Reports on the outbreak of rabies among deer in Richmond Park during the years 1886-7 / by A.C. Cope and Victor Horsley ; presented to both Houses of Parliament by command of Her Majesty.

REPORTS

ON THE

OUTBREAK OF RABIES

AMONG

DEER

IN

RICHMOND PARK DURING THE YEARS 1886-7,

BY

MR. A. C. COPE,
CHIEF INSPECTOR, AGRICULTURAL DEPARTMENT, PRIVY COUNCIL OFFICE,

AND

PROFESSOR VICTOR HORSLEY, B.S., F.R.S., &C.,
PROF. SUPERINTENDENT OF THE BROWN INSTITUTION, WANDSWORTH ROAD, S.W.

Presented to both Houses of Parliament by Command of Her Majesty.

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Reports on the Outbreak of Rabies among Deer in Richmond Park during the years 1886–7.

To the Lords of the Committee of Council for Agriculture.

My Lords,

I have the honour to submit two reports on the subject of the hitherto hardly recognised disease, Rabies among deer.

In the spring of last year (1887) my attention was called to the existence of a fatal malady among the deer in Richmond Park by Mr. Lupton, the Veterinary Inspector of the district, and from his description of the symptoms which he had observed I was led to suspect that the disease was Rabies, a suspicion which Mr. Lupton shared. At my request two diseased animals, a buck and a fawn, were sent to the Royal Veterinary College, and it did not require much observation of the behaviour of these animals to convert the suspicion into a strong conviction. The question was, however, too important to be permitted to rest without a positive answer when the means of resolving the doubt were within reach. Accordingly I forwarded the necessary portions of the diseased organs of the deer which died soon after admission to the College to Professor Victor Horsley, in order that he might apply the crucial test of inoculation; and at the same time I instructed the Chief Inspector of the Department, Mr. A. C. Cope, to make an inquiry into the circumstances under which the outbreak occurred. Mr. Cope's report furnishes a complete history of the case.

In reference to the means by which the virus of Rabies was conveyed from the diseased to the healthy deer, Mr. Cope's observations are conclusive, as they place beyond doubt the fact that rabid deer did attack and bite their companions. This circumstance explains the long continuance of the disease in the herd.

Generally among herbivora, cattle and sheep which are most often the subjects of Rabies from the bite of a rabid dog, the disease ceases with the death of the animals which were bitten. But in the instance of the deer it appears that the animals became extremely agressive when suffering under excitement.

Professor Horsley's report is a valuable contribution to the literature of the subject, and illustrates the importance of experimental research in dealing with problems in pathology. It may now be asserted without hesitation that the obscure disease among the deer was Rabies, and in any future outbreak the mere observation of the symptoms exhibited by the diseased animals will, in the light afforded by Professor Horsley's experiments be sufficient to enable the observer to form a correct opinion as to the nature of the malady.

I have the honour to be,
My Lords,
Your Lordships' most obedient servant,
G. T. Brown.

Agricultural Department,
Privy Council Office.

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Report on the Outbreak of Rabies among Deer in Richmond Park during the years 1886-7, by Mr. A. C. Cope.

It has long been known that Rabies can be communicated to nearly all warm blooded animals by natural or artificial inoculation.

Record of Rabies in France and Germany.

In France, where the statistics of Rabies are very carefully compiled, and where more cases of the disease are reported than in any other country in Europe, 1,539 dogs, 39 cats, 99 cattle, 13 horses, 11 sheep, 9 swine, 1 mule, and 1 goat were returned affected in the 12 months ended July, 1887; no mention is, however, made of deer in this list, and from a letter which I have received from M. Cagny, Secretary to the Central Veterinary Medical Society in Paris, it appears that there is no record of this disease having been recognised among deer in France.

In Germany also the disease is very prevalent, 438 dogs, 5 horses, 92 cattle, 32 sheep, and 72 swine were reported affected in 1886, but here again no mention is made of Rabies among deer.

In a letter which I have received from Professor Müller, of the Royal Veterinary School at Berlin, he states: "I know "nothing about outbreaks of Rabies in deer in Germany. I have "asked the Professors of our Institute, and have received the "same answer. I find in the German literature a remark about "epidemics of Rabies among foxes in the years 1823–26, and "a notice that some cases of Rabies have been observed at "the same time among deer. I have sought information from "the Professors of the Academy of Foresters, but there is "nothing known about Rabies among deer. Nobody remembers "a single case of Rabies among deer. I am convinced that "deer can become affected with Rabies when bitten by a mad "dog or by a mad fox as any other animal belonging to the "mammalia. But such a disease must occur very seldom, "because deer are very much inclined to take fright when a dog "is near, and escape biting by their fleetness. I therefore doubt "the possibility of a large number of deer falling ill by Rabies at "the same time. But the circumstances may be different in "England, where deer are living, if I am rightly informed, mostly "in parks in a half tame condition, and not in forests as in "Germany. I am not aware that any case has been observed "with certainty in which Rabies has been transmitted from "herbivora to herbivora, and I cannot think that deer will bite."

It is evident from these inquiries that Rabies has never been identified among deer, either in Germany or France, and although the disease has never been recognised among these animals in

this country, there is, I think, very good grounds for believing that it has from time to time made its appearance among the herds of half tamed deer which are kept in private parks in Great Britain.

I am indebted to Mr. Sawyer, the keeper of Richmond Park (whose experience and knowledge of the habits of deer has materially assisted me in making my inquiries), for the following accounts of outbreaks of disease among deer in this country, in which the symptoms presented bear such a strong resemblance to those observed in the deer in Richmond Park, that I have little doubt that former outbreaks of Rabies have occurred among these animals, and, what is still more interesting, it appears to have been transmitted from deer to deer, a circumstance which is extremely unusual in the herbivora, the rule being that only those animals of a herd which have been first bitten fall victims to the disease.

Former outbreaks of disease among deer believed to have been Rabies.

Among the outbreaks of disease in deer communicated to me by Mr. Sawyer is one which occurred in the Grove Park, the property of Lord Clarendon, in the year 1795. The description of the symptoms is as follows :—"Some of the animals when they "first showed evidence of being unwell seemed giddy, turning "round, and sometimes running forward, as is often seen in a "deer when shot before it falls. Others seemed quite stupid, "crept about by themselves, and were found dead, the skins "upon the foreheads of some, and upon different parts of the body "of others, being quite thin and parched."

It would appear that at the same date a disease was prevailing among the deer in Windsor Great Park, and that it lasted for some time, for in a letter from an ancestor of Mr. Sawyer's to the keeper at Cassiobury Park in 1798, he says, "I am sorry to "hear that the distemper has destroyed so many deer at Cassiobury, "and that it should remain so long in Windsor Great Park."

In 1872 an outbreak of disease appeared among the deer in the park at Eaton Hall, Cheshire, the property of his Grace the Duke of Westminster. The symptoms described to Mr. Sawyer by William Roberts, the park keeper, are in many respects identical with those observed in the deer in the recent outbreak in Richmond Park. "The park at Eaton Hall contained about 400 deer "and 250 sheep. The first animal found affected was a buck. "This animal had broken his horns, which were hanging by the "velvet. Three days after he was found dead. The disease "appeared among the herd in June 1872, and continued for a "very long period, until about 350 died. The first symptom "noticed was pointing their noses in the air and sniffing, next "day they were seen running at other deer. They were then "seen to run at other deer and butt and fight at the trees, in "fact they drove at anything dead or alive, until they rubbed "the skin clean off their foreheads, in some instances until the "bone was left bare, and they invariably died after an interval "of from two to eight days."

Again in 1880 cases of apparent madness occurred among the deer at Swythamley Park Staffordshire, the property of Mr.

Philip Brocklehurst. "Some of the animals were seen charging "furiously and endeavouring to bite any other deer which "approached them, and even chased hares and rabbits. Seeing "the keepers watching them these animals, usually so timid, "rushed at the men like wild bulls and were shot.

"On examination, no bite or wound was discovered, but the "top and back of their heads had the hair rubbed off, and looked "puffed and swelled, having the appearance of a leather foot-"ball."

About six years ago the deer in Cassiobury Park (which belongs to the Earl of Essex) were affected with a disease which presented the following symptoms:—"The affected animals ran "about the park in a frantic manner, rushing against trees and "thereby injuring themselves; they attacked other animals "furiously, and many of them died."

In none of these outbreaks does Rabies appear to have been suspected, nor was there any evidence to show that Rabies was known to exist in the districts where they occurred. It must, however, be borne in mind that rabid dogs wander away from their own districts and not unfrequently roam about the country without their presence being known. Most of the parks in which deer are kept have their gates left open, or have footpaths through them which would make it an exceedingly easy matter for a dog to pass in and out of a park without being observed.

The outbreak which I am now about to report upon occurred among the deer in Richmond Park, in the county of Surrey, towards the close of a serious outbreak of Rabies which existed among dogs in London and its suburbs.

History of the outbreak of Rabies among the deer in Richmond Park.

Richmond Park is one of the royal parks, it is 2,300 acres in extent, and is surrounded by fences or walls There are five carriage entrances into the park, and about 1,200 deer are usually kept there, besides a certain number of grazing cattle. Most of the deer are of the kind known as fallow deer, but in a remote part of the park there are a few of the larger kind known as red deer. The park is open to the public at all times of the day, but the gates are closed in the evening. It would therefore be easy for a dog to enter the park at any time during the day, and, if fleet enough, bite a certain number of deer, and make its exit without being seen.

It should here be stated that it is the habit of the deer to separate into herds of about one or two hundred; further, that these herds rarely leave the part of the park in which they are accustomed to pasture, and it is a noticeable fact that the animals of these respective herds rarely intermix. This habit of segregation on their part will account for the disease being confined to the infected herds, as will hereafter be seen.

The first intimation of the existence of any disease among the deer was the discovery by the keepers, towards the end of September 1886, of a doe, which was suckling a fawn, staggering about in the herd pasturing near the entrance gate at East Sheen. The animal was killed, and it was then found that the hair was rubbed

off the head, giving it the appearance described in the accounts of the outbreaks at the Grove in 1795, at Swythamley, and at Eaton Park. (Mr. Sawyer informs me that when a doe has a fawn she will attack a dog, and under these circumstances it is quite possible that this and other does in the herd may have been bitten by a stray rabid dog.)

Some days after the death of this doe, the keepers noticed others of the deer in the same herd behaving in a very erratic manner. At first they were constantly rubbing their heads against the stems of trees or on posts, and with such force that their hair was in some cases entirely removed. They were frequently seen to be biting the skin about their shoulders and bellies until they were perfectly raw, tearing out their hair, and at times they charged at the other deer.

As a rule the animals appeared to feed up to the time of their death, and when the keepers opened them they found within the stomachs pieces of stick, and other things which they would have ordinarily refused for food. All the animals were represented as showing the same symptoms, some being very violent before dying, and they usually died within two or three days of being first observed to be unwell.

It was at first thought that the animals had died from eating some poisonous food. The contents of the stomachs were analysed on the suggestion of Mr. Lupton, the Veterinary Inspector of the Local Authority, but no poisonous food or substance could be found therein. The pastures were also searched for poisonous plants, but without success. The disease spread slowly through the herd, the animals dying at the rate of four a week; and by April 1887, 160 had died, all presenting decided symptoms of some form of nervous disease, which in many instances ended in paralysis, and always in the death of the animal.

Departmental inquiry into the nature of the disease.

At this period Mr. Lupton suggested that the attention of this Department should be called to the outbreak, and on visiting the park on April 17th I found, first, that the disease had up to that time been entirely confined to the herd grazing nearest to the East Sheen gate; and, secondly, that, although the herd had been removed from their former pasture, and had been enclosed in another part of the park, where their mode of feeding had been entirely changed, the animals continued to die at about the same rate and with the same symptoms. From this fact I concluded the disease had not originated in the feeding of the animals. When watching the herd I observed that they presented several of the symptoms which are described in the outbreaks previously referred to. One of the earliest indications of their being affected was that of throwing the head back and sniffing the air, as described in the Eaton Hall outbreak. After a few moments they would start at a gallop, as though they had been suddenly alarmed, and they as suddenly stopped and again commenced to graze.

It being impossible to devote sufficient time in the park to study the symptoms and nature of the disease, a buck and a fawn

were forwarded to the Royal Veterinary College; the fawn, however, died four hours after admission. A post-mortem examination was made of this animal. The first stomach was found to contain a fair amount of the usual food; mixed with it was a considerable quantity of hair. The vessels of the brain appeared to be somewhat congested. The medulla of this animal was taken to the Brown Institution, where, under the direction of Professor Horsley, rabbits were inoculated, which died of Rabies.

Inoculation of rabbits with portions of spinal cord of rabid deer.

The buck became so wild and violent that the persons in charge were unable to enter the loose box in which it was placed. This animal died two days after its arrival, and other rabbits were inoculated with portions of its spinal cord, with the same results as in the former case.

On April 18th another buck was sent to London; this time to the Brown Institution. It was placed in a loose box, and presented the same violent symptoms as the animal that died at the Veterinary College; but in this case paralysis of the limbs set in before death.

These animals, usually so timid, would rush at any person looking at them, and bite at a broom or a stick if put through the bars of the door.

Result of the inoculation of a dog.

Although the inoculation of the rabbits resulted in their death from paralytic Rabies, I suggested to Professor Horsley the desirability of inoculating a dog to see if true Rabies could be produced in that animal. Accordingly, on May 26, a dog was inoculated with part of the spinal cord of another affected deer which had been sent up from Richmond Park. Eleven days after the inoculation, *i.e.*, June 6th, the dog presented symptoms of Rabies, and died on June 12th; the autopsy was conducted by Professor Horsley, who found all the characteristic symptoms of Rabies present.

It having now become certain that the disease among the deer in Richmond Park was true Rabies, it was considered desirable to stamp out the disease as soon as possible. The animals were still confined to the enclosure in which they had been placed, and Mr. Sawyer was advised to forthwith shoot any animal presenting the least indication of the disease. This was accordingly carried out.

Extension of the disease to another herd of deer in Richmond Park.

The next feature in connexion with this outbreak was the appearance of the disease in the month of June in the herd which had been grazing in the park next to the infected herd. As soon as the disease was detected in this second herd the whole of the animals were driven into an enclosure and this time divided into small lots. The animals in this herd suffered in a larger proportion than the previous herd, and the disease continued with more or less virulence until September 24th, by which time 264 animals had succumbed to the disease. Since that date no further cases have been reported.

Total losses during the outbreak.

There some points, however, in connexion with this outbreak which are worthy of consideration, and this being the first occasion in which Rabies has been identified in deer, a description of the symptoms of the disease will not be devoid of interest.

Symptoms diagnostic of Rabies in deer.

The earliest symptom observed in most cases was that of throwing their heads back on the shoulders and keeping their noses pointed to the sky ; the animals are then seen to make sudden starts and gallop right away from the rest of the herd.

Next they begin to rush at other deer, also at posts, rails, trees, or other fixed objects. When rushing at the latter they bruise their heads between the horns and rub off the hair in patches. This may be looked upon as a prominent sign in the early stages of the disease.

Subsequently, instead of being timid, they become unusually bold, charging at other deer, and causing the greatest alarm in the herd, and if kept in close confinement they will rush at persons or objects brought in their way. At times a fawn will be seen to pursue and bite at old deer in a manner quite unnatural.

After a few days illness the animals invariably die, some presenting violent paroxysms, while in other instances paralysis of the limbs becomes most marked before death.

Further, it is now clearly established that Rabies can be transmitted from herbivora to herbivora by the ordinary means of infection, viz., the saliva.

This assertion is, I think, warranted by the fact that although these animals were isolated for a period of six months, a time far beyond the recognised period of incubation in Rabies, the disease continued to progress in the herds after all possible means by external infection had been cut off.

The most important question, however, which arises out of this outbreak, is the means by which the virus was transmitted from animal to animal.

It has been found that although the deer attempted to bite one another, they did not really penetrate the skin with their teeth, but only produced sores thereon ; at the same time the diseased animals left a certain amount of saliva on the skins of those which were bitten. It was observed on several occasions when a healthy deer had been bitten by a rabid one, that the animal bitten licked the spot, no doubt with the desire to soothe the irritation caused by the pinch or bite, and Mr. Sawyer informed me that it is a common practice for deer to lick the coats of other deer.

Experiment proving that Rabies can be transmitted from herbivora to herbivora by the bite of a rabid animal.

As a means of testing whether the disease could be communicated by the bite, a rabid doe was placed in a shed with a healthy buck, which had been previously entirely isolated from the infected herds. Immediately the rabid doe was placed with the other animal she flew at it like a dog, and bit it about the ears and neck ; the healthy deer was carefully watched, and on the morning of the 19th day it showed symptoms of disease, it became furious, and died in a very short time. This experiment conclu-

sively proves that Rabies can be conveyed by the bite of the rabid herbivora to another animal, and was a means of transmitting the infection in this outbreak; the absence of upper incisors in these animals must have rendered this method of inoculation very uncertain in its result, and no doubt accounts for the slow progress of the disease among the herd, a circumstance which throughout constituted the most peculiar feature in this outbreak.

Experiment showing that the disease is not readily conveyed by feeding on infected pastures.

There still remained another means by which the disease might have been transmitted, viz., that of feeding on pastures infected by the saliva of the diseased animals. This view is, however, negatived by the following experiment.

Four large red deer were enclosed with one of the infected herds of fallow deer and fed on the same herbage on a circumscribed area, but none of the red deer contracted the disease from eating the infected food. Nor were they infected by the saliva. This may be accounted for by the circumstance that the red and the fallow deer do not associate closely, and did not lick or bite one another.

Finally, in reference to the progress of the disease in these herds, it is interesting to note that the greater mortality in the early part of the outbreak was among the does and fawns; this is accounted for by the bucks protecting themselves with their horns from the attacks of the rabid does. Simultaneously with the shedding of their horns, the mortality increased among the bucks, and during the time the horns of the bucks were in velvet this continued.

ALEXR. C. COPE.

December 7th, 1887.

Report by Professor Victor Horsley, B.S., F.R.S., &c., Professor Superintendent of the Brown Institution, &c., &c.

The following is a brief account of observations and experiments made by myself upon certain deer sent to the Brown Institution from the infected herd in Richmond Park, by the courtesy of Mr. Sawyer, to whom I am also indebted for much information respecting the outbreak, and tissues from the same animals, submitted to me for examination and opinion by Mr. Cope.

I have watched the course of the disease as described by Mr. Cope in the foregoing report in four of the affected animals, and will now proceed to enumerate such symptoms as were exhibited by each as far as they could be observed in a loose box, the only accommodation possible at the Brown Institution.

I. CLINICAL REPORT.

DEER No. 1.—Admitted into the Brown Institution from Richmond Park, sent by Mr. Sawyer, at 6 p.m., 18th April 1887. When removed from the box in which it was brought the animal was very excited, but evidently very ill.

19th April, 9.30 a.m.—When seen this morning it had not fed since admission, and was lying on the ground apparently but semi-conscious. The position was peculiar, namely, the legs were stretched straight at right angles to the trunk, while the head and neck were strongly retracted (tonic spasm?).

When touched it staggered up on to its feet, markedly paretic in its hind limbs. It was nevertheless still very excitable, for it flew at the stick with which I touched it with much fury. In doing so it fell down owing of course to the commencing paralysis.

20th April.—Animal weaker, but still aggressive. The hind legs were more obviously paralysed. Occasionally there was a general tetanoid spasm specially marked in the hind quarters. This spasm fixed the animal in a remarkable position, in which, while the forelegs were vertical, the hind limbs were stretched far back and partly separated. The same attitude may often be seen in a similar stage of the disease in a rabid dog.

21st April, 10 a.m.—Temperature in the rectum 41° C. (about 105·8° F.). The animal was now almost completely comatose; it lay on its left side with marked opisthotonic contraction of the muscles of the back. The least touch caused tetanoid spasm of the limbs in extension. There was, in addition, a constant rhythmical chewing movement of the jaws. (It, however, had not

eaten anything since admission.) Sensation to pain appeared dulled. At 11 a.m. the animal suddenly died. (Cardiac failure probably.)

Post-mortem Examination.

Immediately after death.

Central Nervous System.

Brain.—Appeared perfectly normal.
Spinal Cord.—Vessels moderately distended.

Lymphatic System.

Serous Membranes (*i.e.*, Pericardium, Pleuræ, Peritoneum). Perfectly normal.

Circulatory System.

Heart.—Normal.
Blood.—Dark and fluid.

Respiratory System.

Larynx.—Full of tenacious mucus. Marked capillary congestion of the mucous membrane, with slight œdema of the larynx, epiglottis, and the base of the tongue.
Trachea.—Venous congestion.
Lungs.—Very pink; doubtful if more than normal vascularity.

Alimentary System.

Pharynx.—Normal, but full of mucus.
Gullet.—Ditto ditto.
Stomach.—Full of normal food. The reticulate mucous membrane was very pink, with distended vessels.
Intestines.—Both the large and small intestines were nearly empty, the former only containing a little watery bile-stained mucus.
Liver was normal on section, save that scattered through its substance were numerous small circular tumours, pale and yellowish white on section.
Spleen.—Normal.
Pancreas.—Do.

Renal System.

Kidneys.—Both a little congested.
Bladder.—Distended with urine.

DEER No. 2.—Received dead at the Brown Institution on the 26th May 1887.

Post-mortem Examination.

In this all the organs appeared normal except the *larynx*, which, as in the former case, was congested.

From the spinal cord of this animal rabbits Nos. 5 and 6 and dog No. 1 were inoculated by trephining.

DEER No. 3.—Admitted into the Brown Institution on 1st June 1887. This animal, a doe, is of special interest, inasmuch as it is the one referred to on page 9 of Mr. Cope's report as having bitten deer No. 4, *vid. infra*. Moreover, being pregnant, it afforded the invaluable opportunity of testing the asserted power of the rabic virus to pass from the maternal to the fœtal circulation through the placenta.

1st June 1887.—Animal extremely aggressive, rushing fiercely to the door of the stall whenever any one approached it, and savagely seizing with its teeth any object presented to it. The hind legs were very much paralysed, and this may have been rather unusually marked at this stage in this particular instance, since this animal had during the previous 18 hours violently attacked deer No. 4, and consequently it may have become more or less exhausted. This is the more probable, because on the 2nd June 1887 it was found dead, having succumbed during the night probably to syncope.

POST-MORTEM EXAMINATION (about 6 hours after death).

Rigor mortis well marked.

Central Nervous System.

Brain.—Moderate, but general congestion.
Spinal Cord.—Ditto.

Lymphatic System.

Serous Membranes.—Normal, &c., &c.

The rest of the organs in this case presented the same appearances as in No. 1, save that there were no tumours in the liver, these being clearly accessory. Most noteworthy is that there was to be seen, as in the former cases, the same congestion and œdema of the larynx, which was full of tenacious mucus. The lungs were distinctly congested, and in places collapsed. The uterus contained a fœtus about 2 feet in length. From this fœtus two rabbits were inoculated, *vid. infra*.

DEER No. 4.—Admitted into the Brown Institution 20th June 1887. This animal, a buck, had been separated from the herd for three months till the 1st June when, as described by Mr. Cope, Deer No. 3 was placed with it and attacked it severely. On the 19th June (thus 19 days, incubation period) it showed the premonitory symptoms, and was at once forwarded to the Institution.

20th June 1887.—Animal very excitable and most aggressive. It made attempts to eat and drink, but it was very difficult to determine whether it actually swallowed food.

21st June.—Worse, much more vicious. It stood with its head thrown back, the eyes staring, and it charged everything which suddenly attracted its attention. This day I observed for the first time in these animals a genuine pharyngeal spasm on its

attempting to swallow water. It plunged its muzzle deep in the water, made champing movements with its jaws, and tried to swallow. The larynx could be seen rising in jerks just as in the human being, while the water ran out of the angles of the mouth. It did not eat.

22nd June.—Paresis set in this day. Every charge the animal made was accompanied by staggering, and not infrequently fell, the hind quarters, as in the other cases, sinking and the hind limbs collapsing.

23rd June.—Animal died in the night.

Post-mortem Examination.

As in Deer No. 3, save that the brain and spinal cord were more intensely congested.

Microscopical examination of the tissues revealed the well-known changes that have been observed in man, the dog, &c., viz., extreme congestion, hœmorrhages, and extravasation of leucocytes, &c.

II. PATHOLOGICAL AND EXPERIMENTAL REPORT.

The outbreak of Rabies among the deer in Richmond Park was, as detailed in Mr. Cope's Report, investigated by him, and he received two animals at the Veterinary College for examination.

Experiments 1, 2, 3, 4, on Rabbits Nos. 1, 2, 3, 4.

From these two animals the medulla oblongata was removed and sent to the Brown Institution. In each case a portion of the medulla was crushed in sterilised bouillion, according to the method described by M. Pasteur, and a small quantity injected into the subdural space of two rabbits.

The four rabbits thus inoculated all died of typical rabies, the incubation period varying from 10 to 14 days. The post-mortem appearances were most characteristic, as I have elsewhere described to be found in these animals when dying of this disease. (Report to the President of the Local Government Board of a Committee of Inquiry into M. Pasteur's treatment of Hydrophobia.)

Although the malady affecting the deer was thus proved to be Rabies, I consented at the request of Mr. Cope to complete the proof by testing the virus on a dog.

Experiments 5, 6, 7, on Rabbits Nos. 5, 6, and Dog No. 1.

I took therefore the medulla oblongata and cervical spinal cord of Deer No. 2 and inoculated therefrom (also by trephining two rabbits and one dog.)

The rabbits died just as Nos. 1, 2, 3, 4, of typical Rabies, with the rather longer incubation period of 14–16 days. The post-mortem signs also were quite characteristic. The details of the dog's illness may with advantage be briefly alluded to, since this is the first instance in which the transmission of Rabies has been effected by inoculation from deer to the rabbit and the dog.

DOG No. 1.—Small, young adult, black and tan terrier inoculated by trephining on 26th May 1887. It remained perfectly well until the 7th June 1887, *i.e.*, 11 days' incubation, when it was noticed to be very excitable and restless, jumping up to the top of its cage, snapping at everything, and eating the straw of its bed. It furiously attacked two dogs in the same cage after quietly but energetically licking them, they being evidently alarmed at it. The Dog No. 1 was much exhausted after these combats, but its viciousness was increased. Its bark, already hoarse, soon developed the well known falsetto termination. The disease then ran its usual course during the succeeding four days, the dog remaining savage to within the last two days, when paralysis of the hind legs set in, and death by coma followed.

POST-MORTEM EXAMINATION (about 8 hours after death).

Rigor mortis well marked. No organ presented any marked change, save the following:—

Respiratory System.

Larynx.—Moderately congested.
Trachae.—Ditto.
Lungs.—Greatly congested, being of a dark red colour.

Alimentary Canal.

Tongue.—Dry.
Pharynx.—Slightly congested.
Stomach.—Well marked capilliary congestion of the mucous membrane.
Contents.—Watery mucus, coffee ground material (evidently blood), and a quantity of hay.

The evidence was thus rendered quite conclusive as to the real nature of the malady from which the deer were suffering.

EXPERIMENT with the FŒTUS OF DEER No. 3.

The question whether the virus of an acute specific disease can pass through the placenta from the maternal to the fœtal circulation is yet so indeterminate and yet so important that any observation on the point, negative though it may be, is worth recording.

On laying open the uterus of Deer No. 3, there was found a healthy fœtus about 2 feet long quite dead, but its decease evidently had only occurred on that of the mother.

On dissection nothing was observable in the organs, but the spinal cord being removed a small portion was crushed in bouillon, and inoculation practised therewith on two rabbits.

Nos. 7 and 8 on 2nd June 1887.

Experiments 8 and 9 on Rabbits 7 and 8.

3rd June 1887.—One rabbit No. 7, unfortunately died of septicaemia 26th November 1887. The other rabbit, No. 8, lived

in perfect health till this day, when it was inoculated in series and succumbed with the usual symptoms.

It will thus be seen that these experiments were negative in their results, but at least it is evident that rabbit No. 8 received no virus from the fœtal deer. This question of the transmission of the virus through the placenta can only be definitely decided when a large number* of independent observations have been collected together.

(Signed) VICTOR HORSLEY, F.R.S.

* A few observations are already recorded by Perroncito and Carita, and Bardach in the Annales de l'Institut Pasteur, 1887.