
Anthrax in South Africa.

**With Special Reference to Improved Methods of Protective
Inoculation.**

**By P. R. VILJOEN, M.R.C.V.S., Dr.Med.Vet., Sub-Director of
Veterinary Education and Research ; H. H. CURSON, F.R.C.V.S.,
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A.—INTRODUCTION.

KEHOE (1919) has drawn attention to the increased prevalence and spread of anthrax in the Union, and since then State veterinarians have had even better reasons to class it amongst the most serious stock diseases in this country. Discussing anthrax, the Secretary for Agriculture makes the following statement in his Annual Report for 1921-1922:—"Anthrax. This disease is widely prevalent. The Principal Veterinary Officer reports that the losses from this cause amongst farm livestock are greater than the total losses from all other contagious diseases."

In spite of its increased prevalence there can be very little doubt that anthrax is now under better control than it has ever been in this country. A great deal of research work, particularly in connection with the working out of an improved method of vaccination, has been carried out during the past few years, and our efforts in this direction have been crowned with a considerable measure of success, as will be revealed elsewhere in this report.

The Union Government appreciates the seriousness of the anthrax problem to the fullest extent, and consequently is prepared to do everything in its power to get the disease under proper control. As proof that the Government gives its active and practical support to the campaign against anthrax, we need only mention the fact that from July, 1923, it decided to issue vaccine free of charge to all stockowners in the Union. What this means in actual practice will be understood when it is stated that the annual issue of anthrax vaccine for the year ended 31st March, 1925, amounted to two and a quarter million doses, representing in cash value the amount of £30,000. This is done to encourage annual vaccination of all susceptible stock wherever necessary, and in this way to prevent further cases of the disease occurring. Moreover, free vaccine assists State control very considerably, leaving stockowners no excuse for not carrying out inoculation, as prescribed by regulations under the Stock Diseases Act (Act No. 14 of 1911).

Although special attention is to be paid in this article to a consideration of the methods of preventive inoculation, it is deemed advisable to include a review of the position as it affects all other aspects of the anthrax problem at the present time. When doing this, it will be impossible to avoid touching on points already discussed by Kehoe and other writers, but at the same time it is hoped that a good deal of useful information will be added. It is realized that much of this extra information, especially that relating to historical data, will not be of great interest to readers outside South Africa, but, on the other hand, we feel this to be an opportune moment for putting together facts which are widely scattered in numerous reports and most inaccessible to the veterinarian.

The opinions expressed and observations referred to in this article are based on extensive field experience and on numerous laboratory experiments upon which the authors have been engaged during the past four years.* Unfortunately, experimental data resulting from this work have been allowed to accumulate to such an extent that

* This article was written in July, 1925, and deals with work on anthrax carried out during the four years preceding this date.

publication of all protocols is now out of the question; some produced only negative results, while others have become out of date, having been replaced by more recent observations. We have therefore decided to select for publication in detail comparatively few experimental records, and to insert these where experimental proof was considered to be most essential.

B.—HISTORY OF ANTHRAX.

Since several South African stock diseases have at one time or another been mistaken for anthrax, the task of tracing the history of this disease has been rendered somewhat difficult. It was natural that Europeans, on encountering an acute malady in a little known country, would be inclined to associate it with the well-known anthrax of Europe. Diseases that have been mistaken for anthrax are red-water, gall-sickness, heartwater, biliary fever of equines, geilsiekte, lamsiekte, and even rinderpest. Even at the present day, when anthrax is comparatively well known to all stock owners, cases of arsenical poisoning or plant poisoning, e.g. by *Dichapetalum cymosum* ("gifblaar") or *Homeria* spp. and *Morea* spp. (the "tulps") are mistaken for anthrax.

Without plunging into archival records, it would appear that Livingstone (1857) was the first European ⁽¹⁾ to describe the disease in animals. He describes anthrax as being particularly prevalent in what is now the Bechuanaland Protectorate, but it is clear from his narrative that he believed horse-sickness and anthrax to be identical. So interesting are his remarks from a veterinary point of view that the following passage is appended:—

"I am here led to notice an invisible barrier, more unsurmountable than mountain ranges, but which is not opposed to the southern progress of cattle, goats, and sheep. The tsetse would prove a barrier only until its well-defined habitat was known, but the disease passing under the term of horse-sickness exists in such virulence over nearly seven degrees of latitude, that no precaution would be sufficient to save the animals. . . . Cattle, too, are subject to it, but only at intervals of a few, sometimes many, years; but it never makes a clean sweep of the whole cattle of a village, as it would do of a troop of fifty horses. . . . When the flesh of animals that have died of this disease is eaten it causes malignant carbuncle, which, when it appears over any important organ, proves rapidly fatal. It is more especially dangerous over the pit of the stomach. The effects of the poison have been experienced by missionaries who had eaten properly cooked food, the flesh of sheep really, but not visibly, affected by the disease. The virus in the flesh of the animal is destroyed neither by boiling or roasting. This fact, of which we have had innumerable examples, shows the superiority of experiments on a large scale to those of acute and able physiologists and chemists in the laboratory, for a well known physician of Paris, after careful investigation, considered that the virus in such cases was completely neutralized by boiling.

(1) With regard to humans, Pijper and Zwarenstein (1922) have the following passage in a recent contribution, "The Account Book of John Haszing": "1766. Anthony Barrange de Jonge, Deb. 1 May. Visit to your servant girl suffering from a considerable anthrax and found several furuncles on the back; cured same." It is hardly likely that the anthrax referred to above was due to *B. anthracis*; but more likely a common term embracing any severe localized dermatitis.

“ The disease attacks wild animals too. During our residence at Chonuane ⁽²⁾ . . . no fewer than twenty-five died on the hill opposite our house. Great numbers of gnus and zebras perished from the same cause, but the mortality produced no sensible diminution in the numbers of the game, any more than the deaths of many of the Bokwains who persisted, in spite of every remonstrance in eating the dead meat, caused any sensible decrease in the strength of the tribe.”

It is intended to follow the history of the disease separately for each *veterinary administrative area*, although it is realized that such sub-division of the Union of South Africa did not take place until 1911. Previous to amalgamation of the four colonies in 1910, there was a veterinary service for each colony; but after 1910, five administrative areas were created, the senior veterinary officer of each region being responsible to the principal veterinary officer at headquarters, Pretoria.

Cape Province Proper. ⁽³⁾

It is common knowledge that anthrax has been a scourge in Bechuanaland and Griqualand West for many generations, but when and how the disease originated it is unknown. In Central and South Africa there is much evidence which indicates that anthrax is a modern disease ⁽⁴⁾, having closely followed in the van of civilization, but it is noteworthy that its existence, at any rate in Bechuanaland, dates back further than the advent of civilization.

Brandford, the first Government veterinary surgeon, who apparently did not see any cases of anthrax himself, refers, in his report for the year 1876, in the course of correspondence, to the hygienic measures which should be adopted in the event of an outbreak of “ Miltziekte or Splenic Apoplexy.” The Stock Diseases Commission, appointed in 1876, also mentions, in its minutes of proceedings, appearing along with its two reports, “ meltsickness ” several times, indicating that the disease was not unknown in the eastern Cape Colony.

Hutcheon, who succeeded Brandford as Government or Colonial veterinary surgeon, states in his Annual Report for 1880, that he had “ seen only two cases of this disease since I came to the Colony, but I am given to understand that in some districts it carries off a great many animals.” He adds:— “ . . . Centres of contagion are being established along the lines of transport in this Colony, through the neglect to bury or otherwise completely destroy the carcasses of animals which die from this disease.”

In referring to horse-sickness in his next report, that for the period March, 1881-February, 1882, Hutcheon opines, no doubt

⁽²⁾ The Government Secretary for the Bechuanaland Protectorate, C. L. O'Brien Dutton, Esq., has been informed that Livingstone's Chonuane “ is situated on a farm managed by Mr. Ruben, fourteen miles east of Ramoutsa, Bechuanaland Protectorate, and that it is now called ‘ Sechele's Old Stad.’ ” If this is the case, the village actually lies in the Marico District, Transvaal, and not in the Protectorate (Letter 13.10.24).

⁽³⁾ For convenience in administration, Vryburg, Mafeking, Taungs, and Kuruman (British Bechuanaland) have since 1.4.17 been considered part of the Transvaal. Anthrax returns from this date are included under the Transvaal and no longer under the Cape Province proper.

⁽⁴⁾ At the Fifth Pan-African Veterinary Conference, April, 1923, it was mentioned by Hornby that anthrax had not been discovered definitely in north-east Rhodesia, Nyasaland, or Tanganyika Territory. On the other hand, the disease is prevalent in north-west Rhodesia and Kenya.

influenced by Wiltshire (1878), of Natal, that horse-sickness and anthrax were identical, or rather that the former was "of the nature of anthrax." During this period Hutcheon spent much time at the Government farm Leeuwfontein, Fort Beaufort Division, investigating in sheep the cause and nature of the disease heartwater, now recognized as a specific entity. In a report dated 18th May, 1882, Hutcheon states his belief that heartwater is also "of the nature of anthrax," but describes the eating of flesh of dead sheep by natives without ill-effects ensuing. Organisms which were seen on microscopic examination were thought to be those of anthrax. Subsequently, in his Annual Report for 1882, Hutcheon, in relating to the microscopic examination of blood of two sheep which had shown similar symptoms during life, describes the finding of *B. anthracis* in one animal, and a negative result in the other. Apparently, to add to his confusion regarding the nature of heartwater, he was dealing at the same time with two entirely different diseases.

Hutcheon, in his Report for 1884, describes a visit to Griqualand West, where he "saw three oxen which were recovering from a disease called 'Carbuncular Anthrax' or 'Melt Ziekte' with special localizations." He was informed that the disease appeared "only after the heavy rains which fell in the beginning of March." As a matter of interest, it may be added that it was in this year that Hutcheon first realized that lamsiekte and anthrax were two distinct diseases. About this time, C. Rutherford, Esquire, of the A.V.D., wrote a series of articles in the *Cape Times* of August, 1885, on the problem of horse-sickness. His views were similar to those of Wiltshire (1878), Lambert (1881), and, indeed, Livingstone (1857), namely, that horse-sickness and anthrax were identical. Incidentally, Rutherford mentions that F. Duck, Esquire, P.V.O. to the Bechuanaland Field Force of 1884, had seen "three oxen suffering from anthrax in Stellaland."⁽⁵⁾ Between 1884 and 1891 Hutcheon makes but little reference to the disease, but that it was regarded as serious may be judged from the fact that Soga, one of Hutcheon's assistants, in lecturing to natives in the eastern Cape Colony on stock diseases, emphasized the great danger of anthrax.

In Hutcheon's Annual Report for 1890-91, Borthwick refers to a severe outbreak of anthrax among horses at Kimberley, but owing to the adoption of carbolic acid treatment, injected hypodermically around the edges of the swellings, twenty animals recovered out of twenty-five treated. In 1892 Henning, after a tour to infected farms in the Herbert District, in his annual report states ⁽⁶⁾:—"The principal cause of the spread of the disease in some farms was in my opinion the horsefly, which appeared this year to be unusually numerous." In the next year the same worker encountered a case of bovine anthrax on a farm in the Caledon Division, and described for the first time what was undoubtedly anthrax in the ostrich. He states, in connection with this investigation, that "the blood, examined bacteriologically directly after the death of the animals, contained a great many microbes similar to the *Bacillus anthracis*, but larger than these usually appear." In 1894 * Henning, while travelling among

(5) Now \pm the Vryburg District.

* In this Chapter this signifies that in each instance the reference has been gleaned from the Annual Report for the year indicated.

farmers in Griqualand West, advised them to take up preventive inoculation, which advice, it appears, many adopted. In the same year Patterson diagnosed anthrax microscopically in an outbreak of the disease among cattle at Knysna. Other outbreaks occurred near Port Elizabeth (1895 *) and Paarl (1895 *). According to Hutcheon, 1896, 1897, and 1898 were severe anthrax years, especially in Bechuanaland and Griqualand West. In 1899 * a case of anthrax in a mule was diagnosed by Spreull near Worcester, and in 1902 * several serious outbreaks occurred in the Komgha District.

In 1903 * Hutcheon draws attention to the increasing prevalence of anthrax, and Dixon reports that it was unusually prevalent in the East London, Kingwilliamstown, and Komgha Districts. He adds:—“Anthrax I found was chiefly affecting oxen riding transport, and on several occasions I have been called to examine oxen that had fallen down dead in the streets of East London.” He further reports that “anthrax inoculation has not been adopted to any extent.” In the same year a serious outbreak of the disease was diagnosed at Maitland, Capetown, and in connection with this over 100 head of cattle were inoculated with vaccine. In 1904 * Hutcheon again draws attention to the spread of anthrax, particularly in Griqualand West and in the districts on the eastern border. Spreull, in the same report, in relating to an outbreak of the disease in Bedford District, attributes infection in a large number of cases to the fact that the stock were feeding on prickly-pear, which plant causes injury to the buccal mucosa, and so provides a channel for entrance of virulent organisms. In this year was also submitted for the first time an appendix giving statistics in connection with the scheduled infectious diseases. Data, from this and subsequent appendices, appear in Table I, page 442. The date 1904 then is a convenient one in regard to any comparison being made in connection with the occurrence of anthrax. Kehoe, in dealing with the relative prevalence of the disease within the Union, compares the position subsequent to and prior to 1904; whereas in the present report regarding the question of distribution of anthrax, the position at 1904 and at the present day may conveniently be compared. It is for this reason that the localities where outbreaks were reported previous to 1904 have been noted.

With reference to the later history of anthrax in the Cape Province proper, seeing that the events are of comparatively recent occurrence and have already received attention from Kehoe, it is sufficient that only a brief outline is given. In 1905 * outbreaks of the disease were reported by veterinary officers stationed at Mossel Bay, Vryburg, Grahamstown, and East London; in fact, every annual report of the Chief Veterinary Officer until Union in 1910 contained an appendix relating to the prevalence of anthrax in some part or other of the Colony. Since Union, the disease has continued to spread, the highest number of outbreaks being reported in 1914. In 1911 * Dixon observes that “the disease is likely to become more widely spread unless some more effective means are taken to strictly enforce the proper burial or burning intact the carcasses of all animals dying from this disease.” In his report for the period 1.4.13-31.3.14, Dixon expresses the opinion that if blood-smears were examined from

(*) In 1894 Henning reports: “In the course of not two months’ time more than 100 horses had contracted the external form of ‘giftziekte,’ of which only four or five recovered.”

all animals dying suddenly the record of outbreaks would be considerably increased. As evidence of this, he quotes the position in the Districts of East London and Kingwilliamstown, where the taking of blood-smears from all dead cattle was compulsory on account of the campaign against East Coast fever. In these two districts the number of outbreaks recorded for the year ending 31st March, 1914, was 436, whereas the total for the Cape Province proper was 577. During the year 1916-17 the Director of Veterinary Research carried out experiments to ascertain the position with reference to anthrax infection existing in dams. It was possible in three cases to prove that such was the case. In 1918 * Dixon states that he did not believe that the outbreaks recorded represented one-fourth of the number actually occurring in his area. A year later the same authority writes:—“Anthrax is the most serious disease we have to contend with, and is responsible for more losses among farm stock than the total losses from all other contagious diseases.” Later records show the same serious position of affairs against which far-reaching measures, to be discussed later, have been enforced.

Transkeian Territories.

Previous to 1911 this area was administered as an integral portion of the Cape Colony, but to add to the value of the statistics regarding relative prevalence of anthrax, data relating to this area have been tabulated separately as from 1904. (See Table I, page 442.)

It would appear that the first record of anthrax is that of Hutcheon, who in 1883 * investigated an outbreak amongst sheep at Umtata. According to the same author, the disease also occurred in humans (natives), of whom twenty died after partaking of the flesh of the dead sheep. The owner of the farm had lost in 1882 approximately forty head of cattle from “meltsiekte,” the sheep that year remaining healthy. Twelve years later, i.e. 1896,* another outbreak was recorded, this time in the Matatiele District. In 1901 * Hutcheon stated:—“Anthrax was found to be affecting several kraals in Tsolo District.” In the following year serious outbreaks were investigated in the Kokstad and Umtata Districts, and in 1903 * Dixon, who was stationed at East London, wrote:—“ . . . I am afraid the outspans along the main Transkeian roads are badly infected with the anthrax organisms, for numbers of oxen have died of this disease at these different outspans, and no precautions have been taken to properly bury the carcasses.” In 1904 * Hutcheon remarked on the alarming extension of the disease, and referred particularly to the Transkeian Territories. In 1906 * Hutchence, stationed at Kokstad, reported:—“This disease broke out in the Umzimkulu District in February, following the use of a sample of bone-meal.” The next year * Kearney, stationed at Kokstad, reported that “these deaths occur so rapidly that there are great opportunities to conceal altogether, or report ‘gall-sickness,’ and thus escape the inconvenience of quarantine restrictions; as a consequence the owners bear the loss, say nothing, and do nothing” In 1911 * Dixon referred to anthrax as “very prevalent in certain districts . . . native areas in the eastern portion of the Province,” and pointed out the difficulty of suppressing the disease in such areas “owing to the lack of proper police supervision there, the class of people to be dealt with, their ignorance, and their natural propensity to eat the carcasses of

* Reference obtained from Annual Report for year indicated.

cattle dying from any disease." It may be added that at this time East Coast fever was rampant throughout the Transkeian Territories, and had it not been for the systematic examination of smears from all dead cattle the number of outbreaks of anthrax detected by the veterinary authorities would have been considerably less. In 1919 * the Principal Veterinary Officer (Gray, C. E.) emphasized the gravity of the position, which is amply borne out by a perusal of the figures relating to outbreaks. See Table I, page 442.)

Natal.

Although at the present time Natal is the least seriously affected veterinary area of the Union of South Africa, yet anthrax has existed in the country for many years, as the records will show. Making allowances for the confusion existing in the minds of early veterinarians concerning the identity of horse-sickness, redwater, and heartwater with anthrax, it may be set down that the first undoubted report of the last-mentioned disease was in 1886, when Wiltshire, who was Government veterinary surgeon, stated:—"Cases of splenic apoplexy seem to be somewhat frequent, as every now and then natives die, or are very ill, from eating the meat, as the hospital records will show." The fact that deaths did not follow the consumption by natives of the flesh of animals dying of the so-called anthracoid diseases, e.g. heartwater, redwater, etc., seems to have been the chief factor in causing the early veterinarians (7) to reconsider their earlier opinion that these were diseases allied to anthrax.

It is quite clear from Wiltshire's report for 1887 that he was dealing with an outbreak of anthrax, for he writes:—"The only really serious outbreak of disease among sheep occurred in April on a farm near Greytown . . . this occurred in two separate flocks of sheep kept on the farm some distance apart, and in each flock it broke out exactly seven days after being put into a stable at shearing time. I learned that the end of November a horse had died in this stable after a few hours illness, accompanied by a considerable swelling of the throat and other parts of the body . . . on being dragged outside a quantity of blood escaped and formed a pool, to which eighteen ducks were attracted. . . . Shortly afterwards fourteen out of the eighteen died with swellings of the throat, etc., similar to the horse; a dog also was affected in a similar way, but recovered . . . the sheep began to die in April from similar appearances . . ."

Wiltshire also states in the same report that "meltsickness" also kills animals in other parts of the Colony." In 1888 * he reports a serious outbreak of the disease near Stanger, "when natives, horses, and pigs died from meltsickness (anthrax)." What is apparently the first diagnosis (8) of anthrax microscopically is a case examined by Van der Plank and referred to in Wiltshire's report for 1893-94. In a report for the year ended 30th June, 1895, anthrax was diagnosed in Richmond District, and in the same report, what appears to have been an outbreak of the same malady, is the following passage relating to the diseases of pigs:—"Two outbreaks of malignant sore throat . . . came under my notice. The exact cause of this disease is

(7) Wiltshire, Lambert, Duck, and Rutherford, the last three all of the A.V.D.

(8) Van der Plank deputized for Wiltshire while the latter was absent on leave the previous year.

* Reference obtained from Annual Report for year indicated.

unknown, also the means by which it is spread, but the flesh is poisonous to other animals, hence it points to contagion."

Watkins-Pitchford, who succeeded Wiltshire in 1896, stated in his first report that "anthrax has lately shown itself upon several farms among cattle and sheep. This disease . . . I am unable to cope with owing to the present inefficient state of the Department as regards appliances." The following year Watkins-Pitchford reported as follows to the Commissioner for Agriculture:—"I would call your attention to the recent report made by D. V. S. Baxter, having reference to the outbreak of anthrax at a spot north of Eshowe, by which 164 head of cattle were lost. Had a veterinary surgeon been on the spot this outbreak could have been easily repressed, and many hundreds of pounds saved to the owner." In 1898 * District Veterinary Surgeon Woollatt reported a few cases of the disease at Pietermaritzburg. In 1901 * Woollatt, at that time Principal Veterinary Surgeon, described the malady as being prevalent in Victoria County, in Zululand, between Eshowe and the Tugela, in Klip River, and Pietermaritzburg. Unfortunately no statistics are given with the earlier Natal reports. In 1902 * twenty cases in all were reported from widely separated centres in the Colony, and on two occasions "several natives died from the effects of eating anthrax flesh." In 1903 * outbreaks involving sixty-six deaths occurred in the counties of Victoria, Umvoti, Klip River, and Lions River. During the year ended 30th June, 1905,* 112 deaths were reported among stock, but the number of outbreaks was not stated. During the following financial year * sixteen outbreaks were recorded, i.e. more than the totals for the Transvaal and Free State combined, and in his report the Principal Veterinary Surgeon stated "anthrax is a disease which is becoming more prevalent in the Colony, but it is impossible to determine the number of the farms which have become freshly infected during the year."

After Union the first report of the Senior Veterinary Officer (Power, W. M.) draws attention to the fact that the "disease appears to be increasing, although it may be that more outbreaks are being reported and coming to light than was hitherto the case." It must, however, be remembered that since 1906 blood-smears had been systematically examined from all parts of Natal, especially where East Coast fever existed, and it is improbable that centres of infection were overlooked to the same extent as occurs even nowadays in the Transvaal, Free State, and Cape Province proper. Be that as it may, the Principal Veterinary Officer, in his report for the year ended 30th June, 1923, reported that "the position appears to have improved since the introduction of the spore vaccine, forty-nine outbreaks having been reported, compared with eighty-six the year before."

Orange Free State.

Very little information is available regarding the early history of anthrax in the above Province, since no Government veterinarian ⁽⁹⁾ was appointed until the outbreak of rinderpest. The Volksraad, however, legislated for anthrax as far back as 1891, and further it is known from the records of the Colonial Bacteriological Institute.

⁽⁹⁾ As Otto Henning was not released by the Cape Government for service with the Free State Government until after Dr. Koch's departure in 1897, it was arranged that G.V.O. Murdoch perform his duties temporarily.

* Signifies that the reference has been gleaned from the Annual Report for the year indicated.

Grahamstown, that anthrax vaccine was despatched thereto as early as 1897. After the Anglo-Boer War of 1899-1902 a Civil Veterinary Service was organized under Col. Flintoff. In a "Review of Diseases in the Colony," appearing in his first annual report (1904-05), Flintoff makes only a casual reference to four outbreaks of anthrax which had occurred during the year ended 30th June, 1905. As a total of 133 outbreaks of contagious scheduled diseases were dealt with during the year in question, it is obvious anthrax was of comparatively little importance. From a position of relative insignificance anthrax has now become the most serious disease in the Province, as indeed it has throughout the Union. This point is best shown by the following tabulated statement:—

Scheduled Disease.	Outbreaks, Year ended 30.6.05.	Outbreaks, Year ended 30.6.23.
Redwater.....	6	—
Anthrax.....	4	357
Tuberculosis.....	—	2
Glanders.....	76	—
Mange.....	31	13
Lung-sickness.....	9	—
Epizootic lymphangitis.....	7	—
	133	372

It will be seen that in eighteen years anthrax has increased from 5 per cent. of the total of scheduled diseases (scab of small ruminants excluded) to 95 per cent. During the intervening years the more important observations are the following:—In his annual report for 1907-08 Grist opines that outbreaks of the disease remain unnotified as owners do not even suspect the disease. In 1914 the Principal Veterinary Surgeon of the Union (Gray, C. E.) doubted whether the annual record of outbreaks faithfully reflected the position in the Free State. In 1918 * the same authority referred to the type of disease encountered in the Orange Free State as being "so virulent that neither the Pasteur Institute vaccine nor the local laboratory vaccine had any immediate inhibitory effect on the progress of the disease." In 1919, Senior Veterinary Officer Goodall, in his annual report to the Principal Veterinary Officer, submits that compulsory inoculation of all farm stock should be enforced in areas in which the disease is prevalent. As will be seen in Table I, page 442, anthrax is more prevalent now than ever before.

Transvaal.

The returns of the Colonial Bacteriological Institute (now Veterinary Research Laboratory), Grahamstown, show that as far back as 1899 anthrax vaccine was despatched to the South African Republic. The disease, however, was undoubtedly of minor importance, for in the first annual report (1903-04) of Stockman, chief of the recently established veterinary division, the following remark appears:—"This disease, although usually fatal, cannot be looked upon as a serious item in the catalogue of South African maladies."

* Reference obtained from Annual Report for year indicated.

The following gives an idea of the relative importance of anthrax at that period and at the present day:—

Scheduled Disease.	Outbreaks, Year 1.7.03–30.6.04.	Outbreaks, Year 1.7.22–30.6.23.
Rinderpest.....	14	—
Lung-sickness.....	256	—
Lymphangitis.....	71 ⁽¹⁰⁾	1 ⁽¹¹⁾
Tuberculosis.....	6	6
Glanders.....	158	5
Swine fever.....	4	—
Anthrax.....	3	560
Mange in equines.....	56	154
East Coast fever.....	400	20
TOTAL.....	968	746

In his annual report for 1905-06, Gray, who had succeeded Stockman, in referring to anthrax, remarked:—“ . . . some farms in the south-western portion of the Colony are said to have become contaminated to such an extent that they are almost useless for stock raising.” In 1909-10 * Gray draws attention to the carelessness on the part of owners in disposing of infected carcasses, and adds that in time “ protective inoculation will have to be adopted if stock are to be kept on certain farms at all.” In his first Union report (1911), the same authority hints at “ the necessity for a general inoculation of stock in order to protect them from the ravages of this disease.” He also refers to the reports of the Bradford Anthrax Investigation Bureau, to the effect that anthrax organisms had been detected in South African mohair and wool, and adds a note of warning as to the ultimate effects of this discovery on the sale of local produce. Another extract taken from departmental reports showing the increasing seriousness of anthrax is the following:—“ Report of Principal Veterinary Officer for year ended 31.3.17. The skinning and opening of the carcass of an animal which has died suddenly of disease is forbidden (in the Witwatersrand area) until such time as a blood-smear has been taken, and the examination thereof has proved that the animal has not died of anthrax. The advisability of applying this regulation to the whole of the Union is a point which will have to be considered.”

A summary, which gives a good idea of the increased prevalence of anthrax, is the following:—

Diagnosis of Anthrax Smears by Division of Veterinary Research.

Year ended 30.6.04.....	2	1911.....	109
„ 30.6.05.....	15	1.1.12–31.3.13.....	?
„ 30.6.06.....	9	1.4.13–31.3.14.....	400
„ 30.6.07.....	13	1.4.14–31.3.15.....	?
„ 30.6.08.....	12	1.4.15–31.3.16.....	924
„ 30.6.09.....	18	1.4.16–31.3.17.....	No returns issued after this date.
„ 30.6.10.....	48		
1.7.10–31.12.10.....	30		

⁽¹⁰⁾ Ulcerative lymphangitis !

⁽¹¹⁾ Epizootic lymphangitis !

* Reference obtained from Annual Report for year indicated.

TABLE I.
Showing Number of Outbreaks Registered in the Five Veterinary Administrative Areas of the Union since 1904.

Period.	Cape Proper.			Transkeian Territories.			Natal.			Orange Free State.			Transvaal.		
	Outbreaks.	Deaths.	Animals dealt with.*	Outbreaks.	Deaths.	Animals dealt with.*	Outbreaks.	Deaths.	Animals dealt with.*	Outbreaks.	Deaths.	Animals dealt with.*	Outbreaks.	Deaths.	Animals dealt with.*
Year ended 30.6.04.....	—	—	—	—	—	—	—	—	—	2	—	—	3	4	300
„ 31.12.04.....	15	269	1,650	13	23	241	—	—	—	—	—	—	—	—	—
„ 30.6.05.....	—	—	—	—	—	—	—	112	—	4	—	—	11	28	156
1905.....	37	243	994	8	9	—	—	—	—	—	—	—	—	—	—
Year ended 30.6.06.....	—	—	—	—	—	—	16	—	—	4	—	—	10	15	466
1906.....	40	140	1,408	26	50	106	—	—	—	—	—	—	—	—	—
Year ended 30.6.07.....	—	—	—	—	—	—	—	—	—	3	—	—	9	14	40
1907.....	37	259	1,702	26	44	—	—	—	—	—	—	—	—	—	—
Year ended 30.6.08.....	—	—	—	—	—	—	—	—	—	3	—	—	13	13	74
1908.....	26	252	—	13	29	—	—	—	—	—	—	—	—	—	—
Year ended 30.6.09.....	—	—	—	—	—	—	—	—	—	1	—	—	17	27	118
1909.....	59	467	3,222	23	62	56	—	—	—	—	—	—	—	—	—
Year ended 30.6.10.....	—	—	—	—	—	—	—	—	—	†	—	—	†	—	—
1910.....	86	307	5,572	24	41	1,355	9	25	360	1	14	140	57	64	175
1911.....	99	326	11,136	14	83	600	11	110	572	9	26	523	68	101	138
Fifteen months, 1.1.12—31.3.13	231	613	19,027	147	229	345	13	53	190	17	—	—	104	225	11,851
Year ended 31.3.14.....	577	710	11,374	106	251	3,313	25	—	—	25	—	—	241	373	15,221
„ 31.3.15.....	467	936	7,569	83	194	1,415	24	59	2,629	78	235	6,047	529	1,365	28,587
„ 31.3.16.....	345	493	4,768	52	100	9,383	334	211	5,379	88	548	12,763	688	1,100	27,500
„ 31.3.17.....	147	258	3,125	86	251	14,640	50	132	7,227	134	245	19,524	881	1,723	90,600
„ (1)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
„ 31.3.18.....	115	221	2,148	94	151	41,041	42	176	12,952	103	901	23,489	602	836	98,601
„ 31.3.19.....	103	194	12,235	125	250	47,522	54	413	17,813	112	524	33,983	700	1,500	67,600
Fifteen months, 1.4.19—30.6.20	179	636	4,354	265	—	52,887	96	413	37,417	378	3,545	81,950	973	550	93,600
Year ended 30.6.21.....	169	701	17,415	493	—	—	105	315	24,180	307	3,186	145,599	800	1,550	93,600
„ 30.6.22.....	198	1,033	38,475	303	—	—	86	320	34,526	323	1,353	58,699	684	1,008	98,000
„ 30.6.23.....	292	4,105	116,771	298	—	182,130	49	179	17,366	357	1,100	74,227	560	1,112	80,000
„ 30.6.24.....	316	2,377	339,295	484	—	461,900	114	312	—	263	1,339	—	579	1,129	257,138
„ 30.6.25.....	124	471	315,276	429	—	295,373	90	257	123,913.	195	499	275,125	399	811	155,194

* Animals dealt with means incontacts or other animals inoculated with protective vaccine.

† No return for six months, July-December, 1909, available. Blanks indicate no information obtainable.

(1) From this year onwards anthrax returns relating to Vryburg, Mafeking, Taung, and Kuruman (British Bechuanaland) are included in the Transvaal record, these districts being considered as part of the Transvaal for veterinary administrative purposes.

C.—OCCURRENCE IN SOUTH AFRICA.

In this chapter it is intended to refer to the distribution of anthrax and to show the relationship between the various environmental factors and the distribution. For convenience the subject will be dealt with under the following headings:—

- I. Distribution.
- II. Factors influencing the maintenance and spread of anthrax.
- III. Seasonal prevalence.
- IV. Anthrax in industry.

I.—*Distribution.*

Present Position.—Since the distribution of anthrax has never been described in literature dealing with South African diseases, it is proposed to discuss the matter briefly in the present paper. As the distribution does not vary within wide limits from year to year, it is felt that an account of the position as at the year ended 30th June, 1924, would suffice for the present. A knowledge of the anthrax infected localities of the Union is important for many reasons, and it is obvious that no consideration of environmental factors is possible without such preliminary information. In a well-conducted campaign against the scourge local conditions should be borne in mind, and it is only possible to deal effectively with the various factors when their significance has been thoroughly studied.

It must be pointed out that it is an extremely difficult matter to obtain accurate data concerning the relative prevalence of such a disease as anthrax in the different parts of the country owing to the sporadic manner in which it generally occurs, and on account of the lack of knowledge on the part of the farmer cases of the disease go unrecognized. In other cases the existence of the disease may be suspected or recognized, but, owing to the fear of quarantine restrictions, the owner does not report to the veterinary authorities; in such cases he prefers to deal with the outbreak himself, and in fact carries out his own preventive inoculation.

Accurate data could be made available only if it were possible to enforce compulsory notification of all sudden deaths *throughout the country*, but unfortunately owing to various circumstances this is out of the question at present. The issue of anthrax vaccine to different parts of the country would serve as a rough indication of the relative prevalence of the disease, but unfortunately no records of vaccine supplies to the various magisterial districts are available.

To get an idea of the distribution of the disease we are therefore forced to fall back on the official records kept by the Veterinary Division, such records being compiled from the results of microscopic diagnosis carried out at the different laboratories and by Government veterinary officers undertaking this kind of work. These records, kindly furnished by the Assistant Principal Veterinary Officer (Dixon, R. W.), are tabulated according to the scheme adopted throughout this paper, i.e. dealing with each veterinary administrative area separately. As will be seen, the year 1st July, 1923-30th June, 1924, has been selected, but it must be made quite clear that if records for other periods were examined districts now represented as free from infection might be found infected, and vice versa, but as a *general indication* of distribution the information conveyed below is sufficient. It will be observed that the outbreaks have been arranged according to the month in which they occurred, and use will be made of this information in discussing seasonal prevalence.

TABLE II.

Cape Province.—Outbreaks of Anthrax during Year ended 30/6/1924.

District.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	Total.
Albany.....	2	1	—	1	—	1	—	3	1	—	—	—	9
Alexandria.....	1	—	—	—	—	—	—	—	—	—	—	—	1
Barkly West.....	1	3	3	6	17	14	5	5	8	2	6	5	75
Elliot.....	1	—	1	—	1	—	—	—	—	—	—	—	3
Herbert.....	1	—	—	1	8	8	4	3	5	4	1	2	37
Malear.....	1	—	—	—	—	—	1	—	—	—	—	—	2
Queenstown.....	1	—	2	—	2	1	—	1	—	2	—	3	12
Bathurst.....	1	1	3	1	—	—	—	1	1	2	—	—	10
Woodhouse.....	—	—	2	1	1	1	—	—	—	—	—	—	5
East London.....	1	1	—	—	—	2	—	1	—	—	—	—	5
Glen Grey.....	—	—	—	1	1	2	2	2	—	—	—	1	9
Komgha.....	1	3	3	3	2	2	2	4	7	2	1	4	34
Kingwilliamstown.....	—	2	4	3	5	2	—	7	4	—	1	—	28
Peddie.....	—	1	—	—	—	1	—	—	—	—	—	—	2
Hay.....	—	—	2	2	5	13	6	4	3	1	2	—	38
Herschel.....	—	—	2	1	—	—	—	2	—	1	1	—	7
Victoria East.....	—	—	—	—	—	—	—	—	—	1	—	—	1
George.....	—	—	—	1	3	—	4	—	—	—	—	1	9
Kimberley.....	—	—	—	1	3	—	4	—	—	—	—	1	9
Somerset East.....	—	—	—	1	—	—	—	—	—	—	1	—	2
Port Elizabeth.....	—	—	—	—	—	—	—	—	—	—	—	—	—
Uitenhage.....	—	—	—	—	1	—	2	1	—	—	—	—	4
Stutterheim.....	—	—	—	—	—	—	1	—	—	1	2	—	4
Humansdorp.....	—	—	—	—	—	—	—	—	—	—	—	—	—
Stoekstrom.....	—	—	—	—	—	—	—	—	—	—	—	1	1
Cathcart.....	—	—	—	—	—	1	2	—	—	1	—	—	4
Gordonia.....	1	—	—	—	—	—	—	—	1	—	—	—	2
Caledon.....	—	—	—	—	—	—	2	—	—	—	—	—	3
Prieska.....	—	—	—	—	—	—	—	—	1	—	—	—	1
TOTALS.....	12	12	22	24	48	50	31	34	32	17	16	18	316

TABLE III.

Transkei.—Outbreaks of Anthrax during Year ended 30/6/1924.

District.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	Total.
Willowvale.....	2	1	6	3	2	—	9	1	—	3	—	4	31
Flagstaff.....	2	1	1	4	—	—	—	—	1	—	—	1	10
St. Marks.....	1	1	—	—	—	—	2	2	1	—	—	—	8
Engcobo.....	2	—	3	4	6	10	4	1	2	3	2	3	40
Umtata.....	1	2	5	6	5	13	11	4	7	4	4	5	67
Ngamakwe.....	1	2	4	2	4	5	4	—	6	1	1	2	35
Matatiele.....	2	1	—	1	4	2	3	—	3	1	—	—	19
Bizana.....	1	2	—	2	1	—	—	1	3	—	—	1	11
Butterworth.....	4	1	1	—	1	6	1	—	3	2	—	—	21
Libode.....	1	1	—	—	1	1	—	—	—	—	1	—	5
Elliotdale.....	1	1	2	1	3	4	3	4	2	—	1	—	22
Umzimkulu.....	1	2	2	1	3	2	1	2	1	2	2	3	22
Lusikisiki.....	—	1	3	2	—	—	2	2	—	—	1	—	12
Ngqeleni.....	—	2	2	2	1	—	2	2	—	—	3	—	14
Kentani.....	—	1	1	4	8	1	3	5	5	8	4	—	45
Idutywa.....	—	1	4	2	—	3	2	—	4	1	—	—	18
Mount Fletcher.....	—	2	—	—	1	—	—	1	—	—	1	—	5
Port St. Johns.....	—	1	—	—	2	—	—	—	—	1	—	—	4
Tsolo.....	—	1	2	1	2	2	2	—	1	2	2	—	15
Xalanga.....	—	—	2	—	1	—	—	1	—	—	—	—	4
Mount Ayliff.....	—	—	1	—	—	1	—	2	3	1	—	—	7
Mount Currie.....	—	—	—	2	1	1	1	—	—	—	—	2	8
Mqanduli.....	—	—	—	1	1	2	1	—	2	5	—	—	18
Qumbu.....	—	—	—	—	1	1	—	4	1	—	1	—	10
Mount Frere.....	—	—	—	—	2	2	3	1	4	2	—	—	15
Tabankulu.....	—	—	—	—	1	4	1	2	1	—	—	3	12
Tsomo.....	—	—	—	—	—	—	1	1	1	—	1	—	4
TOTALS.....	19	24	39	40	50	60	56	36	52	32	34	40	482

TABLE IV.

Natal.—Outbreaks of Anthrax during Year ended 30/6/1924.

District.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	Total
Dundee.....	1	1	—	1	—	2	2	—	—	—	—	1	8
Lower Umfolosi.....	2	1	1	1	—	—	—	2	—	—	—	2	9
Pinetown.....	1	—	—	—	1	—	—	—	—	—	—	—	2
Ixopo.....	—	1	—	3	—	—	3	2	1	—	—	—	10
Port Shepstone.....	—	1	—	1	2	1	1	1	1	—	—	—	8
Alfred.....	—	1	1	1	—	—	—	—	—	—	—	1	4
Bergville.....	—	1	—	—	—	—	—	1	—	—	—	—	2
Mtunzini.....	—	1	—	—	—	2	1	2	—	1	—	—	7
Eshowe.....	—	—	1	—	—	—	—	1	1	—	—	—	3
Umzinto.....	—	—	2	1	1	—	1	—	—	—	—	—	5
Camperdown.....	—	—	1	—	—	—	—	—	2	—	—	1	4
New Hanover.....	—	—	—	2	1	—	—	—	1	—	—	—	4
Polela.....	—	—	—	—	1	—	—	—	—	—	—	—	1
Mapum lo.....	—	—	—	—	1	—	—	—	—	—	—	—	1
Klip River.....	—	—	—	—	1	—	—	—	—	—	—	—	1
Umvoti.....	—	—	—	—	1	—	2	1	—	—	—	—	4
Newcastle.....	—	—	—	—	1	1	2	1	1	—	—	—	6
Utrecht.....	—	—	—	—	1	—	—	—	—	—	—	—	1
Richmond.....	—	—	—	—	1	—	1	—	—	1	—	—	3
Ngotshe.....	—	—	—	—	—	1	—	2	1	—	—	—	4
Vryheid.....	—	—	—	—	—	1	—	—	—	—	—	—	1
Hlabisa.....	—	—	—	—	—	—	1	—	—	—	—	—	1
Estcourt.....	—	—	—	—	—	—	1	—	—	3	—	—	4
Krantzkop.....	—	—	—	—	—	—	2	—	—	—	—	—	2
Nkandhla.....	—	—	—	—	—	—	—	1	—	—	—	—	1
Nongoma.....	—	—	—	—	—	—	—	2	—	—	—	—	2
Helpmakaar.....	—	—	—	—	—	—	—	1	—	1	—	—	3
Lower Tugela.....	—	—	—	—	—	—	—	—	1	—	—	—	1
Pietermaritzburg.....	—	—	—	—	—	—	—	—	1	—	—	—	1
Mpofana.....	—	—	—	—	—	—	—	—	1	—	—	—	1
Nqutu.....	—	—	—	—	—	—	—	—	—	—	1	—	1
Durban.....	—	—	—	—	—	—	—	—	—	—	1	—	1
TOTALS.....	4	7	6	10	12	8	17	17	12	6	2	5	106

TABLE V.

Orange Free State.—Outbreaks of Anthrax during Year ended 30/6/1924.

District.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	Total
Bloemfontein.....	1	6	2	1	—	—	5	—	2	2	1	—	20
Boshof.....	3	—	—	1	3	3	2	—	1	1	—	—	14
Kroonstad.....	2	—	1	3	8	3	2	2	—	2	—	—	26
Thaba Nchu.....	2	1	—	2	—	—	1	2	1	—	2	—	15
Senekal.....	1	1	—	1	3	—	1	1	—	—	1	—	11
W'nburg.....	2	3	1	2	2	1	—	1	5	3	3	—	25
Ficksburg.....	—	2	—	3	1	2	1	—	—	—	—	—	9
Harrismith.....	—	1	—	1	3	—	3	1	3	—	1	—	14
Hoopstad.....	—	1	1	2	—	1	1	1	—	1	—	—	11
Ladybrand.....	—	1	—	—	2	—	1	1	2	2	—	—	11
Vredefort.....	—	2	2	6	—	1	2	2	1	—	—	—	16
Lindley.....	—	—	1	3	—	—	5	2	2	—	2	3	18
Vrede.....	—	—	1	—	—	—	1	—	—	3	—	—	6
Frankfort.....	—	—	—	2	2	1	—	2	1	—	1	3	12
Heilbron.....	—	—	—	2	4	2	1	2	2	1	3	—	17
Jacobsdal.....	—	—	—	1	3	—	—	—	—	—	—	—	4
Bethlehem.....	—	—	—	—	2	2	—	2	2	2	1	1	12
Wepener.....	—	—	—	—	—	—	—	1	—	—	—	—	2
Fauresmith.....	—	—	—	—	—	—	—	—	—	—	1	—	1
TOTALS.....	11	18	9	31	33	18	27	18	24	17	19	19	244

TABLE VI.

Transvaal.—Outbreaks of Anthrax during Year ended 30/6/1924.

District.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	Total.
Benoni.....	—	—	—	2	—	1	—	—	—	—	—	—	3
Bloemhof.....	2	1	4	3	3	11	2	3	2	1	3	—	35
Carolina.....	1	1	—	—	1	—	—	—	1	—	1	—	5
Bethal.....	—	—	—	4	—	—	2	2	—	1	—	—	9
Ermelo.....	1	1	—	1	3	—	—	—	—	—	1	—	7
Boksburg.....	—	1	1	4	—	—	—	1	1	—	1	—	9
Germiston.....	2	—	1	2	—	—	—	—	—	—	—	—	5
Heidelberg.....	1	4	6	6	2	9	6	9	2	1	1	2	49
Krugersdorp.....	1	1	2	—	—	—	1	1	—	3	—	3	12
Johannesburg (Witwatersrand)	3	13	—	5	1	3	9	1	8	6	7	6	62
Mafeking (British Bechuanaland)...	1	1	—	1	—	—	1	—	—	—	1	—	5
Lichtenburg.....	1	—	—	—	8	1	5	3	1	1	2	—	22
Middelburg.....	6	4	4	5	4	10	9	10	8	6	9	5	80
Pietersburg.....	2	1	2	11	4	3	1	2	1	1	1	1	30
Potgietersrust.....	2	2	8	3	9	9	4	5	1	1	—	4	48
Pretoria.....	8	6	8	9	2	7	9	3	9	4	9	5	79
Rustenburg.....	—	2	3	4	5	5	6	3	3	1	1	7	40
Standerton.....	3	3	3	2	3	1	3	3	4	4	2	2	33
Springs.....	1	1	1	1	—	—	—	—	—	—	—	—	3
Kuruman (British Bechuanaland)...	—	—	—	—	1	—	1	3	—	—	—	1	6
Wakkerstroom.....	—	—	—	—	—	1	2	2	1	3	—	1	10
Waterberg.....	4	5	1	—	3	4	2	—	3	2	1	—	25
Marico.....	—	—	1	1	5	4	2	—	2	2	1	2	20
Potchefstroom.....	—	3	2	3	1	8	5	3	3	2	2	3	35
Vryburg (British Bechuanaland)...	—	1	3	1	—	—	1	—	—	—	—	—	6
Lydenburg.....	—	—	1	—	2	1	1	1	1	—	1	1	9
Wolmaransstad.....	—	—	—	2	—	—	—	—	—	—	—	—	2
Piet Retief.....	—	1	—	—	1	—	—	—	—	—	—	—	2
Zoutpansberg.....	—	—	—	—	—	1	—	—	1	—	1	3	6
Taungs (British Bechuanaland)...	—	—	—	—	—	—	—	—	1	3	—	1	5
TOTALS.....	39	52	51	70	58	79	72	55	53	42	45	48	664