

(4) Inactivated extract confers little or no protection. The strain of virus used for testing the pigs on their immunity after treatment with inactivated extract would appear to be responsible for the small percentage which survive an immunity test with virulent blood.

As a result of the experimental immunization work, a number of recovered pigs are now available for hyperimmunizing with a view to the production of an anti-serum, and work in this direction is being continued.

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RABIES IN SOUTH AFRICA.

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For many years the Union of South Africa has been considered free of rabies.

1. PORT ELIZABETH OUTBREAK, 1893.

The last authentic outbreak to occur was at Port Elizabeth in 1893. The disease had been introduced into the country with an Airedale terrier which was landed at Port Elizabeth in September, 1892. This dog took ill soon after arrival and exhibited symptoms which were very suspicious of rabies: "he first became unaccountably savage, attacked and fought with every dog he met, and barked and howled incessantly for a day or two before he died." The next case was observed in January, 1893, and this was followed by numerous cases until the disease was diagnosed by the local Government Veterinary Officer Britton in April, 1893.

The diagnosis was confirmed by subinoculation into rabbits by Edington and Hutcheon at the Laboratory in Grahamstown.

Steps were immediately taken to deal with the outbreak. A Rabies Act was passed by Parliament and regulations were issued which prescribed the measures to be enforced. In Port Elizabeth all dogs had to be muzzled and tied up. Stray dogs were to be destroyed; and in less than a year about 2,000 had been dealt with in this way.

The disease also spread to the surrounding districts of Uitenhage, Jansenville, Willowmore and Albany, and in these areas also large numbers of ownerless dogs were destroyed.

The measures adopted were entirely successful and *a year after the first outbreak the disease had disappeared completely*. No mention is made of rabies in the subsequent annual reports of the Colonial Veterinary Surgeon, and at no time since 1893 has the disease again made its appearance in dogs in the Union of South Africa.

Before leaving this outbreak the following significant statement which occurs in the Annual Report for the year 1893 of Colonial Veterinary Surgeon, Dr. Hutcheon, may be quoted: "I was in great

dread at one time when the disease was reported at centres a considerable distance from Port Elizabeth, *lest it should be communicated to our wild animals, such as jackals, etc.*, but with the exception of the cattle which developed the symptoms of the disease near Van Stadens, we have not heard of any other animals except dogs and cats that have become affected with the disease."

2. RABIES IN SOUTHERN RHODESIA, 1902-1913.

In Southern Rhodesia a case of rabies was diagnosed in a dog in August, 1902, in the neighbourhood of Bulawayo. The disease spread rapidly and preventive measures were immediately enforced. In about 6 months nearly 40,000 dogs were destroyed. In his annual report for the year 1902/1903 the Chief Veterinary Surgeon for Southern Rhodesia writes: "the outlook seems more hopeful now than it did some time ago, although *the likelihood of the disease being kept alive by jackals and other wild carnivora* rather negatives the possibility that we shall ever be able to eradicate it altogether."

The following year the Chief Veterinary Surgeon reports further progress; about 60,000 dogs had been destroyed for non-compliance with the muzzling regulations. He says: "although *cases have been reported amongst wild carnivora*, there is still every hope that the disease may be stamped out."

The disease then fluctuated for several years. During the years 1904 and 1905 very few cases were reported; then the number increased again very considerably. From 1907 to 1910 there was another marked reduction in the number of cases, but in 1911 and 1912 the position again became worse. However, in 1913 the position improved definitely, and since 1914 there have been no further cases.

One incident which is mentioned by the Chief Veterinary Surgeon in his report for the year 1909 should be recorded here: "A most extraordinary case occurred in the Mazoe district . . . During the night, a farmer was awakened by a noise on the verandah of his house. On going outside he found his dog fighting with something which he believes was a wild animal. This animal left the dog and tackled him, and, after biting him severely on the shoulder and hand, unfortunately escaped. The dog was sent to the Veterinary Laboratory for observation, and on the 19th day it developed symptoms of dumb Rabies and was destroyed two days later. The presence of Rabies was confirmed by test inoculation of rabbits."

From these accounts it would appear that the Union of South Africa has been free of rabies for about 35 years, and that during the last 15 years no cases have occurred south of the Zambesi.

In both outbreaks described above (Port Elizabeth, 1893, and Southern Rhodesia 1902-1913) there was a considerable spread and then a complete disappearance of the disease. In both cases, however, the fear was expressed that the disease might spread to the wild fauna (carnivores), and so become permanently established in the country.

Recent events have tended to confirm those fears.

3. SUSPICIOUS HUMAN CASES IN THE UNION, 1916-1927.

Since 1916 a number of cases (more than a dozen) have occurred in human beings, in which the symptoms were typical of rabies. These cases were fully described by Cluver (1927) who found that in the majority of cases the persons had been bitten either by a *yellow mongoose* ("rooi meerkat," *Cynictus penicillata*) or by a genet cat ("muskejaatkat," *Genetta felina*). A few persons had been bitten by dogs.

In none of the cases mentioned by Cluver could the diagnosis of rabies be confirmed by the demonstration of Negri bodies or the successful inoculation of rabbits. In some cases the material which was submitted for these examinations was too decomposed, and in others no material was submitted at all.

There was, therefore, room for serious doubt whether those cases had been true rabies. From the medical point of view the suspicion that they were rabies seemed very strong; the symptoms in the human patients were so typical of the disease that it was almost impossible to doubt the diagnosis. But from the veterinary point of view the position was not so clear. The chief argument against the assumption that it was rabies, was the consideration that rabies is a disease that cannot be hidden. If rabies had been present in the Union for all these years, why did it not spread among the dog population and cause much greater damage than was actually the case?

It should be remembered that in two of the cases enumerated by Cluver (1927) the infection was actually ascribed to the bite of a dog.

Doubt in regard to the nature of the disease persisted in the minds of the veterinary authorities until the latter end of 1928 when two further cases occurred in the Wolmaransstad district of the Transvaal under the following circumstances.

4. THE WOLMARANSSTAD CASES, NOVEMBER, 1928.

On the 30th October, 1928, some children on their way to school caught a "meercat" (yellow mongoose) on the farm Syfergat 44, in the Wolmaransstad district. The meercat, which was obviously ill, was driven into a shallow hole, and in catching it, one of the children was bitten in the finger. Later in the morning while the children were playing with the meercat another boy was bitten in the finger. The meercat was then killed by the other children and the body thrown away.

Both boys began showing symptoms on the 17th November, i.e. 19 days after the bite. The one died on the 20th November and the other on the 23rd, after having shown all the classical symptoms of hydrophobia, as described in the textbooks. An excellent account of these cases was given by the local physician, Dr. Herzenberg.

A post-mortem examination was made in both cases. The brains were removed and portions sent to the Medical Research Institute, Johannesburg, while the other portions were sent to the Veterinary Research Laboratories, Onderstepoort, Pretoria. A microscopic examination of the brain material was carried out at the latter Institute by Dr. de Kock, who succeeded in demonstrating typical *Negri bodies*.

The material was also injected into rabbits and other animals and *typical cases of rabies were produced*. This portion of the work was entrusted to Mr. I. P. Marais, who will publish a detailed report on the transmission experiments in due course.

The diagnosis was also confirmed at the Medical Research Institute, Johannesburg.

Here then, for the first time since 1893, rabies had been diagnosed in the Union with absolute certainty, and there was a clear indication that infection had come about through the bite of a yellow mongoose.

The positive result obtained in this case makes it extremely probable that the explanation offered by Cluver for some of his cases was correct, viz., that those persons had actually become infected with rabies through the bite of a yellow mongoose.

5. THE DISEASE AMONGST YELLOW MONGOOSE (*Cynictus penicillata*).

It should be explained here that the mongoose is ordinarily a very alert and nimble little animal which is not easily caught. When therefore, it is caught with comparative ease there would seem to be reason to suspect that it is not healthy. Such was the case in some of the instances mentioned by Cluver. In one case a student, 21 years of age, gave chase to a yellow mongoose "*which was wandering aimlessly*." The animal was caught and bit its captor viciously in the finger. Eight weeks later the student developed typical symptoms of rabies and died. In another case a yellow mongoose "*was found ill in a hole*" and was caught by a boy of 7 years. The animal bit the child in the hand. Six weeks later he developed symptoms of rabies and died.

In the case of the two boys in the Wolmaransstad district, mentioned above, it was also found on subsequent investigation that the mongoose which inflicted the bites, was probably ill. An elder brother of one of the boys said that the animal was thin and sick looking. He stated that it would have been impossible for the children to have caught a healthy meercat.

Other farmers in the neighbourhood stated, in reply to enquiries made by the local Government Veterinary Officer, Mr. Lund, that they had at various times seen thin meercats on the veld which appeared to be sick and mad. These sick animals do not run away when approached by human beings, as healthy meercats would do, but may even adopt a threatening attitude.

Similar evidence was obtained by the Sub-Director of Veterinary Services, Mr. Goodall, who visited the area soon after the death of the two boys. Many farmers stated that they had seen these thin meercats wandering aimlessly about the veld. A taxidriver informed Mr. Goodall that he had often seen such animals which would not get out of the way but could easily be run over.

A reward was offered for anyone catching and sending to the Laboratory such a meercat. Eventually in April, 1929, a meercat was caught by the police on the farm Syfergat 44, the same farm where the two boys had been bitten in October, 1928. In forwarding this meercat the Police reported that the animal was obviously

suffering from some disease as it was wandering about in an aimless manner. Unfortunately the meercat died before it reached Onderstepoort, but the brain was removed and both by microscopical examination and by animal inoculation could the diagnosis of rabies be confirmed.

Another interesting case was reported from Dealesville, in the Orange Free State. A resident of this village reported that, while standing at his kitchen door one afternoon about 5 o'clock he saw his dog running away from something. He then noticed a meercat (yellow mongoose) coming towards the house and taking up a threatening attitude towards one of his children. The child ran away and the father killed the meercat which seemed ready to attack him. The lower jaw of the meercat was found to be wet, as if there had been profuse salivation. The dog was subsequently examined and found to have teeth marks on his lips, and a son of the man stated that he had seen the dog fighting with the meercat and then running away.

The head of the mongoose was sent to Onderstepoort and Negri bodies were demonstrated in the brain. The dog was also sent to the Laboratory and will be kept under observation. Up to the time of writing (3 weeks after the incident) the animal appeared to be normal.

We have thus proved finally that *rabies is actually present amongst wild meercats on the veld.*

6. THE DEALESVILLE CASES.

A. *Rabies in a Dog, February, 1929.*

A very interesting case occurred on the farm Blandford (Boshof district) about 16 miles from Dealesville in the Free State. The farmer on returning home was informed that one of his dogs, a bulldog pup, about 9 months old, had suddenly attacked and killed two cats and a number of fowls. Upon inspection the farmer found the dog viciously attacking another dog. He tried to separate the animals, but the bulldog jumped at him and bit him in the hand. The dog then ran away and attacked everything he met: cattle, pigs, fowls, geese, etc. Later on the dog was caught and tied up, but escaped again and attacked more animals. Before it could be secured once more it bit a native in the face. (This native subsequently died of rabies.) The dog was then put in a box and despatched for examination, but it died the same night. Its brain was examined and *rabies was diagnosed* both by microscopical examination and by inoculation of rabbits and guinea pigs.

Subsequent investigations elicited the following interesting story from the owner of the dog: About a month before the incidents just referred to, both dogs were seen "fighting" with a yellow mongoose which they had chased into a stone cave. The farmer could not say whether the animals were actually bitten, but he considered it very likely as the mongoose was at bay in the cave and appeared to be very vicious. The dogs did not kill the meercat, which eventually escaped. In considering this occurrence it should be borne in mind

that the bulldog was only a puppy of 8 months, and was far more likely to be bitten than its older and more experienced companion.

In view of this observation and the fact that the farm in question literally swarms with meercats, it seems very likely *the infection in this case should also be traced to a yellow mongoose.*

In order to complete the above account, it should be mentioned here that the *farmer* was treated with anti-rabic vaccine and remained healthy. The second *dog* which was bitten by the rabid animal was sent to Onderstepoort for observation; up to the time of writing (about 4 months after being bitten) no symptoms had developed. The other animals on the farm which had been attacked by the dog were kept in quarantine. One *pig* became ill and "dumb rabies" was diagnosed by a local veterinarian. The other pigs were thereupon slaughtered.

B. *Rabies in an Ox, June, 1929.*

On the farm Witdam, which is situated about 10 miles from the farm Blandford, in the Dealesville district, the owner proceeded on horseback to the veld, on the 11th May, to inspect his animals. From a distance he observed the oxen standing in a circle and then jumping away and re-forming the circle. On coming nearer he saw a meercat (yellow mongoose) in the middle of the circle with its head down making a peculiar noise. The cattle would approach the meercat out of curiosity and smell at it, when the meercat would snap at them and then return to its original position. When the farmer approached, the meercat seemed inclined to attack him, but it was killed and buried.

Nineteen days later one of the oxen which had formed the circle began to show peculiar symptoms. The animal bellowed continually with saliva running from the mouth and tongue protruding. The farmer suspected a bone in the animal's throat and tried to catch it, but the animal (which was formerly very tame) assumed a threatening attitude. When it was caught it immediately lay down, but as soon as it was released it proceeded to push down fences and other objects. The ox was driven to the veld and there chased other animals. The next day the aggressive symptoms had increased. Other cattle were attacked, fences were pushed over, and when the ox fell over in one such attempt it proceeded to bite at its own side and tore its skin with its horn. The ox got up again and chased a horse and then also the farmer. Finally the animal was tied up and when examined the following day by the local Government Veterinary Officer, Mr. Canham (from whom the above facts were obtained), it was partially paralysed. Watery liquid dropped from mouth and eyes. The animal yawned frequently and the eyes had a staring look. On being offered green food the ox had the greatest difficulty to pick up some, but could not chew it and dropped it again.

The ox was then killed and the brain removed for examination. Microscopical examination showed *numerous Negri bodies* and the rabbits which were inoculated developed *typical symptoms of rabies.*

Although it could not be proved that the ox had been bitten by the meercat, the facts recorded above make it extremely likely that in this case too *the infection was brought about by the bite of a yellow mongoose.*