are 44 per minute, and a grunting noise accompanies each expiration.

3.26. The muscles of the body are again rigidly contracted.

3.27. The muscles commence to relax, allowing the head to rest on the ground and the joints of the limbs to be flexed.

3.35. The animal is much easier and the muscles are no longer spasmodically or unduly contracted nor is hypersensitiveness marked. The respirations are 40 per minute.

3.39. At this time the symptoms appear to return in a lesser degree. Hypersensitiveness is again noted, and when the flank is struck with the hand, a marked clonic spasmodic contraction of the extensor muscles of the fore limbs occurs. The muscles of the hind limbs are again slightly rigid, so that the limbs are outstretched as before, but only offer slight resistance to passive flexion.

3.42. The hind limbs are still rigid and the respirations are 66 per minute.

3.46. The animal is still lying down, and left fore foot is raised to remove flies present on the skin of the lower part of the chest. The joints involved in making the movement appear to be flexed with ease.

3.51. The animal has been straining slightly at times with short intervals between them, and now passes faeces of the usual quantity and consistency.

4. The muscles of limbs are relaxed. Faeces are again passed and are accompanied by flatus. The quantity of faeces is not so large as before. Tympanitis is present, and on a couple of occasions the animal turns the head round to look at the left flank region.

4.1. Attempts to induce the animal to rise are without result, the head and neck and fore part of the body are slightly raised, but the animal then falls back on to its side again.

4.3. Slight spasmodic contractions of the muscles are again seen, and after slight straining a small quantity of liquid faeces is passed. The hind limbs offer no resistance to passive flexion, although they are slightly outstretched.

4.5. A large quantity of faeces, which are more fluid than usual, is passed.

4.8. Straining is present, though slight in degree, and a small quantity of semi-liquid faeces is passed.

4.10. The animal now rises and can stand and walk firmly. The muscles and skin of the hind quarters still quiver slightly.

4.22. The quivering of the muscles and skin of the hind quarters is the only indication of a deviation from the normal which the animal shows.

At 4.27 the animal seemed to be normal in condition and was feeding. No further symptoms were noticed up to 12.30 a.m. (8/12/11).

(31) *HEIFER 1,751.*

Received $\frac{1}{2}$ grain of Arecoline hydrobromide and $\frac{1}{2}$ grain of Strychnine sulphate in solution subcutaneously on 7/12/11 at 3.7 p.m. 3.8 p.m. The base of the tail is raised.

3.12. The raising of the root of the tail is still the only apparent symptom.

3.19. An expression of uneasiness is present on the face, the head and neck are depressed and the root of the tail still raised.

3.21. At this time there is present, in addition to the previous symptoms, a quivering of the muscles and skin of the shoulders and the region of the dewlap.

3.25. Salivation is present and a grunting expiratory sound is heard at times.

3.30. The animal passes faeces in normal quantity and of normal consistency. The quivering of the muscles and skin has ceased.

3.40. The head hangs slightly, and the base of the tail is still held in a raised position, straining if present is too slight to be apparent.

3.44. Faeces of normal consistency are again passed, though in slightly smaller quantity than on the last occasion.

3.50. The animal at this time appears to be perfectly normal in condition. It was feeding at 4.25, and no further symptoms were noticed when it was seen on three or four occasions up to 12.30 a.m. (8/12/11).

(32) *HEIFER 1,752.*

Received $\frac{1}{2}$ grain of Arecoline hydrobromide and $\frac{1}{2}$ grain of Strychnine sulphate in solution subcutaneously on 7/12/11 at 3.8 p.m.

3.12 p.m. At this time the root of the tail is held in a raised position and slight straining is present.

3.22. The animal shows, in addition to the raising of the base of the tail and slight straining at intervals, a slight quivering of the muscles and skin of the hind quarters.

3.20. The animal is apparently normal, except that the tail is slightly raised at the base.

3.45. The animal appears to be normal.

4.12. Defaecation occurs. The quantity and consistency of the faeces were normal.

4.27. At this time the animal was feeding and no further symptoms were seen.

EXPERIMENTS MADE WITH ARECOLINE HYDROBROMIDE,
VERATRINE HYDROCHLORATE AND STRYCHNINE SUL-
PHATE IN COMBINATION.

(33) *HEIFER 1,664.*

Received 1 grain of Arecoline hydrobromide, 1 grain of Veratrine hydrochlorate and $\frac{1}{2}$ grain of Strychnine sulphate, in solution subcutaneously on the 7/2/12 at 11.32 a.m.

11.34 a.m. The animal is restless, walking round the box at times and is slightly aggressive.

11.45. The head and neck are depressed, the base of the tail is raised and a very dull look is present on the face. A slight grunting sound is heard at times.

11.54. The conditions are the same as at 11.45, except that tenesmus is well marked.

11.55. Clonic spasmodic contractions of the muscles appear. The back is arched, and the animal falls on its knees, but rises again quickly.

12.10. The animal is still dull looking. After slight straining a small quantity of faeces of normal consistency is passed. A grunting sound is frequently heard and the respirations are extremely frequent (100 per minute), and are also shallow in character. Salivation is present.

12.15. The straining efforts are more marked and the degree of salivation is pronounced.

12.2. The same conditions prevail as were seen at 12.15.

12.27. Straining is still present and the root of the tail is still raised. Some saliva is ejected from the mouth by the coughing of the animal. The animal still looks uneasy.

12.31. The head and neck are held up and are slightly extended. The respirations are again normal. Slight straining is present at intervals, as is also a grunting sound. Salivation is not very profuse.

12.38. The straining is very marked for about half a minute.

1 p.m. The animal is quieter and is slightly dull looking. Salivation has ceased and the other symptoms, previously seen, are no longer present.

2 p.m. The animal is apparently normal, and no symptoms are seen at 3 or 4.30 p.m.

(34) HEIFER 1,751.

Received 1 grain of Arecoline hydrobromide, 1 grain of Veratrine hydrochlorate and $\frac{1}{2}$ grain of Strychnine sulphate, in solution subcutaneously on the 7/2/12 at 11.30 a.m.

11.35. The animal is uneasy, and rapidly shakes the head from side to side. There is a dull expression on the face.

11.38. The shaking of the head is repeated at short intervals.

11.45. The animal is very dull and uneasy looking, the head and neck hang downwards and the ears droop. There is slight straining present and the root of the tail is raised.

11.50. In addition to the symptoms seen at 11.45, salivation, a quivering of the muscles and skin of the shoulders, and a slight grunting sound made at intervals, are now present.

11.53. The straining movements at this time are marked, and faeces, which are normal in quantity and consistency, are now passed. The animal still salivates, holds the base of the tail in a raised position and also makes a moaning sound.

11.55. Spasmodic clonic contractions of the muscles occur. The animal goes down but lies in the normal attitude, and makes a grunting noise at intervals.

11.57. The animal rises and stands with the head and neck depressed. It is still very dull looking and grunts at intervals. The quivering of the muscles and skin of the shoulder is no longer seen.

12.10. The symptoms are the same as at 11.57, except that the salivation is more profuse.

12.21. The head and neck are quickly outstretched as if vomiting was about to occur. A slight effort to vomit is made, but only some saliva is ejected from the mouth. The animal is still very dull and moans at intervals.

12.25. Straining movements are seen, and the respirations are 56 per minute.

12.30. Defaecation follows straining movements, the faeces passed being in quantity and consistency the same as passed during the normal act. Some saliva is coughed up, and a slight moaning sound is made at intervals.

1. The appearance of the animal is dull, and the tail is held raised at the base. Straining movements and a grunting sound are present at intervals. Salivation is still present, and once or twice the head and neck are outstretched in the position of an animal about to vomit. Vomitting does not occur however.

2. The animal is lying down and is very dull looking, the upper eyelids hanging down so as to half close the palpebral fissure. Slight salivation is still present, the saliva hanging in strings from the mouth. It has defaecated once during the interval since last seen, the faeces being slightly more fluid and smaller in quantity than they would be in the case of a normal defaecation.

3 p.m. At this time the animal is brighter and almost normal in appearance.

4. The animal appears to be normal in condition.

(35) *HEIFER 1,742.*

Received 1 grain of Arecoline hydrobromide, 1 grain of Veratrine hydrochlorate and $\frac{1}{2}$ grain of Strychnine sulphate, in solution subcutaneously on the 14/2/12, at 12.15 p.m.

12.19. The animal paws the ground with the fore foot.

12.21. The appearance of the animal is dull and uneasy. A slight quivering of the muscles and skin in the regions of the triceps extensor cubiti muscles occurs, which lasts for about half a minute. The root of the tail is held in a raised position.

12.27. The animal looks uneasy and anxious, the tail is held as before, and the legs seem to be weak. There is a quivering movement of the muscles and skin of the shoulders, and in the regions of the fold in front of the thigh. Tenesmus is also present.

12.41. At this time there is very slight salivation and slight tympany present. The respirations are frequent.

12.50. The animal is still very uneasy looking. Salivation is not at all well marked, being only very slight, but the tympanitis is slightly more marked.

12.55 Defaecation occurs. The faeces are normal in quantity and consistency.

2 p.m. The animal still wears an anxious expression on the face, salivates freely, and passes very fluid faeces. It has defaecated in the interval since it was last seen.

3.20. A slightly dull appearance and a very slight salivation are still seen. Otherwise the animal appears to be normal. When seen later during the evening, the animal had completely recovered and was quite normal in appearance.

(36) *HEIFER 1,822.*

Received 1 grain of Arecoline hydrobromide, 1 grain of Veratrine hydrochlorate and $\frac{1}{2}$ grain of Strychnine sulphate, in solution subcutaneously on the 14/2/12 at 12.19 p.m.

12.25 p.m. The animal is very dull looking, and the head and neck hang slightly downwards.

12.72. Marked straining movements occur, the back being arched and the root of the tail slightly raised. A quivering of the muscles and skin of the hindquarters is seen and the legs appear to be weak.

12.34. At this time the animal, being excited by the assistant entering the box, attempts to run round, but falls after a few steps and rises quickly. The movements of the legs are very uncertain and improperly co-ordinated, and the fetlock and knee joints are flexed involuntarily, owing apparently to the loss of power of the extensor muscles of these joints.

12.35. The animal stands with the head and neck depressed, and the root of the tail raised and salivates freely.

12.50. Tenesmus is noted. The head is held in the same position as when last seen, the ears droop and the dull appearance of the animal is still present. Slight tympany is apparent and the salivation is still well marked.

2. The dull appearance is still present. The animal has defaecated since the time when last seen, the faeces being normal in quantity and consistency.

3.20. The animal still appears to be slightly dull, and the ears droop very slightly. Otherwise no symptoms are to be seen.

4. The appearance of the animal is normal.

EXPERIMENTS MADE WITH ARECOLINE HYDROBROMIDE, STRYCHNINE SULPHATE AND COCAINE HYDROCHLORIDE IN COMBINATION.

(37) *HEIFER 1,742.*

Received $1\frac{1}{2}$ grains of Arecoline hydrobromide, $\frac{1}{2}$ grain of Strychnine sulphate, and 30 grains of Cocaine hydrochloride, in solution subcutaneously on the 15/12/11 at 3.7 p.m.

3.10 p.m. A quivering of the muscles and skin of the regions of the shoulders and hindquarters is seen, and the root of the tail is slightly raised.

3.16. The animal is very timid and salivates. Urine is ejected in a number of jets. The respirations are 56 per minute.

3.25. Timidity, salivation, quivering of the muscles and skin of the shoulders and hindquarters, and the raised position of the root of the tail are still present. At intervals urine is passed in small quantities. The respirations are 48 per minute.

3.36. The animal is timid and hypersensitive, being easily startled by a slight noise, and there is a frightened expression on the face.

4. The quivering of the muscles and skin of the above-mentioned region is still present, as is also well marked salivation. Defaecation occurs, the faeces being normal in appearance and quantity. The animal is extremely timid and hypersensitive.

4.26. The animal is still slightly timid and frightened looking, and salivation is present but not so marked as before.

The animal was almost normal when seen at 5.5, and was ruminating and apparently normal at 10.30 p.m.

(38) *HEIFER 1,751.*

Received $\frac{1}{2}$ grain of Arecoline hydrobromide, $\frac{1}{2}$ grain of Strychnine sulphate and 20 grains of Cocaine hydrochloride, in solution subcutaneously on 15/12/11 at 3.9 p.m.

3.11 p.m. The animal is restless and excited-looking and shakes the head from side to side. The base of the tail is slightly raised. The extremity of the tongue projects slightly between the lips and salivation is seen.

3.15. There is an excited appearance of the eyes present and the animal is timid and hypersensitive.

3.28. A quivering of the muscles and skin of the shoulders and hind quarters is present. A quivering of the lips is also seen. The animal is still salivating and holds the base of the tail slightly raised. Very slight straining movements are seen at times.

3.30. Defaecation occurs. Faeces are normal.

3.38. The quivering of the muscles and skin of the shoulders and hind quarters, the salivation, the excited expression, the timidity and hypersensitive condition, and the raising of the base of the tail are still present. Urine is passed in successive small quantities which dribble away from the labiæ vulvæ.

4. The animal is still timid and the eyes have an excited look but the other symptoms are no longer present.

4.25. At this time a slight degree of timidity, and an excited look in the eyes, are noted, but the animal is otherwise normal and feeds.

5.5. The animal is normal except that it is slightly timid.

At 10.30 the animal was perfectly normal in appearance and was lying down ruminating.

(39) *HEIFER 1,752.*

Received $\frac{1}{2}$ grain of Arecoline hydrobromide, 1 grain of Strychnine sulphate, and 20 grains of Cocaine hydrochloride in solution subcutaneously on 15/12/11 at 3.10 p.m.

3.14 p.m. The animal is timid, has an excited expression on the face and is restless.

3.16. Spasmodic clonic contractions of the muscles occur which cause the back to be arched, the head and neck to be extended and the legs to be rigidly outstretched. The sudden marked contractions

of the muscles causes the production of an involuntary jumping movement which lifts the hind feet off the ground. The root of the tail is raised, salivation is present and a grunting sound is heard accompanying the expirations.

3.23. The same symptoms occur as were seen on the last occasion and the animal is markedly hypersensitive.

3.24. The spasmodic contractions of the muscles again occur and this time the animal falls down. The head and neck are rigidly extended as are also the fore and hind limbs. Salivation is well marked and the respirations are dyspnoëic.

3.29. The animal is still lying on its side, the muscles being rigidly contracted so that the head, neck and limbs are in the same position as before mentioned. The respirations are 44 per minute.

3.34. The position of the animal is the same as was seen on the last occasion. At intervals clonic spasms occur, the muscles relaxing only, however, to again rigidly contract. The hypersensitive condition of the animal is very marked.

3.55. At the time the animal is still lying on its side with the head and neck and limbs rigidly outstretched. It is markedly hypersensitive and clonic contractions of the muscles of the limbs are produced when the legs are handled. The eyes are rolled upwards, so that the sclerotic coats of the lower part of the eyes are visible, and the respirations are 52 per minute and laboured.

4.25. When seen at this time the animal was in the same condition as when last seen and had defaecated during the interval, passing a larger quantity of faeces than is seen after a normal defaecatory act.

4.26. Marked clonic contractions of the muscles occur and the respirations are 48 per minute and very laboured. Salivation is marked.

4.34. Marked clonic spasms of the muscles again occur and the animal dies during a period when they are markedly contracted, death occurring at 4.35 p.m.

EXPERIMENTS MADE WITH COCAINE HYDROCHLORIDE.

(40) HEIFER 1,742.

Received 30 grains of Cocaine hydrochloride in solution subcutaneously on the 13/11/11 at 3.12 p.m.

3.19 p.m. The animal has an excited appearance, is restless and urine is passed in several successive small jets.

3.24. Defaecation occurs at this time. The faeces are normal in character and about the same in quantity as would be passed during normal defaecation.

3.25. The animal is very timid, restless, and there is an excited look in the eyes. Salivation is well marked.

3.30. The excited and timid condition is still marked and the head is frequently quickly moved up and down. The respirations are slightly increased in frequency.

3.45. The animal is still excited, and tosses the head about at times. Salivation is still present. At times the animal draws the left hind leg up and kicks at the side of the abdomen.

3.47. The timid and excited appearance of the animal is more apparent than before. Salivation is still present.

3.49. The animal urinates in the same manner as at 3.19.

3.55. The timidity and restlessness are still present and at times the head is rapidly moved up and down.

4.7. The same condition is present as when the animal was last seen.

4.10. The animal is slightly timid and restless. The animal gradually recovered and at 5.30 p.m. its appearance was normal.

(41) *HEIFER 1,742.*

Received 30 grains of Cocaine hydrochloride in solution subcutaneously on the 14/11/11, at 2.40 p.m.

2.50. p.m. The animal is restless, excited and salivating.

2.59. Restlessness, timidity, salivation, and excited look are still present.

3.11. The restlessness and timidity are slightly more marked than at 2.59.

The animal gradually recovered and at 3.42 the symptoms had disappeared to a great extent, the animal being much quieter. At 4.15 p.m. the appearance of the animal seemed to be normal.

(42) *HEIFER 1,751.*

Received 30 grains of Cocaine hydrochloride in solution subcutaneously on the 6/12/11, at 2.44 p.m.

2.46 p.m. The animal is very excited and restless, with a wild look in the eyes. It struggles violently to free itself from the chain by which it is tied.

2.48. The base of the tail is held in a slightly raised position.

2.53. The animal wears a very excited expression and is very timid. It is also very restless and keeps continually in motion, moving its position all the time and alternately raising each foot off the ground. It salivates and also defaecates. The faeces appear normal in quantity and character.

3.5. The marked restlessness, timidity and excitement are still present.

3.20. The animal is still very restless, excited and timid, and salivates freely. At short intervals successive small jets of urine are passed which dribble from the lower commissure of the labiæ vulvæ.

4.7. The animal is still timid and slightly restless. This condition of the animal gradually disappears until at 8.30 p.m. the animal has quite a normal appearance.

(43) *HEIFER 1,752.*

Received 30 grains of Cocaine hydrochloride in solution subcutaneously on the 6/12/11, at 2.39 p.m.

2.42 p.m. The animal is slightly restless.

2.45. The animal is still slightly restless. It defaecates. The faeces are normal in appearance.

2.50. Salivation is well marked and the back is arched.

2.58. Salivation is very marked and the animal is restless and timid.

3.10. The animal is very restless and keeps moving about. There is a wild excited expression of the eye apparent and salivation is still very marked.

3.13. The restlessness and salivation are still very marked and the animal makes an effort to expel the saliva from the mouth.

3.20. The animal is still restless, timid and salivating.

3.25. Urine is passed in a number of successive small jets.

4.7. The animal is still timid, restless and salivating.

5. The appearance of the animal is quieter.

8.30. The animal appears to be normal in condition.

(44) *HEIFER 1,751.*

Received 20 grains of Cocaine hydrochloride in solution subcutaneously on the 8/12/11, at 11.43 p.m.

11.46 p.m. The animal is timid and restless and defaecates.

11.50. The restlessness is very marked, the animal continually moving about. Salivation is also present.

12.4. The animal is still very restless, constantly moving about, alternately lifting each foot off the ground.

Sometimes it stands and sways backwards and forwards a few times. Defaecation occurs.

12.10. The restlessness and timidity are still present and profuse salivation is seen.

12.50. The symptoms noted on the last occasion are not so marked at this time though still present.

At 2 p.m. the animal had almost returned to a normal condition, and when the animal was seen at intervals up to 4.30, the symptoms were less and less marked, finally disappearing at this latter hour.

(45) *HEIFER 1,664.*

Received 20 grains of Cocaine hydrochloride in solution subcutaneously on the 8/12/11, at 11.42 a.m.

11.55. The animal is very timid and has a frightened expression on the face. Salivation is present and a twitching of the muscles and skin of the shoulders and hind quarters is seen at times. Urine is passed in successive small jets and in a spasmodic fashion.

12. The animal is very timid and is easily startled by a slight noise. The muscles and skin of the shoulders and hind quarters quiver and the back is arched. After slight straining defaecation occurs. The faeces are normal in appearance.

12.5. Up to this time the animal is very timid but is not restless, standing in the same place all the time and not being inclined to move out of this position. The quivering of the muscles and skin and the salivation are still seen.

12.10. The animal stands with the back arched and straining movements occur at intervals. It is very timid and is also restless.

12.50. The timidity, slight restlessness and salivation are still present. The quivering of the muscles and skin is not so marked as at 12.5.

2 p.m. The symptoms have almost disappeared and only slight timidity of the animal is noted.

The animal gradually recovered after this time and appeared to be in a normal condition when seen at 4.30 p.m.

(46) *HEIFER 1,822.*

Received 20 grains of Cocaine hydrochloride in solution subcutaneously on the 8/12/11, at 11.41 p.m.

11.45 p.m. The animal defaecates. The faeces are normal. Timidity and restlessness are also present.

11.50. At this time salivation is seen and marked restlessness is noted.

11.55. Urine is passed in a number of small quantities which dribble from the lower commissure of the labiæ vulvæ.

12.3 The animal is still timid and restless and again defaecates. The faeces being slightly smaller in quantity than before but otherwise normal.

12.10. The timidity, restlessness and defaecation are again noted as at 12.3 p.m., and salivation is still present.

12.50. The animal is still restless and timid. Salivation is not so marked as before.

2 p.m. At this time the animal was still slightly restless, but otherwise was better looking and the symptoms gradually disappeared from this time up to 4.30 p.m., at which time it was normal in appearance.

EXPERIMENTS MADE WITH STRYCHNINE HYDRO-
CHLORIDE.

(41) *HEIFER 1,748.*

Received 5 grains of Strychnine hydrochloride in solution subcutaneously on 13/11/11, at 3.10 p.m.

Up to 3.20 p.m. no other symptom is noted than that the animal is hypersensitive and easily startled and looks more alert than usual.

3.21. The animal is now standing with the head and neck outstretched. The respirations are frequent, being 60 per minute.

3.22. Marked spasmodic contractions of the muscles which cause the limbs to stiffen, the back to be arched and the head and neck to be drawn upwards and backwards, occur. These spasms occur at intervals up to 3.24 p.m., at which time the animal falls to the ground during one of the periods of contraction of the muscles. It lies there on its side with the muscles markedly contracted, the back being arched, the head and neck being drawn upwards and the limbs rigidly outstretched. The eyeballs are rolled slightly upwards so that the sclerotic below the cornea is visible, and the animal is markedly hypersensitive. The respirations become more and more laboured and the animal dies at 3.25 p.m.

(48) *HEIFER 1,828.*

Received $1\frac{1}{2}$ grains of Strychnine hydrochloride in solution subcutaneously on 14/11/11, at 2.46.

2.50. The animal stands with the head and neck depressed and has a nervous expression on the face.

2.51. Twitching of the superficial muscles and skin is noted and the animal is hypersensitive. Then the back is arched, the respirations become more frequent, marked contractions of the muscles in general occur. The animal falls to the ground during one of the spasms and lies there on its side with the legs rigidly outstretched, and with the back, upper part of the neck and also the head, forming a curve, the extremities of which point in an opposite direction to that in which the legs are pointing (opisthotonos).

The respirations are laboured, the animal is very hypersensitive. On occasions clonic spasms affect the muscles for short periods.

2.58. The spasmodic clonic contractions occur more rarely and last for only a few seconds.

3.9. The respirations are very shallow and laboured, and the muscles are rigidly contracted.

The animal dies at 3.11 p.m.

(49) *HEIFER 1,752.*

Received $\frac{1}{2}$ grain of Strychnine hydrochloride in solution subcutaneously on 14/11/11, at 2.48 p.m.

The animal was slightly hypersensitive at 3.18 p.m., and at 3.25 one marked spasmodic contraction of the muscles occurred which caused the animal to make a jumping movement. After this, however, no further symptoms were noted, the animal appearing to be perfectly normal in condition.

(50) *HEIFER 1,752.*

Received $\frac{1}{2}$ grain of Strychnine hydrochloride in solution subcutaneously on 17/11/11, at 11 a.m.

This dose had no visible effect on the animal.

(51) *HEIFER 1,822.*

Received $\frac{1}{2}$ grain of Strychnine hydrochloride in solution subcutaneously on 17/11/11, at 11.2 a.m.

This dose of drug produced no visible effect on the animal.

(52) *HEIFER 1,752.*

Received 1 grain of Strychnine hydrochloride in solution subcutaneously on 21/11/11, at 11.40 a.m.

This dose produced no visible effect on the animal.

(53) *HEIFER 1,742.*

Received 1 grain of Strychnine hydrochloride in solution subcutaneously at 9.45 a.m. 22/11/11.

10.25 a.m. The animal was lying down with the hind legs rigidly extended and the forelegs slightly flexed. The respirations

were accelerated, a pool of very liquid faeces lay behind the animal and the reflex excitability was markedly increased since marked spasmodic muscular contractions could be induced by gently striking the legs with the hand.

10.40. The condition was the same.

11. The animal at this time was standing up but was still slightly hypersensitive.

11.5. Rumination was noted though a slight hypersensitiveness still remained.

12 midday the animal was ruminating and otherwise normal.

(54) *HEIFER 1,664.*

Received 1 grain of Strychnine hydrochloride in solution subcutaneously on 22/11/11, at 9.45 a.m.

10.25 a.m. The animal when seen at this time was lying down on the right side with the hind limbs extended rigidly and the fore limbs slightly flexed. The respirations were slightly more frequent than usual and the animal was markedly hypersensitive. Very marked spasmodic contractions of the muscles of the body occurred on striking the legs with the hand. The head and neck were outstretched and the eyes slightly upturned.

10.40. At this time the appearance of the animal was the same as when last seen.

At 11 a.m. The animal was standing up and had walked out of the box as the door had been left open. It was still slightly hypersensitive and easily startled by any unexpected noise made in its vicinity.

At 12 noon the animal had completely recovered and was ruminating.

EXPERIMENTS MADE WITH CURARE.

(55) *HEIFER 1,750.*

Received $\frac{1}{2}$ gramme of Curare (Merck) in solution subcutaneously at 4 p.m. on 19/12/11.

4.30 p.m. The animal was feeding and appeared to be quite normal.

5 p.m. The animal appeared to be normal in condition. The animal was ruminating and apparently normal at 8.15 p.m.

(56) *HEIFER 2,216.*

Received $1\frac{1}{2}$ grammes of Curare (Lennon, Ltd., Capetown), in solution subcutaneously at 10.48 a.m., on 2/6/12.

A few minutes after the injection the animal appeared to be restless and excited.

10.57 a.m. There was noted a quivering of the muscles and overlying skin of the hind quarters, shoulder regions and fore-arms. The back was arched and the animal attempted to walk but the legs failed to support the weight of the animal, which fell down with the head outstretched.

11 a.m. The animal lay on its side on the ground, the limbs could be passively flexed with ease, the pulse was imperceptible and the respirations slow and shallow. The animal lay in an apparently inert condition, the corneal reflex was present.

At 11.5 a.m. the respirations ceased, the heart continuing to beat for about 30 secs. after the last respiration.

Death thus occurred in about $17\frac{1}{2}$ minutes from the time the drug was received.

(57) *HEIFER 2,224.*

Received $\frac{1}{2}$ gramme of Curare (Lennon, Ltd., Capetown), in solution subcutaneously at 2.50 p.m., on 12/7/12.

No effect of the drug was noted until 3.8 p.m., when the animal was noted to appear to be weak and unsteady on its legs walking when forced to do so in a hesitating and uncertain fashion with short steps.

3.10 p.m. The animal laid down in the normal position and was able to hold up the head and neck and move them freely from side to side but was unable to stand. The cutaneous sensibility of the regions of the back, sides of the body, flanks and fore and hind quarters was still present. The pulse was 26 and the respirations 24 per minute.

3.50 p.m. The animal was lying partly on the left side and partly on the sternum, the head and neck outstretched, the chin resting on the ground and the right hind leg extended. Pulse 76 and respirations 24 per minute. The cutaneous sensibility was as before.

4 p.m. The condition of the animal was the same as at 3.50.

4.15. The position of the animal remained the same. Pulse 80 per minute and weak, respirations 28 per minute.

4.30. The position of the animal was the same as before. Pulse 78 and respirations 24 per minute. Temperature 102.4. When the attendant was taking the temperature the head was momentarily raised but fell back immediately again on to the ground.

5 p.m. The animal maintains the sitting posture to which it was raised and can hold up its head. The pulse was 80 and the respirations were 22 per minute. The general appearance of the animal is much better.

6 p.m. The animal was much better but still unable to rise.

When seen at 7.45 p.m. the same evening the animal had risen of its own accord and had fed and was able to walk in a normal manner round the box, the symptoms having entirely disappeared.

SUMMARY OF RESULTS.

EFFECTS OF $\frac{1}{2}$ GRAIN OF ARECOLINE HYDROBROMIDE.

This dose was administered to Cattle 1,751 and 1,752.

The effects produced by this dose were very slight in both cases and consisted of very slight tenesmus, raising of the root of the tail and slight uneasiness. Slight salivation was noted in the case of animal 1,751 after 14 minutes. Both animals appeared to be in a normal condition about one hour after the administration of the drug.

In neither case did defaecation occur within this time.

EFFECTS OF 1 GRAIN OF ARECOLINE HYDROBROMIDE.

This dose was administered to four cattle: Nos. 1,742, 1,751, 1,752 and 1,822. Two of these animals, 1,751 and 1,752, had already received as above-mentioned the dose of $\frac{1}{2}$ grain of the drug.

In the case of No. 1,751 the effect of the drug was to cause the animal to raise the root of the tail, salivate, and make a grunting sound at intervals. Defaecation occurred 17 minutes after the drug was given (faeces being normal in quantity and consistency) and again 8 minutes after this the faeces being smaller in quantity than usual and more fluid in character than before. The symptoms had disappeared in 37 minutes.

No. 1,752 showed more marked symptoms than the last animal. In 6 minutes the animal was restless, hanging its head, the legs appeared weak, knuckling over on the right hind fetlock-joint, raising the root of the tail and making a grunting noise with each expiration. Straining, however, was not very marked at any time and defaecation occurred in 20 minutes (faeces being normal in quantity and consistency) and again 14 minutes afterwards.

The animal seemed normal in about one hour after receiving the drug.

No. 1,742. The symptoms in this case were quivering of the muscles and skin of the hind quarters, raising of the root of the tail, slight salivation and straining. Defaecation (faeces being normal in quantity and consistency) occurred also in this case and urine was passed in jets in 8 and 11 minutes after the injection of the drug.

No. 1,822. The effect produced in this case was to cause the production of a slightly dull appearance, raising of the root of the tail, slight quivering of the muscles and skin of the flanks, urination (the urine being passed in jets shortly after administration) and defaecation (normal) about an hour after the drug was received. The symptoms had disappeared in about two hours, the only abnormal condition noted at this time being a grinding of the incisor teeth and pad.

EFFECTS OF $1\frac{1}{2}$ GRAINS OF ARECOLINE HYDROBROMIDE.

The number of animals receiving this dose was three, viz.; Nos. 1,664, 1,742 and 1,822.

No. 1,742. Within two minutes of the receipt of the drug symptoms were noted, these being that the animal stood with the head hanging, and anxious expression on the face, straining slightly, and holding the root of the tail raised at intervals. A slight quivering of the muscles and overlying skin of the hind quarters was also seen. Later salivation occurred. These symptoms were more or less present up to about half an hour after the administration of the drug defaecation only occurred one hour and a half after the receipt of the drug and at a time when the animal appeared to be normal. The faeces were in greater quantity than usual and were very fluid in character.

No. 1,664. In the case of this animal whilst straining raising the root of the tail, weakness of the limbs and grunting were noted, yet this dose did not cause the occurrence of defaecation nor was salivation produced, and in the case of

No. 1,822 the dose of $1\frac{1}{2}$ grains caused similar but more marked symptoms than seen in the last case and in addition quivering of the muscles and skin of the flanks and hind quarters and salivation. Defaecation was not produced.

EFFECTS OF 2 GRAINS OF ARECOLINE HYDROBROMIDE.

Cattle Nos. 1,742, 1,751 and 1,752 received this dose on different dates and the effects were as follows:—

No. 1,752 showed symptoms of straining, raising of the root of the tail, grunting with each expiration and restlessness, and passed a small quantity of faeces which were more fluid than normal on three different occasions, that is, at 23 minutes, 30 minutes and 39 minutes after the receipt of the drug. Muscular weakness was very marked in this case and the quivering of the skin and muscles of the shoulders, arms, flanks and hind quarters was also seen. Salivation was also present. The symptoms had disappeared in about one hour after the drug had been administered.

No. 1,742. In this case whilst the symptoms were similar to those of the last animal they were not quite so marked. Defaecation occurred on two occasions, namely, 31 and 36 minutes after the drug had been injected, the faeces passed on the first occasion, being about equal in quantity to the amount passed during an ordinary defaecation whilst on the second occasion the faeces were more fluid in character than usual. The symptoms had disappeared in a little over an hour.

No. 1,751. The symptoms appeared quickly and were more marked than in the last case. Restlessness, muscular weakness, quivering of the skin and muscles of the shoulders, grunting, hurried respirations and raising of the root of the tail were all present and the animal also showed some slight symptoms of excitement becoming aggressive at one time. Defaecation occurred on four occasions, *i.e.*, at 18, 25, 39 and 46 minutes after receiving the drug. On the first and second occasion a small quantity of faeces was passed which was not much more fluid than normal, then a small quantity of liquid faeces was voided and finally a large quantity of faeces of a more fluid character than usual was passed. The symptoms had practically disappeared in about an hour's time.

EFFECT OF 3 GRAINS OF ARECOLINE HYDROBROMIDE.

Only one animal, No. 1,742, received this dose. The symptoms were only slightly more marked than those produced by 2 grains of the drug and defaecation occurred within 34 minutes of the injection of the drug, the faeces being in very small quantity. Faeces were again passed in about 14 minutes, and on this occasion the quantity was about the same as is seen during normal defaecation.

EFFECTS OF $\frac{1}{2}$ GRAIN OF VERATRINE HYDROCHLORATE.

Three animals, viz., 1,822, 1,664 and 1,751, received this dose.

This dose produced practically no effect on No. 1,751, but No. 1,822, after the injection, appeared dull, the ears hung down in a drooping fashion, the respirations became more frequent and at times a grunting noise accompanying the expirations was heard. The animal also ground the incisor teeth and pad together at intervals.

Defaecation occurred over an hour and a half after the animal received the drug.

No. 1,664 showed more marked symptoms than the last animal and defaecated (faeces being normal in quantity and consistency) about 20 minutes after the injection of the drug. As well as this restlessness and uneasiness shown by the animal pawing the ground and also grinding of the incisor teeth and pad was also noted. Straining was also present and the respirations were increased in frequency. A grunting sound accompanying the expirations was heard at times.

EFFECTS OF 1 GRAIN OF VERATRINE HYDROCHLORATE.

Four animals, viz., Nos. 1,664, 1,822, 1,751 and 1,742 received this dose and the effects were as follows:—

No. 1,664. Showed symptoms of restlessness and uneasiness, pawing the ground about 5 minutes after the injection and urinated in another 7 minutes. The animal appeared to be very dull, the ears were drooping and a stringy saliva dripped from the mouth. A grunting sound was heard accompanying the expirations, and this later became more like a groan. Straining was also seen, and this was followed by vomiting 37 minutes after the drug was injected. Vomiting occurred on only one occasion and defaecation did not occur.

No. 1,822. Up to an hour after the injection the only symptoms noted were a general appearance of dullness, increase in the frequency of the respirations, salivation, and the animal appeared as if about to vomit on a couple of occasions. Vomiting occurred an hour after the injection, and for a time after vomiting was noted the animal appeared very dull-looking, standing with the head hanging and the ears drooping. It recovered completely some hours after this. Defaecation was not noted.

No. 1,751. The symptoms in this case were marked. Dullness, straining, salivation were noted 4 minutes after injection and vomiting occurred in another 12 minutes. This was the only occasion on which vomiting was noted. Defaecation occurred 22 minutes after the injection and the other symptoms such as straining, groaning at intervals, salivation, raising of the root of the tail, drooping of the ears, standing with the back arched, lasted for a long time. Seven hours after the injection the animal was lying down and appeared unable to arise except with great difficulty. The ears drooped and the head was turned round so that the nose rested in the flank, the animal appearing to be very ill. On the next day the animal had, however, completely recovered.

No. 1,742. The symptoms in this animal were not very marked. About 2 minutes after the injection urination occurred and 15 minutes afterwards defaecation was noted, the animal appeared slightly restless. When seen an hour and a half later it appeared to be normal, and had defaecated during the interval.

EFFECTS OF 1½ GRAINS OF VERATRINE HYDROCHLORATE.

Three animals, Nos. 1,822, 1,664, and 1,742 received this dose.

No. 1822. The effects produced by this dose on this animal were very marked. Symptoms of marked tenesmus and salivation occurred 8 minutes after the injection. The straining, however, was only followed by the expulsion of jets of urine. At 12 minutes after the injection food was regurgitated and expelled from the mouth, but not in the same way as was noted during the vomiting seen in the other cases. The straining was noted for some time. In 17 minutes time from the receipt of the drug some food was regurgitated and expelled in the same manner as before. Marked excitement was also noted, as was also weakness of the muscles of the limbs and drooping of the ears. The symptoms passed off over 4 hours after the injection. Defaecation was not noted.

No. 1,664. In the case of this animal, restlessness, excitement, straining, profuse salivation and drooping of the ears also occurred following the injection, and vomiting occurred at 25, 27 and 28 minutes after the injection. Efforts to vomit were noted 37 minutes after the injection, but no material was vomitted at this time, and the same condition was noted 13 minutes later. A very small quantity of faeces was passed about 2½ hours after the injection. The symptoms had not entirely disappeared 4 hours after the drug was injected.

No. 1,742. Also showed symptoms of salivation, uneasiness, and straining. Defaecation occurred within 9 minutes from the time of receipt of the injection, and vomiting occurred within 10 minutes from this time. The symptoms had disappeared in about two hours from the time of administration of the drug.

EFFECTS OF 1 GRAIN OF ARECOLINE HYDROBROMIDE, AND 1 GRAIN OF VERATRINE HYDROCHLORATE, IN COMBINATION.

This dose was given to two animals, viz., Nos. 1,751 and 1,664.

No. 1,751. Appeared to be uneasy and slightly restless within 4 minutes of the injection, and 15 minutes after this drooping of the ears, salivation, and a grunting sound accompanying the expirations was present. Later on marked salivation, groaning and raising of the root of the tail was noted, and 29 minutes after the injection marked tenesmus and vomiting occurred. Vomiting and marked straining accompanied by the passage of fluid faeces occurred 8 minutes later. About an hour after this the animal was standing with the head hanging, the tail slightly raised, was salivating and

had defaecated and vomitted once in the interval. About 2 hours and a quarter after the injection the dull appearance, salivation, drooping of the ears, raising of the tail, and groaning at intervals were still present, but these symptoms were absent, and the animal appeared to be normal, in another hour and a quarter.

No. 1,664. In the case of this animal restlessness, raising of the tail, straining and salivation were also present, but not so marked as in the case of the last animal. Vomitting occurred on two occasions over an hour after the injection, whilst defaecation occurred about 2 hours and a half after the receipt of the drug, and at this time the animal appeared to be normal in condition.

EFFECTS OF $1\frac{1}{2}$ GRAINS OF ARECOLINE HYDROBROMIDE, $1\frac{1}{2}$ GRAINS OF VERATRINE HYDROCHLORATE, IN COMBINATION.

This dose was administered to two cattle, viz., No. 1,742 and 1,822.

No. 1,742. This animal showed increased frequency of the respirations, quivering of the muscles and overlying skin of the hind-quarters and raising of the root of the tail 11 minutes after the injection. Later straining tympany and grunting were noted, and the salivation was more marked. These symptoms still later became somewhat more marked, and in one hour and 10 minutes from the time of injection, defaecation (faeces normal) occurred. About $2\frac{1}{2}$ hours after the injection the animal had almost recovered and had not vomitted, and 15 minutes later defaecation again occurred.

No. 1,822. Within 4 minutes of the injection the animal is uneasy looking, the root of the tail is raised and the respirations are frequent and hurried, being 84 per minute, and urination occurs. Later the animal stands, with the head hanging, the ears drooping, and salivation is seen. Still later the straining becomes very marked, the animal standing with the hind legs outstretched behind it, quivering movement of skin and muscles of the shoulders and hind-quarters being present. Following this the legs appear to be weak, a mucous r le is heard in the larynx and salivation becomes very profuse. The straining continues, and fruitless efforts to vomit were made. The animal was also somewhat timid. These symptoms gradually disappeared, and the animal was almost normal in appearance $2\frac{3}{4}$ hours after the injection.

EFFECTS OF $\frac{1}{2}$ GRAIN OF ARECOLINE HYDROBROMIDE AND $\frac{1}{2}$ GRAIN OF STRYCHNINE SULPHATE, IN COMBINATION.

Two animals, Nos. 1,751 and 1,752, received this dose.

The effects produced were as follows:—

No. 1,751. The first visible symptoms were that the animal stood with the head hanging, the root of the tail raised and an uneasy look on the face. Later a quivering of the muscles and skin

of the shoulders and the region of the dewlap appeared, and salivation and a grunting sound accompanying the respirations were also noted. These symptoms were not very marked, however, and tenesmus was not apparent. Defaecation occurred 23 minutes after the injection (faeces normal), and again in 14 minutes after this. On the second occasion the faeces were in smaller quantity. The symptoms had disappeared in about 43 minutes from the time of receipt of the drug.

No. 1,752. The general symptoms in the case of this animal were similar to those of the last, save that straining was slightly more marked. The animal appeared to have recovered in about 37 minutes from the time of injection, but faeces of normal character and quantity were passed about 27 minutes after this time.

EFFECTS OF $1\frac{1}{3}$ GRAINS OF ARECOLINE HYDROBROMIDE AND $\frac{1}{2}$ GRAIN OF STRYCHNINE SULPHATE, IN COMBINATION.

Only one animal, No. 1,742, received this dose. Symptoms appeared within a few minutes of the injection, and consisted of raising of the root of the tail, then straining, salivation, quivering of the muscles and skin of the regions of the shoulders, flanks and hind-quarters. Later these symptoms, excepting the straining, became more marked in character and following this and about 11 minutes from the time of injection well-marked spasmodic contractions of the muscles were noted. These spasmodic contractions eventually caused the animal to fall to the ground, where it lay with all the muscles rigidly contracted, the head and neck outstretched, and the limbs rigidly extended, save on occasions when this condition gave way to clonic spasms. Hypersensitiveness was also present. Defaecation occurred five times while the animal was down. On the first occasion, about 42 minutes after the injection, the faeces were normal, both in quantity and appearance, on the second occasion, 9 minutes later, the quantity of faeces was smaller and accompanied by flatus, tympanitis being then present. Three minutes later a small quantity of liquid faeces was passed, and in another two minutes a large quantity of faeces which were very fluid in character, whilst 3 minutes after this and after straining, a small quantity of semi-liquid faeces were expelled. After this the animal rose and appeared to have recovered in about an hour and 18 minutes from the time the drug was injected.

EFFECTS OF 1 GRAIN OF ARECOLINE HYDROBROMIDE, 1 GRAIN OF VERATRINE HYDROCHLORATE, $\frac{1}{3}$ GRAIN OF STRYCHNINE SULPHATE, IN COMBINATION.

This dose was administered to four animals, viz., Nos. 1,664, 1,751, 1,742 and 1,822. The effects were as follows:—

No. 1,664. In the case of this animal restlessness and aggressiveness is noted in about 2 minutes after the injection. Later the animal stands with the head hanging, the root of the tail raised and

grunting slightly at times. Still later well-marked straining movements were noted, as well as spasmodic contractions of the muscles, which latter occurred 23 minutes from the time of injection.

Tenesmus and salivation were well-marked symptoms, but defaecation only occurred once, this being 28 minutes from the time of injection, and the faeces were normal in appearance, except that the quantity passed was smaller than usual. The animal had almost recovered in an hour and a half after the injection, and an hour after this time appeared to have completely recovered.

No. 1,751 showed rather more marked symptoms. Uneasiness, dullness and rapid shaking of the head from side to side were noted 5 minutes after the injection. Later the animal stood with the head hanging, the ears drooping and the tail raised at the base, and was straining. Following this, quivering of the muscles and skin, of the shoulders, salivation and grunting at intervals were noted. The grunting was later replaced by a groaning sound. Spasmodic contractions of the muscles were noted 25 minutes after the injection. The animal went down, but rose again in a couple of minutes. Faeces of normal character were passed 23 minutes after the injection, and the same occurrence was noted in an hour from the time the drug was received. Attempts to vomit were seen about 51 minutes after the injection, but only some saliva was ejected. Some more faeces were passed over an hour and a half from the time of injection, and on this occasion they were smaller in quantity and more fluid than is usual during normal defaecation. The animal appeared to be practically normal in about $3\frac{1}{2}$ hours from the time the drugs were administered.

No. 1,742. This animal, a few minutes after the injection, was pawing the ground with the fore-foot, appeared uneasy, held the root of the tail in a raised position, and a quivering of the muscles and skin in the regions of the triceps extensor cubiti muscle behind the shoulder joint was noted. Later the legs appeared to be weak, and, straining, slight salivation and slight tympany were seen. The salivation later became more marked. Faeces of normal character and usual quantity were passed 40 minutes after the injection. Defaecation occurred again over three quarters of an hour from the time the drugs were injected, and in an hour and three quarters from the time of injection some more very fluid faeces were passed. The symptoms had almost disappeared in 3 hours from the time of the injection.

No. 1,822. This animal within about 8 minutes from the time of injection was standing with the head hanging, the root of the tail raised, and was straining markedly. The legs appeared to be weak. Later on excitement, weakness of the extensor muscles of the fore limbs manifested by knuckling over at the fetlock joints and involuntary flexion of the carpal joints appeared, and the movements of the fore limbs were uncertain and improperly co-ordinated.

Following this, straining, dullness, drooping of the ears and marked salivation and slight tympany were seen. Defaecation occurred between 40 minutes and $1\frac{1}{2}$ hours from the time of injection, the faeces being normal in character, and the symptoms had disappeared in about $3\frac{1}{2}$ hours from the time the drugs were administered.

EFFECTS OF $1\frac{1}{2}$ GRAINS OF ARECOLINE HYDROBROMIDE,
 $\frac{1}{2}$ GRAIN OF STRYCHNINE SULPHATE, AND 30
 GRAINS OF COCAINE HYDROCHLORIDE, IN COM-
 BINATION.

One animal, No. 1,742, received this dose.

Quivering of the muscles and skin, of the shoulders and hind-quarters, and raising of the root of the tail were present 3 minutes after the injection. Later marked timidity, well-marked salivation, urination (the urine being passed in a number of successive small jets), and increased frequency of the respirations were present, in addition to the beforementioned symptoms. Defaecation occurred about an hour after the injection, the faeces being normal in appearance, and the symptoms had disappeared in about 2 hours from the time the drugs were administered.

EFFECTS OF $\frac{1}{2}$ GRAIN OF ARECOLINE HYDROBROMIDE, $\frac{1}{2}$
 GRAIN OF STRYCHNINE SULPHATE, AND 20 GRAINS
 OF COCAINE, IN COMBINATION.

No. 1,751 received this dose, and a couple of minutes afterwards was restless, excited, shaking the head from side to side, holding the root of the tail raised, and salivating. The excitement and timidity became more marked later, and quivering of the muscles, and skin of the shoulders and hind-quarters, and quivering of the lips were also present. Slight straining and the ejection of urine in a number of successive small jets were also seen. Defaecation occurred 21 minutes after the receipt of the dose, the faeces being normal in character and the symptoms had practically disappeared in a couple of hours from the time of injection.

EFFECTS OF $\frac{1}{2}$ GRAIN OF ARECOLINE HYDROBROMIDE, 1
 GRAIN OF STRYCHNINE SULPHATE, 20 GRAINS OF
 COCAINE HYDROCHLORIDE, IN COMBINATION.

No. 1,752 received this dose, and as a result died after showing the symptoms of Strychnine poisoning.

EFFECTS OF 20 GRAINS OF COCAINE HYDROCHLORIDE.

Three cattle, Nos. 1,751, 1,664 and 1,822, received this dose.

No. 1,751. Showed symptoms of restlessness 3 minutes after the receipt of the injection, and also defaecated at this time, and salivation was noted in 4 minutes afterwards. Defaecation again

occurred in 21 minutes from the time of injection. Restlessness, timidity and profuse salivation were well marked symptoms which passed off after a few hours.

No. 1,664. Showed the symptoms of timidity and restlessness. In addition, twitching and quivering of the skin and muscles of the shoulders and hind-quarters and tenesmus were also noted. Salivation was seen 13 minutes after the receipt of the injection, and jets of urine were also passed at this time. Defaecation occurred in 18 minutes from the time of injection of the drug.

No. 1,822. In the case of this animal defaecation occurred in 4 minutes, salivation in 9 minutes, and urination in 14 minutes from the time of injection of the drug. Defaecation again occurred in 22 and 29 minutes from the time of receipt of the drug.

EFFECTS OF 30 GRAINS OF COCAINE HYDROCHLORIDE.

This dose was given to three animals, Nos. 1,742 (on two occasions), 1,751, and 1,752.

No. 1,742. On the *first* occasion this animal was restless, excited, and passing jets of urine in 7 minutes from the time of injection, and defaecation occurred in 12 minutes from this time. In 13 minutes from the time of injection salivation was present, and in 37 minutes from this time urination again occurred.

The symptoms lasted for a few hours.

On the *second* occasion, the restlessness, excitement and salivation were noted in 10 minutes after the injection. These, however, were the only symptoms noted, and the animal appeared to have recovered in a few hours time.

No. 1,751. Showed marked restlessness, and excitement commencing within 2 minutes from the time of injection, and salivation, and defaecation were seen to occur within 9 minutes from this time. Urination was noted 36 minutes after the administration of the drug, and the symptoms gradually disappeared after some hours.

No. 1,752. Showed symptoms of restlessness in 3 minutes from the time of injection, while defaecation, salivation and urination occurred respectively in 6 minutes, 11 minutes and 46 minutes from this time. The symptoms passed off in a few hours time.

EFFECTS OF $\frac{1}{2}$ GRAIN OF STRYCHNINE HYDROCHLORIDE.

This dose was given to two animals, Nos. 1,752 (on two occasions), and No. 1,822. It will be seen that on the first occasion one marked general muscular spasm occurred in the case of No. 1,752 in 37 minutes from the time of injection, but on the second occasion, and also in the case of No. 1,822, this dose produced no visible symptoms.

EFFECTS OF 1 GRAIN OF STRYCHNINE HYDROCHLORIDE

Three animals, Nos. 1,752, 1,742 and 1,664 received this dose. No visible symptoms were noted in the case of No. 1,752, but as will be seen in the record of the experiment, marked symptoms were produced in Nos. 1,742 and 1,664. These symptoms, however, rapidly disappeared, the animals quickly recovering.

EFFECTS OF $1\frac{1}{2}$ GRAINS OF STRYCHNINE HYDRO- CHLORIDE.

This dose was given to one animal, No. 1,828, and in 4 to 5 minutes from the time of injection the symptoms produced by the drug were visible. Death occurred in 25 minutes from the time of injection.

EFFECTS OF 5 GRAINS OF STRYCHNINE HYDRO- CHLORIDE.

This dose given to one animal No. 1,748 caused its death in 15 minutes from the time of injection.

In concluding it is considered unnecessary to recapitulate here the experiments made with Curare, as the details of these three experiments may be readily seen on reference to the previous records.