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D.V.Sc. Thesis

THE STUDY AND CONTROL OF THE VECTORS OF  
RABIES IN SOUTH AFRICA.

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THE STUDY AND CONTROL OF THE VECTORS OF RABIES  
IN SOUTH AFRICA.

PART I.

INTRODUCTION.

In most countries the epizootology of rabies is usually associated with the rabid dog only, and control measures are aimed at restricting the chances of spread of the disease by biting. Legislation, which is everywhere nearly alike, provides for the destruction of infected animals and for placing under strict veterinary observation of all those suspected of being infected. In order to have efficient control and to prevent the spread of the disease, large areas are proclaimed, and in these "rabies orders" are enforced. These orders aim at restricting the movement of dogs, eliminating stray dogs by licensing and by muzzling to prevent dogs from <sup>disseminating</sup> transmitting the disease. In some instances further more compulsory immunization of dogs is resorted to.

There are countries, where animals other than dogs play the main rôle in transmitting the disease and where the control problem assume a totally different aspect. In parts of South America certain species of vampire bats Phyllostoma superciliatum and Desmodus rufus in Trinidad are the chief vectors of the disease, which occurs mainly in cattle. Outbreaks in these countries are remarkable for the disproportion between the small number of rabid dogs and the very large number of diseased cattle. In Trinidad alone during the years

*Quote the reference*

1929, 1930, and 1931, the death rate averaged a thousand animals each year, and 90 per cent of the animals affected were bovines. Only two cases were seen in dogs. It is obvious, that under these conditions checking the disease is very difficult, since bats cannot easily be destroyed in large numbers. Preventive measures have therefore been resorted to. Metivier (1935) in discussing these measures mentions the construction of batproof cowsheds and stables, repelling the bats by bright illumination and concludes that vaccination of animals is the most suitable method of control of the disease in Trinidad. Although the conditions and the vectors in South Africa are totally different, the problem nevertheless presents points of similarity with that in South America. In this country the results of observations for the past ten years, show that dogs play a negligible role in the dissemination of rabies and that certain small wild carnivora are the vectors.

Snyman and Thomas (1939) in an exposition of the difficulties attending the control or destruction of these "wild carriers" pointed out, that restraint of any kind on wild animals was out of the question, and that total eradication of any one or all of the species concerned in the dissemination of rabies could not be contemplated. Even if undertaken by the State, the cost of such a scheme would be prohibitive and it is doubtful whether anything more than a temporary reduction in numbers would result. It was suggested that extermination on a much reduced scale to include only centres of active infection and the immediately adjoining ground, might have the desired effect. It is clear from the mode of transmission <sup>they</sup> ~~to~~ point out, that if all infected animals as well as all susceptible ones, which might have come in contact with them are destroyed, the disease at that point must die out as the virus cannot exist outside living animals. Should the area immediately become reoccupied by uninfected animals this

this would be of no consequence. The hope was expressed that by treating each successive outbreak of rabies in this fashion that the incidence of rabies would gradually be reduced.

The peculiarities and difficulties of the problem as the methods of control tried and finally adopted as well as the experimentation, which led up to them, form the subject of this paper. *as well as*

### HISTORICAL.

#### Writings of early Travellers.

Reports on the existence of rabies in South Africa prior to the first authentic outbreak at Port Elizabeth in 1893, are scanty and rather contradictory. While Thunberg (1780) and Amicus (1825) referred to outbreaks of rabies, Barrow (1801) and Livingstone (1857) remarked on the absence of the disease in the country. An isolated outbreak of rabies was reported by Shepstone (1828) in Natal. In 1861 a case was reported at the Wittbergen in the Harrismith district in "The Friend of the Freestate", a newspaper which circulated in the sixties.

The first authentic record of an outbreak of rabies in South Africa was written by Hutcheon in 1894. The outbreak, which was traced to an imported Airedale terrier, occurred at Port Elizabeth in 1893. The diagnosis was confirmed by subinoculation into rabbits and other animals. The disease spread to Uitenhage, Jansenville, Willowmore and Albany. A very significant statement was made by the Colonial Veterinary Surgeon, Dr. Hutcheon, that he feared lest the disease should be communicated to wild animals, such as the jackals, but except for a case in an ox, no cases other than in dogs and

cats were observed.

4 This outbreak has stamped out from

Following the outbreak at Port Elizabeth, the disease next made its appearance in Southern Rhodesia in 1902. The incidence rate fluctuated, fewer cases being reported one year and more the following year. In 1911 a severe outbreak occurred again and in 1913 Sinclair, the Chief Veterinary Surgeon was able to report, that a marked decrease in the prevalence of the disease had occurred. Southern Rhodesia apparently remained free from 1913, when the last case was reported until last year (1938) when a positive case occurred on the Northern Rhodesian border. *where?*

As was the case with Hutcheon, Gray, the Principal Veterinary Officer, also feared that owing to the wide distribution of the disease, that it would spread to wild carnivora and so lessen the possibility of eradicating it altogether. A few cases were reported in wild carnivora, but in spite of that, it was actually brought under control.

It was only by drastic precautionary measures that the disease did not spread into the Transvaal, when outbreaks occurred near its border. In an area fifty miles wide in the Zoutpansberg district along the Bechuanaland and Southern Rhodesia borders the number of dogs was greatly reduced. Farmers were allowed only two dogs each. These had to be registered, and all stray dogs were destroyed.

The adjoining territories of Bechuanaland Protectorate and South West Africa are not entirely free from rabies. Hobday (1936) reported a case in a native child, and for precautionary measures dog free belts were formed by destroying some 2,000 dogs.

In South West Africa, owing to the vastness of the country and the absence of veterinary control in the native areas along the Angola border the position has remained



obscure for a long time.

In 1926, it was reported, that several natives died at a Mission Hospital in Ovamboland, with symptoms of hydrophobia, and a history of having been bitten by rabid dogs. From information gathered at an investigation it would appear that the disease has existed there for the past twenty years.

Since 1926 suspected cases have been reported from Ovamboland and Okavango at various intervals. In 1935 the District Surgeon for that area reported, that a hyena entered a native kraal one night and attacked fowls, smashed pots and calabashes and eventually attacked a native. He reports further that every year isolated cases of hydrophobia occur in natives, and for that year eighteen cases were reported, four came under European supervision. He concluded that on clinical grounds there exists no doubt that rabies is present in the area and that the chief carriers are dogs. Reports of rabies in domestic animals other than dogs chiefly cattle have also been made from Kuring Kurn in South West Africa.

In July 1938 the Native Commissioner for Okavango succeeded in obtaining the head of a dog, that had showed signs of rabies. Material in preservatives was dispatched to Onderstepoort and a positive diagnosis of rabies was made. Commenting on the outbreak of rabies in that area the Native Commissioner states, that the natives have no love for or interest in their dogs, and merely keep great numbers of them to give alarm at night. Many of the dogs are seldom fed and never watered at the kraals, with the result that they wander from kraal to kraal and prey upon wild animals, and that they are therefore considered to be the main carriers of rabies.

The Southern portion of the Mandated Territory of South West Africa <sup>settled</sup> by Europeans has apparently remained free from the disease except for an unconfirmed case in the Grootfontein

district where a European woman, having been bitten by a wild (grey) cat six weeks before, developed symptoms of hydrophobia and died.

Native Beliefs and Reminiscences of Local Inhabitants.

Fitzsimmons (1919) makes the following observation when describing the spotted genet (Geneta felina): "The saliva of this animal apparently has some poisonous property, but this has not been satisfactorily demonstrated." Further on he says, "Several cases have been reported of men dying two or three weeks after being bitten by genets. In these instances it is stated, that after being severely bitten on the hand or arm by a genet the wound healed satisfactorily, but subsequently violent and sharp pains radiated up the arm from the site of the bite into the shoulder, followed later by symptoms, which seemed to resemble hydrophobia." This statement not only agrees closely with actual cases that have been observed and described in later years, but it is all the more significant that it was written at a time (1919) when hydrophobia was not thought to exist in South Africa.

Cluver (1927) in a report on the suspected cases of hydrophobia in humans from 1916 to ~~1927~~- 1927 systematically investigated reports of madness in animals made by him in the Vryburg and Mafeking districts. He remarks on the surprising general belief in these two districts amongst both natives and Europeans that a fatal madness follows the bites of wild mad wild cats. The Genet cat being singled out as normally a shy animal and very seldom seen, but when mad will approach homesteads and attack persons. He further mentions, that tales relating to such cases go back twenty years.

Sargeant Roberts (1937) of the South African Police at Vryburg, a keen observer of wild life informed me in a

personal communication that as a boy about 35 years ago the old natives at Sterkstroom in the North Eastern Cape Province where he lived, always warned him that the bite of the Genet cat was fatal, but only after six weeks, when the wounds were healed.

On his arrival in Vryburg in 1906 he heard of the same belief amongst natives, and during his thirty-one years as police officer, he heard and dealt with a number of deaths resulting from the bite of wild animals behaving very strangely.

Of some interest is a tale related to him of a family living near Maribogo. It was stated that about 1885 three children were playing outside when one of them was attacked by a Tsipa (Genet cat) and that the child died a few weeks later.

Sergeant Roberts feels convinced, that on account of the numerous cases related to him from different sources, that wild carnivora have been infected with rabies for very many years.

If the information obtained from these various sources is correct one may assume that rabies existed in the small wild carnivora before the outbreak of 1893 at Port Elizabeth.

#### Brief review of literature dealing with rabies in South Africa.

Cluver (1927) described all the suspected cases that had occurred in the Union since 1916, when the first case was discovered. All these cases were diagnosed clinically.

In all, ten cases were recorded from 1916 to 1927. In four of the cases the biting animal was a yellow mongoose (Cynictus penicillata). In four others the biting animal was a dog. In one, either a dog or a yellow mongoose appeared to have been responsible for the disease. In the tenth case the

history implicated the spotted genet - Genetta felina.

These cases all occurred in the Northern part of the Union, in a triangular area formed by Bloemfontein in the South, Mafeking in the North and Ermelo in the North-East.

Mitchell (1929) commenting on the sporadic cases of suspected hydrophobia, stated that all the cases were investigated by the Public Health Department, but none of these cases were confirmed by laboratory examination, owing to unfortunate delay in submitting material.

The first cases in which the diagnosis was confirmed occurred on the 20th and 23rd November 1928. On November 17th 1928, two boys, who were bitten 19 days previously in an endeavour to catch what appeared to them to be a tame yellow mongoose on the farm Cyfergat 44, Wolmaransstad district, became ill and showed symptoms of hydrophobia. Brain material was submitted to both the Medical Research Institute, Johannesburg and the Veterinary Research Laboratories at Onderstepoort.

The diagnosis at both institutes was confirmed by demonstrating negri bodies and subinoculation into rabbits. Mitchell concluded his report with the remarks, that the long search resulted in establishing the fact, that the infection of rabies or hydrophobia existed in smouldering and enzootic form amongst and was being perpetuated and spread by the wild fauna over a considerable area of the Union.

Du Toit (1929) in reviewing the rabies problem in South Africa described further cases of rabies in which the diagnosis was confirmed by laboratory methods. The first case in a yellow mongoose, caught on the farm Cyfergat, where the two boys referred to above were bitten in October 1928, <sup>was</sup> on the 1st April 1929, and three others viz. a dog, an ox and a European child. The latter was bitten by a genet cat.

Neitz and Marais (1932) described in detail the experiments conducted with material sent in from the two boys from Cyfergat, and on material sent in from further outbreaks that occurred up to that time. Some twenty-six outbreaks are tabulated by them, giving the distribution of the outbreaks and the known carriers.

In 1933 Neitz and Thomas tabulated the cases of rabies that had occurred during 1932 and drew attention to the spread of the disease.

#### RABIES IN OTHER COUNTRIES.

In spite of the advances, that have been made in the study of rabies, the disease still exists in the majority of countries throughout the world. The Australasia<sup>As the people</sup> is the only continent<sub>part</sub> that is entirely free from rabies.

In Europe the disease is very prevalent in the Central and Eastern states of the Continent, while England, Belgium, Holland and the Scandinavian Peninsula are the only countries from which the disease has been eradicated.

Of the other countries France, Germany and Italy have the best control of the disease. In Germany one case only occurred in a human being since 1930, while in France it was diagnosed in 143 dogs and 33 cats during 1937. The disease is the worst in the South Eastern States of the Continent. The cases reported for 1937 varies from 256 in Greece to 708 in Bulgaria. In Yugoslavia in 1936 a great increase in the disease occurred in the mountainous districts, where wolves played a great part. Over 27,000 cattle in the Province of Vardar were attacked by wolves, which it is thought numbers approximately 10,000. During the same year the disease was diagnosed in 904 dogs, 34 cats, 14 equines, 144 cattle, 50 sheep, 11 goats and 71 pigs. In the following year it was

diagnosed in 1,110 dogs and cats, and in 738 other animals.

United states of America.

It is reported that rabies has increased in recent years in the Southern States and during the period 1929 - 1934 examination for rabies gave positive results in the brains of 4,256 animals in Alabama, 2,912 in Tennessee, 2,757 in Texas, 2,379 in Georgia, 1,097 in Mississippi<sup>188</sup> and 496 in Florida. 86 percent of the domestic animals concerned in the cases of human rabies were dogs, 6.3 per cent cows, 4.8 per cent cats, the rest being horses, rats, goats, hogs, rabbits and monkeys.

It is further stated, that rabies is quite prevalent in 19 out of 53 states, and that Illinois has more rabies than any other state, only 9 states are free from the disease.

Canada.

From Canada it is reported, that rabies is rare. In 1933 the disease was diagnosed in 7 dogs, 2 bovines and 3 sheep.

South American States and West Indian Islands.

In some cases of the South American States notably Brazil, Puraguay, British Guiana and others, and certain of the West Indian Islands like Trinidad and Tobago, the disease assumes quite a different aspect in that the vectors are species of vampire bats. The disease is known as "Mal de Caderas" in Puraguay, Bolivia and the Argentine, and as "Pestes das Cadliras" in Brazil. In both the furious and quiet forms of the disease an early symptom is in-coordination of movements, which led to the disease being confused with trypanosomiasis, and therefore called by the same name.

Here the outbreaks are marked by a disproportion between the small number of rabid dogs and the large number of cattle infected. In Trinidad alone during the years 1929,

1930 and 1931 the death rate averaged a thousand animals each year, and ninety per cent of the animals affected were bovines. Only two cases were seen in dogs.

In Venezuela rabies in the dog is quite prevalent, but more so in foxes. It also occurs in other wild animals, such as the skunk. In the interior of the country where the grey fox can be seen, staring at one on every acre bordering the forests, they come, when rabid, into the dwelling houses. During the day they are more dangerous, as they suddenly come round corners and bite young children. At night the inhabitants sling their hammocks ~~se~~ high<sup>50</sup> as to avoid these animals

#### Asia.

##### Japan.

Great progress was made in Japan by the adoption of prophylactic vaccination measures. The incidence declined from 1041 cases in 1918 to 60 in 1930.

##### India.

The disease has been known for many centuries, and the wide spread nature is due to the religious views of the natives in not taking life, resulting in numerous socalled pariah dogs prowling about the villages. The numerous antirabid clinics are indicative of the prevalence of the disease.

##### Malay States.

Mitchell (1930) sums the position up as follows: "In the East, where artificial methods of sanitation are still very rudimentary, nature provides her own means of disposal of waste material by calling to her aid vultures, crows and pariah dogs, and so long as there is an available food supply pariah dogs will maintain their numbers. The Burman on

account of his religious views will not willingly take life in any form, and until the rabid animal becomes a menace to human life little action is taken."

Under these conditions it is only natural that rabies infection is widely disseminated. A small army of suspects is daily treated at the Pasteur Institute in Rangoon, with a carbolyzed virus with very good results.

#### Ceylon.

The disease is prevalent throughout the island and in 1934 out of 272 suspected cases in dogs 132 proved positive, and in 1936, 253 cases were positive.

#### Dutch and French India.

The position is the same here as in the Malay States.

#### Hong Kong.

The main duty of the Veterinary Police consists of enforcing control measures against rabies.

#### Palestine.

The disease is enzootic in Palestine, and during 1937, 122 cases were reported positive out of 587 suspected cases, and during the same year 19,930 stray dogs were destroyed.

In Iraq, Persia, etc., the disease is very widely spread as no control measures are adopted at all.

The Pacific Islands are considered to be free from the disease.

#### African Territories.

Rabies is very wide spread on the African Continent, and is more prevalent in the Northern than in the Equatorial and



Southern Territories. In North Africa the disease has been known for centuries, and is enzootic. In Morocco, Algiers, Tunis and Egypt the disease is widely distributed and over a hundred cases from each country are reported every year. The cause of the disease is mostly ownerless dogs, which stray in the Arab villages, and in spite of drastic measures the disease seems to be on the increase.

In Central Africa the disease although wide-spread is not very prevalent. In the Congo, Cameroons, Sudan, Nigeria, Ivory and Gold Coast, etc., the disease is enzootic appearing as epizootics which dies out, and is known as "Oulou-fato," or mad-dog disease. Dogs are the exclusive carriers of the disease and although the paralytic form predominates the virus is the same as that of classical rabies. It is further reported that humans very seldom contract the disease although they are frequently bitten. In British Sudan and Somaliland, Abyssinia and Eritrea the disease is very prevalent as the result of little control work.

In Kenya the disease was first diagnosed in 1929, and was found to be similar to classical rabies. The jackal is the only important host apart from the dog. In 1935, the disease was diagnosed in seven dogs, fourteen jackals and one cow.

In Tanganyika the disease has not been diagnosed with certainty, although several suspected cases have been reported of which one was in a human being.

In 1916 a suspected case occurred in Nyasaland, and in 1924 it was thought, that the disease did not exist in the territory, but in 1926 its existence was definitely established.

In Northern Rhodesia the incidence has increased since 1927 and in 1931 one of the seventeen positive cases, that were reported, originated from a jackal. The infection has further

been found in cats and monkeys, but has not been noticed in Viveridae.

In the Bechuanaland Protectorate a case was diagnosed in a native child in 1936, and as a prophylactic measure dog-free-belts were established and some 2,000 dogs were destroyed.

Southern Rhodesia has been free from the disease since the epizootic which terminated in 1914 until last year when a case in a dog occurred again. The outbreak was successfully checked.

In South West Africa the disease has definitely been established in the Okavango area, where it seems to be enzootic.

#### Madagascar.

In Madagascar rabies is prevalent throughout the island. The dogs, which run all over the island in famished troops congregating around slaughter houses, fumigators and meat factories, are the main carriers of the disease. In spite of twenty five years of control, the disease runs yearly through the island with exceptional severity amongst natives, owing to their lack of hygienic measures.

#### RABIES IN SOUTH AFRICA.

(a). The outbreaks of rabies in the Union of South Africa with all relevant details for the period November 1928 to <sup>August 1939</sup> ~~December 1938~~ are summarized in Table I in the appendix.

In the table the outbreaks are grouped together according to available evidence showing whether they are considered as being due to infection from the same origin, or whether there is some connection between the outbreaks, and those that are regarded as being of an independent source or isolated cases. In all cases the connection between the outbreaks considered

to be of the same origin is given briefly in the column "Probable connection between Outbreaks."

(b). Only those cases are considered, in which the diagnosis of rabies has been confirmed by laboratory examination at the Onderstepoort Veterinary Research Laboratories or at the Medical Research Institute, Johannesburg. A few cases, however, are included where no confirmation of the diagnosis was possible owing to bad material or for some other reason, but where the history and symptoms were of such a nature that no other diagnosis except that of rabies could be accepted. Where such cases have been included in the table, they are qualified by the remark "No" in the column "Diagnosis Confirmed."

(c). The information, recorded for each of the outbreaks, was taken from the original reports submitted by the Veterinary Officers, who investigated the particular outbreaks. The source of the information is indicated in each case e.g. S.V.O., Bft. indicates reports in the file records of the Senior Veterinary Officer, Bloemfontein; S.V.O. Ct. refers to the Senior Veterinary Officer, Cape Town; G.V.O. Mfk. to the Government Officer, Mafeking; G.V.O. Pot. to the Government Officer Potchefstroom and D.V.S. to that of the Director of Veterinary Services for the Union.

(d). The species of animal infected or the vector in many of the reports was referred to by the local name, but for the sake of uniformity the generic name is given. In those instances where it is uncertain to what animal reference is made to, the name mentioned in the report is given.

(e). As regards the vector, the name is given in those cases only, where the evidence points directly to the species of animal probably implicated. The cases for which the evidence is doubtful are marked, and where the species is unknown a blank is left. The information given in the remarks column describes the circumstances under which any

assumptions are made.

(f). The sketch map showing the distribution of the cases of rabies is compiled from the information obtained in Table I. Each dot represents one farm, whether one only or more than one case have occurred on it. On Trompsburg Commonage e.g. some eight cases have occurred over a period of years and this is represented by a single dot only. For the sake of ready reference the index number given in Table I of each group of outbreaks is represented by a corresponding number on the map. This map is the same as that published by Snyman and Thomas, except that those cases that have occurred since January 1939 have been added.

Analysis of the information contained in Table I.

The Information contained in Table I may be discussed under the following headings:

- (1) The distribution of the disease in the Union of S.A.
- (2) The occurrence of the disease in definite foci or centres.
- (3) The origin of the disease in fresh outbreaks.
- (4) The spread of the disease.
- (5) The possibility of a seasonal influence on the occurrence of rabies.
- (6) The epizootics of rabies that have occurred during the period November 1928 - August 1939.

(1) The Distribution of Rabies in the Union.

The distribution of rabies in the Union may be divided according to the incidence rate, into a Central area where the disease is very prevalent, and adjoining this, a North-Eastern and a Southern area where only a few isolated outbreaks have occurred the Peninsular area in the extreme South of the sub-continent and the extreme Western area of Griqualand West.