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Preliminary Note on the Infection of White Mice and Guinea Pigs with the Virus of Horse-sickness.

By R. A. ALEXANDER, B.Sc. Agric., B.V.Sc., Onderstepoort.

South African veterinarians know the enormous amount of research work that has been carried out, notably by Sir Arnold Theiler, in attempts to evolve a uniformly successful method of immunization of horses and mules against horse-sickness. Possibly only a limited number, however, will appreciate the severe handicap of not having a susceptible small laboratory animal on which to carry out fundamental and preliminary research work, before applying the results to the horse. Apart from the enormous expense involved in purchasing susceptible horses, the cost of their maintenance, and the extensive accommodation required for even small numbers are factors which contribute to the confinement of any experimental work to narrow limits. The outcome is that data are accumulated very slowly, the conclusions drawn from results of experiments on small numbers of animals frequently may be misleading, and chance becomes an increasingly prominent factor in that only a few of inumerable variations and modifications of technique and method can be subjected to severe critical tests.

As an example of the importance of discovering a small laboratory animal susceptible to a given virus one cannot do better than direct attention to the experience with distemper. A clear conception of even the aetiology and clinical manifestations of the true disease was not obtained, nor was an efficient method of immunization developed until Laidlaw and Dunkin(1) had made the discovery that the ferret is fully susceptible to distemper and that distemper in the ferret is analagous in all its phases with distemper in the dog. This discovery was the commencement of intensive research work which led first to the immunization of the ferret, then to the experimental immunization of the dog, and finally had as its outcome the production of a highly efficient prophylactic on a commercial basis by Messrs. Burroughs Wellcome.

When the results of dog distemper immunization were published two independent attempts(2) were made to apply the method of formalized infective spleen tissue to immunization against horse-sickness as was being done with success in the case of rinderpest in cattle. Published reports of the work show that the application was not entirely successful. Here again, one of the chief obstacles in the path of developing the method into one which would be safe and efficient in over 95% of cases was the inability to conduct the experiments on sufficiently large a scale owing to the limited number of available experimental animals. The result was that once more it became apparent

that if any advance was to be made in work on immunization and allied phases of the problem such as propagation of the virus *in vitro*, it was essential to discover a susceptible small animal which would be available at all times in large numbers.

Choice of a Laboratory Animal.

To be of real value the laboratory animal most suited to extensive study of the problem must conform to the following requirements:—

1. It must be easily available, it must be cheap, and it must be capable of being bred in large numbers in close confinement.

2. It must be uniformly and highly susceptible.

3. Infection with the virus should produce a well marked and clearly defined reaction. Preferably, injection of the unmodified virus should be fatal in 100% of cases, so that there should be a minimum number of recovered animals to act as reservoirs of the virus, or to upset the results of immunization work by being drafted into experiments when immune as a result of recovery from an unobserved natural attack of the disease.

4. The method of injection should be simple, but infection by direct or indirect contact should not occur, so as to obviate the necessity of elaborate precautions to exclude infection in the breeding stock, and to enable numbers of experiments to be carried on simultaneously in the same building.

A. Theiler(3) and P. and E. Kuhn(4) demonstrated the susceptibility of the dog to horse-sickness, but for many reasons this animal has not proved of any material value for research purposes. In 1930 Max Theiler(5) reported that he had been successful in transmitting yellow fever, a highly infectious septicaemic disease of man and monkeys, to white mice. In the mouse it was of particular interest that the virus assumed exclusively neurotropic properties.

As all attempts to infect the guinea pig, the rabbit, and the rat with horse-sickness had been consistently unsuccessful, it was decided to ascertain whether the white mouse might not prove susceptible under conditions similar to those that had been reported by Theiler in the case of yellow fever.

Almost immediately it was found that the mouse was to prove susceptible to yet another virus disease.

Experimental.

In September 1932 two white mice amongst others received an intracerebral injection of a 1:10 dilution of citrated blood obtained from a horse (20451) which was reacting to 0 virus. These mice were kept under close observation for 9 days without showing any apparent

departure from normal health. During the following night one mouse died and was discovered next morning partially eaten by the others. The second mouse died two days later and was only discovered the following morning in a state of advanced decomposition. No adequate cause of death other than as a result of the injection could be ascertained for either mouse. This was the commencement of careful investigation into the susceptibility of the white mouse and the most certain method of infection.

Details of the experimental work involved will be published in a future report of the Director of Veterinary Services and Animal Industry. At this stage it is merely necessary to state that, under the conditions outlined below, the particular strain of white mouse bred for experimental work at Onderstepoort is highly susceptible to horse-sickness, the virus taking on exclusively neurotropic characters in a manner similar to that observed in yellow fever.

Up to the present time two different strains of virus, each on two separate occasions, have been established in mice, namely 0 virus 20319, being the 192nd generation in horses and virus 20329 obtained from a spontaneous case of horse-sickness that developed in an 0 virus hyper-immune horse at Onderstepoort.

METHOD OF INFECTION.

Apparently the only certain method of infection is the injection of virus-containing material directly into the brain of the mouse. Blood, either in sodium citrate solution as an anticoagulant or in oxalate-carbol-glycerine as a preservative, is the most handy form of virulent material and was used in a dilution of 1:5 or 1:10 in saline, higher concentrations proving toxic for the recipients. Injection is done by means of a 1 cc. syringe fitted with a fine needle, which is either inserted through the foramen magnum or is gently forced through the posterior aspect of the skull slightly to one side of the middle line. The amount injected is usually 0.05 cc.

The mice stand the injection well. Provided there is no side to side movement of the point of the inserted needle to cause mechanical injury of the brain there follows usually a temporary loss of consciousness, or some excitement, or incoördination of movement. Within a few hours the mice appear to have returned to normal health.

All attempts to set up infection by simple subcutaneous, intramuscular, intraperitoneal, or intravenous injection have failed. On the other hand, when the virus has become established in mice it is possible to set up the disease by the intraperitoneal injection of a massive dose (.5 cc. of a 25% brain emulsion) immediately preceded or followed by injury to the brain in order to establish a *locus minoris resistentiæ* in the central nervous system. The method of injuring

the brain adopted was that advocated by Sawyer and Lloyd(6), namely, the intracerebral injection of .05 cc. of a 2% starch solution in 0.9% sodium chloride. Infection by this method has been successful in only four out of ten attempts, possibly due to the fact that either the virus has not been 'passaged' sufficiently long to become 'fixed' for mice or because in some cases insufficient virus was injected (.5 cc. of a 5% brain emulsion). Further investigation into this point is being carried out.

The intravenous route with simultaneous brain injury has failed no doubt because only minute traces of virus can be injected owing to the extreme toxicity of the brain material in the unpurified virus emulsion.

Period of Incubation.

The period of incubation varies with different strains of virus and with any given strain becomes progressively shorter as the virus becomes 'fixed.' With 0 virus it varied from an average of 8 days in generation 2 to an average of 6 days in generation 9; with virus 20329 it has decreased from 17 days in generation 1 to 4 days in generation 15. It is not yet possible to say what the incubation period will be when the virus is finally fixed for mice.

Course of the Disease.

The first generation of virus in the mouse produces little that is of interest. At any time between the 8th and the 23rd day one or more mice may be found either dead in the cage in the morning, or, more frequently, may be noticed sitting huddled up in a corner, with ruffled coat, taking little notice of the other occupants. This condition may last for several days, being followed in many instances by complete recovery. If, however, the brain is removed during this period of visible illness, an emulsion made in saline, and subinoculated into a second series of mice, more definite symptoms appear. With both strains of virus established, definite symptoms have appeared after the second subinoculation and the mortality after the 3rd subinoculation has reached 100%. This indicates that it takes several generations for the virus to become accustomed to propagation in the brain of the mouse, after which there is a tendency for it to become fixed.

In later generations the first symptom is a hypersensitiveness or increased nervousness, the affected mouse often careering wildly round the cage for no apparent reason. There follows a slight paresis usually of the hind limbs, rapidly increasing in severity and progressing cranially until after 24 hours the mouse is found sitting huddled up on its haunches with arched back and ruffled coat and able to drag itself in circles or for short distances with its fore feet. A state of coma rapidly follows and death supervenes usually within the next 12 hours.

The crouching attitude adopted by the mice appears to be quite characteristic and the clinical picture differs markedly from that exhibited by mice infected with louping ill.

In still later generations, say after generation 10, the duration of symptoms is distinctly shorter, it being a frequent occurrence for mice which appeared perfectly normal at 9 a.m. to be found dead in the cage at 3 p.m. on the same day.

Post Mortem Appearance.

Post mortem examination has revealed no characteristic lesion. In practically every case there is some degree of hyperaemia of the meningeal vessels but this is certainly not pathognomonic. In approximately 50% of cases a very marked *tumor splenis*, and fatty degeneration of the liver has been observed, but the relationship to the disease is obscure since none of the organs except the brain, spinal cord, and, in a much smaller concentration, the adrenals have been found to contain any virus. The histo-pathology is receiving attention and will be reported in detail later.

Passage of the Virus.

When once the virus has become established in mice, passage is a simple matter. The brain is removed with aseptic precautions from an animal either prior to the appearance of clinical symptoms, or at any time during the exhibition of nervous derangement, or even many hours after death. A 4% emulsion in isotonic saline is made, centrifuged for a few minutes to deposit the coarser particles of tissue, and 0.05 cc. of the opalescent supernatant fluid is injected intracerebrally into healthy mice. It is preferable to use mice about two months old as penetration of the soft skull is then easy. As the mortality in later generations of mice is 100% and as brains of different individuals on two occasions were found to be infective in a dilution of 1 in 1,000,000 no difficulty is experienced in maintaining a strain. Further, the virus appears to retain its remarkable keeping qualities very well since infective brains left frozen or at low temperature in the form of an emulsion were found to be fully virulent after 6 weeks.

Discussion.

While this work was in progress Dr. O. Nieschulz of the Tropical Division of the University of Utrecht forwarded to the Director of Veterinary Services the manuscript of an article by him entitled "Over den infectie van muizen met het virus der Zuid Afrikaansche Paardeziekte," to be published in the *Tijdschrift voor Diergeneeskunde*. It was then seen that working quite independently this investigator had succeeded in transmitting horse-sickness to mice and that the major portion of his findings was confirmed.

Nieschulz made the additional interesting observation that horse-sickness virus is capable of setting up a fatal infection in the splenec-

tomized dog and that blood taken from the reacting dog at the height of the febrile curve is fully virulent for mice. This is taken as an indication of the value of the mouse for diagnostic purposes, but it is worthy of note that the source of the virus for the infection of the dog was mouse virus generation 10 that had produced fatal horse-sickness in a horse. On the other hand when one remembers that virulent blood from a horse reacting to a natural attack of horse-sickness is not fatal in 100% of cases in mice and may produce only slight clinical symptoms after a period of incubation of 21 days, the value of the mouse for diagnostic purposes cannot be considered great, unless one is prepared to make numbers of confirmatory subinoculations.

So far no mention has been made of the result of transferring the virus, that has been accustomed to its new host, back to the horse. Considerable attention was paid to this important point since it would prove that the disease produced in the mouse really was horse-sickness. Actually, virulent mouse brain material on several occasions when injected either subcutaneously or intravenously into susceptible horses has produced the typical clinical syndrome of *dikkop* or *dunkop* horse-sickness. Further, *in vitro* neutralization tests show that the serum of recently recovered horses is capable of neutralizing many infective doses of fixed virus in mice. This aspect will be dealt with in detail in a future publication.

With regard to the infectivity of the mouse virus for horses, Nieschulz states that "with a strain of horse-sickness virus which had been maintained for 10 generations in mice by intracerebral passage it was possible to set up a fatal infection in a horse. By mouse passage the virus was not attenuated nor was its character altered." (Translation). Consideration of the details submitted by Nieschulz together with my own experience with eight horses compels me to disagree with this statement. Nieschulz used 0 virus, a strain which a very considerable experience at Onderstepoort has shown to produce a febrile reaction commencing after a period of incubation of from 48 to 96 hours and death after 4 to 6 days. Very occasionally resistant animals survive to the seventh day. Unless the course of the disease is modified by simultaneous injection of large quantities of hyperimmune serum, or unless the virus is modified for example by exposure to formalin in suitable concentration(2) oedema of the supraorbital fossa which may be considered the clinical manifestation of subacute or chronic horsesickness does not appear in laboratory infections. Stated in another way, following injection with 0 virus the course of the disease is too rapid for *dikkop* to appear. Nieschulz's single horse, the full susceptibility of which is beyond question, was injected with his 10th mouse passage strain of 0 virus on 21st September 1932 and died on 30th September 1932, nine days later, after showing the typical clinical picture of *dikkop* horsesickness. This

must be taken as an indication that the virulence of the virus had been lowered appreciably and that its character certainly had been altered.

Tentative investigation into this aspect of attenuation of the virus, at the same time maintaining careful observations on any alteration in antigenic properties has shown that as a result of passage in the mouse there is an appreciable progressive decrease in virulence for the horse. This alteration has been more marked with strain 20329, a strain isolated from a case of natural infection, than with 0 virus which is probably fixed for the horse after its 30 years of repeated subinoculation. Consequently the work is being extended in the hope that alteration may be found to go hand in hand with full retention of antigenic properties. The object, of course, is to develop a rational method of immunization analogous with that which has been applied so successfully to yellow fever by Sawyer and his co-workers.(7)

The results obtained so far have been decidedly encouraging and will be reported as soon as sufficient data have been collected to warrant the drawing of definite conclusions.

Transmission to Guinea Pig.

The small size of the mouse brain (average weight approximately .45 grams) indicated the necessity of attempting to infect a larger laboratory animal as a more voluminous source of neurotropic virus. The guinea pig was selected and, on 1st December 1932, six young guinea pigs were injected intracerebrally through the foramen magnum with 0.25 cc. of 4% infective mouse brain emulsion. This material represented generation 7 of strain 20329.

After an incubation period of only 48 hours a severe febrile reaction commenced. Temperatures reached as high a point as 106.6°F and the animals rapidly became emaciated and lost weight. A progressive paresis gradually supervened and all six guinea pigs died, after collapse and coma, between the 8th and the 16th day. Up to the present time this strain has been maintained in guinea pigs by brain to brain passage for five generations and the mortality has been 100%. Moreover, the 0 virus strain is in process of establishment and it is confidently anticipated that this strain also will prove infective for guinea pigs.

In addition to the intracerebral route infection has been successful in guinea pigs by intracardiac and intraperitoneal injections, in the latter case so far only with simultaneous brain injury with 2% starch solution. Those animals injected intraperitoneally and intramuscularly which did not succumb showed a variable degree of immunity to subsequent infection.

Sufficient work has not been done to warrant the expression of any

opinion of the value of the guinea pig as a passage animal, but tentative experiments have shown that the guinea pig modified virus is more attenuated for the horse than is one which has been passed through mice for a limited number of generations.

The immediate result of the above work would therefore serve to indicate that the value of the mouse, and possibly to a greater extent the guinea pig, may lie not in the direction of their usefulness for diagnostic purposes, but as a means of carrying out detailed fundamental research into the biological properties of the infective agent of horse-sickness. Of even greater importance is the possibility of using these small animals as a basis of natural attenuation of the virus in the development of a simple, efficient, and safe method of immunization of equines.

SUMMARY.

1. The work of Nieschulz on the susceptibility of the white mouse to horse-sickness has been confirmed by independent and concurrent investigation.

2. In the mouse there is again encountered the anomaly of a virus which follows a septicaemic course in one species becoming neurotropic in another.

3. The virus may be propagated in the mouse apparently indefinitely by brain to brain passage.

4. Infection may also be set up by the intraperitoneal injection of a massive dose of virus together with simultaneous traumatic injury of the brain such as that caused by injecting sterile 2% starch solution.

5. Repeated passage of the virus in the mouse causes an increased virulence for mice accompanied by a decrease in the period of incubation.

6. As the virus becomes fixed for mice there is a progressive decrease in virulence for the horse.

7. Besides the mouse, the guinea pig is susceptible to the neurotropic virus.

8. The virulence of the guinea pig virus for horses appears to be further decreased.

9. There appears to be every possibility that the mouse and the guinea pig will prove of great value in the development of a safe method for immunization of equines.

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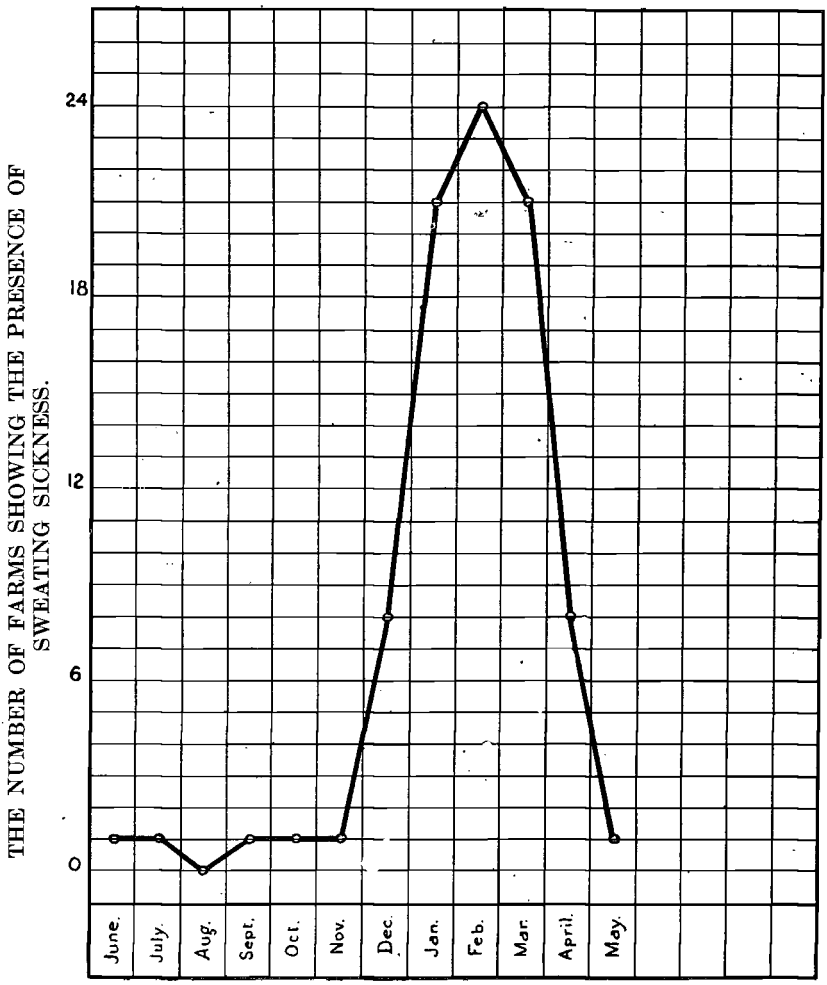
Observations on Sweating Sickness in Northern Zululand.

By RICHARD CLARK, B.V.Sc., Ermelo.

The following description is based on observations made in Northern Zululand, more especially in the Hluhluwe and Mkuzi Settlements during the summers of 1931 and 1932.

HISTORY.

The disease was first reported in the Hluhluwe Settlement on the farms H.63, Umbukwane and Coleford, in January, 1927. Since then the disease has appeared annually.



Graph showing seasonal occurrence of sweating sickness in 1931-1932.

Pathogenicity.

According to du Toit (1923) the disease usually appears only in calves up to 8 months old. This has also been the experience of the writer, but cases in older cattle are by no means rare. On one farm (H. 57/58) in January 1932, the disease first appeared in two calves, the one 12 months and the other 14 months old. A typical case in a cow three years old has been observed. Cases in cattle up to 14 months old are quite common. In older cattle, however, the symptoms are much milder and the prognosis much more favourable.

Incidence.

Isolated cases of the disease usually appear towards the beginning of January, the incidence increasing to about the middle of February. Cases are usually seen up to April. Two cases were actually seen by the writer in July 1931.

The incidence of the disease within the Settlement is most peculiar as the maps at the end of this article clearly show.

The disease has not yet appeared in the extreme south of the Settlement. In fact only two farms south of the Hluhluwe township have been infected, i.e. H. 40 and H. 16/23. These were only slight infections. No difference can be detected between this portion and the infected portions with regard to either climate or vegetation. From the southern boundary (roughly the Hluhluwe township) the disease occurs throughout the Settlement (with exceptions to be noted later), through the Mkuzi Settlement, and right into the Ngotshe District to Swaziland. The disease has never been reported from the north of the Ubombo mountains. The native tank areas of Mzineni and Nkwemi are also infected.

Even isolated farms in the infected portion of the Hluhluwe Settlement are free from the disease, although surrounded by farms showing a high morbidity. A close study of the farming methods, plant and insect life on these farms might throw some light on the aetiology of the disease.

Morbidity.

The morbidity varies greatly. The highest reported in 1931 was 17 out of 17 or 100%, the lowest 8 out of 80 or 10%. In 1932 the figures varied from 17 out of 17 or 100% to 5 out of 120 or 4.2%, averaging 38.8%.

Isolated cases among a batch of calves are by no means rare.

Mortality.

No definite figures for mortality can be given, as it is very difficult to obtain reliable information. Many mild cases are undoubtedly missed and therefore the mortality would appear higher than is actually the case. The average mortality for 1931 was 35%, the highest

reported by an individual farmer being 14 out of 24 or 77%. From the figures for 1932, the average mortality was 30.1%, varying from 60% to 0%.

SYMPTOMS.

The first symptoms usually noted are dullness, grinding of the teeth, and a staring coat. The animal usually stands with the head and ears hanging and an arched back. It usually seeks shade. Lachrymation and salivation are common symptoms. The temperature is high—106° to 108° F. The animal often shows ague.

Later on (24 to 48 hours after) the animal, in a typical case, breaks into a profuse perspiration. This perspiration is often seen only in the early morning, as later in the day it dries too rapidly. In many cases

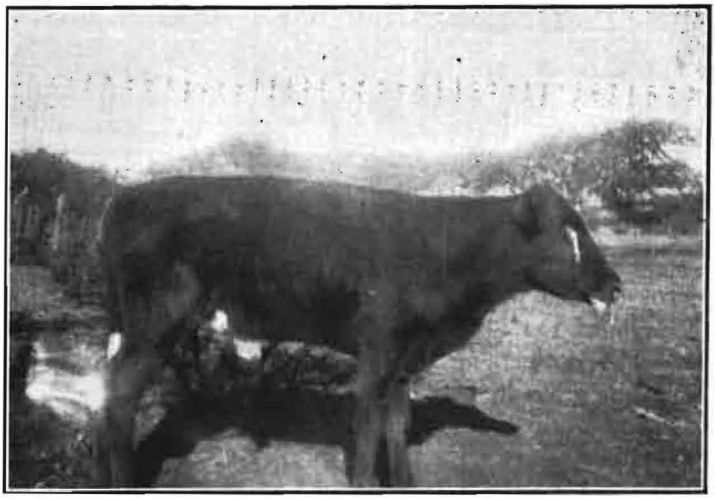


Fig. 1. Sweating Sickness. An Early Case showing lachrymation and salivation.

the sweat can actually be seen dripping off the animal on to the ground. In others the coat appears wet and clammy to the touch. The buccal mucous membrane is swollen, reddened, and often ulcerated. The ulcers are usually covered with a diphtheritic pseudomembrane. Because of the pain caused the calf does not suckle, although frequently it may attempt to do so, but later will desist entirely. The nasal and even the vaginal mucous membranes may be affected in the same way. There is often difficulty in breathing owing to the rhinitis, but the lungs are unaffected. Conjunctivitis is very acute. Profuse salivation and frothing at the mouth are noted.

The sweating usually takes place on the face, behind the ears, the sides of the neck, the shoulders, flanks, and rump. In rare cases it may be seen over the entire body. The temperature is usually normal during this period.

Twenty-four to thirty-six hours later the sweating stops. The skin is reddened and often necrotic. The hair falls out over the affected parts. When handled the hair comes away easily, often bringing pieces of epidermis with it. The skin is hard, like that of a scabby sheep. Keratitis and corneal opacity are often seen. The tips of the ears and the end of the tail may necrose and fall away. The edges of the lips at times necrose, and hard, wart-like protuberances form round the borders. Patches of skin the size of a man's hand may be completely denuded of hair.

In older animals the symptoms seen are dullness and fever followed by sweating over a small area behind the shoulders or the sides of the neck, with recovery in four or five days.

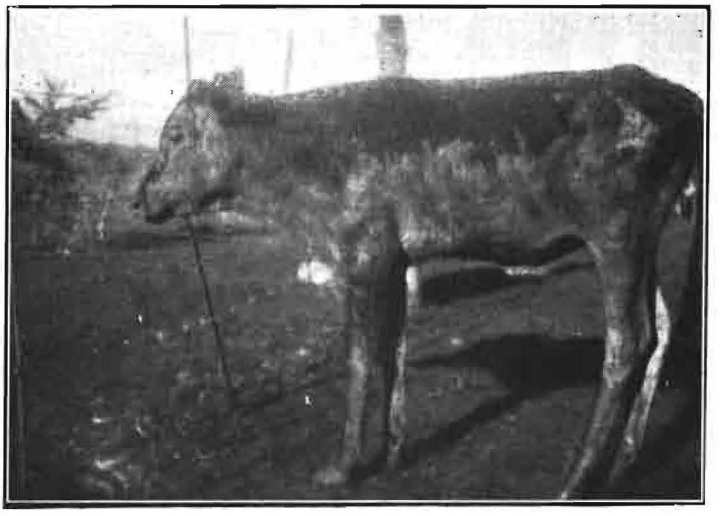


Fig. 2. Sweating Sickness. A Recovered Case showing denuding of the skin.

The disease may be peracute or acute. It may appear chronic but this is generally due to sequelae *(vide infra)*. In peracute cases the calf may be dead within 24 hours. The usual course of the disease is about seven to eight days.

TRANSMISSION.

The writer would like to place on record the almost unanimous opinion of farmers with long experience of the disease, namely the suspicion that the "bont poot" tick (*H. aegyptium*) is the carrier. In the opinion of the writer further experiment is needed before this can be definitely excluded. In this connection the following extract from a letter from the late Mr. Tyzak of Tshaneni, Mkuzi, is of interest:— "This calf [a case of sweating sickness] had several ordinary brown ticks and one large blue tick at the end of its tail. We hand-dress

the tails daily but this one must have been overlooked. There are several other young calves in the same pen as this one, but none with ticks and no sweating sickness."

The introduction of 5 day dipping and hand-dressing in the Hluhluwe Settlement has tended to discredit this idea as no falling off in the number of cases has been noted since its inception.

TREATMENT.

There is no known specific for the disease. Treatment can only be symptomatic. The calf should be brought into the shade and given a liberal supply of water. As the calf cannot suckle, it suffers from lack of nutrition. This is, in the writer's opinion, the indirect cause of a large proportion of the deaths. Although the calf cannot suckle it is nearly always able to drink, and should be given milk from a bucket or be hand-fed. These two simple precautions alone will reduce the mortality greatly.

The "doses" recommended are legion and many of the claims at first sound convincing enough. In this connection one must, however, remember the natural variations in the mortality. As the digestive tract is seldom affected, no oral administration is indicated in the opinion of the writer.

The badly affected parts of the skin may be treated with carron oil or other suitable dressings.

Invasion of the necrotic parts by maggots must be carefully guarded against by treating with a weak solution of copper sulphate or other suitable preparation. The mouth and eyes should be washed out with light disinfectants such as dilute boracic acid or permanganate of potassium solutions.

COMPLICATIONS.

Dr. Thomas states in his report dated the 1st of March, 1932:—

> Under the semi-ranching conditions prevailing in this area, particularly where cream and milk form the main sources of revenue, there are a number of difficulties which the farmer is not always in a position to overcome and in consequence of which the hygiene and management of stock leaves much to be desired. The result is a series of complicating factors which tend to accentuate and even overshadow the original disease. Thus Sweating Disease by reason of its novelty and mysteriousness is probably blamed for more damage than it actually causes while the contributing factors tend to be overlooked. This statement must not be taken to mean that Sweating Sickness is of no importance. On the contrary the position is very serious as is amply proved by the enormous yearly losses in calves.
>
> The following are some of the factors which undoubtedly contribute to these losses: ticks, ophthalmia, scours, malnutrition, maggots, dip scalding, and also possibly paratyphoid, coccidiosis, red water, gallsickness and nagana.

The writer entirely agrees with this statement. The position in Hluhluwe shows many complications. These will be dealt with separately.

Conditions of Farming —The farming is of the ranching or semi-ranching type. As cream is the main source of revenue, the calves

are often underfed. This naturally aggravates the disease and retards recovery. The calf sheds, byres, etc. are often non-existent or very inadequate. Calves are therefore often not given sufficient shelter while suffering from the disease.

Ticks.—"Ticks, especially *A. hebraeum* and *H. aegyptium* are very prevalent and cause swellings, limping, and sloughing of the tail-brush. With the dip-wash kept on the strong side for these ticks, scalding is not infrequent." [Thomas].

Ophthalmia.—Ophthalmia is very prevalent in the area under review. On this account it is very difficult to state definitely what eye lesions follow on sweating sickness and what are due to a concurrent attack of ophthalmia.

Conjunctivitis and lachrimation are typical symptoms. Du Toit states that "in rare cases the cornea becomes affected resulting in opacity." The frequency with which this occurs in Northern Zululand, followed by *phthysis bulbi* and total blindness, has forced the writer to the conclusion that this is a frequent symptom of sweating sickness in this area. As stated before, however, the complication of ophthalmia is very common. The writer is of opinion that the weakness and emaciation following on sweating sickness are potent predisposing factors to ophthalmia and that eye lesions due to both ophthalmia and sweating sickness, at times complicated by myasis, often occur together.

Scours.—White scours is very common in the area and may appear in calves suffering from sweating sickness. This is looked upon by many farmers as part and parcel of the disease. In the writer's opinion, however, it is merely a complication of the disease, aggravated by the general condition of the animal. Even blood-scours has been noted.

Maggots.—Blow-fly and maggots are exceedingly prevalent in this area, causing perhaps the most important complication in sweating sickness. The eyes, lips, anus, vulva, and even the affected parts of the skin, especially the inguinal and perineal regions, all become a seething mass of maggots unless preventive measures are taken. These maggots are as often as not the cause of death, or of blindness, etc. Prophylaxis and treatment for myasis cannot be too greatly stressed in connection with the disease in the area under review.

Nagana.—Nagana is very prevalent in the area and the loss of condition due to this infection often aggravates the sweating sickness causing a higher mortality than would probably be the case normally.

Paratyphoid.—Although this disease has never been diagnosed in the area its presence is strongly suspected. This possibility, together with bad calf hygiene and the general farming conditions again complicates the picture. Similar remarks apply to coccidiosis.

East Coast Fever.—The outbreak of East Coast fever has produced another grave complication. Calves suffering from sweating sickness, if dipped during the fever, invariably succumb. Owing to the strict dipping regulations now in force, this factor has greatly increased the mortality.

PREVENTION.

As the mode of transmission is unknown, definite rules for prevention cannot be given. Good hygiene and careful calf management will undoubtedly assist.

As the disease occurs in a serious form only at a certain time of the year and only in calves up to a certain age, the obvious course to adopt is to arrange for the calves to be born at such a time that they will not be susceptible during the dangerous period. Thus calves born in June would be 6 months old (i.e. past the most susceptible age) at the advent of the dangerous season. This would mean putting the cows to the bull in about the month of October. With a reasonable degree of safety, it could be arranged for calves to be born from April to July inclusive. Unfortunately owing to the lack of fencing and the general ranching conditions in this area, this is, at present, impracticable.

CONCLUSIONS.

It will, therefore, be seen that the problem of sweating sickness in the Hluhluwe Settlement cannot be looked upon from the viewpoint of sweating sickness alone. Many and varied local and climatic conditions have to be taken into account.

ACKNOWLEDGMENTS.

I wish to express my thanks to Dr. Thomas for valuable suggestions with regard to this paper, and to Stock Inspector Liversage for his willing assistance in collecting data, etc.

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ADDENDUM

The following is intended to show the morbidity, the mortality and the season of occurrence of sweating sickness in the Hluhluwe Settlement during the year 1931:—

Farm	Calves	Deaths	Total Infected	Date of First Case	Date of Last Case
Coleford	17	11	17	December	January
Culmington	6	2	2	,,	,,
Bront	45	3	10	February	March
H. 56	45	9	35	January	,,
H. 57/58	62	8	15	February	,,
H. 52	28	4	7	December	,,

H. 51	16	3	10	January	,,
Cadillac	35	5	15	,,	,,
Iseme	45	6	45	,,	,,
Umbukwane	21	1	3	,,	,,
H. 54	80	0	8	,,	February
Ufumba	20	1	3	December	December
Ntabankosi	16	2	4	January	March
H. 49	24	1	4	,,	January
H. 48	30	1	5	,,	March
Cairn Bane	3	1	3	February	,,
Mont Rosa	80	10	30	January	,,
Ityelwana	24	3	5	March	,,
H. 90	25	6	12	January	,,
H. 88	16	1	4	,,	,,
H. 70	24	11	14	,,	,,
H. 86	2	0	2	,,	,,
H. 62	6	1	3	,,	,,
H. 61	65	9	25	,,	,,
H. 72	68	11	30	December	April
H. 76/77	52	0	3	February	February
Experimental Station	22	3	6	,,	March
Total	877	113	327		

NOTES ON MAPS AND TABLES FOR 1931.

Taking these farms as representing average infected farms it will be seen that the losses represent 12.6% of the crop of calves. 35.3% of the calves were infected and the mortality averaged 35.6% of the infected calves.

It will be seen that the incidence of the disease presents many baffling phenomena, e.g. the farm "Coleford" showed 100% infection and 64% mortality, whereas "Umbukwana," bordering on "Coleford," showed only 14% infected and 33% mortality. "Culmington," also bordering on "Coleford," showed 33% morbidity and 100% mortality. (This rather points to the recognition by the owner of the very severe cases only). The farm "Umbukwana" is also bordered by another 100% morbidity farm, "Cairn Bane."

It will be noted from the maps that all the most heavily infected farms are on the Mhlosinga River, namely "Coleford," "Culmington," "Iseme," and H 86. All these are shown as 100% infection but H. 86 shows no losses. The following farms are also on the river:—

Umbukwana	Morbidity	14%
Ufumba	,,	15%
H. 64	,,	Nil
H. 90	,,	50%
H. 88	,,	25%

Also the farms on the Ingweni and Mzineni Rivers do not show exceptionally high morbidity.

It therefore, seems scarcely logical to connect the thick bush along the rivers with the incidence of the disease.

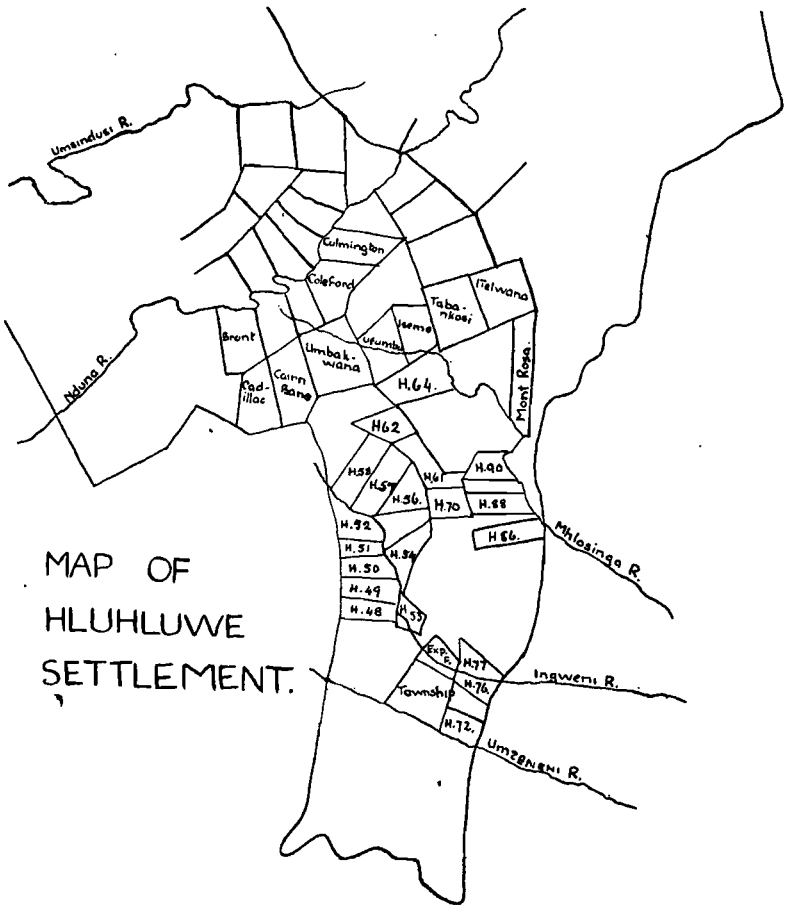
The mortality will also be seen to range from 100% to 0%, averaging 35.6%. Of course this figure depends on the diagnosis of mild cases and to my mind should read more like 25% of the infected calves.

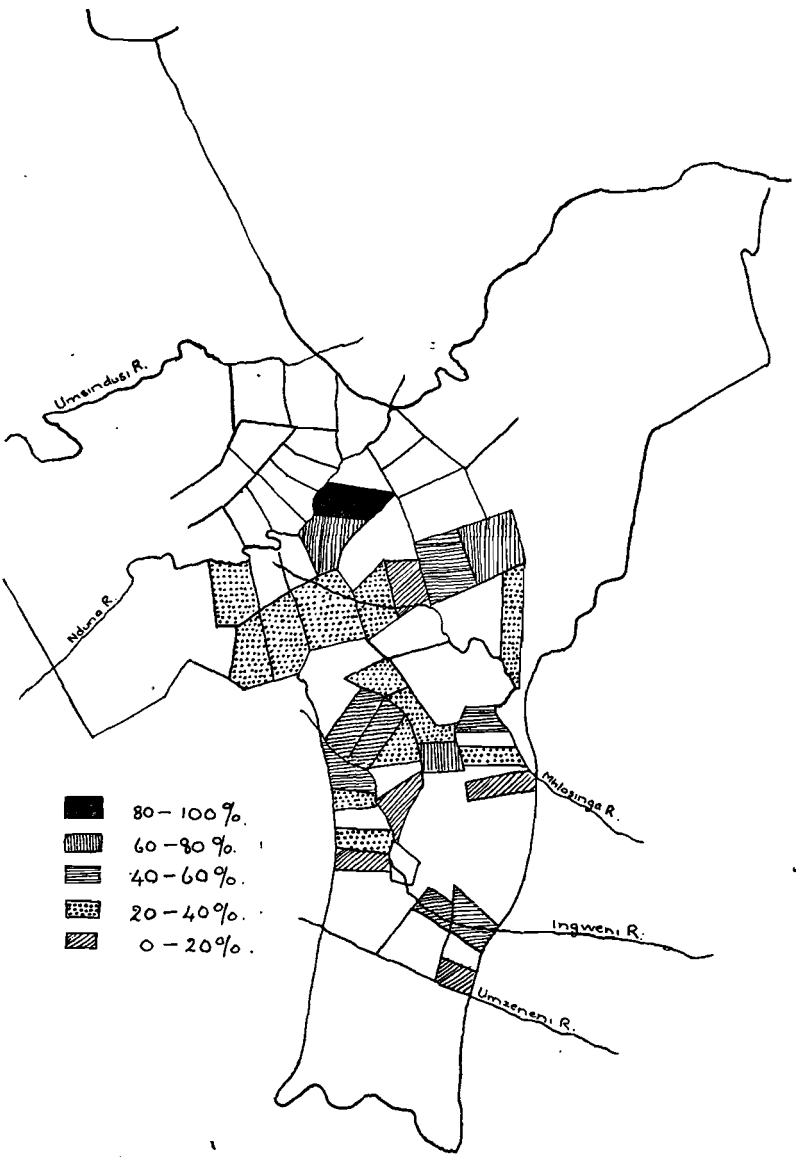
It will be seen from a study of the maps appended that it is hardly possible to trace the infection to certain areas, as widely different rates of morbidity and mortality are seen on adjoining farms. It would therefore seem impossible to put infection down to local conditions.

Table showing average loss on calf crop from sweating sickness:—

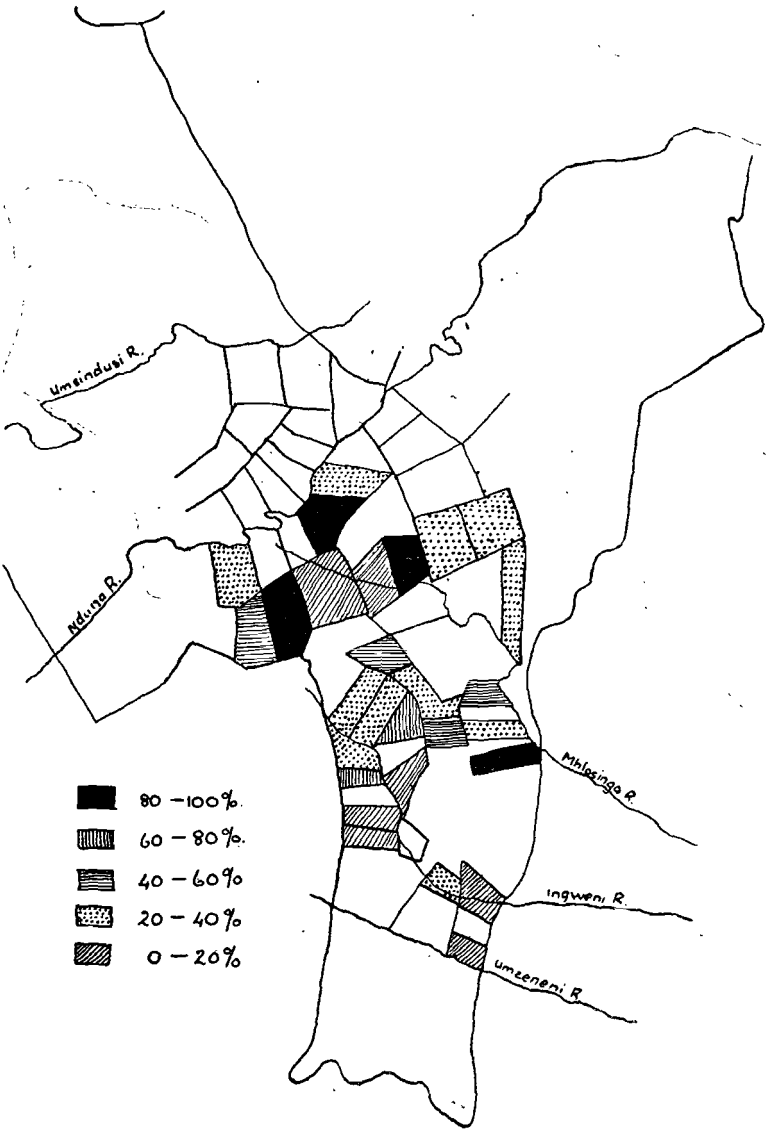
Season	Loss on Annual Calf Crop	Mortality	Morbidity
1930-1931	12.9%	35%	37.3%
1931-1932	11.7%	30.1%	38.8%

The figures for 1931-1932 were taken from 26 farms with a gross calf crop of 840; 326 were affected of which 98 died.





Map of Hluhluwe Settlement showing mortality rate in Sweating Sickness, 1931.



Map of Hluhluwe Settlement showing Morbidity rate in Sweating Sickness in 1931.

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IV (1) 1933.

A New Species of Setaria from Antelopes.

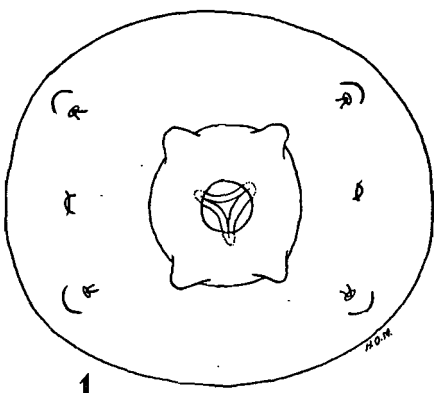
By H. O. MÖNNIG, B.A., Dr. Phil., B.V.Sc., Onderstepoort.

The Setarias are common parasites in the peritoneal cavity of ungulates and are very frequently found in various antelopes. In the latter hosts a common species is *S. hornbyi* which has also once been found in a sheep, but a number of other species, of which a good account has been given by Thwaite (1927), are sometimes met with.

The following description of a worm, for which the name *Setaria thwaitei* is proposed, is based on material collected in the Northern Transvaal in July 1932 from the sable and the roan antelopes and one female specimen in the Onderstepoort collection taken from the waterbuck. The specimens from the sable antelope constitute the types.

The worms are very large and milky white in colour, tapering especially towards the posterior extremity. The tails are spirally coiled, more so in the males than in the females. There is a constriction of the body 0.22 to 0.27 mm. from the anterior extremity (Fig. 2) which is very pronounced in most specimens and visible in all of them. The nerve ring lies at the level of this constriction or slightly posterior to it.

The cervical papillae are situated 0.49 to 0.64 mm. from the anterior extremity. The head bears two lateral, and four pairs of submedian papillae, the anterior of each pair being small and pointed while the posterior is dome-shaped (Fig. 1).



1.

Fig. 1. *Setaria thwaitei* n. sp. Head, anterior view.

The mouth is surrounded by an oval, chitinous peribuccal ring, which differs from that of all known species of the genus in that it is notched dorsally, ventrally, and laterally, forming four truncate "lips" which are almost submedian in position (Fig. 1). Comparing the

structure with that found in other species, it could be described as consisting of dorsal and ventral lips which are deeply notched, so that the two halves of each stand far apart, the lateral lips being absent.

The oesophagus consists of the usual two portions; the anterior muscular part is 0.51-0.55 mm. long in the males and 0.73-0.91 mm.

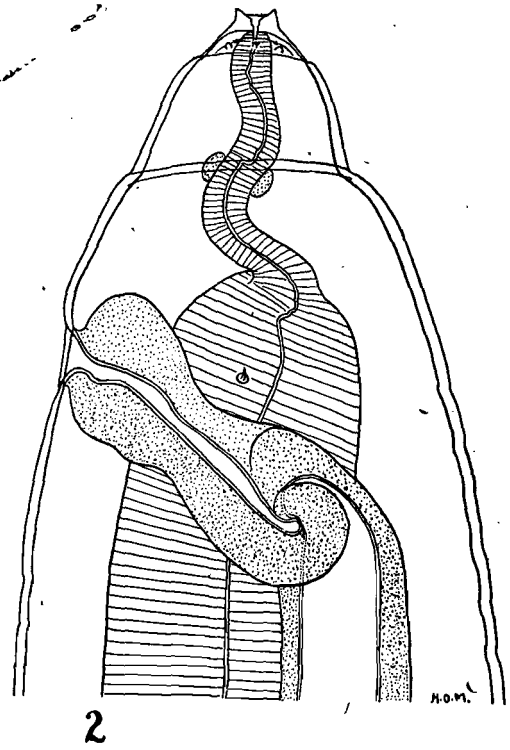


Fig. 2. *Setaria thwaitei*, n. sp. Anterior extremity of female, lateral view.

in the females. The whole oesophagus measures 7.3-9 mm. in the males, i.e. 1/11-1/12 of the body length, and in the females 12.5-12.8 mm. or 1/13-1/20 of the body length.

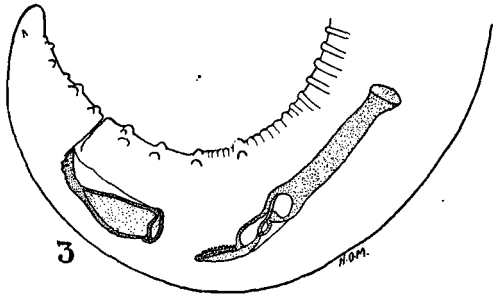


Fig. 3. *Setaria thwaitei*, n. sp. Posterior Extremity of male, lateral view.

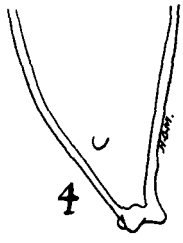


Fig. 4. *Setaria thwaitei*, n. s.p. Posterior extremity of female, lateral view.

The *males* are 88-98 mm. long with a maximum width of 0.66-0.68 mm. The spirally coiled tail bears a series of ventral transverse thickenings of the cuticle, which are also seen in several other species. There are four pairs of precloacal and four pairs of postcloacal papillae, the latter situated somewhat asymmetrically, and in addition an unpaired papilla near the anterior border of the cloaca (Fig. 3). Near the extremity of the tail there is a pair of small lateral appendages.

It may be noted here that *Setaria equina* also has an unpaired precloacal papilla, which has never been described, and many specimens show a similar postcloacal papilla in addition.

The spicules are unequal and dissimilar. The left is 0.42-0.487 mm. long; its distal portion is partly membranous and in most specimens (four out of five) the extremity bears on its ventral aspect a number of small tubercles. The right spicule is 0.21-0.23 mm. long, thick, and usually slightly serrated dorsally near the tip.

The *females* are 215-280 mm. long, with a maximum thickness of 0.95-1.28 mm. The tail is 0.64-0.84 mm. long, usually ending in three blunt tips, but there is much variation in this part. A pair of small lateral appendages, sometimes bifid, is situated near the posterior extremity.

The vulva opens ventrally in a very shallow depression, 0.51-0.62 mm. from the anterior extremity. The vagina has the usual sphincter and leads into a wide ovejector. The worms are viviparous.

TYPE HOST: Sable antelope *(Oxanna nigra)*, other hosts: Roan antelope *(Egocerus equinus)* and Waterbuck *(Cobus ellipsiprymnus)*.

LOCATION: Peritoneal cavity.

LOCALITY: Transvaal, South Africa.

TYPES in Onderstepoort Helminthological Collection, No. 2498.

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The following five candidates obtained their B.V.Sc. degree in the Pretoria University at the end of last year: H. P. Steyn, T. F. Adelaar, J. H. Cloete, P. J. Meara, W. D. Malherbe.

JL. S. A. V. M. A.
IV (1) 1933.

The Blesbuck *(Damaliscus albifrons)* as a Carrier of Heartwater and Blue Tongue.

By W. O. NEITZ, B.V.Sc., Onderstepoort.

I. HEARTWATER.

No work has yet been done on the transmission of heartwater to game. It is important to establish transmissibility so that control measures can be applied more effectively. Webb (1898) made the statement that bushbuck suffered from this disease along the Fish River at Southey's Poort. His observations were, however, never confirmed experimentally.

The following experiment records the passage of heartwater virus through the blesbuck:—

Experiment No. 1 (S 4841).

Object: To attempt transmission of heartwater from a sheep to a blesbuck and to note the reaction.

Method: (a) 5 cc. virulent heartwater blood from a sheep inoculated intravenously into the blesbuck.

(b) 10 cc. blood from this blesbuck subinoculated intravenously into susceptible sheep on the 8th, 12th, and 18th day.

Result: (a) The blesbuck did not show any symptoms that could be ascribed to heartwater, but died on the 25th day after inoculation. At autopsy it was found that the marked emaciation present was due to a severe panverminosis.

(b) The two sheep injected with blood from the blesbuck on the 10th and 12th day did not show any reaction and following a subsequent immunity test both died from typical heartwater.

The third sheep injected on the 18th day started to react to heartwater 8 days after injection and died on the 15th day. The presence of *Rickettsia ruminantium* in the brain was demonstrated. The subinoculation from this sheep into two susceptible ones further confirmed the diagnosis of heartwater.

Conclusion: 1. The blesbuck was found to be susceptible to heartwater, but its death is ascribed to heavy worm infection.

2. The subinoculations from the blesbuck on the 10th and 12th day failed to produce heartwater in sheep, but produced a positive result in a third sheep on the 18th day.

II. BLUE TONGUE.

According to Theiler (1907) blue tongue has been known to occur in South Africa ever since sheep-breeding was started. Hutcheon

The sheep inoculated on the 17th day showed a typical febrile reaction with clinical symptoms, but no blue tongue lesions. The incubation period was eight days. The sheep was killed *in extremis.*

The sheep injected on the 40th day did not react and was found to be susceptible to blue tongue on testing the immunity.

Conclusion: 1. Both blesbuck were found to be susceptible to blue tongue but did not manifest any clinical symptoms.

2. The presence of the virus could be demonstrated on the 8th, 10th, 14th, and 17th day but not on the 20th, 24th, and 40th day by inoculation of susceptible sheep.

In sheep Theiler was able to demonstrate the presence of virus 30 days after the reaction had passed off and Spreull in one case after 50 days.

3. The potency of the virus was not changed. Both mild and severe reactions were obtained in the sheep inoculated.

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Lightning as a Cause of Mortality in Stock.

"South Africa has more lightning, and a higher mortality rate from this cause, than any other country. A committee, of which Dr. O. R. Randal is the chairman, has been formed to investigate the causes of this unusual frequency. The research includes the direction and paths of storms, areas specially affected with lightning, the nature and incidence of casualties, medical effects, the growth or diminution in the number of thunderstorms, the collection of photographs, the manner in which flashes enter building, the experiences of motorists, the physiological effects of thunderstorms on nervous persons and animals."

Medical Press and Circular.

This subject is undoubtedly one that would greatly interest veterinarians, as the mortality in stock due to lightening in this country must be considerable. The chairman of the above committee has intimated that he would welcome any help forthcoming from veterinarians. It is hoped at a later date to circularise members for such precise information and statistics as are available.

Would members in possession of such information kindly communicate with the Editor S.A.V.M.A.

Jl. S.A. V. M. A.
IV (1) 1933.

Notes on the Double Intra-dermal Tuberculin Test carried out in Durban and Neighbourhood.

By W. J. GREEN, B.V.Sc., Durban.

It is not my intention to describe in detail the technique of the test but to deal with certain factors in the interpretation of the test which may confuse the veterinarian who has had no previous experience of the test. The technique is fully and concisely described in a memorandum by the Tuberculin Committee of the Medical Research Council—copies of this pamphlet may be obtained from the Director of Veterinary Services.

The site of injection may sometimes have a bearing on the resultant reaction. The usual site is approximately at the middle of the neck. It is important, however, not to inject too low down on the neck as the resultant oedema in the case of a reactor may be masked by the loose folds of skin occurring in this situation or the oedema may disappear more rapidly from here than from a site where the skin is fairly firm and tense. In bulls and oxen with extremely thick skins over the neck the injection should preferably be made over the shoulder blade where the skin is usually thinnest.

A definitely positive or a definitely negative reaction does not give rise to any difficulty in interpretation. The cardinal symptoms of a positive reaction are a definite increase in the skin measurement accompanied by oedema, pain, and heat. It is however the occasional border-line or doubtful reactions that may give rise to confusion. Even veterinarians with considerable experience of the test may err in this connection.

Such border-line or doubtful reactions may be classified as:—

1. Slight oedema with no pain on palpation.
2. Slight oedema with pain on palpation.
3. Hard non-oedematous swellings.

If any of the above reactions are encountered the practitioner definitely should not commit himself, but retest the animal within a fortnight.

1. *Slight Oedema with no pain on Palpation:* The slight oedema present in a 'negative' animal is sometimes due to constant rubbing of the neck against a tree, post, or wall. Whitewash marks are sometimes seen along the neck on the injected side. The injection in the skin sometimes gives rise to a certain amount of irritation in very sensitive animals. In a doubtful reaction the pain and heat symptoms must not be taken too seriously. Some animals are far more skin-sensitive than others, and will flinch even if pressure is applied to the definitely negative "blob" in the skin. It is also a matter of con-

jecture whether heat can be detected in a border-line swelling on a hot summer's day.

2. *Slight Oedema with pain on Palpation:* On the other hand, slight oedema with pain on palpation may indicate a "faint" reaction, is only a slight response to the injected tuberculin. Such reactions must be treated with great care as they are occasionally met with in an animal with advanced generalised tuberculosis. The emaciated condition of the animal together with the results of a systematic clinical examination should influence the practitioner's opinion in this connection. Such animals were occasionally encountered in some of the Durban dairies and on post mortem examination were extensively infected with advanced generalised tuberculosis. I do not wish to suggest that all advanced generalised cases fail to give a good reaction to the double intra-dermal test. It will be seen later that 239 animals with generalised tuberculosis reacted and of these 65 were in an advanced stage, and manifested "grapes."

3. *Hard, Non-Oedematous Swellings:* Such types of swellings may sometimes occur in both reactors and non-reactors. In the former case they are apparently due to the fact that the injection has been made too superficially, i.e. immediately under the surface epithelium. It is important, therefore, in the performance of the injection that the needle should reach the deepest layers of the *dermis,* otherwise the swelling has not the same facility for spreading. Hard, non-oedematous swellings may occur in very thick-skinned animals for the same reason.

Occasionally an animal has given two or even three doubtful reactions in succession at intervals of two weeks. In such cases it is advisable to employ a subsidiary test in conjunction with the intra-dermal, such as the subcutaneous or opthalmic.

To indicate the number of doubtful reactions which may occur the following figures give an idea of the test carried out in the Durban area up to November, 1932:—

No. of animals tested	Negative	Positive	Doubtful
3411	2195	993	223

On retesting the 223 doubtful reactors 121 gave a positive and 102 a negative reaction, and the final figures are given below:—

No. of animals tested	Negative	Positive
3411	2297	1114

Percentage of infection—32.5.

Since the commencement of the test in Durban all animals introduced from outside were tested. Such animals were brought in by dairymen chiefly to replace losses due to the test and losses from other causes such as disease, non-profitable cows, etc. Such cows were classed as replacements. A summary of replacements tested is given below:—

No. of animals tested	Negative	Positive
813	721	92

The actual percentage of infection in Durban at the time the test commenced was therefore as follows:—

No. of animals tested	Negative	Positive
3411—813=2598	1576	1114—92=1022

Percentage of infection—39.3.

It may be interesting to compare with this tests carried out in rural areas in different parts of Natal. A summary is given below:—

Total No. of animals tested	Negative	Positive
1558	1507	31

Percentage of infection—1.3.

A wrong impression must, however, not be formed from the comparatively low percentage of infection in the rural areas, as more or less specially selected herds were tested, some of which had undergone previous tests. It is well known that some individual herds tested in rural areas have shown an abnormally high percentage of infection.

It is evident from the high percentage of infection revealed by the test that tuberculosis had gained a stranglehold on the dairy herds in Durban, and that this insidious disease had assumed alarming proportions from the public health viewpoint. Apart from this, the economic aspect of the disease must be taken into consideration, as post mortem statistics reveal that at least 23.4 per cent. of the reactors slaughtered showed generalised tuberculosis.

POST MORTEM RECORDS OF 1020 REACTORS.

No. visible lesions	Generalised Tuberculosis.	"Grapes"	Tuberculosis of the udder and mammary lymph glands
58 (5.6%)	239 (23.4%)	65 (6.3%)	66 (6.4%)

From the above figures it will be seen that the direct infection of the milk supply in this particular area was 6.4%. Indirect infection of milk from extraneous sources must, however, increase this percentage taking into account the 23.4% of generalised cases, since it has been experimentally demonstrated that a cow with advanced or open tuberculosis may secrete tubercle bacilli in considerable quantities through the milk although no microscopic lesions are visible in the udder.

Briefly reviewed, the double intra-dermal test was applied to approximately 5,000 animals and the following impressions were formed:—

1. The test was reliable and its application fairly easy provided the head of the animal was properly controlled.

2. The test was 94.4% efficient. Of reactors condemned 5.6% showed no microscopic lesions on post mortem examination. Microscopic lesions may, however, have been present in some of these cases. In this connection it may be advisable to state that certain workers have found that sometimes the only site of infection present is in the form of small tubercular skin tumors which may be very easily overlooked on post mortem examination.

3. Proficiency in interpretation of readings can soon be acquired by experience and correlating clinical observations with the autopsy findings.

4. It is better to rely on the clinical characters of the swelling than merely on the increase of skin measurement. In fact, after some experience it is better to discard the callipers altogether.

5. Occasionally in animals which had given a good reaction and which were carefully "post mortemed" no tubercular lesions were found. In some instances an abscess or purulent process was encountered. Further research work on these non-specific reactions is necessary.

6. The size of the skin swelling in a reactor bears no relation to the degree of infection present. On an average it was found that the greater the swelling the less extensive the infection. The highest measurement recorded was 80 mm. and the only site of infection in this case was a very small focus in the mediastinal lymphatic gland.

7. Unless reactors are immediately and completely isolated from non-reactors one cannot expect to eradicate the disease from any particular dairy.

8. Certain dairies were in a deplorable state of hygiene and sanitation, and no amount of testing would probably eradicate the disease from such premises unless the general hygiene and sanitation were improved. The local authorities are now fully aware of this and it is pleasing to note that besides appointing a full time veterinary officer they have effected great improvements in construction of byres and in hygiene and sanitation. The average percentage of tubercular infection was 39.3 although some dairies registered as high as 80% to 90%.

A Proposal to Form a Society for the Study of Comparative Pathology.

In his presidential address to the South African Biological Society,*

*See S. A. Medical Journal, December 24th, 1932.

Dr. G. de Kock makes a timely and very strong plea for closer co-operation between the medical, veterinary and other research workers in biology in furthering the study of comparative pathology.

He points out that many diseases like rabies, tuberculosis, etc., common to human and veterinary medicine demand the close consideration not only of the medical and veterinary authorities separately, but that there is a real need for co-operation in jointly evolving a policy of effective control for such diseases. There are furthermore numerous problems which, although not offering points of direct interest to one of the two professions, present similarities or analogies which could very profitably be discussed on common ground. In order to illustrate this, Dr. de Kock recapitulates much of the work that has been and is being done at Onderstepoort, most of which is already well known to veterinarians in this country.

Finally, an appeal is made to investigators interested in medicine and veterinary science, to meet at an early date under the auspices of the South African Biological Society, to discuss ways and means of fostering the suggestions made, and also for more frequent consultations between officers of the Departments of Public Health and Agriculture and prominent local authorities, in order to obtain uniformity of policy on the main issues. As the matter is largely one in which officials of State departments are concerned, there should be no difficulty in achieving this, and we sincerely hope that steps will be taken at an early date to give effect to the excellent suggestions advanced.

A.D.T.

Jl. S.A. V. M. A.
IV (1) 1933.

The Brooding and Rearing of Chicks.

By E. VAN MANEN, M.Sc., Agric. (Cornell), Durban.

The Feeding and Rearing of Chicks.

It has generally been supposed that chicks should be starved for the first 48 to 72 hours after hatching in order to allow of complete assimilation of the unabsorbed yolk which is still present in the body of the chick at hatching time. Several investigators have within the last few years given this matter their attention, and among others Heywang and Jull (1930) have concluded that it is probably true that feeding has but a slight effect on the rate of assimilation of the yolk in day-old chicks, and that early feeding is not harmful. They also state that the feeding of mash as compared with scratch grains seems to cause a less rapid rate of yolk assimilation.

Roberts (1928), Parker (1929), and Holmes, Halpin, and Beach 1929) all found that starving compared with feeding chicks within the 48 to 72 hour period did not materially affect the rate of yolk assimilation.

Young chicks should be kept in an active condition and for that reason a system of feeding should be devised which will enable them to get plenty of exercise.

For practical purposes a combined system of mash and grain feeding has been found to be efficient. The mash must be fed in hoppers and the grain scattered in the litter. The mash is thus left before the chicks all day long, and the grain is fed in the morning, at noon, and in the late afternoon. The amount of mash eaten can thus be regulated by the amount of grain which is fed. The chicks may also be given one or more feeds of moist mash daily. Besides receiving green food the chicks should be allowed access to oyster shell and grit.

Prominence has recently been given to the feeding of mealies and skimmed milk to young chicks. Chicks can be grown to maturity on such a ration, but it remains to be proved whether or not the addition of supplementary feed is beneficial during the latter stages of growth.

The Protein Requirements of Growing Chicks.

Due to the rapid growth of chicks their protein requirements during the early stages of growth are relatively high. Scientific investigators during the last five to seven years have concerned themselves particularly with the amount of protein required by chicks during the first eight to ten weeks after hatching.

According to Mussehl and Gish (1925) maximum growth at nine weeks of age was obtained upon a 19 per cent. protein ration. They

also found that no additional growth was obtained when the protein content was increased to about 20.6 per cent. Meat scrap was used as the chief source of protein. When liquid skimmed milk was used as the chief source of protein they found that approximately 17.3 per cent. produced maximum growth during the same period.

These results have been confirmed by Carrick, Hauge and Prange (1927) who report no better growth when they increased the protein content above 19.4 per cent.

Card (1918) suggests a starting ration containing 19.5 per cent. protein but recommends that the protein should be reduced as growth declines.

Norris and Heuser (1930) state that "the greatest growth in chicks during the first eight weeks was obtained on rations which contained approximately 20 per cent. protein." The parallel course taken by growth curves of chicks, which received 15 to 16 per cent. protein after eight weeks, indicates that the protein requirement thereafter is in the neighbourhood of this quantity.

Until about 1930 the concensus of opinion upon the protein requirements of chicks has been that growing birds require about 20 per cent. of protein for maximum growth up to eight or ten weeks of age, and that after that time a reduction of protein may be made in the ration without interfering with growth.

From the experiments conducted at the Ohio State University by Winter Metal (1932) it now appears that it is not necessary to reduce the protein content of the ration after the first ten week period. They conclude that "it is desirable to change pullets from the starting ration to the laying ration at the age of eight to 12 weeks without the use of a growing or 'finishing' ration that is lower in protein than the laying ration.

"This system of feeding results in larger and more uniformly developed birds at the time production begins, and also more intensive and uniform early production.

"There is no correlation between the level of protein intake and the age at which the first egg is produced."

For practical chick feeding the following ration for the first ten to twelve weeks will give satisfactory results: 30 per cent. (by weight) yellow mealie meal, 25 per cent. wheat bran, 25 per cent. pollard, 19 per cent. meat meal and 1 per cent. salt. Grain in the form of cracked yellow mealies may be fed sparingly.

It will be noted that no allowance is made for the feeding of mineral mixtures, the above ration being complete as regards mineral requirements. Excess mineral elements in chick rations do not, as is commonly supposed, make for safety, but may in fact be harmful. Free access to oyster shell, the addition of 1 per cent. of salt to the

mash, and a plentiful supply of green food will be found to be sufficient for the needs of growing chicks.

Confinement Brooding and Rearing.

As the result of increased knowledge of feed requirements and management, the successful brooding and rearing of chicks in confinement is no longer a problem. The large losses annually sustained by poultrymen due to the ravages of coccidiosis and internal parasites have been partly instrumental in establishing the confinement system. To say that chicks reared in confinement will be free from the attacks of coccidia would be fallacious. They are liable to contract the disease just as much as chicks reared on free range. Better control, however, can be exercised over chicks in confinement, and the disease can be eradicated more easily, since it is possible to maintain strict sanitation.

The use of sun porches in connection with the intensive brooder house is strongly recommended. This gives the chicks greater freedom and exercise, and enables them to get the full benefit of the direct rays of the sun.

The advantages of the confinement system of brooding and rearing may be summarised as follows:—

1. It gives the poultryman an opportunity for keeping strict supervision over all the chicks and enables him to obtain reliable information in regard to feed consumption and feed costs.

2. Losses through thieving, hawks, crows, and other vermin are practically controlled.

3. It serves to check the intermingling of various ages of chicks and enables the poultryman to pick out the young cockerels at an early age.

4. It does not necessarily increase labour costs.

5. It hastens the development of pullets to the extent of three to four weeks.

6. It creates a closer contact between the poultryman and his stock, enables him to observe strict measures of sanitation and hygiene, and gives him the satisfaction of rearing pullets free from intestinal parasites.

Cannibalism.

Among the cannibalistic habits of chicks may be mentioned the following: toe-picking, feather-picking, and "eating out behind." Toe-picking is generally confined to the very early stages of rearing, feather-picking to the feathering stage, and "eating out behind" to the more advanced stages of rearing.

Cannibalism is more often referable to poor management rather than to poor rations. Even with good rations cannibalism may result

if the management of the chicks is at all inefficient. Overcrowding in the brooders and failure to keep the chicks active and occupied are two contributory causes of cannibalism. Chicks should be continuously thinned out and the various ages and sizes should not be allowed to mix. Any affected chicks should be removed immediately and special efforts should be made to keep the remaining chicks active. The experience of the Washington Agricultural Experiment Station in the control of cannibalism in battery brooders serves to show the ease with which this vice can be controlled under careful management.

Carver (1931) states that

> for the past three years cannibalism has been controlled and prevented by the use of natural coloured ruby lights in battery brooders and fattening batteries. The trouble appeared when the chicks reached five or six weeks of age and were developing new feathers at a rapid rate. Close confinement and the presence of blood-filled shafts of new feathers in a well-lighted battery room were apparently major contributing causes of these outbreaks of cannibalism. The cannibalism was so severe that many of the chicks were killed before any method of prevention could be devised. The natural coloured ruby Mazda 60-watt light prevented cannibalism in chicks that had not acquired the habit, and immediately arrested cannibalism in batteries where it was in progress. The natural ruby coloured lamp makes it impossible for the chicks to distinguish blood on the shaft at the base of the new succulent, rapid-growing feathers, or red ink ruling on a piece of white paper.

CULLING OF YOUNG STOCK.

Poultrymen generally do not pay sufficient attention to the culling of young stock. In their efforts to raise as many pullets as possible for the laying houses, they frequently grow to maturity everything female. The laying houses then become overcrowded, and the results of laying are disappointing.

With strict culling practice from hatching to maturity, only strong vigorous pullets are placed in the laying houses. Culling should be accompanied by a system of grading based on the quality of the pullets, in order that pullets of equal intensity may be placed together in different houses. In this way better production will be obtained and the selection for breeders, layers, and culls at the end of the laying year will be a simple matter.

(To be continued).

Mr. James Reid, B.Sc. Agric., B.V.Sc., until recently farming near Standerton, has just started practice in Pretoria. We wish him all the success he deserves in this much neglected aspect of our professional activities.

The Veterinary Profession in South Africa.
4.—Transvaal Volunteers (1902-1913) [1].

By H. H. CURSON, F.R.C.V.S., Dr. Med. Vet., Onderstepoort.

INTRODUCTION.

Soon after the Anglo-Boer War (1899-1902) there was organised a volunteer force which, during both Crown Colony Government and Responsible Government, fell under the Colonial Secretary's Department. Headquarters were at the Drill Hall, Johannesburg. The headquarter staff, which was permanent, included many officers and other ranks seconded from the Imperial Army.

Comprising part of this force were the mounted regiments whose total strength varied from approximately 1,200 men (year ended 30/6/05) to 2,750 (year ended 30/6/06), thus constituting roughly 25-50% of the total. As, however, only approximately 75% of the mounted men owned horses, the efficiency of the mounted corps naturally suffered accordingly. Apart from a capitation grant of £6 per annum for each mounted man, there was until 1908, a horse allowance of £18 a man per annum (higher than in any other British Colony). Conditions of this allowance were that a horse was not to be less than 4 years of age, and was to have been passed "by a Board, consisting of the Adjutant and not less than one officer of the regiment, who shall be nominated by the Commanding Officer" (p. 658 Min. of Evid., Tvl. Vol. Com. 1906). Presumably the officer in question was always the Veterinary Officer. A scheme of compulsory horse insurance came into operation in July 1905, the premium being 8% for all districts, and the risk being undertaken by a well known insurance company.

The volunteers were on the whole a most efficient force, the training at the annual camps of exercise proving invaluable. At these, Imperial Troops sometimes participated, e.g. in 1904 the R.H.A. and 7th Hussars were present and, in the following year, the R.H.A. and 2nd Dragoon Guards. In 1906 a composite regiment, the Transvaal Mounted Rifles, saw active service in the Natal Rebellion, and gave a good account of itself.

Of the several mounted corps formed since 1902, only the Imperial L.H., which dates back to 12/12/02, still exists. This, since 1/7/14 has been designated the 5th Mounted Rifles, but still retains its old title in addition. It is allied to the 4th (Queen's Own) Hussars, which affiliation took place in 1925.

[1] See Ordinances 33 of 1902 and 37 of 1904.

ORANGE RIVER COLONY VOLUNTEERS —Although Ordinance 35 was passed in 1905 regulating the formation of Volunteer Corps, no advantage was ever taken of this legislation. The question of a volunteer veterinary service in this Colony does not therefore come into consideration.

VETERINARY SERVICE: TRANSVAAL VOLUNTEERS

The term "Veterinary Service" includes both (A) the regimental veterinary surgeons and (B) the Veterinary Department. Actually the latter term is only used once in the Transvaal Government Gazettes studied, viz. in that of 19/2/09, when reference was made to the appointments of Captains Bush, Evans, and Peddie,(2) who, however, remained for duty with the regiments in which they had previously served as regimental veterinary officers. Here, Veterinary Department is used to include not only these three officers, but also the Transvaal Veterinary Corps. Whereas in the Imperial Army the regimental system was entirely replaced by the departmental system in 1881, in the Transvaal, both systems existed side by side. Probably it was intended to introduce the departmental system in due course, but the Union of the four colonies on 31/5/10 no doubt put an end to further veterinary reorganisation.

(A) Regimental Veterinary Surgeons.

Shortly after the passing of the Volunteer Corps Ordinance (No. 33 of 1902), the first veterinary appointment, viz. of James Francis Scott, was made (G. 23/1/03). The date of commission is not given but as the seniority of his regiment,(3) the I.L.H. (Right Wing), goes back to 12/12/02, presumably the commission dates from the same period. Scott's appointment was veterinary surgeon with honorary rank of captain. Three other veterinarians received commissions shortly afterwards (G. 9/4/03), but only one in a veterinary capacity, viz. Frank Gregory who was appointed Capt. (V.O.), Scottish Horse. The other officers referred to were E. A. Hollingham, Captain, Johannesburg Mounted Rifles, and Richard Stokoe, Lieutenant, I.L.H. (Left Wing). The latter soon afterwards resigned this commission (G. 19/6/03), but on the same date David S. Tamblyn was gazetted Captain (V.O.) of the same regiment.(4) In the following August (G. 21/8/03) William G. Steele was appointed Captain (V.O.) to the South African Light Horse.

Although we see here the institution of the regimental system, yet a reference during the following year (G. 25/11/04) suggests that it was proposed to create a Veterinary Corps, i.e. not only to have officers but also N.C.O.s. and men. In defining the four military areas into which the Transvaal was to be subdivided, it was stated that recruiting for the veterinary corps would be allowed in each area;

(2) It is not known whether these officers wore the T.V.C. or regimental badge.

(3) The Imperial Light Horse was originally raised 21/9/1899 for service in the Anglo-Boer War.

(4) Tamblyn (see Smith's *Veterinary History of the War in S.A.* p. 213), a C.V.S. attached to the A.V.D. was present at the disaster at Tweebosch, Western Transvaal, on 7/1/02. He behaved gallantly by distributing ammunition "along the bullet swept line." Two horses were killed under him during the engagement.

but it was not until 1909 (G. 3/9/09) that the T.V.C. as such, with its reserve, was established by Government Notice 1028.

For the first three years (1903-5) the rank was gazetted as indicated above, e.g. in Gregory's case; but from the middle of December 1905 (G. 15/12/05) compound rank[5] (i.e. Veterinary-Lieutenant, Veterinary-Captain, etc.) was adopted, except in the case of those officers who during 1909-10 were appointed to the Veterinary Department, Transvaal Volunteers.

It has not been possible to trace all Gazette notices concerning appointments, promotions, and resignations; but information gleaned is set down for each of the mounted regiments as follows:—

I.L.H. (Right Wing).—It is not known how long Scott was veterinary officer, but in 1907, a year notable for reorganisation in the Volunteers, John Peddie, who had served as a trooper, was made Veterinary-Lieutenant (G. 15/11/07). Later (G. 19/2/09) he was promoted Captain, not of I.L.H., be it noted, but in the Veterinary Department.

I.L.H. (Left Wing).—Tamblyn apparently did not remain long in the regiment, for on 1/1/05 (G. 13/1/05) he was permitted to resign. It would appear that in the meantime he had been transferred to the Western Rifles in which he ranked as Captain (V.O.). In 1907 (G. 15/11/07) Roderick MacDonald, who also had served in the ranks, was appointed Veterinary-Lieutenant.[6] Actually he was gazetted in the East Rand Mounted Rifles, under which name the I.L.H. (Left Wing) was known for some months. By Union Government Gazette 20/1/11 he was promoted Veterinary-Captain I.L.H., for since Union the Veterinary Department, Transvaal Volunteers, does not appear to have functioned. In 1908 (G. 3/7/08) the two wings of the I.L.H. had amalgamated under the title I.L.H., which later, 1/7/13, became embodied in the Active Citizen Forces of the Union.

S.A.L.H., J.M.R., and S.H.—These regiments were disbanded in 1907. Steele later (G. 22/1/09) transferred to the Reserve with the rank of Veterinary-Captain, and presumably became a member of the T.V.C. (Reserve) when this was established on 1/7/09 (G. 3/9/09). Hollingham, who had served with the I.L.H. during the Boer War, died in 1912. Gregory died 21/2/06 (G. 1/6/06), his place being taken by Edward Kellett.

Northern Rifles.[7]—J. Ingram Edgar was the first veterinary

[5] The abolition of compound rank was secured in the Imperial Army in 1903.

[6] MacDonald (see Smith's *Veterinary History of the War in S.A.* p. 227), a C.V.S. (A.V.D.) served for 14 months with the 1st M.I. He kept records (quoted by Smith) which indicated that from March 1901 to May 1902, the regiment "was completely rehorsed over 3¼ times."

[7] The Northern, Eastern, and Western Rifles subsequently (G. 12/7/07) became known as Mounted Rifles (cf. N.M.R.—Natal Mounted Rifles).

officer, being promoted from trooper to Lieut. (V.O.) (G. 6/5/04), and to Vet.-Capt. at the end of 1907 (G. 15/11/07). In 1905 Stanley Fletcher was similarly promoted Lieut. (V.O.) from the ranks (G. 10/3/05). but resigned a year later (G. 9/3/06).[8] Charles E. Gray, the P.V.O. Department of Agriculture, who had joined as a trooper (G. 4/5/06) served a year as V.O., with the rank of Vety.-Capt. (G. 10/5/07). G. May, who also served for a short time as Vety.-Lieut. resigned his commission early in 1908 (G. 13/3/08). In 1909, George W. Lee, who previously had served in the Western Rifles, became Vety.-Lieut. and by Union Government Gazette 29/3/1912 he was promoted Vety. Captain. Hugh X. Turnbull, who had been Vety.-Lieut. in both the Eastern Rifles (G. 7/7/05) and Northern Rifles, was on 3/9/09 gazetted Vety.-Capt. The following year by U.G.G. 2/8/10 he was transferred to the Reserve.

Western Rifles.[7]—Tamblyn was the first veterinary officer and, as mentioned before, he apparently transferred from the I.L.H. (Left Wing). In any case his stay was very short, for the seniority of Thomas H. Dale, his successor, (G 10/3/05) was dated 1/1/05. In 1906 (G. 30/3/06) Lee was promoted Vety.-Lieut. from the ranks but he soon exchanged for the combatant commission of Second Lieut. Later (G. 22/1/09) he again took a Vety.-Lieutenancy but this time in the Northern Rifles, under which regiment his career may be followed. In 1907 (G. 8/3/07) William G. Evans, formerly a trooper in the regiment, was appointed Vety.-Lieutenant. Amalgamation of the Western and Eastern Rifles to form the Southern Mounted Rifles took place during the middle of 1908 (G. 3/7/08) and Evans remained with the united regiment. In 1909 (G. 19/2/09) he was promoted Captain, not of S.M.R., but in the Vety. Dept. He remained, however, with the S.M.R. for duty.

Eastern Rifles [7]—Hugh X. Turnbull, already mentioned under Northern Rifles, was promoted Lieutenant (V.O.) from the ranks (G. 7/7/05). Later he served in a similar capacity in the Northern Rifles, where he received further promotion. John Pollard, who obtained commissioned rank shortly after Turnbull (G. 13/10/05) was appointed V.O. with honorary rank of Capt. He resigned, however, two years later (G. 15/11/07). In 1906 (G. 7/12/06) Samuel I. Johnston, also promoted Vety.-Lieutenant from the ranks, and eventually transferred to S.M.R. after amalgamation. For 18 months he was on the Reserve List; but by U.G.G. 2/8/10 he was promoted Vety.-Captain in his old regiment. Whereas Evans had been transferred from the S.M.R. to the Vety. Dept. Johnston remained with the S.M.R. throughout. In 1907 Joseph G. Bush, previously a trooper was appointed Vet. Lieu-

(8) Captain Fletcher (see Smith's *Veterinary History of the War in S.A.* p. 95 was V.O. to the West Australian Contingent and was present at the Siege of Elands River Depôt in August 1900.

tenant (G. 12/4/07), continuing as a regimental veterinary officer of the S.M.R. until after amalgamation in July 1908. Like Peddie (I.L.H.) and Evans (S.M.R.), when promoted (G. 19/2/09), he was appointed Capt. in the Vety. Dept. and merely attached to S.M.R. for duty.

At the beginning of 1909 (G. 5/2/09) when the scheme of a veterinary corps was evidently being encouraged (presumably in place of the regimental system) James Irvine-Smith, formerly Capt., Vety. Dept. South African Constabulary, was appointed Principal Veterinary Officer, Transvaal Volunteers, with rank of Major. This clearly shows that the authorities recognised the need for some central veterinary control.

(B) Veterinary Department.

As stated above, this term is employed here to include not only the 3 officers specifically appointed to the Vety. Dept. Transvaal Volunteers (G. 19/2/09), but also the Transvaal Veterinary Corps which through being created at an unfavourable period (impending unification of the colonies with amalgamation of their volunteer forces), probably did not receive the official encouragement it deserved. At any rate, it did not absorb or replace the regimental system, and thus the ideal of military veterinary organisation was not achieved. Nevertheless, under the energetic P.V.O., Major James Irvine-Smith (G. 5/2/09) much was accomplished in a very short time.

TRANSVAAL VETERINARY CORPS.

The Officer Commanding or P.V.O. was appointed (G. 5/2/09) with seniority from 1/12/08; but actually the T.V.C. was not gazetted until 3/9/09. Seniority, however, dated from 1/7/09, although the annual report of the Transvaal Volunteers for year ended 30/6/09 referred to the T.V.C. (Reserve) as having an establishment of 24! Six months later (G. 7/1/10) the prescribed strength was 12, with 50 in the Reserve.

As will be observed in appendix 1 (g) of the Volunteer regulations (G. 20/8/09) provision was made for mobile veterinary sections, a most necessary link between field units and hospitals. It was not until 1913 that the A.V.D. succeeded in securing approval for the creation of similar units (Blenkinsop and Rainey, 1925). Actually mobile veterinary sections had been employed in the 2nd Boer War.

Officers in the Corps.

Active List.—(9)Major Irvine-Smith, P.V.O. Promoted Lieut. Col. T.V.C. as from 20/8/09 (G. 3/9/09).

Reserve List.—Although Vety.-Capt. W. G. Steele was not actually gazetted to the T.V.C. (Reserve), yet he might be considered the first reserve officer. By Gazette 22/1/09 he was appointed Vety.-Capt.

(9) Apparently D. B. J. McCall was in the T.V.C., for in the Register of members of the R.C.V.S. 1916, his address is given as such.

in the Reserve, with seniority from 1/12/08, i.e. date of the seniority of Major Irvine-Smith on his becoming P.V.O. Transvaal Volunteers. Later, Lieut. J. K. Pilkington, T.V.C. (Reserve) (G. 3/13/09) and Vety.-Capt. J. M. Tate, late S.A.C. (G. 14/1/1910), were promoted captains; and Messrs. D. T. Mitchell (G. 11/2/10) and F. J. Dunning (G. 13/5/1910) were gazetted lieutenants in the T.V.C. (Reserve).

After Union, the T.V.C. does not appear to have functioned, as the few veterinary appointments prior to the creation of the S.A.V.C. were all regimental.

Regulations affecting Veterinary Officers.

These are extracted from Govt. Notice 972 (G. 20/8/09) as follows:—

Chapter I, Para. 6 and 12. Of the 11 corps organised for military service, the Veterinary Corps came last in precedence.

Capter II, Para. 23 and 24. Concerning special appointments for officers it is stated:—

23. (1) Veterinary Surgeons who are members of the Royal College of Veterinary Surgeons, or who hold some other recognised veterinary diploma, may be appointed and commissioned as veterinary officers of volunteer corps, either

(a) as an officer of a Veterinary Corps; or

(b) as veterinary officer to an Artillery or Mounted Corps.

(2) In the case of (a) they shall receive the rank of lieutenant on appointment; captain after three years' service as lieutenant; major after nine years' service as captain.

In the case of (b) a veterinary officer shall rank as veterinary-lieutenant on appointment; as veterinary-captain after three years' service as veterinary lieutenant; as veterinary-major after nine years' service as veterinary-captain.

(3) All applications for appointment as veterinary officer shall be submitted through the Principal Veterinary Officer of the Volunteer Force.

24. The Officer Commanding the Veterinary Corps shall be the Principal Veterinary Officer of the Force, and shall rank as lieutenant-colonel. Subject to the instructions and supervision of the Inspector, he shall have control of and be responsible for all the veterinary arrangements and personnel of the Force.

Concerning military training, it is stated in Chapter IV:—

78. The following volunteers shall be deemed "efficient" in any volunteer year for the period during which they have served in that year without leave of absence, and capitation grant shall be paid in respect of such service notwithstanding that such volunteers have not performed the prescribed number of drills of the prescribed musketry course, provided, however, that no volunteer shall be qualified as "efficient" for the purpose of capitation grant unless he has attended the annual camp:—

Commanding officers.
Seconds-in-command.
Assistant adjutants.
Quartermasters.
Paymasters.
Signalling officers.
Transport officers.
Medical officers.
Veterinary officers.
Chaplains.
Sergeant-instructors of musketry.
Members of the Transport, Supply, Intelligence and Veterinary Corps.

Regarding Volunteer Reserves, Chapter IX contains the following:—

155. No person shall be eligible for service in the Volunteer Reserves who is not qualified for enrolment as a volunteer under Regulation 47, and who is not qualified in respect of previous military experience either by service

(a) in the Regular Forces; or

(b) in the Auxiliary Forces or in the Colonial Forces of other Colonies in time of peace for not less than three years; or

(c) in the Transvaal Volunteers in time of peace for not less than two years, during which he has been returned as "efficient" for each year; or

(d) in the field with any military forces in time of war for not less than six months, or in the case of the Reserves attached to Transport, Supply, Intelligence or Veterinary Corps, who cannot satisfy the Inspector that he has had an adequate training in the special duties connected with those corps.

In the Handbook of Volunteer Ordinances, Regulations, Orders and Instructions, the following passage occurs (p. 126):—

271. A veterinary officer, accompanied by a farrier, will attend all field manoeuvres. The former will be detailed by the Principal Veterinary Officer and the latter by the unit to which the veterinary officer is attached.

Appendix I (g) of the Handbook reads as follows:—

VETERINARY CORPS.

Field Service Establishment. (10)

1 Principal Veterinary Officer.
1 Assistant Veterinary Officer.
1 Staff Sergeant.
2 Sergeants.

Advanced Veterinary Hospital.

2 Officers.
1 Staff Sergeant.
1 Sergeant.
1 Lance-Sergeant.
1 Corporal Shoeing-smith.
2 Shoeing-smiths.
2 Corporals.
2 Lance-corporals.
5 Privates.
45 Natives.

Mobile Sections.—Establishments.

1 Veterinary Officer.
1 Sergeant.
1 Corporal.
1 Shoeing-smith.
2 Privates.
10 Natives.

Transport required for Mobile Section is as follows:—

1 Buckwagon.
1 Scotch-cart.
1 Water-cart.

(10) For each Mounted Corps (517 strong) the establishment allowed for one Veterinary Officer.

Remount Depôts.

Personnel as found to be necessary.

Note: It is calculated that columns of 1,500 mounted men would require five Mobile Veterinary Sections with the Advanced Veterinary Hospital, capable of taking 200 sick horses.

Mobile Sections are equipped to treat 50 sick animals, and are the connecting links between the fighting line and the Advanced Field Veterinary Hospital on the lines of communication.

The actual number of Mobile Sections and Advanced Field Veterinary Hospitals required depends on the number of mounted troops in the field.

In Appendix V (a) are mentioned the books recommended for study in Horsemastership for the Higher Proficiency examination, Transvaal Volunteers. These are: "Cavalry Training," Hayes' "Veterinary Notes for Horse Owners," and Fitzwygram's "Horses and Stables."

Badge of T.V.C.—Thanks to Col. Irvine-Smith, who gave the writer an illustration of the badge, it is possible to describe it here. It took the form of an eight pointed star, in which there was a circle containing the monogram T.V.C. and surrounding this was the motto *Vis unita fortior.* Surmounting the star was the Imperial Crown. This seems to have been the standard type of badge for regiments or corps not possessing a distinct regimental badge e.g. old badge, Army Veterinary Dept., Transvaal Police, South African Police, etc. See Figure.

Disbandment of T.V.C. The corps may be said to have ceased to function at the time of Union, but officially it was non-existent after 30th June, 1913, on which date the South African Defence Act of 1912 took effect with regard to the Active Citizen Force. Headquarters were at the Drill Hall, Johannesburg.

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List of Veterinarians.

It will be noticed in Appendix 1 that more than half the officers were employed by the Department of Agriculture. This is a reason for the frequent changes, since District Veterinary Surgeons were frequently transferred from one district to another.

Appendix 1.

TRANSVAAL VOLUNTEERS.

Regular Corps Veterinarians. (11)

Name	Corps to which first attached	Date of Commission	Born	College & qualified	Died
Bush, J. G. (12),	Eastern Rifles	1/3/07		1902, Lond.	
Dale, T. H. (12),	Western Rifles	1/1/05	29/11/68	1889, N.Edin.	15/7/17
Dunning, F. J. (12),	T.V.C.	1/4/10	5/9/78	1901, N.Edin.	
Edgar, J. I. (12)	Northern Rifles	11/4/04	16/5/73	1895, Edin.	
Evans, W. G. (12),	Western Rifles	7/12/06	9/4/79	1901, Lond.	
Fletcher, S.,	Northern Rifles	22/2/05		1895, Melbourne	
Gray, C. E. (12),	Northern Rifles	3/4/06	10/4/64	1890, Edin.	
Gregory, F.,	Scottish Horse	20/2/03		1890, Lond.	21/2/06
Hollingham, E. A.,	Jhbg. M.R.	24/2/03		1881, Lond.	Aug. 1912
Irvine-Smith, J.,	T.V.C.	1/12/08	1876	1898, Glas.	
Johnston, S. I. (12),	Eastern Rifles	6/11/06	26/3/66	1895, Edin.	5/8/29
Kellett, E. B.,	Scottish Horse	21/2/06		1889, N.Edin.	6/9/32
Lee, G. W. (12),	Western Rifles	19/1/06	25/9/72	1893, Edin.	
May, G. (12),	Northern Rifles		2/7/79	1901, Lond.	
MacDonald, R.,	Imperial L.H.	17/10/07		1891, Ontario	
Mitchell, D. T. (12),	T.V.C.	24/12/09	16/6/85	1908, Dub.	
Peddie, J.,	Imperial L.H.	1/10/07	1870	1893, Edin.	5/8/32
Pilkington, J. K.,	T.V.C.			1881, Lond.	
Pollard, J. (12),	Eastern Rifles	8/9/05		1897, N.Edin.	
Scott, J. F.,	Imperial L.H.	1902		1895, Edin.	Nov. 1925
Steele, W. G.,	South African L.H.	1/5/03		Unqualified	
Stokoe, R.,	Imperial L.H.	16/2/03		1901, Lond.	
Tate, J. M. (12),	T.V.C.	18/11/09	7/6/62	1899, Lond.	
Tamblyn, D. S.,	Imperial L.H.	24/3/03	28/1/81	1901, McGill	17/8/10
Turnbull, H. X. (12),	Eastern Rifles	1/6/05	13/3/80	1902, Lond.	17/8/10

Appendix 2.

SOUTH AFRICAN CAMPAIGNS IN WHICH THE ABOVE PARTICIPATED.

Matabeleland Rebellion 1896.

Gray, C. E. (13).

Mashonaland Rebellion 1896.

Lee, G. W.

Anglo-Boer War 1899-1902.

Bush, J. G. (14).
Dale, T. H.
Kellett, E. B. (14).
Lee, G. W. (14).

(11) The only *irregular* or temporary mounted corps which calls for attention is the Transvaal M.R. formed for service in Natal in 1906. Capt. Hollingham of the Johannesburg M.R. accompanied the unit.

(12) Employed by Dept. of Agriculture.

Dunning, F. J. (14).	May, G.
Edgar, J. I.	MacDonald, R.
Evans, W. G.	Peddie, J. (14).
Fletcher, S.	Pilkington, J. K. (14).
Gregory, F.	Pollard, J.
Gray, C. E.	Scott, J. F.
Hollingham, E. A.	Stokoe, R.
Irvine-Smith, J. (14).	Tate, J. M.
Johnston, S. I. (14).	Tamblyn, D. S.

Natal Rebellion 1906.

Hollingham, E. A.

(13) Gray served in Upper Egypt and Sudan and was awarded the Egyptian medal (Nile 1884-5) and Khedival Star.

(14) Also served either in German S.W. Africa or German E. Africa or both during the Great War 1914-1918.

Appendix 3.

SHORT BIOGRAPHIES OF VETERINARIANS BELIEVED TO BE DECEASED.

T. H. DALE. See Jl. S.A.V.M.A., September, 1932.

FRANK GREGORY (18...-1906). Apart from what is stated in this paper, and the fact that he served with the 18th Battn. Imperial Yeomanry (Rhodesian Field Force) in 1900, nothing further is known of Gregory. He was a private practitioner in Johannesburg after the Boer War.

E. A. HOLLINGHAM. See Jl. S.A.V.M.A., September, 1932.

S. I. JOHNSTON. See Jl. S.A.V.M.A., November, 1929.

RODERICK MACDONALD (1874-19...). Born in Scotland on 26/12/74 and according to "Who's Who" of 1908 (published in Durban), he graduated at the University of Toronto, but enquiries show that a Robert MacDonald graduated there in 1891. At any rate, a MacDonald came to South Africa in 1900 as a C.V.S. (A.V.D.) and served with the 1st M.I., gaining both the Queen's and King's medals. Smith, in his *History of War in South Afrrica,* makes reference to him on p. 227. MacDonald, who was not a member of the T.V.M.A., was established in private practice at Germiston, and from 1907 to 1911 was a Veterinary Officer to the I.L.H. After this there is no trace of him.

J. PEDDIE. See Jl. S.A.V.M.A., September, 1932.

J. F. SCOTT. See Jl. S.A.V.M.A., September, 1932.

H. X. TURNBULL. See Jl. S.A.V.M.A., September, 1932.

Jl. S.A. v. M. A.
IV (1) 1933.

Anthrax Control in Native Reserves.

By J. NICOL; M.R.C.V.S., Umtata.

At the beginning of 1928, on my transfer to Umtata, I found that every district in the Transkei was more or less badly infected with anthrax. At that time the control adopted consisted in inoculation of all cattle in each location in which an outbreak was discovered. Since as soon as the quarantine was raised from an infected location cattle would enter from another in which inoculation had not been carried out, often necessitating a repetition of the whole process, this procedure, although reducing the mortality to a certain extent, was far from satisfactory.

In August, 1928, after consultation with the Magistrate of Engcobo, the outbreaks in which district had for that year numbered 61 and involved a mortality of 300, I proposed, and with the aid of the Magistrate's dipping staff, carried out inoculation of all cattle in this district. The results (see Table II.) were so encouraging that I suggested to the Chief Magistrate that the inoculation should be extended to the whole of my area the following year.

To this end in May, 1929, I addressed the Magistrates' Conference at Umtata at which the proposal was enthusiastically and sympathetically received. Since 1929 we have inoculated all cattle in the districts listed in Table II. The figures given, as the reader may judge, speak eloquently for the success of the venture, especially when considered in conjunction with Table I, which shews that the reduction of outbreaks has occurred in spite of the general increase in the number of smears examined since 1928—an increase which must reflect upon the number of outbreaks discovered. They serve further to emphasize the efficacy of the spore vaccine issued by the Onderstepoort Laboratory.

It is found that May is the most favourable month in which to inoculate. At this time the cattle are in fair condition, the weather is settled, and agrarian activities largely in abeyance.

Factors responsible for the continued occurrence of a few outbreaks in spite of this policy of general inoculation include the surreptitious transfer of stock from the Cape by natives and the presence among the inoculated animals of susceptible calves born subsequent to inoculation. It would be desirable to carry out inoculation of these calves, which investigation has repeatedly shown to constitute a danger, in November or December. However, the demands made on my limited staff during this period, when dipping activities are at their height, make this impracticable.

I have arrived at the conclusion that a policy of general inoculation

is the only satisfactory way of dealing with anthrax in native reserves, and is the one by which the disease, although it may not be eradicated, can certainly be reduced to a minimum.

TABLE I.

ANNUAL EXAMINATION OF SMEARS.

1927-28	1928-29	1929-30	1930-31	1931-32
35267	56505*	56698	68178	81645

TABLE II.

ANNUAL OUTBREAKS OF ANTRAX.

District	1927-28	1928-29	1929-30	1930-31	1931-32
Elliotdale	22	22	3	4	3
Engcobo	61	15	11	2	5
†Libode	15	14	3	2	6
Mqanduli	13	23	2	3	3
Ngqeleni	14	14	6	6	7
†Qumbu	20	26	6	7	1
St. Marks	13	13	5	1	1
†Tsolo	34	43	6	5	3
Tsomo	23	15	1	3	2
Umtata	32	31	11	3	3
Xalanga	1	20	6	0	0
Totals	248	236	60	36	34

TABLE III.

NUMBER OF ANIMALS INOCCULATED.

District	1927-28	1928-29	1929-30	1930-31	1931-32
Elliotdale	36598	48256	57494	60913	57570
Engcobo	110086	89695	102497	110667	98999
Libode	6741	57604	57406	41091	67352
Mqanduli	8460	67671	47683	68293	68355
Ngqeleni	9976	86185	79184	86383	85042
Qumbu	10790	60245	69805	51305	63791
St. Marks	7302	65836	76432	56432	48131
Tsolo	8610	48641	35842	37606	65913
Tsomo	4863	40878	28527	35820	34564
Umtata	43559	110967	69614	87629	86609
Xalanga	1150	21107	22673	21694	26530

*) This large increase on the figure for the previous year is referable to the sending in of smears, since July 1928, from the districts of Bizana, Flagstaff, Tabankulu, Eastern Pondoland, Idutywa, and Willowvale.

†) These districts were taken over from me in April 1930, by G. V. O. Blomefield and since September 1931, have been under the control of G. V. O. Smith.

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The Veterinarian and the Law. VI.

By C. P. BRESLER, M.A., LL.B., Pretoria.

BAILMENT.

The term "Bailment" is an English term denoting a delivery of goods on a condition express or implied that they shall be restored by the bailee to the bailor or according to his directions as soon as the purpose for which they are bailed shall be answered. (JONES on Bailments). To constitute a bailment of goods the actual or constructive possession of a spectific chattel must be transferred by its owner, or his agent, duly authorised for that purpose, to another person in order that that other person may perform some act in connection therewith for which such physical or constructive possession of the chattel is necessary upon the understanding either express or implied that when the act is performed or the service rendered, the recipient of the chattel shall re-deliver it in specie to its owner or his nominee. (PAINE on Bailments.

MORICE in English and Roman-Dutch Law II. p. 115 has dealt with the subject from the South African point of view. He says:— "The class of contracts completed *re* or by delivery of a thing should be compared with the English bailments. . . . . Bailments are classified as follows on the basis of the purpose for which the bailment is entered into (the Latin names being retained in English law): (1) *depositum* (2) *commodatum* (3) *locatio et conductio* (4) *vadium* (5) *locatio operis faciendi* (6) *mandatum.* This classification illustrates the difference between the Roman-Dutch contracts *re* and the English bailment. In the former (contracts *re*) the thing which is handed over need not be the identical thing which is returned. Thus *mutuum* which includes the loan of money where the same coins are not returned as are delivered, does not fall under bailments while other contracts *re* namely deposit, *commodatum, pignus* are included in the class of bailments. On the other hand several contracts where the same thing is returned and which are therefore included in the English bailments such as the letting of movables, handing over a thing for work to be done on it are included under the Roman-Dutch consensual contracts. A further point of difference between the English bailment and the Roman-Dutch contracts *re* is that bailments are confined to movables while as a rule the contracts *re* refer to movables, this is not essential . . . . the English bailments in so far as they are gratuitous have a striking resemblance to the Roman contracts *re.* There is no binding agreement between the parties until the object or chattel has actually been delivered to the bailee. . . . Thus, if A undertakes to lend B a horse gratuitously B has no action against A for not carrying out

the promise; nor has A an action against B for not accepting the horse; but if B has received the horse, A has an action for not taking care of it and B has an action against A for damages incurred through an unsuitable and dangerous horse being lent to him. . . . ."

There seems to be little doubt that the common law of England as to bailments is founded upon, though it has not exactly adopted the Roman law. *(Coggs v. Bernard (1703) 2 Ld. Raym. 909; 1 Com. 133; 92 E.R. 107).* In this judgment Lord HOLT, C. J., stated that the law of England was very much as it is to be found in the Digest and Institutes of Justinian using with slight variations the terminology there given to describe the different kinds of bailments. These he divided into six classes. STORY on Bailments considers three classes sufficient:—

(a) Those in which the trust is exclusively for the benefit of the bailor or of a third person;

(b) Those in which the trust is exclusively for the benefit of the bailee;

(c) Those in which the trust is for the benefit of both parties or of both or one of them and a third party.

Usually in modern practice in England we find a division into gratuitous Bailment, and Bailments for valuable consideration. Involuntary Bailment would seem to be included in the former. Most of the problems confronting the veterinarian would fall under these heads. The law relating to involuntary Bailment has been stated as follows:—" Where a chattel is sent without request or arrangement by one person to another who does not hold himself out to receive it the person to whom it is sent is under no liability to the sender for its safe custody or protection "—see *Lethbridge v. Phillips 1819, 2 Stark 544.* In this case a picture was without defendant's knowledge or request sent to defendant's house, and was there damaged. In *Howard v. Harris 1884 1. Cab and El. 253* where the plaintiff, an author, being asked by the defendant to send him a sketch or synopsis of a play sent the whole manuscript which the defendant lost, it was held that no duty of any kind was cast on the defendant by sending him something he had not asked for.

It follows on principle that a party in the case of an involuntary deposit must of course not use it or convert it to his own use. The case of a dog being left involuntarily has been presented to me. It would in such a case be safer not to accept it at all. Once acceptance has been taken, I would suggest that the owner be written to and requested to remove the animal, failing which action would be instituted against him to take delivery and to pay damages occasioned by the detention, etc., of the dog. If he really believes the owner cannot be ascertained, ... that he has intentionally parted with the property in it, his duties as bailee towards the true owner become merged in

his own possessory rights as finder, and he can then proceed to deal with the offending animal as he may think fit. If he takes it believing genuinely that the owner has abandoned it or that he cannot be found he is protected.

The measure of diligence demanded of a gratuitous depositary is as a rule that degree of diligence which men of common prudence generally exercise about their own affairs. In order to maintain an action, therefore, the plaintiff must show that the defendant has been guilty of a breach of orders, negligence, or fraud. (HALSBURY 1082). In our Courts the case of *Sakazi v. Gur. 1906 TS 303;* may be cited. There a postmaster gratuitously took charge of a considerable sum of money belonging to an employee and placed it in an office safe belonging to the department. Having locked the safe he carried the key in his coat pocket. At a place of public resort he took off his coat and left it lying about unprotected. Next morning he found the key in his office and on opening the safe no money. INNES, C. J. said in the course of his judgment: "A man who has charge of the key of a safe in which there is a large sum of money should exercise greater care and diligence than that. In my opinion he was grossly negligent."

English law dealing with Bailment for valuable consideration is stated thus by HALSBURY 1107. "The contract implies in the absence of special agreement that the custodian will use due care and diligence in keeping the chattel in return for a reasonable compensation to be paid by the owner." A number of South African cases will serve to illustrate the point where a bailee of a horse receives remuneration for the keep thereof, the bailment is one for hire and the bailee must use a high degree of diligence. The rule is the same even though the remuneration is merely nominal. *(Mothlabane v. Smit (1908) 18 C.T.R. 315.)* In terms of a contract of deposit one Lituli was to be paid for taking charge of one Omar's goats. The latter without alleging negligence in his summons sued Lituli for the return of the goats or their value. In giving judgment INNES C. J. said "It is common cause that the respondent entrusted the goats to the appellant to be kept with the latter's own herd and that they have not been restored to their owner. The Magistrate found after hearing the evidence which was conflicting that there was a contract between the parties by which the appellant was to be paid for taking charge of the goats . . . . It was the *actio depositi directa* of our law by which, where there has been a contract of deposit the owner of the goods deposited may demand them back with their fruits or in default their value. . . . But then it is contended that there must be some proof of negligence and there is none here. But to my mind the moment it is shown that the appellant had received the animals under the contract and did not produce them but said they had disappeared the onus lay upon him to explain why they were gone." The Magistrate's

judgment for Omar was accordingly upheld. This case was quoted verbatim in a recent case of *Weiner v. Calderbank 1929 T.P.D. 654* which dealt with the destruction of a motor car stored in a garage.

In *Enslin v. Meyer 1925 O.P.D. 125* plaintiff and defendant had entered into a contract whereby plaintiff delivered to defendant certain cattle on condition that they and their progeny were to be depastured and cared for by defendant for plaintiff in consideration whereof defendant became entitled to the use of the oxen for farming operations and the enjoyment of the milk of the cows. A claim was made in a Magistrate's Court for the return to the plaintiff of certain of the cattle which were missing or their value. Defendant pleaded *inter alia* that the death of a calf was due to an accident and that two of the oxen had been stolen. The death of the calf was due to its eating sheep dip which had apparently been blown from a window-sill through a hole in a window in defendant's house. It was held that the onus was on defendant to prove that the death of the calf and the theft of the oxen were not due to his negligence. It was further held that the contract though not *commodatum stricto iure* might be treated as in effect one of *commodatum* in the wide and less technical sense.

I may say in conclusion that the question as to whether distinctions should be drawn between degrees of care required in different kinds of agreement is of no practical importance—at least for the purpose of this article.

(To be continued.)

CLINICAL NOTES.

Three Cases of Interest.

By F. J. DUNNING, R.R.C.V.S., Stellenbosch.

CASE 1.

A four months' old bulldog was run over by a car and brought to me with a fractured femur and humerus on the one side. I considered the prospects of satisfactory union rather remote, but at the owner's urgent request treatment was undertaken. A full grain of morphia was given, causing profound anaesthesia and perfect relaxation. Both limbs were then bandaged and the area over each fracture set in bandages with water glass. The pup slept for 14 hours. A few days later he learned to push himself into a standing position against a wall and eventually made a good recovery, the only abnormality being a slightly shortened hind limb.

CASE 2.

In October, 1931, a local farmer purchased 150 merino sheep and took them to his farm, which has considerable low lying swampy ground along the Eerste River. They improved until the end of December,

but then started to lose condition. By the middle of April about 50 were dead. Of the remainder about half were in fair condition and the rest were poor and suffering from diarrhoea. Autopsies revealed a very heavy fluke infestation with a swollen, distorted, cirrhotic liver and a general dropsical condition. My opinion was that the flock would die out and I tried to persuade the owner to dispose of all healthy ones to the butcher—advice which he declined to follow. Each sheep was dosed with 1 c.c. carbon tetrachloride in 4 c.c. raw linseed oil and this treatment was repeated after a month's interval.

On inspection in October, 1932, the flock had apparently quite recovered and grew a good wool crop. Only one sheep has died since the initial dosing and I consider the results have been astonishing. It would be interesting to compare the results in two flocks on such a farm, one receiving carbon tetrachloride and the other serving as a control.

CASE 3.

Some months after assuming occupation of a farm in this district an owner of a herd of dairy cows was troubled with several cases of illness and indisposition accompanied by purging. This illness was at first attributed to vegetable poisoning, but eventually two good cows died suddenly and others were so seriously ill that my assistance was urgently demanded. The symptoms and post mortem appearances caused me to suspect arsenical poisoning and on inspecting the farm I noticed a cattle dipping-tank full of clear greenish tinged water. Coloured farm workers stated that it had not been in use for at least five years, but could not say whether it had been cleaned out before lapsing into disuse. Since during the whole of this time it had been open, no precautions had been taken to keep stock away, and further it had been filled annually by the rains, my suspicion of it was discredited. Analyses at the local Chemical Laboratory, however, shewed considerable amounts of arsenic to be present in the ingesta and liver of the dead animals and the tank water to contain .025% of arsenic. The moral would seem to be that in such cases disused dipping tanks deserve to be regarded with suspicion until tested for toxicity: although such tanks may have been cleaned out, their walls and surroundings may nevertheless be impregnated with arsenic which may become dissolved and washed again into the tank.

I understand that the owner concerned has now erected a substantial fence to enclose the tank and the ground in its immediate vicinity.

BOOK REVIEWS.

A special veterinary pathology in the English language has for many years been the most serious hiatus in our literature. The wisdom of attempting to remedy this by crowding into a single volume the subjects of pathology, bacteriology, and infectious diseases is some-

what questionable. Nevertheless Prof. S. H. Gaiger and Mr. G. O. Davies of the University of Liverpool have essayed this task in writing a textbook(1) which claims to satisfy the needs of English speaking students in these fields.

Part I is the least valuable of the contents of this work. It deals with general pathology in an uninspiring manner and that indifferent style which with resignation we have come to expect from the pens of too many British veterinarians. We miss from its contents any discussion of the general principles of causation of disease. The lack of a description of post-mortem changes is not calculated to allow the student to comply with the advice (contained later in the book) to determine the interim period at his autopsies. The section on oncology, undeniably the most important biological problem at the present time, cannot be praised. The introductory remarks are scarcely calculated to equip the student with a firm grasp of the subject and the aetiology is not discussed in a manner fully representative of modern opinion; neither is the system of classification of neoplasms above reproach.

One turns with a sense of relief to Part II, covering bacteriology and bacterial, protozoal, and virus diseases. The adoption of an up-to-date classification of bacteria will prove serviceable in unifying the subject in the mind of the student. The Salmonella infections could profitably have been treated more fully. The protozoal diseases are not described in detail sufficient to meet the requirements of students in this country, and the same remark applies to virus diseases of local interest, such as horse-sickness, blue-tongue and heartwater. The bacteriology and bacterial diseases are admirably presented and will be found most readable both by students and practitioners.

Part III, a special veterinary pathology which has the distinction of being the first to appear in English that may properly lay claim to this title, will prove of inestimable value to veterinary students. Its quality varies somewhat from chapter to chapter. That on the endocrine organs we would rather have seen omitted than so inadequately handled. On the other hand, the pathology of the skin might far more profitably have been included.

An appendix dealing with technique contains a variety of useful and practical information.

We feel that although the authors have attempted rather too much, the book will be found of great use to students preparing for examination. One is, however, conscious of a failure to bridge the gap between pathology on the one hand and histology, cytology, and embryology on the other. This is nowhere more apparent than in the treatment of the haemopoietic system and the neoplasms.

C.J.

(1) Veterinary Pathology and Bacteriology by S. H. Gaiger, F.R.C.V.S., and Gwilym O. Davis, M.V.Sc., M.R.C.V.S., D.V.H. London: Baillière, Tindall & Cox, 1932. Pp. viii + 610, text fig. 194: 25/-.

Apart from the few books written from time to time to enlighten the South African farmer on stock diseases and the earlier works such as Hutcheon's Diseases of the Horse and their treatment, Animal diseases in South Africa,(2) by M. W. Henning, M.R.C.V.S., Professor of Veterinary Science at the Pretoria University, is the first serious attempt at compiling in comprehensive form all the more useful information regarding our numerous infectious diseases.

It is neither owing to absence of demand nor through lack of material that such a book had not been written before, but simply on account of the immensity of the task involved. All credit, therefore, is due to Prof. Henning for undertaking, single handed, this huge enterprise and so satisfactorily accomplishing what he set out to do; namely to collect and put into very readable and convenient form, all the latest and scattered information relating to some of our most important diseases. The work naturally enough has a distinct South African bias. The title chosen, however, is a trifle ambitious, and even perhaps misleading, seeing that by no means all animal diseases are dealt with.

Apart from the vast and important subject of internal and external parasites which the author specifically excludes from the scope of his work, there is also a number of other conditions omitted, which cannot be considered as other than animal diseases, namely, the large assortment of medical and surgical ailments such as colic, milk fever, paralysis, mastitis, anaemia, etc.

Readers will also miss reference to actinomycosis, necrobacillosis, coccidiosis, enzootic icterus, ecthyma contagiosum, jaagsiekte, lumpy wool, etc.,—all conditions of particular if not exclusive significance to South Africa.

In a word then Prof. Henning has dealt in a very thorough manner and in orthodox text-book style with a selection of the more important *infectious* diseases of the large domestic animals, and includes in Vol. II a comprehensive chapter on poisonous plants in South Africa. In our opinion the addition of a third volume dealing with these omissions would greatly enhance the value of this work.

Certain minor defects, almost unavoidable in a first edition, will undoubtedly receive attention at the first opportunity, e.g., elimination of ambiguous passages no matter how unimportant, and correction of a considerable number of typographical errors. Further the inclusion of sweating sickness and tick paralysis among the virus diseases appears unfortunate and liable to mislead the unwary.

The excellent illustrations, for the greater part borrowed from the Onderstepoort Veterinary Laboratory, are an outstanding feature of the book and in general the publishers are to be complimented on the very high quality and workmanship of these two volumes. A.D.T.

(2) Animal Diseases in South Africa by M. W. Henning, M.R.C.V.S. (2 vols.), 1932. Central News Agency, Johannesburg, pp. 878. 127 illust.; 50/-.

In a brochure(3) of 336 pages, Mr. G. Curasson, Inspector General of the French Colonial Veterinary Services, has ably summarised our present knowledge of rinderpest. This monograph, in itself, is a complete study of the disease. The ten chapters which it contains treat methodically of the history, epizootology, symptomatology, pathogenesis, etc., of the malady as it effects domestic and wild animals, and of the comparative merits of the various prophylactic measures preconised.

With his fifteen years of experience and direct contact with this scourge, both in Africa and in Eastern Europe, the author is well qualified to discuss, criticise and advise on the many aspects that this problem presents, and a bibliography covering some 41 pages is no small tribute to his thoroughness in consulting existing literature on the subject.

The French authorities are keenly alive to the fact that the eradication of rinderpest, at least from the African continent, is a feasible proposition, and Mr. Curasson's book will indeed stand all those entrusted with this task in good stead.

A.D.T.

The second part of Dr. du Toit Malherbe's "Scientific and Technical Dictionary"(4) has just appeared, and in so far as it now completes the work (which may incidentally be had from the publishers in one volume), it is very welcome, though as in the case of the first part, it contains much that may be criticised. In a review of the first part (see this Journal, Dec., 1932), the scope and general purposes of the work were indicated, and some criticism levelled at certain points which called for mention. Several of these apply with equal force to the second part, and bearing in mind the fact that the "Dictionary" must serve a public for the greater part unacquainted with the more technical aspect of biological nomenclature, the following observations will serve to focus attention on some items which call for special mention:—

(a) Definitions are sometimes given with a laxness that will certainly not make for precision in the use of the terms defined. Thus, for example, "Bobbejaanballe" is defined as the "root-nodules" of *Rhoicissus thunbergii,* whereas in fact they are *tubers.* Under "Boomvaring," again the South African species *Cyathea dregei* and *Hemitelia capensis* have been omitted, both of which are highly important constituents of much of our forest undergrowth, and are commonly

(3) *La Peste Bovine* by G. Curasson. Paris: Vigot Frères, pp. 336, 40 fr.

(4) *Vakwoordeboek* (Scientific and Technical Dictionary) by Dr. D. F. du Toit Malherbe. Part II, Afrikaans-English, pp. XIV + 244, 1932. Pretoria: J. H. de Bussy. Capetown: H.A.U.M. v/h Jacq. Dusseau & Co. 12/6, 13/3 post free.

known by this vernacular. "Altydbos" is defined as "a shrub with virgate roots" instead of "virgate shoots," a very different thing. "Elandsboontjie" is defined as a "small deciduous perennial," when actually the aerial parts are annual. The definition applies to another species *Elephantorrhiza burkei*, and not the one cited

(b) Far too many "typographical" errors are to be met with in the spelling of scientific names, and in truth it is not always possible to regard some errors under this head. For example, *frutescens* is twice mis-spelled as "frutescence" (pp. 89, 90). Inasmuch as scientific names of plants and animals cannot as yet be said to have met with "popular favour," their mis-spelling will certainly not help to improve matters, the more so where the generic names are mis-spelled, since this will frequently render correlation of these names with relevant literature very difficult for those whose activities lie outside the botanical field. The possibility of thereby also introducing serious error into plant toxicological literature, for example, cannot, therefore, be overlooked.

(c) A word of protest must also be tendered against the very careless use of synonyms of plant names, the more so since this same reprehensible laxity appears in a recent authoritative publication which was also reviewed in the December number of this Journal.

(d) In the interests of space economy, one could hardly expect full scientific equivalents for all the vernacular names given, but it is a matter for some regret that the vernacular names of economic plants should be dismissed with a mere enumeration of the genera to which they belong: e.g., " 'Naboom,' several spp. of *Euphorbia*"; "Nentabossie,' sp. of *Cotyledon*, etc." These two genera are so diversified in the habit of their rather numerous species, that an enumeration of the species involved (about 5 and 4 respectively) would have greatly facilitated reference to published descriptions of these plants where and when necessary. In view of further editions of this "Dictionary," it may thus not be out of place to conclude with the suggestion that the botanical nomenclatural questions involved be submitted to a specialist in this critical field. In spite of the defects noted, the reviewer is of the opinion that the work will definitely be of valuable assistance to all technical men—bilingual or not—and as such should form a useful 'vademecum' for veterinarians, who, so far as their own immediate subject is concerned, should have no cause for complaint.

C. A. S.

[The very large number of examples quoted by the reviewer to illustrate his remarks cannot possibly be reproduced in full in the small space available. (Ed.).]

NOTES AND NEWS.

We are indebted to Mr. J. Spreull, F.R.C.V.S., for the following details regarding Capetown municipal Veterinarians* :—

The amalgamation of the different Municipalities constituting Capetown and suburbs took place in 1913, the area extending from Camps Bay to Kalk Bay and including the Municipalities of Sea Point, Woodstock, Mowbray, Rondebosch, Claremont, Maitland, Muizenberg, and Kalk Bay. Wynberg amalgamated later, in 1927.

J. W. CROWHURST, F.R.C.V.S., started private practice in 1900. Although never appointed as Municipal Veterinarian he from time to time rendered professional services to the Municipalities of Capetown, Seapoint, and Wynberg. He was in 1901 appointed veterinarian to the Harbour Board.

WALTER JOWETT, F.R.C.V.S., D.V.H. previously in the employ of the Colonial Veterinary Department, was appointed by the Capetown Corporation as Superintendent of the slaughter-houses in May, 1914. During the Great War he was employed in military duties and he resigned his post at the abattoir on 31-8-15 in order to devote himself entirely to the work of the Defence Force.

JOHN FORREST, M.R.C.V.S., who had been in private practice in Capetown since the Boer War, was appointed on May 27th, 1920, as the first full-time Controller of the Municipal Abattoir and Meat Market, his duties also including the inspection of all imported meat and meat supplies to Capetown from outside districts. During the Great War he was absent on military service for two-and-a-half years, during which time the M.O.H., Capetown, in cases of dispute, at this time called the Veterinary Department to his assistance.

EDWARD FERN, M.R.C.V.S., for a short period during 1925-1926 whilst also practising in Capetown received a retainer from the Municipality of Wynberg for services in connection with meat inspection at its Abattoir in Batt's Road. Prior to the Great War Mr. C. S. ELPHICK, M.R.C.V.S., was in veterinary charge of the Wynberg Abattoir.

THE ASSOCIATION.

Minutes of Council Meeting held at Polley's Hotel, 2.30—5.30 p.m. 17th December, 1932.

Present:—Messrs. Chalmers, Kirkpatrick, Coles and Drs. du Toit, de Kock and Thomas and the Hon. Secretary-Treasurer, Dr. Curson. Capt. Bisschop, S.A.V.C., was present (as a visitor) in order to explain the position re the U.D.F. veterinary post.

*For a note on the history of municipal veterinary services in Johannesburg see this Journal I (3): 39.

Absent:—Apologies were received from Messrs. Amos and Carless. Also absent were Dr. Quinlan and Mr. Alexander.

1. Minutes of 18-6-32 read and confirmed.

2. Arising from these were:—(a) Grievances re S. and T. 7/6 p.d. As it was clear that no change if any, would be made until the new financial year, it was decided to circularise members asking for examples of hardship. The D.V.S. (Dr. du Toit) promised to pay particular attention to cases of differentiation, as between veterinarians and others. (b) The Easter General Meeting was arranged for Thursday afternoon 13/4/33, Show Ground, Johannesburg. (c) In response to a complaint that a certain private practitioner was giving details of treatment to "veterinary" chemists, the Hon. Secretary and Dr. Thomas mentioned that the State did the same. It was finally agreed, however, "That no one should detail treatment in the press, but should advise consultation with a veterinarian." It was also clear that Reprint 61/1932 (Dept. of Agriculture) protected the rights of private veterinarians from competition with State Veterinarians.

3. *U.D.F. Captain S.A.V.C.* The following resolution was passed: "That the attitude of Council in the matter of U.D.F. appointment remain as heretofore, but on account of the present strained financial circumstances of some of our colleagues, it be decided to allow all members to apply for the position at the terms offered." Proposed by Dr. Thomas, seconded by Dr. du Toit.

4. *Reports of Standting Committee. Parliamentary Committee.* Dr. de Kock had seen Dr. H. Reitz who mentioned that probably in the new year the Session would be but three weeks. He hoped, however, to proceed with the Committee stage forthwith. Council agreed to Dr. de Kock interesting himself in the matter when in Capetown in January and left it to him to decide whether Dr. du Toit should be summoned, the expense to be borne by money now in Union Loan certificates.

Editorial Committee: Nothing to report.

Status Committee: This had not met since its formation. It was agreed that concerted effort was preferable to individual.

Finance Commttee: Dr. Curson reported that the matter re Benevolence had been referred to Council. It was agreed to ask the Finance Committee to deal with the matter.

5. Regarding a notice of motion about the future of the profession the D.V.S. (Dr. du Toit) mentioned there was a Faculty Committee to deal with the matter. It was agreed to write to the Dean drawing attention to the notice of motion in question, but stating that it was not considered necessary for the S.A.V.M.A. to act at present.

6. Regarding arrears, it was agreed to draw the attention of a certain member to Rule 7b.

7. Re veterinary duties and Police Sergeants, especially Grahamstown, it was decided this was a Departmental matter and Mr. Paine, G.V.O., Grahamstown, was to be asked to submit his complaint to the D.V.S.

8. Re Veterinary representative on Public Health Committee, etc. This matter is receiving the attention of the Heads of the Department concerned.

9. *General:* (a) Mr. Kirkpatrick referred to comparative absence of bruising of cattle (after dehorning) from certain ranches. See "Farmer's Weekly" of 14/12/32.

(b) Re Next Council Meeting, the Secretary was to keep in touch with the President and suggest a meeting about a fortnight before next General Meeting. Remaining items, e.g., Library Scheme were to be left over until then.

(c) Mr. C. Strachan's resignation noted with regret.

(d) Dr. du Toit referred to next International Veterinary Congress.

JL. S.A.V.M.A.
IV (2) 1933.

Studies in Native Animal Husbandry—8.
The Domesticated Animals of Pre-European South Africa.

By RAYMOND A. DART, Professor of Anatomy,
University of the Witwatersrand, Johannesburg.

There is no more vital aspect of anthropology than the study of domestic animals. For thousands, perhaps hundreds of thousands of years man had known how to bend to his will only inanimate nature in the form of clubs and stones, either rude or fashioned, and had hunted wild game. As a hunter, however diversified the quarry on the plains, in the forest, on mountain crags, in streams, or on the seashore, man culturally was bound to be crude. The monotony of life was relieved only by song, speech, and dance round the camp-fire or by the occasional flight of genius which found expression in carving or painting. Even these cultural achievements were subordinated to and directed towards the dominant and daily demands of hunger, the satiation of the eternal craving for means of subsistence.

Only in the presence of an assured food supply could existence be other than precarious. Finally man learnt to control animate nature. The domestication of animals was the first point of departure in the direction of civilisation by providing an assured food supply and opening up the possibilities of community life and settled existence.

The dog, the oldest and voluntary friend, was the first living creature to be controlled and directed by man. With the assistance of dogs not only could he hunt better and was he better protected, but he also discovered how to herd the elusive and at first unfriendly ungulates such as sheep, goats, and ultimately dangerous cattle, asses, horses, and camels. These conquests, once made, led to greater, until the relative security of nomadic life replaced the vicissitudes of hunting. Possessions and wealth made their appearance in flocks and herds of ungulates and with them probably the patriarchal system replaced the matriarchal.

Our own civilisation has a rich inheritance from this nomadic past. The very word cattle is derived from Norman French *catel* and Late Latin *capitale* meaning wealth or property, and an even closer approximation to the original meaning of the word is found in the term "chattels." Abraham was rich in cattle, and for a long period oxen formed, as they still do among many savage or semi-savage tribes, the favourite medium of exchange between individuals and communities. After the introduction of a metal coinage into Ancient Greece, this method of exchange was commemorated by stamping an image of

an ox on the new money; while the connexion between cattle and coin as symbols of wealth has left its mark on the languages of Europe, as is seen in the Latin word *pecunia* and the English "pecuniary" derived from *pecus*, cattle (*vide* Encyl. Britt.).

But flocks and herds produced in turn their own problem of a huge food supply for the animals. Until man learned agriculture, as he did apparently for the first time in Egypt, he could not supply the constant needs of himself and his increasing animal community without ceaseless Cain-like wanderings over the face of the earth. With the discovery of agriculture, settled village and city life became possible. There was reared on this basic discovery the whole complex of modern civilised existence.

In view of these facts it might have been anticipated that the fascinating spectacle presented by South Africa of pure hunting people (Bushmen), pastoral folk (Hottentots), and settled, but primitive, agricultural groups (Bantu) living side by side would have attracted more attention at the hands of veterinarians, who, being expert in the study of domestic animals, have the material at hand throwing light on a multitude of questions of fundamental anthropological interest.

South African anthropology has urgent need of experts in every field of human endeavour, craftsmen to discover the uses of stone implements, artists to study engravings and paintings, architects to record and consider the ruined temples and forts, engineers and surveyors to assess and map the mining activities of the ancients, botanists to gather and describe the alien plants brought to Africa before European times, linguists to record and compare the native languages and to gauge the sources of their foreign contacts. We know the value that has resulted from initial efforts in these directions; similarly the pre-European domesticated animals have a wonderful story to unfold to the people who are prepared to investigate them.

Too much praise therefore cannot be given to those who have been responsible for probing into and setting on record in this journal data of any kind connected with the South African natives and their animal husbandry. It is with the intention of fostering and forwarding such studies that I have been persuaded by the editor to write something about a subject in which I can claim no serious experience whatever.

Perhaps the most astounding characteristic of man, with his double reputation for initiative and inventiveness, is his conservatism, the tenacity with which he preserves the religious ritualistic and even material inheritance of his ancestors. Our dwellings, means of locomotion, daily business, recreations, and religious observances each have a long history that can be traced back step by step towards their starting points. They have not changed in essence, they are merely

the same age-long pursuits differing slightly in external form. How they all came to be and their history down the ages are investigations proper to anthropology. It is in these investigations that more primitive peoples, such as we are surrounded by in South Africa, assist so greatly. These communities are even more tenacious of ancient things and formularies than we are. Their whole life is a reminder to us of how our own ancestors probably lived and acted; and these three groups of African peoples—Bushmen, Hottentot, and Bantu—have been sufficiently conservative to present us with a living picture of the three fundamental phases or strata in the passage of mankind from the state of Nimrod to that of ancient Egypt.

The questions which we have before us to resolve locally are:— How did these three different types of culture come to South Africa? And how did the three peoples come to differ in their culture? Were their cultures brought here, and if so, by whom and when? Did they arise here and if so, how? Did the Bantu teach the Bushman the use of the bow and give the Hottentot cattle, sheep, and goats? Were the Hottentots always the degraded "strandlooping" people they seemed to be to the early European travellers, or were they once a mighty civilised folk? Did the Bantu and Hottentots domesticate their animals from wild African stocks or did they receive them from Egypt and Asia, and if so, when and how?

A very obvious feature about the domesticated animals of S.A. natives is their limitation. Thus the natives had dogs, cattle, sheep, goats, and barnyard fowls, but no donkeys, horses, buffaloes, camels, pigs, or cats; and no ducks, geese, swans, pigeons, or other birds. Further the animals they have are for the most part mongrel types and reveal little if any recent attempt, by isolation, selection, or other breeding methods, to improve or segregate the stocks they represent. The nearest approach to purity of stock is found in the so-called "king's herd of cattle" found in various tribes, but the term purity even there can be used in only a modified and relative sense.

These facts seem to prove that the natives of Africa have themselves played little if any part in the original domestication of their animals. The animals they have were probably brought to them and apparently at a time so remote that the domesticated buffalo, horse, and camel were unknown or were not sufficiently plentiful to be dispersed indiscriminately.

It is of fundamental interest too that the only addition to the variety of domesticated animals to be ascribed to the coming of the Bantu appears to have been the barnyard fowl. Dogs, cattle, sheep, and goats were here with the Hottentots before the arrival of the Bantu. The Hottentots already knew cattle not only as sources of beef and milk, but also as beasts of burden. On the other hand the

Bantu may have added other types to the breeds of cattle that were already in the country on their arrival.

There are innumerable questions to which at present we stand in need of reply and concerning which little is known. To my knowledge no studied and expert statement has hitherto been published concerning the domesticated animals in the possession of the Hottentots and the various Bantu peoples. Trifling references are made here and there in the works of the old travellers concerning the presence or absence of herds and flocks noted during their journeys. Valuable general statements are on record; for example Dornan says "Their (Cape Hottentot) wealth consisted of long-horned cattle and sheep. Of their cattle they were inordinately fond, and spent much time in training them for riding and racing, and to obey certain calls. They were inferior to the cattle of Europe, but, although they did not give much milk, were hardy and throve well. The oxen were trained to carry the mats and household gear when a tribe removed from one district to another. They were guided by reins fastened on both sides to a piece of wood passed through the cartilage of the nose. Their sheep had hair instead of wool, long legs, and enormous fat tails, and could exist and thrive on the scantiest pasturage in times of scarcity. The flesh of sheep was used in preference to that of cattle as food, because the Hottentots were very unwilling to slaughter their cows."

But nobody has taken the trouble to discover precisely whether the cattle and sheep and goats of the Hottentots were *identical* with those of the Bantu, or to demonstrate how many different pure strains have been mingled to produce the Africander herds, or to reveal the homeland of the original stocks from which they came, or by examining their distribution comparatively to show how and with what tribes they migrated into and were dispersed within Southern Africa.

Yet it is quite clear that if such exact authoritative studies were initiated they would yield information of the most positive character concerning the unrecorded movements and contacts of the Hottentots and the Bantu. They would do far more because it is impossible to study domestic animals and their usages without being brought into immediate contact with all that is and has been vital in the tribal life and customs of those possessing them. They would reveal the original source of those customs.

In primitive times and at the present time amongst primitive peoples, and even amongst highly civilised peoples, e.g. in India, as also amongst the Ancient Romans, Greeks, Babylonians, and Egyptians, animals meant more than food and drink and pets. They are and were the external objects around which all that was sacred and holy in their religious observances were built up.

It is impossible to go far in the study of South African Pre-European domesticated animals without confronting their religious significance in the whole ritual of the tribe, at birth, in initiation, in marriage and the ceremonial of death.

"The (Hottentot) women and girls did all the milking, and a man might not help himself from the milk sack without permission of his wife," says Dornan. The relationship between women and cattle in native life is very intimate. Thus every South African has heard of the custom of "lobola" and loosely describes the natives as "paying for their wives" with so many head of cattle; but few have probed into the ritual and religious significance of the custom and its variations. Again it is known that amongst some tribes the corpse of the chief is buried in an ox-skin or in his cattle kraal, but who can tell us why and how these fascinating burial customs grew up, in which the domestic animal plays a part? Some of the most interesting customs, in fact almost the whole of religion as far as some tribes are concerned, are linked up with cattle. Exact data of every custom involving domestic animals in native tribes should be collected and recorded.

Despite the large number of modern breeds of cattle, all the cattle of the world are said to be derived from two main stocks, *Bos taurus,* long-horned, big-limbed, massive-boned European cattle, and *Bos indicus,* the short-horned, humped cattle of India and Africa. The long-horned breeds have so many characteristics in common with the *Bos primigenius* hunted by primitive man in Europe during the Ice Age, that they are regarded as being largely if not wholly derived from that form. Spread across Central and South-eastern Europe this stately ox appears in Asia as the *Bos nomadicus.* The oldest domesticated remains of the type were found at Anau in Turkestan.

Although cattle of *primigenius* (or *taurus*) type were native to Europe, the earliest domesticated form in Europe was the "peat ox" of the neolithic Swiss pile buildings. It is a delicate small short-horned breed. This "Celtic shorthorn" (*B. brachyceros*), or one almost identical, is also found in the ancient deposits at Anau in Turkestan and seems to be derived together with all cattle of that type from the Zebu stock of India. The nearest wild relatives of the short-horned breeds are the gaur, gayal, and banting, the humped wild cattle of India and South-eastern Asia. Spreading from Asia to Africa as a domesticated species, short-horned cattle reached to Lake Chad and to Southern Africa and across the Mediterranean to Italy and even the British Isles. They were the fundamental type of cattle in Ancient Mesopotamia and Egypt.

The soul of the Egyptian God Osiris dwelt in the black Apis bull, carefully chosen for the feather-shaped white patch on the back, the

scarab-knot under the tongue, and the two sorts of hair on the tail. Lodged in a glorious temple he received extravagant offerings; his death put the whole empire in mourning and the body was immured in a sumptuous sarcophagus.

On general principles it seems probable that the gentler and less formidable short-horned cattle were domesticated first; and it was doubtless their small size and tractability which led to their wide dispersal over land and sea in neolithic times. It was later in history that the half-wild long-horned breeds came into prominence in the bull-baiting and fighting contests of Crete, Mycenae, Spain, and elsewhere.

None the less evidences of early domestication and dispersal of the long-horned type are found in the Ancient Egyptian cattle and the type persists in Africa in the Ankoli oxen, the large brown oxen near the headwaters of the Kagera River, and the big-boned, long-horned Afrikander type and probably the red Mangwato breeds.

By interbreeding of the two main types thus introduced into Africa in ancient times there have been produced the "native" cattle as we find them to-day. Nobbs (1927) has given us an account of the Southern Rhodesian cattle and Thompson (1932) certain data on the small-humped Bolowana cattle. These papers give some idea of the rich field that awaits further investigation of African cattle anthropologically and economically.

Africa then, like Europe, received derivatives of both long-horned and short-horned types, which have interbred rather indiscriminately. These animals have been subjected for many generations to the vicissitudes of the climate and pests of Africa and it is to be expected that peculiarly valuable data on adaptation and immunity will accrue from the intensive study of the African breeds.

For, despite the interbreeding of the African cattle, they belong to the same blood as gave Europe her cattle and there are as marked variations between various African stocks as we find amongst European stocks. The small Mashona cattle (with their variegated colours, fine bones, shapely head, moderately long neck and rather rough sloping shoulders, fine withers and a prominent chine, goose rump and narrow quarters, round and roomy barrel, short clean and flat Jersey-like limbs, short cleanly chiselled triangular head, lean necks, placid, large, prominent and intelligent eyes) appear from these features of Nobbs' description as well-defined a type as any in Europe. They are in strong contrast with the large, black, polled type of Lake Ngami and the small, red, dark-brown and dun, hornless or very short-horned Bolowana cattle of Elliotdale in the Transkeian Territories, and the black, speckled, and brindled Angoni of blatant zebu humped type. These, with other African types previously referred to, seem to con-

stitute definitive breeds, probably introduced at different times into the country from farther north or directly from Asia. Quite apart from deciding the anthropological questions involved in these immigrations it is a matter of economic urgency that as pure representatives of the varied breeds as are obtainable should be isolated and kept pure, their milk-giving, beef-yielding, and disease-resisting capacities tested under laboratory conditions, and their future capacity to improve European breeds for African conditions thoroughly exploited.

Doubtless data along such lines would be already available if only we were familiar with the experiments that have been made in some parts by pioneering spirits along such lines. But it is difficult to see how well-organised experimentation could be undertaken without basic studies of the present distribution of the various breeds, without making a standard collection of skeletons of male and female of each individual breed for reference museum purposes and in short without placing the study of native domesticated animals on a scientific basis and so replacing hypothesis with facts.

From the modern economic point of view probably the study of the native cattle is more important than that of the native goats and sheep; but it would be rather short sighted not to pay some attention also to these animals. From the anthropological point of view they have certainly had a long South African history and while cattle and sheep appear to have had pre-eminent value in the eyes of the Hottentots it is interesting that other living tribes had a different scale of values.

The Berg Damara, according to H. Vedder, "prefers to raise goats. It has not yet been ascertained where the Berg Damaras first obtained goats. In view of the fact that he had once been the herd and servant of the Hottentots, one would think that he would have acquired fat-tailed sheep. This has, however, not been the case." Their word for goat is *birin.* The same word denotes *happiness* in the language of the Koranna Hottentots. Curious Damara customs centre around the goat. "Pots, axes, knives, other utensils, wooden buckets, bows and arrows form portions of the deceased's estate. Rather oddly the goats are not regarded as included in the estate proper. As a rule they are divided amongst the relatives on the day of the funeral in equal shares, after a goat has been prepared for the funeral feast of the men who dug the grave."

It is clear from facts such as these that the preference of the Damaras for goats is not haphazard. The goat is used in funeral feasts and is subject to special tribal customs because of some significance attaching to the goat as compared with all other domestic animals. Just as Moses taught the Jews to utilise the goat as the animal of the sin offering, and caused the scapegoat to be sent out into the wilder-

ness bearing the sins of the people, so some teacher we are not acquainted with taught the Damaras to use the goat for funeral feasts and to distribute goats equally amongst the relatives of the deceased.

As with the cattle the homelands of the goats and the sheep are not precisely known. The more typical goats are markedly distinct from sheep but there is, both as regards wild and domesticated forms, an almost complete gradation from goats to sheep, so that it is exceedingly difficult to define the limits of either group. They grade into one another and were probably derived from one ancestor. None the less several varieties of sheep and goats were doubtless in existence before man attempted to domesticate them, but there is no evidence to show that there were ever any wild goats or wild sheep in South Africa, which owes her sheep and goats, like her cattle, to the north or to Asia.

There are two types of wild goat in Northern Africa, namely the small-horned Nubian of Abyssinia and the hornless Theban of the Soudan. I do not know if the South African goats have been determined as belonging to either of these North African varieties, but the long-haired, spiral-horned Madagascar goats with their excessively long ears (which have sometimes to be clipped, lest they be torn by stones or thorn bushes) are of the Syrian type. They probably tell a story of ancient sea traffic between Madagascar and the Near East. It probably was the same traffic which carried to the islands of Madagascar, Bourbon, and Mauritius the rare *Capra depressa*, a pygmy goat akin to the dwarf goat of Guinea and a similar variety found along the White Nile, in Lower Egypt, and at various points along the African coast of the Mediterranean sea. Perhaps the original home of the domesticated goat was Egypt.

A long-legged hairy sheep ranges from Lower Guinea to the Cape. The ewes are hornless but the rams have short, thick, goat-like horns. They are very variable in colour—pied, white splotched with black or brown, or uniformly yellowish-brown, reddish brown, greyish brown, or even black! In Angola there is a breed of this sheep, which is said to have been crossed with the fat-tailed Malagasy breed; while in Guinea there is a breed with drooping ears and cervical auricles which is believed to owe these characters to inter-breeding with the Roman-nosed, hornless, Theban goat.

In the Cameroons there is a pygmy breed of sheep, rams of which when full-grown stand only 19 in. at the withers. Their bodies are chestnut in colour while their faces, ears, and under parts are black. Their nearest known relatives are the extinct pygmy sheep of certain deposits in the South of England.

The fat-rumped sheep, *Ovis steatopyga* is common to Africa and Asia. They are piebald, and have rudimentary horns and a short hairy coat. On the other hand, the fat-tailed sheep, which have much the same distribution and colour, have a woolly coat. Finally there is a four-horned breed found in South Africa. Four-horned types are found also in Iceland and the Hebrides.

These data go to show that goats and sheep were subjected to selection and inbreeding in the Near East and then widely dispersed in the Old World before historical records of their movements were made. Their long habitation in diverse environments in Africa must have resulted in certain immunities and adaptations that would be of economic significance if they were fully understood. There is no reason to assume that the types of goat and sheep in native herds would not be valuable in these respects.

In an addendum to Thompson's (1932) paper, Bisschop and Curson have indicated the desirability of collecting measurements, descriptions, and data concerning milking, and beef qualities, fertility, longevity, prepotency, and weights at different ages of native cattle. Equally important is the drawing of maps showing the present distribution of different breeds of native cattle, sheep and goats, and the collecting of typical complete skeletons of each breed for more exact osteological description. Indeed in all investigations of domestic animals such as the comparison of different breeds one is struck by the relative lack of comparative osteometrical data and the reliance placed purely on coat colour, shape of horns, and similar external features.

Perhaps this was to be expected as long as selection was dominated by externalities of form and appearance and when veterinary pursuits, like early medical practices, were empirical. In these scientific days much fundamental anatomical investigation of animals is required if we are ever to arrive at an understanding of the factors which were responsible for the origin, evolution, dispersal, and variations of the domestic animals. It is a story which, in intricacy, is for each animal as involved as is the similar story of man; furthermore it is a story linked in the most intimate fashion with the story of man and his civilisation. Consequently even if its solution be deferred for many years to come, the story of South African native herds is one which humanity will demand, if for no other reason, for the simple interest of its recital.

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The Veterinary Board.

The South African Veterinary Board (in terms of Veterinary Act 16/1933) will be constituted as follows:—

Chairman: Dr. P. R. Viljoen.

Faculty Representative: Dr. P. J. du Toit.

Elected by S.A.V.M.A.: A. C. Kirkpatrick, H. H. Curson, F. J. Carless.

JL. S.A.V.M.A.
IV (2) 1933.

Canine Distemper with Particular Reference to Immunization: A Review.

By R. A. ALEXANDER, B.Sc. (Agric.), B.V. Sc., Onderstepoort.

A fairly extensive literature on the immunization of dogs against distemper, chiefly in England, has appeared in recent years. It is realised that since many South African veterinarians may not have had an opportunity of consulting this literature, a review of the salient features of the work accomplished may be of interest.

HISTORICAL.

In Britain the ravages of distemper, particularly among fox hounds, where the incidence among puppies frequently reached 100%, had been so disastrous that the Dukes of Beaufort and Portland and the late Sir Theodore Cook, editor of the "Field," took upon themselves the responsibility of establishing a fund to be devoted to investigation into the problem of distemper. Numerous institutions, sporting organisations, and individuals contributed most generously. This Field Distemper Fund was administered by a Council which appointed a Scientific Committee with Sir Charles Martin, F.R.S., as chairman. Dr. Laidlaw and Major Dunkin were appointed to carry out the research work under the aegis of this committee at Mill Hill, where suitable facilities were provided for the work in conjunction with the Medical Research Institute at Hampstead.

At the time the work was commenced there were two divergent views regarding the aetiology of distemper. The one school represented by McGowan, Ferry, Torrey, and Rahe was of opinion that *Bacillus bronchisepticus* was the causal agent. This organism could not be isolated in 100% of naturally occurring cases, but frequently was encountered in pure culture. Though its virulence decreased rapidly on subcultivation on artificial media, injection of the organism in its virulent form was claimed to produce a clinical picture indistinguishable from that presented by the disease under natural conditions. Recently (1932) Schlingman reported that in a bacteriological study of 100 cases of clinical distemper, he had isolated *B. bronchisepticus* in 81% of cases. With recently isolated cultures he had succeeded in producing distemper in puppies by the intratracheal route, but not by subcutaneous injection. Incidentally a haemolytic streptococcus and various staphylococci were isolated in a small percentage of cases at the same time. In addition, it had been claimed that the use of vaccines prepared from the bacillus afforded a variable degree

of protection. Schlingman has shown that recovery from *B. bronchisepticus* infection does not immunise against experimental distemper.

The other school, led by Carré, was of the opinion that the causal agent was a filterable virus, since they were able to set up distemper by bacteria-free exudates and bacteria-free filtrates of discharges.

It was apparent, therefore, that the first step in any research on the disease must be definitely to clear up the aetiology of the condition. This work was seriously hampered by the lack of a small laboratory animal, which would be susceptible to infection, easily available and cheap, which could be bred in large numbers under laboratory conditions, and which (having regard to the highly contagious nature of the disease) would be amenable to the closest confinement. Eventually Laidlaw and Dunkin established the fact that the ferret is susceptible to distemper. This important discovery proved the means of conducting a large amount of intensive experimental work which, in addition to clearing up the aetiology, had as its outcome the development of a rational method of immunization.

When the results of immunization obtained under laboratory conditions in the ferret had been applied successfully to the dog, the efficacy of the method under field conditions was confirmed by the issue of several thousand doses of vaccine to practising veterinarians for trial, chiefly amongst suitable kennels of fox hounds.

At this time Messrs. Burroughs Wellcome & Co. of London, undertook the preparation and distribution of the vaccine on a commercial scale. As experience accumulated, this firm, chiefly owing to the work of Dalling, found it advisable, from time to time, to introduce certain modifications which have resulted in the production of a highly efficient product. For reasons which will later become apparent, it is not yet possible to make supplies of vaccine available in South Africa, but in December 1932, Messrs. Burroughs Wellcome & Co., Cape Town, were able to announce that they had received supplies of Anti-Distemper Serum for distribution.

The Value of the Ferret.

The ferret proved to be an admirable laboratory animal for many reasons, possibly the most important of which was that the susceptibility of selected experimental animals could be relied upon since practically 100% of ferrets which become infected, either artificially or by accident, die. This necessitates the adoption of the most rigid precautions to exclude accidental infection, and is a serious handicap to breeding, but is a decided advantage to the experimentalist, who is safe to conclude that any animals drafted into his experiments will be fully susceptible.

This is in striking contrast to the experience with the dog. Fully susceptible dogs are exceedingly difficult to obtain. In a laboratory, where the danger of accidental infection is considerable, this inability to be certain of the absence of initial immunity has undoubtedly been one of the reasons why the problem of distemper has evaded solution for so long.

Even after the susceptibility of the ferret had been established, Laidlaw and Dunkin realised that, step by step, each result obtained would have to be confirmed on the dog. To this end, a carefully constructed isolation compound was erected to serve as a breeding establishment for the production of fully susceptible dogs. The precautions adopted to ensure the impossibility of contact by these dogs with infective material makes interesting reading, but is outside the scope of this article. Suffice it to say that the sacrifices made by the kennelmaids, whose sole duty it was to attend these dogs in the strictest isolation, have been justified by the benefits which have accrued to the canine world.

Again this organisation contrasts strikingly with the comparative ease with which it was possible to breed susceptible ferrets. Naturally the greatest attention had to be paid to disinfection on every occasion, but for every compound-bred dog it was possible to produce at least 100 susceptible ferrets at a fraction of the cost.

AETIOLOGY.

A careful study of distemper in ferrets showed that the disease may be passed from ferret to ferret, from ferret to dog, and from dog to ferret by the injection of infective blood or organ emulsion. Six different strains of dog distemper were found to cause in ferrets one disease which ran a fairly uniform course. These strains cross-immunised against one another, so that in all probability dog distemper is a single entity, the response in the ferret being comparable in all essentials to that in the dog.

The blood, which under suitable conditions is invariably infective in as small a quantity as 0.02 ccm, was always bacteriologically sterile except for secondary invaders. The blood is infectious in ferrets from the time of the appearance of the first symptoms until the fourth day of the disease. In dogs the infectivity reaches a maximum at the peak of the first curve of the typically diphasic temperature chart.

The spleen may be infective in as small a quantity as 0.00001 gm. Whereas cultures showed an unusually large percentage of infection with *Staphylococcus albus, Bacillus bronchisepticus* was never encountered, at least in the early investigations of the uncomplicated disease.

Laidlaw and Dunkin report that they were unable to repeat Carré's observations on the filtration of blood, serum, or pericardial fluid from dogs and ferrets and the nasal discharge from dogs, but under suitable conditions the infective agent in the spleen is capable of passing through bacterial filters of standard type and proven quality. Moreover, this agent could not be cultivated either aerobically or anaerobically on any of the media adapted to the propagation of bacteria.

In a recent publication Schlingman reported that he had been unable to set up distemper in ferrets by the subcutaneous injection of the bacteria-free filtrates obtained by passing 20% saline emulsions of spleens obtained from naturally occurring cases through Mandler S candles. It is worthy of note that in the few instances tested he was unable to set up infection with the unfiltered material though he was able to isolate *B. bronchisepticus* in the majority of cases.

Consequently, as a result of confirmation of Carré's work by Laidlaw and Dunkin, it must be accepted as proved that distemper is the result of infection of a susceptible animal with a specific filterable virus, the course of the ensuing disease being modified by the subsequent invasion of the body with different organisms of varying virulence and pathogenicity.

Schlingman (1933) agrees that ferret-distemper, fitch distemper, and the infection of dogs with the virus of experimental dog distemper are similar, but as a result of cross-immunity experiments he is unable to concede that the disease produced by the virus isolated by Laidlaw and Dunkin is identical with the cases diagnosed as typical clinical distemper that were studied by him. It must be borne in mind, however, that some bacteria which for one reason or another assume pathogenic properties may be able to produce a chain of symptoms scarcely distinguishable from those which happen to be the result of infection with distemper virus. At any rate, if there are several similar clinical diseases of different aetiology, the one of prime importance in England is that caused by the filterable virus. Until definite proof to the contrary is advanced, it must be assumed that the same observation holds good for South Africa.

Method of Infection.

Apart entirely from laboratory methods of infection, the disease may be transmitted by direct or indirect contact more particularly during the early stages of the disease. For instance, a healthy ferret housed in the same cage as a sick ferret will invariably pick up the disease, just as will a healthy ferret when placed in a cage recently vacated by a sick animal. Infection probably takes place through the respiratory tract. No definite data are available as to the length of

time bedding, kennels, or clothing may remain infective after contact with the virus. In spite of the fact that except under special conditions the keeping qualities of the virus in the laboratory are strictly limited, one could not consider such material free from danger until a period of at least a month had elapsed.

Further experience of the disease has brought out an additional point of extreme importance, namely, that infection definitely may be air borne, more particularly over short distances in closed buildings, but also in the open. This point had an important bearing upon the planning of experimental work and in future must certainly be given more attention in the hygiene of hospitals, kennels, etc.

Cause and Symptoms in the Dog.

Experimental dog distemper may be defined briefly as "an acute infectious fever characterised by an incubation period of four days, a coryza at the onset of the disease, an unusual temperature curve, severe gastro-intestinal disturbance and a variable set of symptoms due to inflammation in the respiratory system. In a small proportion of cases nerve symptoms due to an encephalitis are encountered."

After a remarkably constant period of incubation of four days, the onset of the disease is sharply defined by fever and a variably profuse watery discharge from the eyes and nose. Within 24 hours the discharge becomes purulent and collects as a dirty crust at the canthi and round the nose. Acute conjunctivitis often occurs, rarely keratitis.

The temperature chart is of great value. The initial rise in temperature is abrupt to about 105° F., at which level it remains for one or two days. It then subsides to approximately normal for one or two days, being followed by a second more gradual but usually much more prolonged rise to 105° or more. The duration of the second rise may be as long as 3 weeks. The diphasic nature of the temperature curve is important since it is at this stage of subsidence, i.e. 24 to 48 hours after the commencement of the discharge, that dogs frequently are brought in for treatment, and the clinician may be misled by the temporary absence of fever.

From the commencement of fever most dogs refuse food and periodically vomit. The appetite usually returns with the first drop in temperature, but complete inappetence recurs with the second exacerbation. Diarrhoea is usually present from the beginning, later becoming profuse, slimy, evil smelling, and often streaked with blood. This diarrhoea may persist for days after the disappearance of fever. The interference with the intake of food, and with the absorption of

nutrients from the digestive canal together with the excessive katabolism due to fever results in marked emaciation.

Interference with the respiratory system is usually slight. Other than those symptoms directly attributable to fever there may be a slight cough, more frequently observed during the second incidence of fever. Extensive broncho-pneumonia is conspicuous by its rarity. This is in direct contrast with the experience of the disease under natural conditions and serves to emphasize the important role of hygiene in any scheme of treatment.

Nervous symptoms as an integral part of the clinical syndrome and not due to secondary causes occur in about 10% of cases, and always are of serious import. They make their appearance early in the second fever attack when they are usually of short duration and not marked. They may pass off and occasionally may reappear in a severe form, the chorea being followed by fits and epileptiform convulsions. The association of nervous disturbances with the virus is not quite clear, but it suggests the possibility of a tendency towards definite neurotropism of the virus.

Purulent lesions except for purulent conjunctivitis do not occur, and it is noteworthy that pustular lesions of the skin in experimental cases are absent.

Corresponding with the regular production of an uncomplicated experimental disease is the exceedingly low death rate in dogs. Peracute cases followed quickly by death do occur and the prognosis of cases showing nervous derangement is grave, but for the rest recovery usually occurs even though the clinical picture for a time may be alarming.

Laidlaw and Dunkin, from a very wide experience, regard dog distemper as an acute infectious fever comparable in many respects with measles or influenza in man, a disease, which, by itself, will induce a severe fever and serious bodily disturbance, but is rarely fatal; and yet it is a disease which is very liable to light up a latent infection or open wide the door to secondary infections of various kinds. This conception of experimental distemper is of great importance because the results of research work in the past must be discounted by the confusion of pathological conditions, purely secondary in nature, with true distemper. Moreover failure to recognise the true disease is undoubtedly responsible for the number of so-called distemper vaccines and prophylactics whose value in the field invariably has proved greatly disappointing.

PROPHYLAXIS.

As soon as the aetiology of the disease had been worked out and a clear clinical conception of the true disease had been established,

it was possible to concentrate upon the development of a satisfactory and rational method of immunization with the uncontaminated virus as the basis. Only the discovery of the susceptibility of the ferret made the rapid accomplishment of this work possible since large numbers of ferrets could be used to try out various methods, the limited number of uniformly susceptible dogs being used only to confirm the results obtained.

From the commencement of the immunological studies the encouraging feature was the knowledge that ferrets and dogs recovered from natural or artificial infection possess a solid immunity to reinfection with either the same or different strains of virus. The problem therefore resolved itself into one of modifying or attenuating the virus so that injection would be followed by a perfectly safe and mild reaction with subsequent solid immunity; alternatively of modifying or controlling by some means the disease set up by the fully virulent virus so as to make its use perfectly safe in every instance under the conditions of practice. This modification of reaction could be brought about either by the use of serum of high protective potency (i.e. the simultaneous serum virus method) or by the use of drugs with a specific virucidal action should any be discovered.

As all attempts to cultivate the virus in adequate amount *in vitro* had failed, an emulsion of infective spleen tissue was used as the source of virus.

The first successes obtained in immunization were largely accidental in that it was observed that simple storage of the virus resulted in a progressive decrease in virulence until a stage was reached when the material had lost its power to set up clinical distemper, but still retained its antigenic property. Consideration of this phenomenon indicated that the immunity produced might be due to:

(1) Progressive attenuation resulting in a stage being reached when the virus is still capable of multiplying in the host, but is incapable of producing the typical clinical picture. No experimental evidence has been adduced in support of this view.

(2) Stored virus dying progressively until eventually a subinfective but antigenic dose is injected in a given quantity. This conception is refuted by the repeated observation that injection of a subinfective dose of virus obtained by serial dilution of fresh virulent material never produces immunity.

(3) Dead virus injected in adequate amount being antigenic provided that this property has not been destroyed by autolysis and disintegration. This view is probably correct, since further investigation into the antigenic properties of the virus inactivated by heat or various

chemical agents, such as formaldehyde and phenol, has formed the basis of the successful method of immunization subsequently elaborated.

Utilization of the phenomenon of attenuation by storage with retention of the capability of provoking an antibody response was prevented by the fact that this phase is of such short duration, and in point of time is so variable in its incidence, that its application in the field would be too uncertain.

It was then found that the use of carbolic acid, to attenuate the virus, gave excellent results in the ferret. To a 20% spleen suspension in saline or 60% glycerine-saline, ½% phenol was added. The application of this method could not be developed owing to the unfortunate toxicity of phenol for dogs.

However, the success obtained with the phenolized virus as a vaccine paved the way for the observation that distemper virus can be "killed" easily with formaldehyde and that the virus so treated is capable of making an efficient vaccine.

Formalised Spleen Vaccine.

The results obtained with formalised spleen virus in distemper have stimulated similar research into immunization against other diseases (horsesickness, rinderpest) with reported success in at least one (rinderpest). Consequently it will be of interest to deal with the subject in some detail.

Choice of Material.

Experience has shown that an efficient vaccine may be produced from spleen, abdominal lymph glands, liver, or brain—in fact from any organ—provided its virus content as determined by biological titration is high (i.e. a minimum of .0001 gm. of tissue should be infective for ferrets). Apparently the efficiency of the final product depends to a large extent upon the initial concentration of the virus. Blood, although frequently infective in as small a quantity as .001 cc. (determined by dilution), has been shown to be practically devoid of immunising properties.

As the abdominal lymph glands and spleen alone are to be relied upon in the majority of instances to provide this requisite concentration of virus, they have been used in practice to the exclusion of other organs. The infectivity of the spleen is no indication of the infectivity of other organs and the extremely variable virus content of the liver and brain has prevented their use in routine vaccine preparation.

It will be seen, therefore, that the amount of material available for formalization is distinctly limited. This limitation is all the more serious, since only dog material may be used; for it has been estab-

lished that infective ferret material; while producing an efficient vaccine for ferrets, results in a product which is capable of immunising dogs only if multiple injections are given. Therefore, for canine practice vaccines prepared from ferret tissue are of no value. In passing it is interesting to note that vaccines made from distemper-dog tissue are of small value for ferrets even after multiple injections.

Preparation of the Vaccine.

Spleens and abdominal lymphatic glands are removed with complete aseptic precautions at that stage of the disease when by experience they are known to contain the maximum of virus; in the case of ferrets on the 4th or 5th day of illness, in the case of dogs when the animal is *in extremis* or when the clinical picture appears most alarming. This material is weighed and either pulped in a suitable apparatus such as a Latapie mincer or pounded in a sterile mortar and rubbed up into a smooth paste. Sufficient 0.85% saline is then added to make a 20% suspension and the whole mass is vigorously shaken in a bottle with glass beads to disintegrate the tissue as much as possible. The suspension is then filtered through a double thickness of sterile butter muslin to remove fibrous material and any lumps. A small portion is removed for titration of virus content by ferret inoculation, and if this does not yield a sufficiently high titre the entire mass is subsequently discarded. To the suspension sufficient formalin is added to produce a final concentration of 0.1% formaldehyde. As this concentration of formalin is insufficient to retard the development of many common bacterial contaminants, it will be appreciated that at every stage of the procedure rigid precautions must be taken to exclude infection. The formalised material is then kept in cold storage for four days when samples are removed for sterility tests, on completion of which the vaccine is available for bottling or for immediate use.

The above is a broad outline of the general method adopted to prepare the vaccine. Suitable modifications may be introduced to meet particular needs, but the general principles have remained unchanged.

Keeping Quality of the Vaccine.

At first it was believed that the formalin exerted a continuous destructive effect upon the virus, thus resulting in slow progressive deterioration of the product. For this reason the practice was adopted of adjusting the pH of the final product to 8 with ammonia, thus converting any free formaldehyde to urotropin. Subsequent work showed that little or no difference could be detected between the ammoniated and non-ammoniated vaccine after storage for as long as 11 months. There is, however, a gradual deterioration noticeable after

about 6 months, which may be counteracted by increasing the dose. The addition of ammonia has been continued as the absence of any free formaldehyde prevents any local irritation following injection as would otherwise occur.

Dose of Vaccine.

It is not possible to dogmatise upon the amount of formalised tissue which is necessary to produce a solid immunity since this is so closely related to the potency of any particular batch, probably to the initial virus content of the tissue. Frequently 0.1 gm. of tissue is adequate, but in practice 5 c.c. of suspension, i.e. 1 gm. of tissue is made up to constitute 1 dose.

Duration of Immunity.

The duration of immunity following a single dose of formalised vaccine is comparatively short—at most a few months. If, however, the immunity is reinforced by a subsequent injection of fully virulent virus, all observations tend to indicate that the immunity is life-long. Incidentally the central nervous system also partakes in this immunity.

The interval which should elapse between the injection of the vaccine and the injection of the virulent virus is 14 days. Before this the animal may not have generated sufficient immune bodies to prevent the ordinary course of the disease with possible secondary infections, but after 14 days little or no reaction should follow, and the immunity will be sufficiently solid to overcome any subsequent natural infection.

Immediate Effect of Vaccination.

Provided due attention is paid to antisepsis at the time of injection, no local reaction other than a transient irritation should be noticed. Any subsequent abscess formation may be ascribed to faulty technique.

In very sensitive subjects there may be slight malaise or at most a slight fever reaction lasting 24 hours as a result of the vaccine injection (i.e. the formalised material). The usual experience is, however, that no disturbance of general health whatever occurs.

As a result of the injection of the virulent virus there may be a short period of dullness or fever commencing on or about the fourth day. This disturbance seldom lasts longer than 48 hours, and provided attention is paid to general hygiene, the animals rapidly return to normal health. Out of the many thousands of dogs that have been injected a few have shown signs of hysteria and nervous disturbance which in at least one case proved fatal, but such cases are so rare that they may be regarded merely as the manifestation of an idiosyncracy.

PRECAUTIONS.

Puppies from 3 to 4 months old are the most suitable subjects for immunisation. Younger puppies frequently show a more severe reaction. In this connection it should be remembered that there is undoubtedly a slight passive immunity in puppies from immune bitches due to the intake of antibodies with the colostrum.

Every care must be taken to ensure that dogs to be injected are in perfect health prior to the administration of the vaccine. Frequently it happens that dogs are brought in for injection after the owner realizes that his animals recently have been exposed to natural infection. Actually such animals may be in the incubation stage of the disease and as the vaccine cannot produce an immunity in less than about 10 days the injection may only serve to aggravate the developing disease. Consequently it behoves a careful veterinarian to insist upon daily temperatures being taken for at least 3 days prior to injection. Otherwise any severe reaction will be ascribed to the vaccine which was not at fault.

The injection of virulent virus should be made not sooner than 10 days after the vaccine. Preferably the interval should be 14 days and during this time every care should be taken to see that the animals are not exposed to infection. On the other hand, the interval between the two injections should not be prolonged unduly as the immunity produced by the vaccine is of comparatively short duration, and gradually wears off.

It is of course hardly necessary to emphasize that throughout the entire process of immunization every attention should be paid to general hygiene so as to minimise any risk of secondary infection in an animal whose natural resistance is lowered during a subclinical reaction to the vaccine or more particularly to the virus.

MISHAPS.

Analysis of reports submitted by veterinarians who had used the vaccine-virus and by masters whose hounds had been immunised showed that in many packs in England the results were practically 100% successful. An endeavour was made to carry out an investigation in all reported cases where this standard was not maintained. Generally the failures may be classified as follows:—

(1) Illness following immediately upon the injection of the vaccine, the virus, or both.

(2) Symptoms of nervous affection immediately after or alternatively a considerable time after immunization.

(3) Breakdowns in immunity after immunization.

Dalling, in offering explanations for these accidents, emphasizes the fact that no vaccine is issued which has not been prepared strictly according to the technique detailed by Laidlow and Dunkin which has given such good results in the laboratory. Moreover, no issues are made from any batch until adequate tests on susceptible dogs have shown it to be of requisite potency. Consequently, any illness immediately following the vaccine or virus must be ascribed either to ignoring those precautions which have been shown to be essential (see above) or to an individual susceptibility on the part of a given animal, a factor which is beyond control. In only one case (*Dalling*) has virulent distemper virus been obtained from a cadaver shortly after immunization. In all the remaining cases bacteriological examination has shown that secondary invaders—Streptococci, *B. bronchisepticus, B. suipestifer,* and *B. paratyphosus*—were the probable cause of illness.

Cases of subsequent derangement of nervous function cannot be explained adequately. Fortunately their incidence is extremely rare, but they probably represent a tendency towards neurotropism on the part of the virus with consequent fixation in the central nervous system. It must be realised, however, that a diagnosis of distemper or a recognised sequel to true distemper is invariably hazarded in any subsequent ailment in an immunised dog no matter when it occurs. It is extremely doubtful, therefore, whether the blame should be laid at the door of the prophylactic in a large percentage of cases which have been designated failures. This observation applies particularly to late breakdowns in immunity, since an ailment totally unconnected with distemper might present a clinical picture indistinguishable from one of the complicated cases often encountered in practice. Still there is no doubt that breakdowns in immunity have occurred. Careful investigation has shown conclusively that these have been due, not to an inferior formalised product, but to inactivity of the reinforcing virus. In other words, the vaccine has produced a temporary transient immunity, but the virus being inactive was unable to convert this into a durable immunity. Clear realisation of this fact has led to an enormous amount of work being done on the question of conservation of the virus, notably by Dalling. A solid and durable immunity follows only the injection of fully virulent living virus. In the laboratory this is conveniently given in the form of a fresh saline emulsion of infective ferret spleen, but the keeping quality of this suspension is so limited—"wet" virus often does not retain its virulence for 24 hours at room temperature, though on some occasions it has remained virulent for 3 days—that it was impossible to be certain of the state of the virus when issued to practitioners even a short distance from the laboratory. This unfortunate fact represents the difference between immunising dogs in the laboratory, where the success has been

practically 100%, and the field, where the results at any rate at first were not so good.

While investigation into methods of conserving the virus was in progress the practice of giving two injections of formalised vaccine at a 14 day interval was substituted after the requisite experimental work had been carried out to warrant its introduction. The results in the field for a time appeared to be highly satisfactory and the method may still be of value in the case of individuals of the more delicate breeds. But the immunity produced is of short duration (a few months), and complete success ultimately depends upon exposure to natural infection before the immunity has worn off. In addition a great deal depended upon the production of a vaccine of exceptional quality—a matter which would seriously hamper the attempt to cope with the growing demand for immunisation.

Fortunately Dalling ascertained that the highly infective spleen, when desiccated *in vacuo* at a temperature below 0°C (i.e. in the frozen state), was capable of retaining its virulence for weeks and even months on storage in the ice box at ±5°C. When stored at room temperature the virulence decreases more rapidly, but even then the period of infectivity for field purposes is sufficiently lengthened to be of practical value.

Finally, a technique of rapid desiccation *in vacuo* in the frozen state over P_2O_5 was worked out. The desiccated powder was placed in carefully dried ampoules in which the air was replaced by dry nitrogen before being sealed off. It is reported that specimens of this material have been shipped through the tropics to the far East and on return to England have still proved to be infective in the prescribed dose. Consequently the issue of living virus in Great Britain was assured, but up to the present the commercial distribution from England to other parts of the world has not been possible. Fresh problems in regard to the keeping quality of the virus appear to arise continually and to-day difficulty is being experienced in maintaining a regular supply of virus of certain infectivity even in England. It may be considered that this is the limiting factor to the universal development of the present method of immunization.

In the meantime Laidlaw and Dunkin had continued their investigations into the possibility of producing a hyperimmune serum of high potency. At the time three homologous sera, other than those produced by bacterial antigens, were on the market, namely, the Cutter Laboratory serum, the serum of Ashe, Cockhart, Ray, and Barber, and that of Musshag and Stecher. Published details of technique for the production of these sera were inadequate, the methods

of testing potency appeared to be inconclusive, and the efficacy appeared not to be very high.

Of the obstacles in the way of producing and standardizing a serum of high potency one of the foremost was the lack of an accurate quantitative method of computing the relative value of different batches. The most satisfactory method still remains the protection test in dogs, i.e. the determination of the amount of different sera injected on one side of susceptible dogs necessary to block out the reaction to a given small but certainly infective dose of virus injected on the other side. The difficulty of obtaining uniformly susceptible dogs in adequate numbers effectively prevents the application of this method on a sufficiently comprehensive scale. Ferrets unfortunately are of little value because it was found that, whereas it often required as much as 5 cc. of a given hyperimmune serum to protect a ferret, this amount is usually more than sufficient for a 3 months old puppy. Further, the biological application of *in vitro* neutralization tests on ferrets for some inexplicable reason gave inconstant results. Even if these tests had been satisfactory, elaborate accommodation would be required to house a very large number of test animals, but of greater moment still would be the great delay in obtaining results. Eventually it was found that immune serum in the presence of appropriate antigen is capable of fixing complement and the complement fixation test was finally decided on as the most suitable for all general purposes.

Briefly the findings were that if a particular rapid technique is followed which reduces non-specific fixation to a minimum, the amount of complement fixed by 0.1 cc. of whole serum, when compared with a given standard, is constant for that serum. Unfortunately the method has several decided limitations. The test only works when an antigen of high titre is used, no matter what its origin may be (spleen, liver, lymph gland, etc.); the serum of the recovered immune dog rarely fixed more than a trace of complement even though such sera are known to possess considerable protective properties; finally the results are not quantitative as a comparison between different batches of sera. The most that can be said is that sera which fix many units of complement have been found always to be of high potency by protective tests on dogs, but sera which fix a much smaller number of units may not be less efficient *in vivo*. In other words, the complement fixation test is capable of picking out the good sera, but is not able to eliminate the poor sera.

Preparation of Hyperimmune Serum.

Dogs which have passed through distemper are allowed to rest for at least one month after the cessation of all symptoms. A large dose —20 cc. of a 20% spleen virus emulsion—is then given either subcutaneously or intramuscularly on two successive days. Blood samples

are taken on every alternate day commencing on day 3 after the second virus injection, and the titre of the serum is ascertained by the rapid complement fixation test, comparison being made with a standard serum of known high potency. As soon as this value equals or is better than that of the standard, the dog is exsanguinated.

By this method, sera of good quality have been produced fairly regularly, but extreme care is necessary since it has been found that the rise in antibody content after a latent period of a few days is very rapid, reaches a peak in from 24 to 48 hours, and then falls equally suddenly. For this reason it is necessary to follow the course of antibody production by the complement fixation test and to bleed out each individual dog at the optimum point, otherwise a product of low protection titre will be the result. As an additional control, each batch of serum is tested for efficacy by simultaneous serum virus inoculation of susceptible dogs.

Simultaneous Serum Virus Immunization.

The development of a technique for the production of a good quality serum has led to the introduction of the serum virus method of immunization, which in principle does not differ from that applied to say rinderpest or swine fever. Sufficient data have not been collected to permit any definite conclusion being drawn from a comparison with the efficacy of the vaccine-virus method. Both methods possess the same common limitation, namely, that everything depends upon the ability to issue a virus of known infectivity. From the point of view of the practitioner, however, the serum-virus method has several distinct advantages which may be enumerated as follows:—

(1) The method is more convenient since only one visit from the veterinarian is essential under normal conditions.

(2) There is greater security. The possession of a serum of high potency undoubtedy contributes to the peace of mind of the practitioner when valuable animals are being treated since any severe reaction may be controlled effectively by the timely injection of further full doses of serum. In fact, any reaction may be blocked completely by the initial use of a large dose of serum, and the experience has been that the immunity resulting from a completely blocked out reaction is not inferior to that produced by a reaction with clinical symptoms.

(3) Theoretically there would appear to be less risk. In the vaccine-virus method the end result is entirely dependent upon the ability of the receiver to respond to the injection of the formalised material by the production of sufficient immunity to resist the reinforcing dose of living virus. This means that a great deal depends upon the particular individual under treatment. In the simultaneous

method the dog is immediately given a passive resistance by receiving an adequate supply of antibody at the time of injection so that individual idiosyncrasy does not assume so important a rôle.

Passive Immunisation and Treatment.

The present difficulty of conserving the virus, or issuing a product which will retain its infectivity for at least several months under ordinary conditions of storage has prevented the active immunisation of dogs in South Africa. In exceptional circumstances arrangements may be made with Messrs. Burroughs Wellcome for the despatch of suitable material in cold storage. Advantage could be taken of this facility for the immunisation of either a very valuable animal or a large number of dogs at the same time.

However, Messrs. Burroughs Wellcome in a circular to the profession in South Africa have announced recently that they are now in a position to supply "Wellcome" Brand Anti-Distemper Serum. This announcement is of extreme importance, because there is no doubt it will be found that judicious use of the serum in accordance with the recommendations given will prove a boon to dog fanciers and veterinarians alike.

Passive immunisation of valuable dogs when in danger of exposure to natural infection, e.g. at shows, on the race track, should be encouraged and developed. Moreover, it has been shown conclusively that the injection of a large dose of serum is capable of cutting short a natural attack of distemper. Knowledge of this fact provides a valuable weapon in regard to treatment, since stopping the development of the virus in the body not only reduces the possibility of secondary infection, but shortens the period of convalescence and minimises the danger of chorea developing. Treatment in the past has always been purely symptomatic, to-day it can be both rational and specific.

Value of Immunisation.

As will always be the case when a new vaccine is brought into general use, somewhat conflicting reports as to its value and safety have been received. Dalling (1931) in reviewing the position from September 1930 to April 1931 states that 3,169 hounds were treated by one or other method with the following results:

(1) Double vaccine: 479 couple of hounds in 19 packs received two doses of vaccine at an interval of 14 days. Of these 8 packs on subsequent exposure to natural infection showed a solid immunity (classified as "good"), 5 packs showed reactions, but no mortality (classified as "moderately good"), and 6 packs showed severe reactions with mortality up to 10% (classified as "bad"). In the latter group at least, one master hazarded the opinion that without previous treat-

men the mortality would have been nearer 50%. Deaths directly attributable to treatment were nil.

(2) Serum-virus simultaneous method: 552 couple of hounds in 34 packs were treated. Of these 22 packs were classified as "good" (see above), 8 packs as "moderately good" and 4 packs as "bad." On the whole, therefore, the results were good, but the data indicated that sometimes a severe reaction may ensue, though this may be controlled effectively by the use of additional serum. On occasion, however, the immunity may be of low order or of short duration.

(3) Vaccine-virus method: Of 512½ couple of hounds treated 8 or 0.7% reacted soon after treatment, and 12 or 1% failed to withstand subsequent infection completely. Of these 20 animals, 6 died and 14 recovered, i.e. there was a total mortality from all cases of less than 0.6%.

It must be considered, therefore, that the results obtained in practice have been decidedly good, especially with the vaccine-virus method. These good results, together with the knowledge that there is available a supply of potent serum with which to control any severe reactions leads one to express the opinion that when the problem of conservation of the virus has been solved, it will be possible for any veterinarian to approach with equanimity the question of immunisation of dogs against distemper.

A final word of warning appears to be indicated. It has been pointed out that the ultimate basis of either method of active immunisation is the injection of virus. It has been definitely proved in the case of ferrets, and a strong suspicion supported by circumstantial evidence exists in the case of dogs, that immunised animals at least for a short period after the completion of treatment, become "carriers" of the virus and are capable of infecting susceptible animals with which they come in contact. To owners who wish to have individual animals treated this warning should always be given both with an eye to the safety of the remainder of their stock and as an inducement to have all dogs immunised at the same time.

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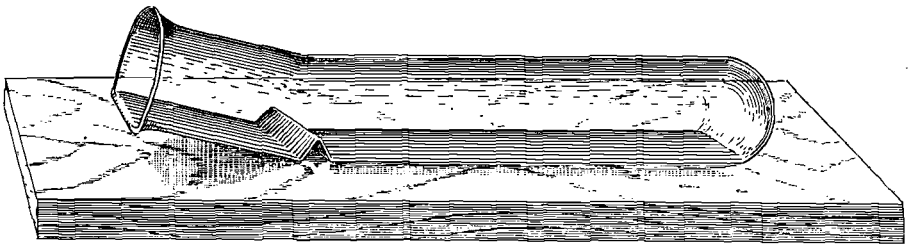
A New Culture Tube.

By J. H. MASON, F.R.C.V.S., F.R.S.E.,
Empire Marketing Board Research Fellow, Onderstepoort.

To the writer's knowledge, the Petri plate method is the commonest in general use for obtaining colonies of micro-organisms. Its advantages are many: a large flat surface with an even depth of medium is obtained and the colonies, visible "back and front," are easily picked off. However, owing to the nature of the movable cover, difficulty is experienced in storing prepared plates in a sterile condition; the fact that every plate must (or should be) incubated "for sterility" prior to inoculation brings out this point clearly. It is usually impracticable if not impossible to sterilise media in the dish itself; the agar or other nutrient must be poured, under sterile conditions, into it.



A new culture tube for solid media.

Work upon which the author was engaged demanded that surface cultures of organisms be kept in a state of purity in the same vessel for 10 to 20 days. Using Petri plates, this was found to be very difficult; daily movement and examination of the dish frequently resulted in contamination. To overcome this difficulty the following procedure was adopted:—

An indentation was made in a tube 20.0 cm. by 3.0 cm. about 3.0 cm. from the mouth. Melted agar was poured in and sterilised, the tubes were then laid "flat," the dent preventing the medium from running on to the cotton-wool plug. A flat layer of agar of fairly even thickness was thus produced, the chances of contamination being no more than in an ordinary "agar slope" tube.

The photograph depicts a modification, the commercial manufacture of which is at present under consideration. The improvements

embrace the flattening of the bottom and the tilting of the neck. This latter modification allows a platinum loop to be inserted more easily and farther, and prevents the plug coming in contact with the bench when the tube is laid "flat."

I am indebted to Mr. C. G. Walker for suggesting the tilting of the neck and for the drawing from which the photograph was made.

Apoplexy in a Dog.

By A. D. THOMAS, D.V.Sc., Onderstepoort.

A nondescript dog, four years old, was recently brought in for postmortem examination, the owner stating that the evening before it had suddenly developed "fits," trembling, and walking in circles, and had died shortly afterwards.

The owner had no reason to suspect malicious poisoning, but on account of the symptoms, and sudden death, naturally thought accidental or intentional poisoning possible.

A blood smear was examined with negative results. At the autopsy then performed, it was found that haemorrhage had taken place in the middle of the right cerebral hemisphere below the cortex. The surface of the cerebrum was intact, and it was only on cutting into the brain that a slight softening and laceration of the brain substance together with a mass of partly coagulated blood in extent about 3 cm. was found. There were no indications of violence either externally on the skin and skull or internally on the meninges. Except for a few localised, hyperaemic patches in the lungs the rest of the autopsy was negative.

Microscopic examination of sections from the edge of the haemorrhagic area showed extravasation of blood, but no obvious predisposing cause such as necrosis or a tumour.

The stomach contents, chemically analysed for strychnine as a precautionary measure, gave a negative result. A diagnosis of cerebral haemorrhage appeared, therefore, perfectly justifiable.

Death from true apoplexy in the lower animals seems rare enough to merit record. It is unfortunate, however, that our knowledge regarding the prevalence in animals of hypertension, atherosclerosis, etc., usually associated with this condition in man, is not very extensive.

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The Housing of Poultry.

By E. VAN MANEN, M.Sc. (Agric.), Onderstepoort.

Success in poultry farming depends largely on good housing, and for that reason it is absolutely necessary for every poultryman to ensure that all his stock is comfortably housed. Comfort means contentment and without this factor good egg production cannot be obtained. The laying hen must not merely have a house; she must also have a home. No matter what system of management is practised the essential features of a good poultry house remain the same.

Location of Poultry Houses.

If possible it is best to select an elevation having a natural drainage away from the buildings. Southern or south-eastern slopes should be avoided. All houses should either face north or north-east. A dry, porous soil, such as a sandy or gravelly loam, is preferred to all other types. Undesirable soil may be corrected by thorough underdrainage if it is impracticable to select a soil that is naturally dry. Prevailing cold winds should also be taken into consideration, and, if possible, the houses should be built in the lee of a suitable windbreak.

The incubation, brooder, and other service houses should preferably be located near the dwelling house. The breeding pens and rearing and laying houses may be placed further away in order to ensure that the birds are disturbed as little as possible.

Essentials of Poultry Houses.

Economy and simplicity of construction, perfect dryness, good light and ventilation, with due regard to comfort, are the essential features of a poultry house. Houses should be so constructed that they can be easily cleaned and the interior fixtures so placed that they can be removed conveniently, for only under such conditions is it possible to control vermin and to check losses due to disease.

Ventilation.

The importance of ventilation in keeping the poultry house dry is not generally appreciated or understood. It is reported that a hen exhales per day approximately 40 cubic feet of air which is saturated with moisture. One hundred birds throw off a gallon-and-a-half of water every twenty-four hours, and unless proper ventilation is supplied the air in the house becomes moist very quickly. Lack of sufficient ventilation is often indicated by damp litter, moist, ill-smelling air, and by the collection of moisture on the walls and fixtures.

Poultry can stand extremes of temperature provided the conditions under which they are kept are dry. To ensure sufficient ventilation the front of the house, except for the lower 2 to 2½ feet, should be entirely open and covered only by wire netting. This lower portion represents the front wall and serves to check floor draughts. Rear ventilation is obtained by leaving an opening of 3 to 4 inches immediately under the eaves along the entire back wall. Increased protection against draughts is afforded the birds by the construction of a false ceiling, extending from the rear ventilation opening forwards only as far as the front edge of the droppings board. With this system a so-called closet is formed around the birds and they are kept as comfortable as possible at all times while on the perches.

LIGHT.

There should be no dark corners in a poultry house. The reason for facing the house North is to ensure the greatest amount of sunlight for the interior of the house Sunlight makes the house warmer in winter, induces greater feed consumption, and consequently greater egg production is obtained. The area under the droppings board should be particularly well lighted as birds work toward the light, and there is less difficulty with the birds scratching the litter back to pile up under the droppings board. Small windows are sometimes placed in the rear wall under the droppings board to give proper light especially in deep houses. The door should preferably be located near the front in one of the end walls of the house.

INTERIOR FIXTURES.

Good interior fixtures are just as important as good housing. A good house is wasted unless the birds have comfort, with proper access to feeding and drinking utensils.

The Droppings Board: The droppings board, with its full complement of perches, should be placed as far back in the house as possible along the entire length of the back wall. The board itself should be two feet from the ground with the perches as movable features 6 inches above the board. Movable perches facilitate cleaning and prevent birds from perching all day long. For three perches the board need not be wider than 40 inches. This allows a space of 9 inches between the last perch and the back wall, 12 inches between the perches and 7 inches from the front perch to the edge of the droppings board. The perch should be constructed out of 2 x 3 in. material placed on edge with the top edges slightly rounded.

The Nests: It is usual to allow one nest to every four or five hens. Better results, however, will be obtained in trapnest houses if the number of nests is increased beyond this ratio. The nests may be placed underneath the droppings board but well off the floor, against

the inner surface of the front wall, or as batteries against either of the two end walls. The last is by far the best site.

If open nests are used in a battery arrangement, either under the droppings board or against the walls, the entrance for the hens should be from the back of the nests along a passage. The front of the nests should be closed by means of a solid bottom portion and a hinged top portion. The attendant is then in a position to collect the eggs without disturbing the hens to any extent. Should a hen wish to leave the nest she can do so from the back, without being interfered with by the attendant.

The nests should be at least 12 inches wide, 12 to 14 inches high, and 14 to 18 inches deep. These dimensions will suit the requirements for trapnesting as well. Ample provision should be made in trapnest batteries for the hens to gain access to the nests.

The Broody Coop: The broody coop is used for breaking up broody hens, a procedure which may be accomplished without much trouble or annoyance. No laying house is complete without this adjunct. As soon as a broody hen is discovered she is immediately removed to the broody coop. There she is treated in the same way as the other hens on the floor. Grain should be fed sparingly while moist mash would be a favourable addition to her daily diet.

The coop should be constructed out of wooden slats, with a wire mesh floor and droppings pan to facilitate cleaning, and should be placed off the floor in a well lighted and well ventilated part of the house.

The Mash Hopper: Various types of mash hoppers may be used provided they all conform to the following requirements:—They should be raised from the floor, be non-wasting, provide easy access to the mash, have sufficient space to allow about half of the number of hens in the house to feed at a time, and hold sufficient mash to last at least five to seven days. Mash hoppers should also be constructed so that the hens may feed from both sides of the trough. For a house of one hundred hens two mash hoppers each six feet long will be found to be ample for the need of the hens. This will give a feed space of 24 feet, provided the hens are allowed to eat from both sides of the trough. If a suitably constructed roller is fixed to the top of the trough, hens will find it impossible to roost on the hopper. In this way the mash can be kept free from droppings.

Water Receptacles: Fowls in full lay drink a large amount of water and for that reason it is necessary to provide sufficient drinking accommodation. A six foot water trough, placed on a suitable stand

so that the hens may drink from both sides, will be found to be sufficient for one hundred hens.

Green Food and Grain Hoppers: Several lengths of guttering suitably constructed to form open troughs may be placed on the floor, and these may be used for green food or even grain.

Shell and Grit Hoppers: Separate oyster shell and grit hoppers may be provided, or the mash hopper may be sectioned off to hold the usual supply of oyster shells and grit.

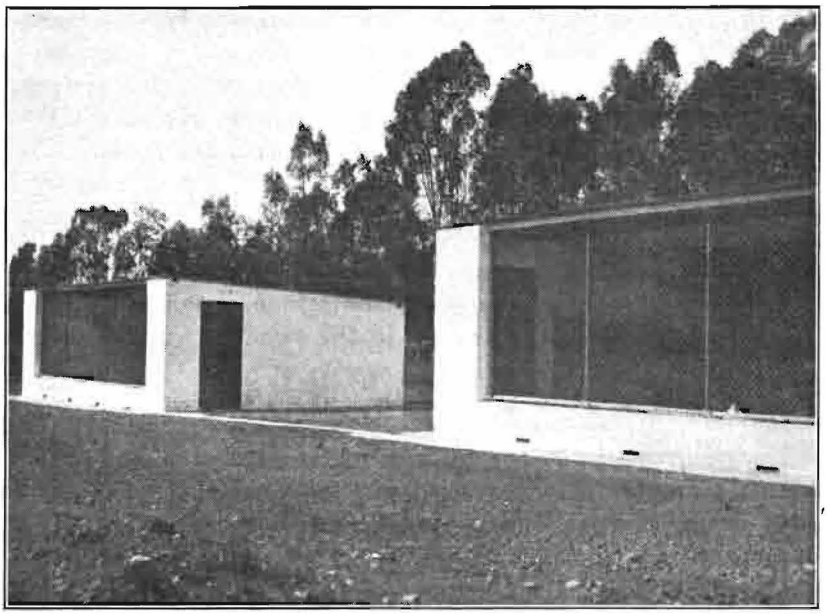

Fig. 1
Two 100-Hen Intensive Laying Houses at Onderstepoort Research Poultry Plant.

THE INTENSIVE LAYING HOUSE.

Under intensive conditions the size of the laying house will vary with the number of hens to be housed, the amount of floor space per bird decreasing as the number of hens per house increases. In small houses it is usual and best to allow four square feet of floor space per hen. When flocks of 500 or more are housed together, 2½ to 3 square feet of floor space per bird will be sufficient. The following dimensions may be used as a guide: for 25 hens, 8 feet by 12 feet; for 50 hens, 14 feet by 16 feet; for 100 hens, 16 feet by 24 feet; for 250 hens, 16 feet by 45 to 50 feet; for 500 hens, 16-18 feet by 80-90 feet.

Laying and other poultry houses should all be provided with concrete floors and have walls with the inner surfaces plastered if possible. The front height should not be more than 7½ to 8½ feet, and the rear height not more than 6 to 6½ feet. Allowance should be made for a front wall two to two-and-a-half feet high.

It is advisable to construct suitable exits in the front wall for purposes of culling or for thorough cleaning of the house when requisite. The hens may then be driven through the exits into catching crates from where they can be easily handled. With the intensive system the hens are permanently housed, and there is no reason why they should ever be allowed to leave the house.

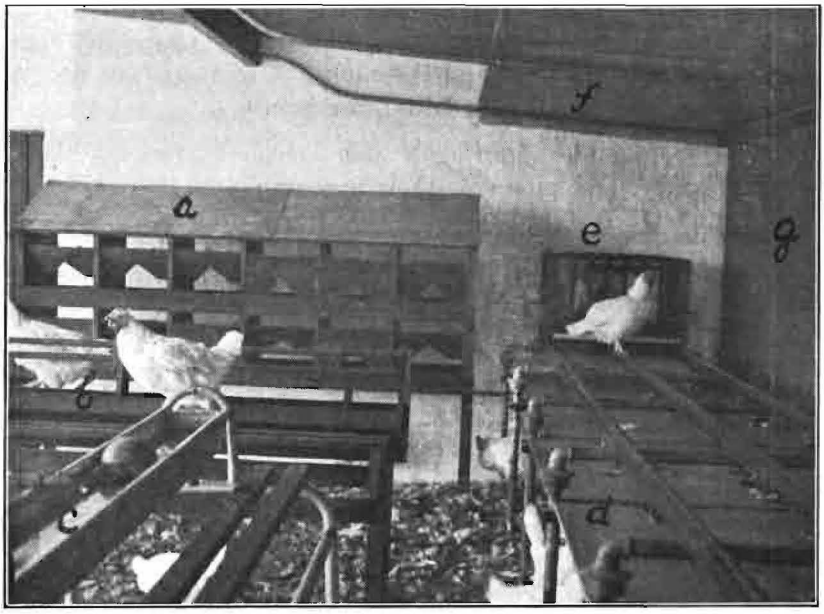

Fig. 2.

Interior view of section of 100-hen intensive laying house showing, a, trap-nest battery with inclined roof; b, mash hopper with rollers to prevent birds soiling the food; c, water trough with ball-valve complete; d, droppings board with perches and oil cups to combat ticks and other vermin; e, broody coop; f, false ceiling over droppings board; g, false rear wall.

Sun Porches.

Sun porches may be constructed in front of poultry houses to enable the chicks or hens to obtain greater freedom, and will be found to be particularly advantageous on sites where sunlight does not penetrate the houses sufficiently. These sun porches should be built off the ground, with a concrete slab 12 to 18 inches below in order that the droppings may be easily removed.

The Cockerel Maze.

The rearing of cockerels is usually a problem on most poultry farms. Many poultrymen have either to kill or sell off good male birds because they lack suitable housing accommodation to hold such birds over until the following breeding season. They must then rely solely on the new season's crop of young cockerels, and if these turn out unsatisfactorily, new males must be bought and chances taken with unproved sires.

The maze or labyrinth does away entirely with the cockerel problem. A suitable camp is selected, and in it a maze or labyrinth is constructed, using old wire netting and discarded poles. The fences need not be higher than 2 feet and should only run to within 3 feet of the enclosed fence. Gaps should be left in the small fences to enable the birds to roam about freely. It is desirable to plan such a maze on paper before constructing it in the camp. Curves are not necessary and the simpler the design the better the result.

The maze eliminates fighting among cockerels, enables them to grow out properly, and preserves their appearance.

A suitable house should be provided at one end of the camp. Outdoor mash and grain hoppers should be placed at intervals about the maze. Under these conditions male birds require very little attention.

Fifth World Poultry Congress.

The congress will take place in Rome this year from the 6th to the 15th September. Simultaneously there will be an exhibition in the forum of Trajan of poultry and different appliances, etc., peculiar to the industry. The various sections deal with genetics, physiology, nutrition, breeding, hygiene, disease, instruction, organisation, economic problems, trade in poultry products, and rabbit raising. After the congress there will be a ten-day tour of the principal poultry areas including Leghorn, Florence, Perugia, Ancona, Rimini, Bologna, Rovigo, Venice, Milan, and Alessandria. Anyone desiring further information should communicate with the Editor.

J.D.W.A.C.

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Musca crassirostris, A Bloodsucking Fly New to South Africa.

By RENÉ DU TOIT, B.V.Sc., Onderstepoort, and
Dr. OTTO NIESCHULZ, University of Utrecht (Holland).

Musca crassirostris Stein is a very remarkable representative of the genus *Musca*, to which the common horsefly also belongs, as it is a true bloodsucker like e.g. *Stomoxys* and *Lyperosia*. The proboscis has been transformed into a strongly chitinised piercing or scratching organ.

M. crassirostris is widely distributed over the Oriental region. In Africa it has been found, according to Bezzi (1921), in Egypt, Senegal and the Belgian Congo. Patton (1926) states that the species is common in Egypt, East and Central Africa. It has not yet been recorded from South Africa.

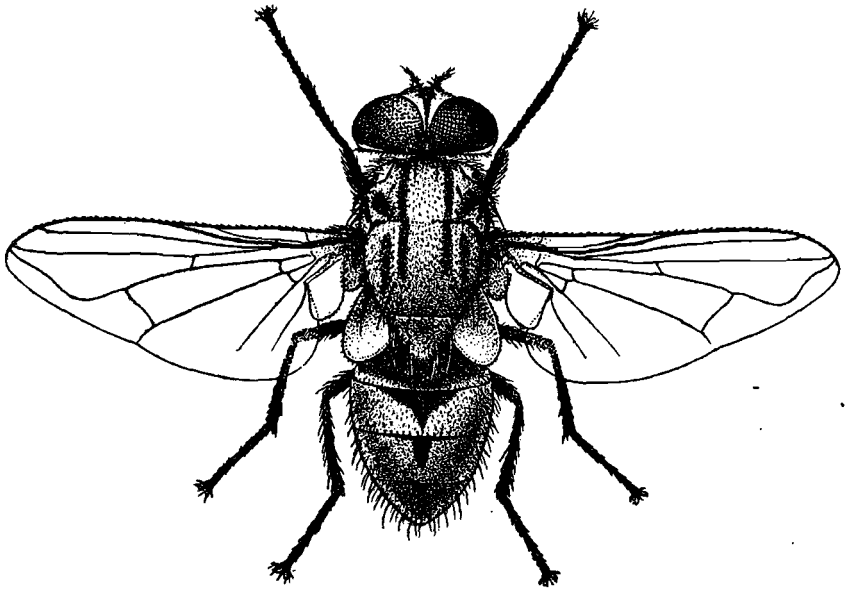

Fig. 1. *Musca crassirostris* male magn. 10 x.

We found this species in fair numbers, at least as common as *Stomoxys*, during March and April 1933, on horses at Onderstepoort and the adjoining farm Kaalplaas in the Pretoria district. It can be readily ascertained that it is a powerful bloodsucker. Out here it only occasionally seems to enter stables and attacks animals mainly in the

veld or kraals, feeding during the daytime up to sunset. It shows a definite predilection for the belly and legs of the horses.

This *Musca* species may prove to be of importance as a mechanical transmitter of diseases. In the Orient Mitzmain (1914) succeeded in transmitting Surra by means of this species. Nieschulz (1928) and Nieschulz and Kraneveld (1929) also succeeded in transmitting Haemorrhagic Septicaemia. In these experiments monkeys, guineapigs and rabbits were used.

Musca crassirostris is a small to medium sized fly, predominantly greyish in colour. The colour markings, contrary to those of most *Musca* species, are not very distinct to the naked eye. The proboscis is strongly chitinised, the mentum enlarged and bulb-shaped. The palps are yellowish. The thorax has four, not very broad, longitudinal dark stripes.

Abdomen in the female: the first segment is greyish green, the basal portion black with a triangular stripe extending over the middle of the segment. The second segment has a basal black band and a narrow, triangular, black median stripe. The third segment has a median stripe, usually extending over its basal part only.

The abdomen in the male is similar: the first segment being mainly black, the second having a black, triangular, median stripe and a black basal band over the whole or part of the segment. The third tergite has a more or less triangular median stripe.

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BENEVOLENT SCHEME S.A.V.M.A.

In terms of a resolution passed at the Council meeting held on 1.5.33, the administration of the above scheme is in the hands of the Finance Committee until the next general meeting. All information and correspondence in this respect should be addressed to the Hon. Sec.-Treasurer.

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A General Survey of the Veterinary Act, 1933.*

By C. P. BRESLER, M.A., LL.B., Pretoria.

A bill "to provide for the establishment of a Veterinary Board for the registration of veterinarians and for other matters incidental thereto" has at long last been placed on the statute book as Act No. 16 of 1933. The enactment represents the culmination of much unflagging endeavour on the part of veterinarians, especially of those more intimately associated with Onderstepoort, and may well be regarded as a monument to the prestige of that institution in general, and in particular of the members of a profession that is deserving so well of the country as a whole. Moreover, it hardly calls for comment to emphasize the fact that this recognition, tardy though it be, can only serve on the one hand to safeguard the interests of a large and important section of the community and, on the other, to imbue every veterinarian with the sense of stability and confidence which is so essential to the healthy progress of his profession.

The Bill provides for the establishment of a Veterinary Board as follows:—

1. As from the commencement of this Act there shall be established a board, to be known as the Veterinary Board consisting of—

(a) a veterinarian in the Department of Agriculture, to be appointed by the Minister of Agriculture (hereinafter referred to a, the Minister) as Chairman of the said Board;

(b) a member of the faculty of veterinary science of each University in the Union at which such a faculty has been established, such member to be appointed by the Senate of the University concerned upon nomination by the majority of the members of the said faculty; and

(c) three persons appointed by the South African Veterinary Medical Association:

Provided that after the expiration of the term of office of the first members of the Veterinary Board, no person shall be a member of that board unless he is registered as a veterinarian under this Act.

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* At our request Mr. Bresler has been good enough to undertake a general survey of the recently passed Veterinary Act, and to give us the benefit of his views thereon. Coming as they do from an independent but highly authoritative source, his comments and suggestions will undoubtedly prove exceedingly interesting and useful. The many points raised will serve not only as an interpretation of the Act, but also as a basis on which future amendments, the need for which is already apparent, can be framed. The series of articles entiled "The Veterinarian and the Law" has, therefore, been temporarily interrupted, but will be resumed at a later date. The Veterinary profession indeed owes Mr. Bresler a debt of gratitude for his painstaking and disinterested researches on its behalf. [Ed.]

It will be noticed that the numerical constitution of the Board is not quite fixed as it may apparently be added to as the result of other Universities establishing veterinary faculties. The Act uses the words "has been established" and as a matter of interpretation it seems doubtful whether the Legislature intended to limit selection of members to the Universities already having such faculties. The practical significance of this is not great and may never arise; moreover, it would in any case be amenable to ministerial influence or amicable settlement. The proviso that persons assuming duty as members of the Board should eventually be limited to veterinarians registered under the Act seems eminently sound and in keeping with the spirit of the statute. The benefits to be derived from a "lay board" are, I think, rather nebulous. It is interesting to note that the machinery provided in England is totally dissimilar, for there we have a charter making the "Royal College of Veterinary Surgeons" a body corporate with a common seal, and declaring veterinary science as practised by the College to be a recognised profession and further, that members of the College should be members of that profession to the exclusion of all others and should be known and distinguished by the name or title of "Veterinary Surgeon." The governing Body is somewhat elaborate. The College consists of fellows, members, and foreign and colonial associates and is governed by a Council consisting of a president and six vice-presidents (all of whom are ex-officio members of Council), the secretary and the treasurer and ordinary members. The Council comprises in all thirty-two members, eight of whom retire annually at the Annual General meeting, but are eligible for re-election. In the Council are vested powers relating to the examination and registration of veterinary surgeons as also to the entire management of the College. The provisions with regard to examination and admission to membership are only found in the charters of the College; these charters are now confirmed by statute and the Council is bound to admit and register such students as have passed the examination of the College [Veterinary Surgeons Act 1881 (44 and 45. Vict. C. 62) S. 4].

In the case of the South African Act the term of office of members and the vacation of office of members are dealt with as follows:—

2. The members of the Veterinary Board shall hold office during a period of three years but on the expiration of their period of office they shall be eligible for re-appointment: Provided that at the end of the second year after the commencement of this Act two of the members who for that purpose shall be chosen by lot shall retire.

3. A member of the Veterinary Board shall vacate his office before the expiration of his period of office—

(b) on his resignation;

(b) on being sentenced to imprisonment without the option of a fine in respect of any offence;

(c) on the sequestration or assignment of his estate;

(d) If he was absent, without the consent of the Veterinary Board, from three or more consecutive meetings of the Veterinary Board;

(e) if, having been appointed—

(i) by the Minister, he ceases to be an officer in the Department of Agriculture;

(ii) by the Senate of a University, he ceases to be a member of the faculty of veterinary science of that University; or

(iii) by the South African Veterinary Medical Association at a time when he was a member he ceases to be a member of that Association.

The retirement of two officers by lot at the end of the second year after commencement of the Act may weaken the personnel of the Board at some important juncture and appears to me to be neither a useful nor necessary provision, while the language tends to obscure intention with regard to the future permanent constitution of the Board. The provision dealing with vacation of office follows generally the provisions found in certain other statutes, as e.g. The Electoral Act, the Insolvency Act, etc. *Section 3 (e) (i) (ii) (iii)* are *sui generis; section 3 (c)* is stringent in that assignment, which does not carry the stigma or disability of sequestration, justifies removal from office. In England a president, vice-president or member of the Council may resign at any time or may be removed by a special general meeting for misconduct or other reasonable cause. (*Section 1 Charter 1892*). No machinery is provided for removal in the South African Act, the authority or body empowered to do so not being expressly indicated. It may be that the intention of the Legislature is to be gathered by implication from the words "by the same authority or body" in *section 4*, viz:

4. Whenever a member vacates his office in terms of section three, or dies, a new member shall be appointed in his stead, by the same authority or body which appointed the vacating member and such new member shall thereupon hold office during the remainder of the period of office of the vacating member.

or assistance may be sought from *section 5*, which deals with the Minister's powers to invite appointment of members. The powers entrusted to the Minister are wide and follow slightly the trend of modern legislation called by Lord Hewart "The New Despotism."

5. (1) As soon as practicable after the commencement of this Act, and whenever the period of office of the members of the Veterinary Board has expired, the Minister shall invite the Senate of each University at which a faculty of veterinary science has been established by letter addressed to the rector, principal or registrar of that University, and the South African Veterinary Medical Association, by letter addressed to the chairman of that Association, to appoint their respective members.

(2) If one of the members referred to in sub-section (1) dies or vacates his office in terms of section three, the Minister shall, in like manner, invite the body which appointed the deceased or vacating member, to appoint another member in his stead.

(3) If any such body fails to comply with an invitation referred to in subsection (1) or (2) the Minister shall, subject to the provisions of paragraph (b) of section one (as the case may be), himself appoint, in his discretion, a member or members of the Veterinary Board in lieu of the body concerned.

It will be noticed that *section 6* dealing with the meetings and decisions of the Veterinary Board is cast in flexible language and makes the consent of the Minister a condition precedent.

6. (1) The Veterinary Board shall meet whenever the chairman of his own motion or upon the direction of the majority of the members of the Board and with the consent of the Minister convenes a meeting.

(2) Three members of the Veterinary Board shall form a quorum.

The bulk of the Act is devoted as is to be expected to the registration of veterinarians and the provisions made with regard to a Registrar and a register read as follows:—

7. (1) The Minister shall appoint an officer in his Department as registrar of veterinarians (hereinafter referred to as the registrar).

(2) The registrar shall keep a register wherein he shall record the name, address, qualifications and the date of registration of every person registered, under this Act, as a veterinarian, and such other particulars as the Minister may direct.

It will be noted that the Minister is consistently given wide powers and this "despotism" may frequently be both beneficent and beneficial; it may certainly make for decisiveness and finality.

One of the most important sections in the Act is *section 8* which follows:—

8. The Governor-General may from time to time, after considering any recommendation of the Veterinary Board to that effect, prescribe by regulation the degrees, diplomas and certificates granted after examination by a university, veterinary medical school or other institution which, when held singly or conjointly with any other degree, diploma or certificate, shall entitle the holders thereof to registration under this Act as veterinarians: Provided that, no degree, diploma or certificate of a university, veterinary medical school or other institution outside the Union shall entitle the holder thereof to be so registered unless—

(a) such degree, diploma or certificate entitle the holder to practise as veterinarian in the country in which such university, veterinary medical school or other institution is situate; and

(b) by the laws of that country a person holding a degree in veterinary science, granted after examination by any university in the Union, and entitling him to be registered under this Act, as a veterinarian, is qualified without further examination for admission to the practice of a veterinarian in that country or for admission to the State veterinary service in that country or in its colonies; and

(c) the Veterinary Board is satisfied that possession of such degree, diploma or certificate indicates a standard of veterinary knowledge not lower than that required for the acquisition of the degree in veterinary science at any university in the Union which entitles the holder thereof to be registered as a veterinarian under this Act.

As fas as I know no regulations have as yet been issued stating what qualifications would entitle holders to registration under the Act as veterinarians. The section seems clear enough but *subsection (c)* may cause difficulty, the word "satisfied" having frequently been before the Courts for interpretation, as witness the series of cases culminating in *Union Government v. Union Steel Corporation, Ltd. 1928 A.D. 220.* In one of the earlier cases, *Shidiacks, 1912 A.D. 657,* the principle is stated as follows: "Now it is settled law that where a matter is left to the discretion of the determination of a public officer and where his discretion has been bona fide exercised or has judgment bona fide expressed, the Court will not interfere with the result ..... therefore it would be inadmissible to call evidence before a Court of law merely to show that his conclusion was wrong. It would be different if the object were to show mala fides or an ulterior motive or a failure to consider the question at all; but cases in which a decision is attacked upon these grounds will be rare."

I might at this stage refer back to the register to mention the position in England where the register is printed by the Council at least once a year and authentic copies are admissible in evidence [*Veterinary Surgeons Act* 1881 (44 and 45 Vict. C 62) SS. 3 (2) 9] and where the Registrar must when required and on payment of 1/- certify whether or not any person whose name and address is furnished to him appears on the register or is a member of the College (*Ibid. section 15*).

An exception is created by *section 9* in favour of certain British subjects who do not fall under the provisions of *section 8.* The provisions of *section 9* are intended to cover most cases where an actual examination has been held and where the applicant would lawfully be entitled to practise in the place where he obtained his degree provided that the Board is satified as to the sufficiency of the standard of veterinary knowledge. I have no knowledge of any regulations published in this connection. The text of the section reads as follows:—

9. (1) Any British subject who—

(a) having been born in any part of the Union; or

(b) being domiciled in the Union when he commences his veterinary studies and having proceeded therefrom for the purpose of prosecuting those studies,

has obtained a degree, diploma, or certificate not prescribed under section eight, but which is prescribed under sub-section (2), may be registered as a veterinarian under this Act.

(2) The Governor-General may from time to time, after considering any recommendation of the Veterinary Board to that effect, prescribe by regulation the degrees, diplomas and certificates of a university, veterinary medical school or other institution outside the Union which when held singly or conjointly with

any other degree, diploma or certificate by any person described in sub-section (1) shall entitle the holder thereof to be registered as a veterinarian under this Act:

Provided that—

(a) such degrees, diplomas or certificates have been granted after examination; and

(b) such a degree, diploma or certificate would, so far as professional qualifications are concerned, entitle the holder to practise as a veterinarian in the country in which the university, veterinary medical school or other institution in question is situate; and

(c) the Veterinary Board is satisfied that such degrees, diplomas or certificates indicate a standard of veterinary knowledge not lower than that required for the acquisition of the degree in veterinary science at any university in the Union which entitles the holder thereof to be registered as a veterinarian under this Act.

Recognition is extended to certain veterinarians in whose cases a mode of registration is granted free of charge provided that proof of residence in the Union is forthcoming. Provisions are also made to meet the case of a person practising veterinary science during a period of not less than three months prior to the commencement of the Act. It will be necessary to compare this *section 10* with *section 12* hereafter. At the moment the details of *section 10* are as follows:—

10. (1) Upon the commencement of this Act every person who is, by virtue of any law referred to in section *eighteen*, registered as a veterinary surgeon, shall be deemed to be registered as a veterinarian under this Act.

(2) As soon as practicable after the commencement of this Act, the registrar shall, free of charge, record the particulars referred to in sub-section (2) of section *seven* in respect of all persons referred to in sub-section (1) of this section in the register of veterinarians and issue to each such person a certificate of registration: Provided that where in connection with the registration of any such person under any law referred to in section *eighteen* his address is given as outside the Union or as unknown or is insufficient for registration purposes, his name shall not be entered upon the register until he proves that he is resident in the Union.

(3) On the application of any person who, in the opinion of the Veterinary Board, has during a period of not less than three months immediately preceding the commencement of this Act, practised veterinary science in the Union as his sole or principal means of livelihood, and who, at such commencement was in possession of any degree, diploma or certificate in veterinary science, granted after examination, outside the Union, which would, so far as professional qualifications are concerned, entitle the holder to practise as a veterinarian in the country where such degree, diploma or certificate was granted and which, in the opinion of the Veterinary Board, indicates a sufficient knowledge and training in veterinary science, the Minister may, after consultation with the Veterinary Board, direct the registrar, upon payment by the applicant, of a fee of ten pounds, to enter him upon the register referred to in section *seven* and issue to him a certificate of registration.

The actual registration of veterinarians is to be found in *section 11.* On application to the Board and on proof of qualification the Minister, if he is satisfied that the requirements of the Act and of the regulations have been complied with shall authorise registration provided a fee of £10 (not applicable to officers of the public service while so engaged) is paid. In England a Fellow under the seal of the College has to pay a fee not exceeding fifteen guineas, while the *Veterinary Surgeons Act 1920* provides a striking contrast, the prescribed fee being only one guinea per annum and it is laid down, *section (2) subsection 3* , that if it is not paid it may be recovered in the County Court, a method which in respect of the amount of the debt is uneconomical and practically useless. In the light of this it is interesting to note that *section 11* of our Act provides that failure to pay the prescribed fee within three months causes the registration to lapse and would seem to apply to all cases. The section is interesting in that good character is required.

11. (1) Every person desiring to be registered as a veterinarian under this Act, by virtue of a degree, diploma or certificate prescribed under section *eight* or *nine* as a qualification for registration as a veterinarian, shall apply to the Veterinary Board for such registration and shall submit proof that he has acquired such degree, diploma or certificate, together with such proof of identity and good character as the Veterinary Board may require.

(2) If the Minister is satisfied that the applicant has complied with the requirements of this Act and of the relevant regulations, he shall direct the registrar to register him as a veterinarian.

(3) The registrar shall thereupon, after payment of a registration fee of ten pounds, enter the applicant upon the register referred to in section *seven* and issue to him a certificate of registration as a veterinarian: Provided that such registration fee shall not be payable if the applicant is an officer in the public service; but if such applicant ceases to be such an officer such fee shall be payable by him and if it is not paid within three months of his ceasing to be such an officer such registration shall lapse.

The provision recognising veterinarians by virtue of practice as such continuously since 31st December 1927 who with adequate qualifications make timeous application for registration is surely a most laudable one and a fitting recognition of the self-sacrificing pioneer spirit. It is comforting to note too that the optional oral and practical examination idea has been abandoned in their cases.

12. (1) The Minister shall, after consultation with the Veterinary Board, grant a certificate to any person who—

(a) proves that during the whole of the period between the thirty-first day of December, 1927, and the commencement of this Act, he practised veterinary science in the Union as his sole or principal means of livelihood; and

(b) proves that during the whole of that period he was the holder of a degree, diploma or other qualification in veterinary science, granted after

examination, but which does not entitle him to claim registration as a veterinarian under section *ten* or *eleven* or that he practised veterinary science in the Union as his sole or principal means of livelihood for a period of at least ten years before the commencement of this Act; and

(c) within six months after the commencement of this Act, makes application for such a certificate to the Minister.

(2) On the application of a person to whom the Minister has granted a certificate referred to in sub-section (1) the registrar shall, upon payment of a registration fee of ten pounds, enter the applicant upon the register referred to in section *seven* and issue to him a certificate of registration as a veterinarian.

(To be continued).

The Ancient Forts of Penhalonga, Southern Rhodesia.

Capt. R. D. S. Gwatkin, S.A.F.A., Pretoria. *The Rhodesian Mining Journal.* 1932/33. 6, 513-695.

Of an archaeological nature, this series of papers nevertheless has an interest for veterinarians in view of the purpose of the forts. The author states that "it is quite conceivable that the forts served the dual purpose of grain storage and fortification," and dismisses the theory that they were "cattle pits," since the entrances were curved tunnels 3 ft. high and 2 ft. wide. While it is not insisted that the ruins served as "cattle pits," it must be noted that the original cattle of Africa were probably diminutive in size and are represented to-day by the Pagan (non-humped) breed of Nigeria. It is significant that the Makalanga beast of Southern Rhodesia is particularly small. Capt. Wilson's paper* on a prehistoric Great North Road to Egypt, recently presented to the Royal Anthropological Institution, London, might be helpful in this regard. H.H.C.

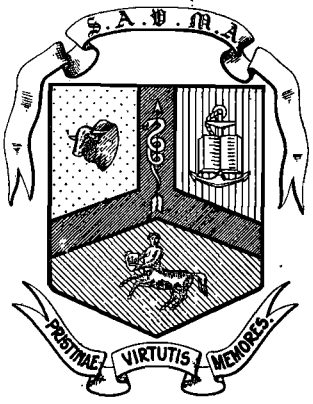
* The Ancient Civilisation of the Rift Valley. Man 32, 298.

The Veterinary Profession in South Africa: 5.—The Coat of Arms and Motto of the S.A.V.M.A.

By Dr. H. H. CURSON, Onderstepoort.

INTRODUCTION.

The design appearing below was approved as the Coat-of-Arms of the South African Veterinary Medical Association at the General Meeting held at Onderstepoort on the 26th of September 1932. It was drawn up as a result of the labours of a sub-committee (consisting of Mr. C. G. Walker, Artist; Dr. P. J. du Toit, Dr. A. D. Thomas, Mr. C. Jackson, B.Sc., B.V.Sc.; and Dr. H. H. Curson, F.R.C.V.S.), appointed 24th October 1931. It was agreed to leave the choice of a motto to the members of the Association.



DESIGN.

It was sought to indicate the following features: (a) The triple sources of the veterinary profession; (b) the fact that the Association is South African; (c) the relationship of the local Faculty of Veterinary Science to the University of Pretoria(1); (d) the incorporation as charges of the crests of the Royal College of Veterinary Surgeons and the University of Pretoria; and (e) the colour associated with the veterinary profession, namely maroon (dark cherry).

On examining the design it will be seen that the shield, similar to that of the University of Pretoria, has been divided into three fields. These fields are gold, red, and green as occurring in the arms of the Union of South Africa, and the area of division is maroon, the veter-

(1) Formerly the Transvaal University College, a constituent college of the University of S. Africa (est. 1918). The Veterinary Faculty was instituted in 1920.

inary colour adopted in South Africa as far back as 1899 when the Natal Volunteer Veterinary Corps was created.

As typical of South Africa is the head of an Afrikander bull, the colour being dark cherry. The crests of the University of Pretoria (established 1930) and the Royal College of Veterinary Surgeons (instituted 1844) are shown in silver and black respectively. These three charges occupy the three fields of the shield. The serpent and arrow occurring on the upper limb of the partition indicate the medical nature of the profession.

The letters on the upper scroll are S.A.V.M.A. and stand for the name of the Association with its Afrikaans equivalent.

Motto [2].

The lower scroll contains the motto *Pristinae virtutis memores,* which was chosen by ballot and had the approval of 88 members out of a total of 96 who voted.

The motto is that of the 8th (King's Royal Irish) Hussars which was the first unit in this country to have a veterinarian. This veterinarian, Thomas Burrows (or Burrowes) was indeed the first veterinary surgeon in South Africa[3].

By adopting this motto (to which heraldically there is no objection) not only is this historical association maintained, but at the same time the memory of pioneers such as Wiltshire, Hutcheon, Lambert, Duck, Rickmann, Watkins-Pitchford, Theiler and others is honoured. The motto will recall pride for the past, faith in the present, and hope that our successors may prove worthy of the traditions handed on to them.

As a profession we have not asserted ourselves sufficiently and it is clear that apart from that of the mining engineers, no other profession has done so much for South Africa.

Note on 8th Light Dragoons [4].

The accompanying photo shows an officer of the regiment in 1810. The regiment was raised in 1693, formed part of the garrison of the Cape of Good Hope from November 1796-February 1803, and then proceeded to India (1803-1822).

[2] It is interesting to note that the motto is a variation of the well-known saying of Paul Kruger, viz.:—"Zoekt in 't verledene al 't goede en schone .....vormt daarna uw toekomst" (Search the past for all that is good and beautiful..... then build your future).

[3] Curson, H. H. (1931). Some Pioneers of the Veterinary Profession in South Africa. *Jl. R.A.V.C.* II, p. 84. Burrowes graduated (30/3/1799) at the (Royal) Veterinary College, London.

[4] Paine, J. (1932). Exploits of the 8th Hussars. *Cavalry. Jl.* Jan. 1932.

In 1822 on its return to Great Britain it was converted into Hussars. While at Aldershot in 1931, the Officers Mess, on being informed

8th (King's Royal Irish) Light Dragoons 1810.
(Reprod. from Cavalry Journal 1911).

by Major A. Pryer, R.A.V.C., of the regiment's association with our profession, sent a framed engraving to the S.A.V.M.A. This unfortunately has not yet received a permanent home.

ACKNOWLEDGMENT.

The thanks of the profession are due to Prof. W. Blommaert of the University of Stellenbosch, for his valuable advice in regard to the heraldic requirements, and to Mr. C. G. Walker for the designing and finishing of this very pleasing coat-of-arms.

REVIEWS.

With the appearance of the first monthly number of the Veterinary Bulletin(1) for the current year, the Imperial Bureau of Animal Health enters auspiciously on the third year of the valuable abstracting service which already has come to be so indispensable in our veterinary literature that we need scarcely emphasise that no veterinarian can afford to be without access to it.

The Bulletin is considerably enlarged, the list of veterinary publications covered is quite exhaustive, and of journals dealing with allied sciences there is a most representative selection.

In regard to the abstracting—a task more difficult and full of pitfalls than the uninitiated may imagine—we take this opportunity of saying that the standard set by the staff of the Bulletin is irreproachable. It is pleasant also to mention that an old colleague of many members of the Association, Dr. H. H. Green, bears a large share of the reviewing work in which he acquits himself with his familiar intellectual acumen and sound judgment.

We wish the Bulletin the continued success to which by its thoroughness and reliability it is deservedly entitled.

C. J.

The title chosen for the book(3) under review is somewhat misleading, as it is little more than a compendium on the subject of equine obstetrics. The author hopes it will be "a handy guide for veterinarians whose professional activities are devoted particularly to solving the problems of disease prevention in breeding establishments." The work will probably serve the purpose for which it was intended, but little else.

It is somewhat questionable whether our present knowledge of the anatomy and physiology of the genitalia of the mare can be crowded

(1) The Veterinary Bulletin Vol. 3, No. 1, 1933. Weybridge: Imperial Bureau of Animal Health, pp. 60; 5/- (Annual subscription £2).

(2) Veterinary Obstetrics and Zootechnics by Howard N. Beeman, D.V.M., pp. 130, 15/-. London: Ballière, Tindall & Cox 1932.

into twenty-nine pages, and still do justice to modern literature on this highly important and interesting subject. The ductless glands whose physiological activities cannot be dissociated from the ovarian function, are scarcely more than mentioned.

Part III in which the diagnosis, pathology and treatment of sterility are discussed, is the most valuable part of this work. In chapter V there is a useful summary of the researches of Dimock of the Kentucky Experimental Station, and his co-workers. The question of sterility of the stallion receives rather curt treatment, although there is a comprehensive review on the examination of spermatozoa. These chapters should prove of great use to students and to busy practitioners who have little time for the perusal of recent literature.

As a work of reference, however, the book is of little value.

J. Q.

A comprehensive report(3) on all aspects of the sheep blowfly problem has just been issued by the Council for Scientific and Industrial Research, Australia, and the N.S. Wales Department of Agriculture acting in conjunction.

For some time past, both these bodies have been investigating different phases of the problem, and a year or so ago they established a joint Committee consisting of Dr. J. A. Gilruth (Chairman), Dr. R. J. Tillyard, Dr. H. R. Seddon, and Mr. W. B. Gurney with Dr. I. M. Mackerras as Secretary to co-ordinate the work of the two bodies, and to advise generally in regard to the initiation of new investigations into other aspects of the main problem. One of the first actions of the Committee was to prepare the above-mentioned report.

The report itself was edited by Drs. H. R. Seddon and R. J. Tillyard. It is written in simple language and comprises 136 pages of subject matter, together with a number of text figures of larvae, traps, etc., a number of photographs of interest, and a coloured frontispiece showing each individual species of blowfly associated with strike. By reference to this coloured frontispiece and to the accompanying descriptions, it will be possible for anyone to determine the nature and importance of any blowfly which he may capture.

The various sections of the report deal with such matters as primary, secondary and tertiary flies, factors influencing fly abundance, the susceptibility of individual sheep, crutching, jetting, swabbing, dipping, dressings, breeding to reduce susceptibility, fold removal

(3) Pamphlet No. 37 of the Council, and Science Bulletin No. 40 of the Department. 1/6 post free. Either from the Council (314 Albert Street, East Melbourne), or from the Dept. of Agriculture, Box 36A G.P.O. Sydney.

operation, biological control, trapping, and carcase treatment as well as a number of other matters of importance in the control of the pest. Every sheep owner should possess a copy of this voluminous report which summarises and discusses all known methods of prevention and treatment of fly strike—a condition which is probably the most serious affliction with which the Australian pastoralist has to contend, and one which in bad years costs Australia upwards of £4,000,000 per annum. (Press notice).

The short account[4] of the part played by the horse in the 1914-1918 war by Col. Tamblyn is written in fluent and interesting style, but it is a pity, from the veterinary aspect, that he did not describe at greater length the military veterinary organisation in all its different aspects. The anecdotes he relates and his chapters on famous Canadian chargers, regimental pets and ambulance dogs are all interesting to read, but the book is of little help to the veterinarian, who is interested in the application of his profession to military practices.

This is all the more unfortunate because Col. Tamblyn has had vast experience in military Veterinary practice and could undoubtedly write a comprehensive treatise for the guidance of Military Veterinary Officers. Such a treatise is urgently needed. J.H.R.B.

THE ASSOCIATION.

Presidential Address.*

The outstanding feature of the past year is the placing on the Statute Book of the Veterinary Act, Number 16 of 1933. Previous to the passing of this Bill the Veterinarian had no protection in the three larger Provinces of the Union. The history of the long fight for necessary legislation dates back, I believe, to 1902, when the T.V.M.A. first drew up a bill for presentation to the Transvaal Parliament. Previous to this, in 1899, the Natal Veterinarians had successfully obtained protection for members of the Royal College of Veterinary Surgeons under the Medical and Pharmacy (Amended) Act, No. 21 of 1899.

Shortly after Union, renewed efforts were made to secure legislation for the protection of Veterinarians throughout the Union. Repre-

(4) *The Horse in War*, by Lt.-Col. D. S. Tamblyn, D.S.O., O.B.E., of the Canadian Army Veterinary Corps. The Jackson Press, London. Obtainable from the author Lt.-Col. D. S. Tamblyn, Officer Administering Canadian Army Veterinary Services. Kingston, Ont., Canada. Price 7/-.

* Arrived too late to be read at the 24th General Meeting Johannesburg, April 13th, 1933. See minutes.

sentatives of the profession from the four Provinces met in Bloemfontein in 1914, the outcome of which meeting was the approval, with minor alterations, of a Draft Veterinary Bill which had been prepared by the Council of the T.V.M.A., and from this date onwards continuous efforts were made to get the Bill into Parliament. A new effort was made by Dr. Hjalmar Reitz in 1931, but unfortunately the bill met with such hostile reception from certain quarters that it was withdrawn for amendment. Dr. Reitz re-introduced the Bill at the 1932 session, where it got as far as the second reading, the Committee stage being taken early in the present Session. The Bill finally became law on March 8, 1933.

While not embracing all the Clauses contained in the Bill, the Veterinary Act is a notable achievement and now that it is upon the Statute Book may be amended from time to time in the interest of the profession. It will enable the public to distinguish the qualified veterinarian from the quack, and will give security to young men of the future who are attracted to this honoured profession.

The Act is primarily in the interests of the private practitioner, present and future. On behalf of the comparatively small body of Veterinarians earning a living in private practice I wish publicly to thank the Parliamentary Committee of this Association, all of whom are Civil Servants, for the great assistance they have rendered during the preparation and passage through Parliament of the Veterinary Bill. Drs. du Toit, Viljoen, and de Kock have put in a great amount of work and have followed up the intricate ramifications attendant upon the varying moods and objections encountered during the debate in the House with a tactful perseverence deserving of our highest appreciation.

Dr. Hjalmar Reitz piloted the Bill through in a masterly manner, and its final success is very largely due to the skill and energy he applied to the task. We owe Dr. Reitz a big debt of gratitude for his services.

I would again appeal to all veterinarians who still remain outside this Association, and particularly those in private practice, to join up at once with the S.A.V.M.A. The appointment of three out of the five members of the Veterinary Board is in the hands of the S.A.V.M.A., and I hope within the next few months this Association will be 100% representative.

While the new Act gives veterinarians a sheltered legal standing, I feel I must sound a note of caution against any sudden flooding of South Africa with students of Veterinary Science. Vacancies in the Department, of course, have to be filled, but it appears at the present moment that the numerical strength of the State Veterinary Service is

at its maximum. Wastage by death and resignations is not sufficient to absorb more than a very limited annual output of B.V.Sc. graduates. There is certainly room for a few more men in the municipal services. It is little short of a scandal that important municipal abattoirs should be controlled by lay inspectors and that inspection and control of dairies and milk supply should be in the hands of any but registered veterinarians. Openings for private practice might at first appear attractive, but except in the larger towns there is very little prospect for the veterinarian. Farmers have too long been accustomed to do what they can to help themselves, assisted very materially by the State. The value of ordinary domestic animals individually is very small and seldom justifies the calling in of a veterinarian. Moreover, the State provides vaccines and medicines for prevention and treatment of specific diseases at or below the cost of manufacture. This is, perhaps, inevitable in a young country, and without these valuable state services, stock farming in many parts of the Union would not be possible. One can only hope that the development of export of chilled meat will create a demand for better and better breeding stock and a large increase in the number of stud herds, which will in turn require the services of the veterinarian. Otherwise, there is nothing to attract the country practitioner.

The Natal Branch Association continues to flourish and fully justifies its formation. It will, I hope, be a source of strength to the parent body, and it already provides opportunity to many members, who owing to the distance from Pretoria, would otherwise be debarred from meeting together for the common good. I would welcome other provincial branches conducted on similar lines.

It must not be supposed that with the passing of the Veterinary Act the work of the S.A.V.M.A. will be materially lessened. On the contrary, I anticipate an increased volume of work during the next twelve months and for this reason I ask that members give the Council all the support and assistance they can. The report of the Secretary-Treasurer, which has been circularised in tabloid form, the reports of the Parliamentary and Editorial Committees, together with the Hon. Librarian's Report, will indicate to you the considerable amount of voluntary work your Council has carried out on your behalf. I would call particular attention to the Library Lending Scheme as outlined by Mr. C. Jackson.

I wish to thank the Council for their loyal support and particularly those of the Council and co-opted members of Sub-Committees who have carried out their various honorary duties with credit and success. I would particularly mention Dr. Thomas, who as Managing Editor of the Journal, has done exceedingly well.

In conclusion I record my grateful thanks to Dr. Curson who has so ably carried out the duties of Honorary Secretary-Treasurer for over three years. In addition to his secretarial work Dr. Curson has collected and compiled some very interesting historical records of the early days in South Africa. These records will prove of particular interest to those who follow us. I hope Dr. Curson will continue his researches.

(Signed) F. J. CARLESS,
President.

13th April 1933.

Council Meeting held at Polleys Hotel, Pretoria, 15.3.33.

Present: Messrs. Carless, Curson, Thomas, Coles, Alexander, du Toit, Chalmers.

Mr. Kirkpatrick sent a letter of apology for unavoidable absence.

Absentees: Drs. Quinlan and de Kock.

1. Minutes of meeting of 17.12.32 were read and confirmed.

2. Arising out of these minutes:—

(a) Dr. Curson mentioned that Capt. Clapham who had accepted an appointment in the S.A. Vety. Corps Permanent Force, was very dissatisfied, as an allowance was paid to all officers, exception being apparently only made in the case of Veterinary Officers. Dr. du Toit stated that Messrs. Bisschop and Quin had resigned their commissions in the S.A. Vety. Corps Active Citizen Force.

(b) *Dehorning—Cruelty.* Dr. Quinlan had agreed to write an article in the "Farmer's Weekly," with the object of emphasising the cruelty aspect of dehorning adult cattle. The Chairman (Mr. Carless) pointed out certain serious practical disabilities if dehorning is practised on a portion of a herd only.

(c) *Complaints—Government Officials.* Council recommends that any grievances of Government Veterinarians should in the first place be addressed to the Director of Veterinary Services. Where no satisfaction is obtained, deserving cases will be examined by Council and suitable action, practicable in the circumstances, will be taken.

The matter of Subsistence and Transport allowance has unfortunately not yet received the promised attention by the responsible authorities.

(d) *Motto for Badge of the Association.* As a result of the referendum motto No. 7: *"Pristinae virtutis memores"* was selected.

(e) *Mr. M. C. Robinson—Sunday Times.* Dr. Curson explained that he did not carry out council's instruction in connection with the complaint raised by Mr. Chalmers for various reasons: (i) Mr. Robinson wrote a courteous letter explaining his position, (ii) complaint was not of a specific nature, (iii) Veterinary Act was not yet in operation.

3. *Alterations in Constitution recommended:*

A. Rule 3. "(a) Membership is open to all veterinarians and persons registered under the Veterinary Act 16 of 1933."

B. Rule 9. "(I) Where a council member resides more than 50 miles from Pretoria, he may nominate an alternate (to be approved of by council) for council meetings."

C. Rule 7. "(c) Every Cadet member shall pay an annual subscription of 7/6."

3. (a) Council recommends that at the request of the Secretary an Assistant Secretary be appointed by Council.

4. Resignation Mr. J. Buck, M.R.C.V.S. Dr. Curson is instructed to approach Mr. Buck and, if possible, to induce him to reconsider his decision to resign membership of the association.

5. Application for membership was received from Messrs. T. F. Adelaar, J. H. Cloete, W. D. Malherbe, P. J. Meara and H. P. Steyn —all B.V.Sc. graduates of the Pretoria University.

6. Council recommends that immediately after the general meeting the new Council shall meet, in order to appoint the various standing committees.

7. *S.A. Veterinary Board.* Council decided to call for nominations immediately, so that the three members of the Veterinary Board could be elected in terms of Act 16/1933. Three candidates are to be nominated and voted for, otherwise the election is to take place in exactly the same manner as that of Council members S.A.V.M.A.

8. Reports of Hon. Secy. Treasurer and Hon. Librarian.

(i) Council sanctions the lending scheme outlined by the Hon. Librarian. The Association to pay forward transport expenses and the borrower return expenses.

(ii) The Hon. Librarian is authorised to proceed with the binding of the S.A.V.M.A. Journal. If it is necessary that other

journals be bound, the Librarian should again approach council for its approval.

(iii) Reports of Standing Committees will be circulated.

9. *Benevolent Scheme.*— Mr. Chalmers pointed out that a sum up to £100 was voted and could be spent on benevolent measures, and that up to now no expenditure on this account was made. From the report of the Finance Committee laid before Council, it is clear that this committee misunderstood the whole position and council is referring the matter back to the Finance Committee for definite recommendation to council as to the sums of money (within the £100) to be donated to deserving cases (Dr. Fourie to act with the finance committee). The Benevolent scheme, of which full details were given in the circular of 15.2.33, will be placed on the agenda for discussion at the general meeting to be held on 13.4.33.

10. *International Veterinary Congress:*— As the Council constitutes the National Committee of the International Veterinary Congress, the following program for the next Veterinary Congress, which will be held in America in 1934, was approved:—

I. *PATHOLOGY, etc.*

(1) *Tuberculosis.* Communication by Dr. G. de Kock on the problem of tuberculosis eradication in the Union of S.A.

(2) *Foot and Mouth Disease.* Joint communication by various authors on the epizootology of Foot and Mouth disease in S.A.

(3) *Anthrax.* Communication by Dr. E. M. Robinson.

(4) *Gas-oedema diseases.* Communication by Dr. E. M. Robinson and Dr. J. R. Scheuber.

II. *MEDICINE, SURGERY etc.*

(5) *Sterility.* Reporter: Dr. J. Quinlan.

III. *VETERINARY PARASITOLOGY.*

(6) *Therapeutics of worm diseases.* Reporter: Dr. H. C. Mönnig.

IV. *FOWL DISEASES.*

(7) Communication by Mr. J. D. Coles, B.V.Sc., on fowl diseases in South Africa.

V. *TROPICAL DISEASES.*

(8) Reporter: Dr. P. J. du Toit.

(9) *African Horsesickness.* Reporters: (a) Sir Arnold Theiler, (b) Dr. P. J. du Toit and Mr. R. A. Alexander.

(10) *Anaplasmosis.* Dr. P. J. du Toit.

VI. *ANIMAL BREEDING AND DIETICS.*

(11) *Deficiency diseases.* Reporter: Sir Arnold Theiler. Communication by Dr. A. I. Malan and Dr. P. J. du Toit on deficiency problems in South Africa.

(12) *The blood group question.* Communication by Dr. P. J. Fourie.

Dr. Curson expressed appreciation and gratification to Dr. du Toit for obtaining recognition for the council as the National Committee of the International Veterinary Congress.

11. (1) *Veterinary Act.* The Secretary has already written a letter of appreciation to Dr. Reitz. Recommended that Drs. du Toit and de Kock be asked to see Dr. Reitz with a view to making a suitable presentation.

(2) Recommended that a sum of £5.5.0. be presented to the retiring Secretary in recognition of valuable services rendered by him.

(3) *Member in Arrears.* Recommended that the name of this member be struck off the list of members.

(4) Dr. Curson stated that he had approached Dr. Phillips in regard to representation of the Association by one of its members (the Secretary) on the Protechnical Section of the Public Service Association (P.S.A.). Dr. Phillips has agreed to this, and the matter now only requires formal recognition by the P.S.A. Council. Dr. Curson's action is approved.

(5) *Distemper vaccine.* As the firm of Burroughs Wellcome is issuing this vaccine only to veterinarians, Mr. Alexander suggests that a letter should be addressed to this firm by the Secretary expressing appreciation of this policy.

(6) Dr. Curson stated that he approached Mr. Butcher, 187 Troye Street, Pretoria, regarding eligibility of all S.A.V.M.A. members for the Civil Service Medical Benefit Society. Negotiations are proceeding. Dr. Curson's action is approved.

Special Council Meeting held at the Show Grounds, Johannesburg, 13.4.33, immediately before General Meeting.

Present: Messrs. du Toit, Quinlan, Thomas, Kirkpatrick, Alexander and Curson (retiring hon. Sec. Treas.). Dr. Fourie, the in-

coming Sec. Treas., was also present, and Mr. C. Jackson attended as member of the Finance Committee at the invitation of the hon. Sec. Treas. Dr. du Toit was asked to take the chair.

1. The report of the Finance Committee (not previously circulated) was read and matters arising therefrom, including a letter from the auditor, referred to the incoming Council.

2. It was agreed that:—

(a) Further consideration of the Benevolent Fund should be left to the new Council.

(b) General Meeting be asked to approve of presentation to Dr. Reitz in principle.

(c) Future of Journal be left for discussion by new Council.

3. Mr. Alexander emphasised what good work had been done by veterinary officers engaged in foot and mouth disease eradication and what little consideration had been shown to them. Dr. du Toit agreed and suggested that the matter be left to the incoming Council. He would be pleased to add his appreciation of the services rendered by these officials when addressing the General Meeting on foot and mouth disease.

4. The results of the election of office bearers for 1933-1934 were announced (see minutes of General Meeting following).

General Meeting.

Minutes of the 24th General Meeting, held at the Show Grounds, Johannesburg, 2.30 p.m., 13.4.33.

Members present: Messrs. P. J. du Toit, Graf, Brown, Dickson, Steyn, Hamlyn, Quin, Verney, Elder, Kirkpatrick, Runciman, Gavin, M. C. Robinson, Marais, Osrin, Bisschop, Thomas, Henning, Chase, Jackson, Quinlan, Alexander, Kind, Mason, Curson and Fourie.

Apologies for Absence: Messrs. Carless, E. M. Robinson, Watt, Chalmers, Keppel, Coles, Martinaglia and de Kock.

Owing to the absence of the President, Mr. F. J. Carless, as a result of ill-health, Dr. P. J. du Toit was asked to take the chair. The Chairman referred to the deaths of Dr. Maag of S.W.A., and Mr. Melck, Sub-Director of Veterinary Services. The meeting expressed sympathy with the relatives of the deceased.

(1) *Minutes* of the 23rd General Meeting, as circulated in the Journal of the S.A.V.M.A., were taken as read.

(2) *Benevolent Scheme.* — In view of the statement in the financial committee's report, the meeting agreed to refer the whole matter to the incoming council for action.

(3) *Presidential Address.*—In the absence of the President, the Chairman referred to the passage of the Veterinary Act through Parliament. He pointed out that after years of fruitless effort the work was at last crowned with success and in this connection particularly mentioned the good offices of Dr. Reitz, General Kemp, and Dr. Viljoen.

(4) *New members* elected: Messrs. T. Adelaar, J. H. R. Cloete, W. D. Malherbe, P. J. Meara, H. P. Steyn and B. Runciman.

(5) *Office Bearers* for 1933-34.—President: Mr. F. J. Carless; Vice-President: Dr. H. H. Curson; Sec. Treasurer: Dr. P. J. J. Fourie. Members of Council: Dr. P. J. du Toit, Mr. A. C. Kirkpatrick, Mr. J. Chalmers, Dr. A. D. Thomas, Dr. J. Quinlan, Dr. G. de Kock, Dr. P. R. Viljoen, Dr. G. Martinaglia.

(6) *Presentations :*—(i) Dr. Reitz—referred to incoming council. (ii) Before calling upon Dr. Curson as the elected Vice-President to take the Chair, Dr. du Toit referred to the good work done by Dr. Curson as Hon. Secretary-Treas. of the Association, and made a presentation to him on behalf of the Association. Dr. Curson, in thanking the chairman, asked for and obtained the approval of the meeting to use the cheque presented to him in paying for the reproduction in the Journal of the S.A.V.M.A. of historical photographs of German Veterinarians in S.W.A.

(7) *Reports of Standing Committees :*— Arising out of the reports of standing committees as circulated the Chairman stated that it was not clear if the veterinarians in S.W.A. were also covered by Veterinary Act 16 of 1933. He also informed the meeting that Captains Quin and Bisschop had handed in their resignations from the S.A.V.C. A.C.F. as a protest against the non-payment of professional allowance to Capt. Clapham.

The report of the financial committee was considered and the controversial matters raised therein were referred to Council.

(8) *Alterations to constitution* moved and adopted:—

(a) Rule 3 "(a) membership is open to all veterinarians and also to persons registered under the Veterinarians Act 1933."

(b) Rule 9 (j) Where a council member resides more than 50 miles from Pretoria he may appoint an alternate (to be approved by council) for meetings of Council.

(c) Rule 7 "(c) Every cadet member shall pay an annual subscription of 7/6.

(9) *Protechnical Section P.S.A.*— Negotiations are proceeding to obtain veterinary representation on the protechnical section of this body.

(10) *Civil Service Medical Benefit Society, Pretoria*—an attempt is being made to induce this Society to accept members outside of Pretoria.

(11) Attention of members was again drawn to the Public Servants Friendly Society, whose premiums are 25% lower than that of any other company.

(12) *Foot and Mouth Disease.*— Dr. du Toit made a statement on foot and mouth disease. He referred to the three definite outbreaks of foot and mouth disease in the Union at: (1) Ramathlabama, (2) Germiston, (3) Koedoesrand. All other suspected cases were definitely not foot and mouth disease. A possibility exists that some of these actually are due to a new disease not yet recorded in the literature. Concluding his remarks, Dr. du Toit expressed appreciaton of the good work done by the entire veterinary staff in the field, Messrs. Keppel, Quinlan, Melck and de Kock being particularly mentioned. Dr. du Toit, on behalf of the Union Government and Union Veterinary Staff, also thanked Mr. Chase and his staff for the very good work being done by them in an extensive and extraordinarily difficult country, and referred to the excellent work done by members of the S.A. Police, who sometimes at very short notice supplied the necessary men to draw cordons around infected areas.

Mr. Chase then gave an account of foot and mouth disease as it occurred in the Bechuanaland Protectorate, and passed round some very interesting and instructive photographs of clinical cases of the disease. Mr. Chase in concluding thanked the Union and Rhodesian Veterinary authorities for the assistance freely given.

(13) *General:*— Mr. Verney drew attention to the widespread prevalence of horsesickness in Basutoland in spite of one of the worst droughts experienced in Basutoland since 1861. The total absence of mosquitos strongly suggested that some other vector may be responsible for the transmission of the disease.

(14) Mr. Carless' Presidential address arrived too late to be read at the meeting, but appears elsewhere in this issue.

Council Meeting held in the Library, Onderstepoort, 7.30 p.m., 1.5.33.

Present: Messrs. Carless, du Toit, Viljoen, Curson, Thomas, Quinlan, Martinaglia, Kirkpatrick and Fourie.

Absentees: Apology for absence was received from Dr. de Kock. Also absent, Mr. J. Chalmers.

1. *Minutes* of meetings held at Polley's Hotel on 15.3.33 and at the Show Grounds on 13.4.33 were read and confirmed.

2. Arising out of minutes:—

(a) *Benevolent Fund.* — Council felt that it was imperative that the instructions of the 23rd General Meeting of 26th and 27th September 1932, in terms of resolution 4(a) of that meeting, be carried out. Accordingly a sum of £100 will immediately be set aside for benevolent purposes. The Finance Committee is instructed to examine the claims against this fund and to donate sums up to £10 to very deserving cases only. At the next general meeting approval will be sought for using the balance of this £100 as the nucleus of a Benevolent Fund. The Secretary-Treasurer is instructed to issue in the meantime a request to all members to make voluntary contributions of say 10/- for benevolent purposes.

(b) *Presentation to Dr. H. Reitz.*—Agreed to make a presentation to Dr. Reitz to the value of £100—Drs. de Kock and du Toit to interview Dr. Reitz and make the presentation.

(c) Although the Secretary-Treasurer intimated that, owing to decreased interest on fixed investments, there is an estimated deficit of £26 for the financial year 1933/34, Council felt that the activities of the journal should not be curtailed in any way, and that quarterly publication of the journal should be continued during 1933/34.

(d) Position of officers on foot and mouth disease work—The matter was discussed, but no decision was taken.

3. Appointment of Standing Committees:

(a) *Parliamentary.*— Drs. Viljoen, du Toit, de Kock and Mr. Snyman.

(b) *Status.*—Messrs. Chalmers, Kirkpatrick, Gavin, Quin and Alexander.

(c) *Finance:* Dr. Curson, Dr. Quinlan and Mr. Jackson.

(d) *Editorial:* Drs. Thomas, du Toit, Robinson and Messrs. Jackson and Brown.

(Each committee to elect from its members its own chairman convener).

4. *Assistant Secretary*— Mr. Brown.

5. Dr. Viljoen was asked to find out what the legal position of the S.W.A. veterinarians is under Act 16/1933, and also to obtain legal opinion as to the legality or otherwise of members of the Association outside the Union serving on the Veterinary Board.

6. *General.*

(a) Election of 3 members of the Veterinary Board by the S.A.V.M.A. Dr. du Toit and the hon. Secretary-Treasurer were appointed to scrutinise and count the votes.

(b) Dr. Curson suggested that the Chairman of the Veterinary Board should obtain from Mr. Amos all records of the Natal Veterinary Board, so that these could be preserved with other historical records of the Association. This was agreed to.

(c) Letter from Abattoir Superintendent, Benoni, re registration of lay meat inspectors was considered and referred to the Veterinary Board for action.

(d) Newspaper cutting from Eastern Province Herald sent for consideration by Mr. Paine. Secretary was instructed to reply suitably and also mention that legislation is being introduced to modify the length of time that measled carcases are to be frozen in accordance with the findings of recent researches.

(e) Several private practitioners complained that they were not allowed to make use of the tuberculin test. Dr. du Toit explained that there must be a serious misunderstanding, and that private practitioners could make use of the tuberculin test for purposes of diagnosis and for testing animals for export. The Sec.-Treas. was instructed to transmit this information to the private practitioners immediately.

(f) Under the heading: "Future of the Veterinarian in South Africa" Dr. Fourie very briefly discussed the prospects of the newly qualified veterinary graduates in government service, and in private practice. As it is realised that the time is fast approaching when all veterinary graduates cannot be absorbed in government service, Council suggests that the Status Committee should seriously consider ways and means of encouraging private practice.

(g) Constitution—Dr. Curson suggested that the Hon. Sec.-Treas. be instructed to have a number of copies of the constitution with added amendments roneoed. This was agreed to.

(h) Dr. Curson presented a request from the librarian to bind three volumes of the Veterinary Record which were pre-

sented to the Association on condition that they were bound. The matter was referred back to the Librarian for an estimate of the cost of such binding, and it was suggested that all future requests for binding be accompanied by estimates of cost.

The meeting was adjourned at 11 p.m.

OBITUARY.

Alfons Maag.

The late Alfons Maag was born at Ebingen in Wuerttemberg, Southern Germany, on 2/7/1886. In 1908 he graduated at the Veterinary High School (Tieraerztliche Hochschule) Stuttgart, and after completing his year of military service with the Yellow Dragoons in 1909, he took up private practice in Hayingen, Wuerttemberg. In 1911 he obtained the degree of Dr. Med. Vet. at Stuttgart, the subject of his thesis being *Experimentelle Beitraege zur Milzbrandinfection beim Schwein.* Thereafter, in May 1914, he secured from the German Colonial Office (*Reichskolonialamt*) an appointment as Government Veterinary Officer (*Regierungstierarzt*), being stationed in S.W. Africa. When the Great War broke out shortly afterwards, Maag fought with the German forces until the treaty of Chorab terminated the hostilities in S.W.A. and as a reward for his services was decorated with the Iron Cross. From 1915 until 1919 he was, owing to the exigencies of the situation, unemployed, but his enthusiasm for his work would not allow him to remain idle and he devoted a considerable amount of time in the interval mentioned to combating stock diseases, more especially dourine and blackquarter. When the epidemic of influenza swept the country in 1918, laying low many of the medical practitioners, he, the veterinary surgeon, devoted himself with great assiduity to assisting as far as possible in the treatment of the sick, to such effect that he received the Red Cross Medal, a distinction of which he was very proud. In 1919 he, along with two of his countrymen, Drs. Schmid and Sigwart, was offered and accepted a position as G.V. Officer under the S.W.A. Administration, being appointed to the district of Gobabis, at which place he remained until his health failed. He died on the 26th of January, 1933, in his native town in Germany whither he had gone for treatment for cancer.

Personally Maag was a straight, open-minded man, possessing a cheery outlook on life and a charming personality, while he was in addition a staunch friend. Having lived so long in the Gobabis area,

he had a profound knowledge of the Kalahari and its varying conditions, a fact which stood him in good stead in dealing with the various problems which arose from time to time in the course of his duties. He was also a keen naturalist, taking a more than usual interest in botany and zoology and I well remember on what was the last occasion on which I was to see him at Gobabis, how in answer to a peculiar whistle, a tame crow which had apparently been sitting in one of the trees in the vicinity of his office flew down and settled on his outstretched hand.

He was keen and zealous in his profession and nothing was too much trouble for him which would assist in elucidating the various knotty points which would arise from time to time in the course of his duties, and his demise is a severe loss to the profession of which he was a highly respected member. He was also held in high esteem by the farming community in the Gobabis district where he laboured so long but withal successfully.

He is survived by his sorrowing wife to whom the deepest sympathy of the members of the profession is extended, while he is also mourned by a large circle of friends, by whom he will be greatly missed.

A. McNAE.

Gilbert Melck.

Gilbert Melck was a son of the late Mr. and Mrs. Hendrik Melck of Berg River, Cape Province. The Melck family is known throughout the Union for its progressive activities in connection with horse breeding, and Gilbert Melck was always true to this family tradition. Mr. Melck studied veterinary science at the Royal Veterinary College, London, where he qualified in 1914. He then joined the Government Service in South Africa and from 1917 to 1919 was on active service in India and held a permanent commission as Captain in the Ghurkas with which rank he retired from the Indian Army. In 1919 he returned to the Union and was first stationed as a Government Veterinary Officer at Umtata, then at Worcester and later at Louis Trichardt. In 1928 he became Senior Veterinary Officer of Natal, where his activities greatly assisted in checking East Coast Fever. On the death of Major Goodall, Sub-Director of Veterinary Services, in 1930, he was chosen to fill this vacancy and transferred to Union Buildings to assume control of the major portion of the administration of the field staff. Since then he was actively concerned with the eradication of scab and East Coast fever, and when the recent outbreak of foot and mouth disease occurred, the late Mr. Melck played

an active part in the organisation to check the spread of the disease in the Union. This work called for his personal attention and was at times carried out under extremely difficult conditions. It was while on duty in the Koedoesrand ward that he was suddenly taken seriously ill.

His death, after a brief illness of a week, occurred on the 30th March. It came as a great shock to all his friends and colleagues and especially to those who were so intimately associated with him while on duty. Mr. Melck was only 41 years of age when he died. He leaves a widow and six small children.

Those of us who have been closely associated with him since his student days in London, will always remember his staunch friendship, honesty of purpose and even temperament. Mr. Melck always played the game, whether at work or in sport. The younger members of the profession in South Africa always greatly appreciated his sound advice and leadership. To him there was no distinction of race, creed or colour in doing what he thought was his duty, and he knew the art of handling farmers. He was a true lover of animals and his special knowledge of horses was always much appreciated in racing circles.

During his 19 years of sterling service in South Africa Mr. Melck served his country well and endeared himself not only to all members of his staff but to various sections of the community. His colleagues and friends will mourn his premature death and will greatly miss the tact, unselfishness, and friendly disposition for which he was so well liked. G. de K.

Statement for the Period 1.4.32—30.9.32.

To Balance B/F Bank Pass Book	£23	10	5	By Typing	£9	10	0
Goldfields Bldg. Society	2	14	10	,, Stamps	8	10	0
Subscriptions	111	12	6	,, Printing	94	17	9
Journal	8	17	2	,, Books	85	18	9
Advertising	23	10	11	,, Dale Fund	2	12	6
Books S.A.V.M.A. to students	104	4	5	,, Bank Charges	2	16	3
Reprints		14	0	,, Sundries	25	16	0
Commission allowed to Bank drafts		12	0	,, Balance B/D	45	15	0
	£275	16	3		£275	16	3

1.10.32.

To Balance B/F	£45	15	0
Balance shown on bank pass book as at 30.9.32	33	13	2
Balance shown Goldfields Bldg. Society as at 30.9.32	21	4	10
	£54	18	0
Less Deposit Slip unallocated	9	3	0
	£45	15	0

11.10.32.

Certified as correct,
C. O. WADNER.

Statement for the Period 1.10.32—31.3.33.

To Balance B/F Bank Pass Book	£33	13	2	By Stationery and Stamps	£18	0	6
,, Balance B/F Goldf. Bldg. Society	21	4	10	,, Wreath	1	1	0
,, Subscriptions	54	19	5	,, Binding		4	6
,, Journal	9	9	4	,, Printing	122	16	3
,, Advertising	19	10	1	,, Typing	8	15	0
,, Books S.A.V.M.A.	15	3	6	,, Books	17	2	5
,, Interest on Fixed Deposit ...	49	15	0	,, Sundries	7	2	0
,, Interest Goldfields Bldg. Scy.	1	1	7	,, Bank charges, Commission, Cheque Book, etc.	10	18	7
,, Cable refunded by students		8	9	,, Balance B/D	19	5	5
			£205 5 8				£205 5 8

1/4/33 To Bal. B/F £19 5 5

Reconciliation with Bank and Goldfields Buildg. Society Pass Books.

Balance as per Cash Book	£19	5	5
Plus cheque No. 05969 not cashed	11	2	2
	£30	7	7
Balance as per Bank Pass Book at 31.3.33	£9	3	11
Balance as per Goldfields Bldg. Scty. 31.3.33	20	14	11
Cash in hand per cable collected from students		8	9
	£30	7	7

Certified as correct,

7.4.33. (Sgd.) C. O. WADNER.

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JL. S.A.V.M.A.
IV (3) 1933.

Essays on the Cancer Problem.
II. Modern Thought on the Aetiology of Neoplasms.

By CECIL JACKSON, B.Sc., B.V.Sc., Onderstepoort.

INTRODUCTION.

In the first contribution[1] of this series we hope to have removed any feeling that the entry of the veterinarian into the field of cancer is an intrusion, and we feel that the opinion of as famous an authority as Bashford,[2] who as early as 1903 recognised in cancer a general and comparative problem, as distinct from a problem of pathology only, viz., that the crucial problems of cancer could all be attacked by a study of cancer in animals, renders further apology superfluous.

While at that time cancer had "been considered . . . . a subject which concerns only medical men" veterinarians have since rendered notable assistance if not directly to the central problem of aetiology at least in the form of careful observations which have very materially contributed to the removal of many widespread misapprehensions as to the nature of cancer in animals, its relation to cancer in man, and also to many diseases (leukaemias, certain virus diseases) which, as will be urged more especially in a later essay, have an essential bearing on the cancer problem. To-day Ewing[3] considers cancer as the "greatest of problems in *biology* and medicine," an opinion which has come to be generaly shared by competent authorities.

I. PERTINENT ASPECTS OF THE RECENT LITERATURE.

For reasons, some of which are mentioned immediately, but others of which may more conveniently be allowed to emerge later in this discussion, it is to-day exceedingly difficult to arrive at a satisfactory classification of even the most representative views on the aetiology of cancer. Indeed, it is not unreasonable to suppose that, were we in a position satisfactorily to evaluate and order the whole body of data at our disposal, the cancer problem, if not actually solved, would at least be so materially simplified, that the further course of research would be clearly defined. It will be evident from a consideration of some of the more prominent tendencies of modern thought on this subject, that there exists a notable overlapping of ideas. A further

(1) 1932 JACKSON, C. *Jnl. S.A.V.M.A. III* (3): 126-132. Essays on the Cancer Problem I. The Veterinarian and Cancer Research.

(2) 1903 BASHFORD, E. F. *B.M.J.* 18/7/03. Problems of Cancer.

(3) 1928 EWING, J. *Rep. Int. Conf. on Cancer.* London, p. 13.
The italics in the quotation are the writers.

difficulty arises in the consideration of those contributions whose authors commit themselves to no definite or single hypothesis of the nature of carcinogenesis. Yet it is often these very articles which deserve our closest attention by virtue of their content of irrefutable experimental data, however much in completeness their theoretical discourse may be lacking.

We aim here at a short summary and evaluation of those recently obtained data on carcinogenesis as will be relevant to the more general discussion to be taken up later. A general review is of course quite beyond the scope of this article, and indeed a task too formidable for many compared with whose extensive knowledge of the subject my own capabilities are quite inadequate. But in any general consideration of carcinogenesis there are several outstanding aspects, each of which has played an important part in recent research, which must receive attention and on which we must as clearly as possible define our attitude. Our object in dealing with these aspects will be not only to introduce the later arguments, but also to include points of general and more popular interest in modern research. In the last respect no claim is made for any rational selection of the limited material dealt with.

1. The Problem of Heredity.

Although those who to-day would maintain the earlier thesis that cancer in general is to be ascribed directly to hereditary influences, to the actual inheritance of cancer cells, are becoming distinctly fewer, modern research has yielded an overwhelming body of evidence to show that at least in the small laboratory animals heredity plays a most important role in determining not only (i) the occurrence of cancer, but also (ii) the site of occurrence of tumours, and (iii) the type of tumour. The evidence for these conclusions, very briefly stated, rests on the following facts (numbered correspondingly to the threefold determination referred to above) :—

(i) By selective breeding it has been possible to increase the incidence of cancer in susceptible strains of mice to approximately 100%. Indeed it has very recently been stressed by Reimann[4] that " . . . the only known way of increasing the incidence of spontaneous tumours is by breeding. . . "

(ii) Tumours show an interesting organ specificity in various animal species, e.g. mice—carcinoma of he breast, rats—sarcoma. Pigs suffer most frequently from embryoma of the kidney (embryonic adenosar-

(4) REIMANN, S. P. *Arch. Path.* 15 (5): 675-697. Aberrant growths in regenerating claws of the hermit crab under the influence of sulphydryl.

coma), and it has elsewhere[5] been pointed out that in this species malformations of the urinary organs are curiously frequent. The significance of this circumstance for the heredity influence responsible for the tumours in question, has already been pointed out in Essay I[6] of this series. Fowls suffer most from ovarian carcinoma. The use of this last example as evidence of an hereditary influence on organ susceptibility at once raises the objection that these phenomena are quite possibly to be ascribed to the fact that in different animals different organs are most prone to exposure to possible carcinogenic influences (e.g. irritation, hyperfunction), an argument which may be and has been especially maintained in connection with the female genitalia of the laying hen.[7] The objection may be met by citing the instance of the milch cow in which, in spite of the traumatic and functional abuses to which its udder is so notoriously subject, mammary carcinoma is unknown; and the case of the liver in mice and rats, infested by certain " carcinogenic " parasites, but manifesting the resulting development of sarcoma only in the case of rats. Furthermore, some strains of rats appear immune, although equally extensively parasitized. Examples of apparent hereditary influence explaining the peculiarities met with in various species and in various organs may be multiplied to include the cutaneous melanomata of grey horses, the skin cancers of Angora goats[8] in South Africa, testicular tumours of equines, mammary tumours of dogs (mixed epithelial and cartilaginous neoplasms), etc. ; although it is as well to admit that such cases demonstrate no more than the existence of what may be an unknown susceptibility (constitutional or local) to specific tumours dependent on or associated with a particular general or local constitutional make-up. To the extent that such constitutional peculiarities (e.g. colour, organ susceptibility as in the pig's kidney, etc.) are inherited in a species or strain, however, it may even here truly be said that a susceptibility to neoplasms is inherited.

The study of experimental irritation tumours also has important evidence to offer in favour of a positive influence of heredity. Thus while cutaneous cancers are easily produced in mice and suitable strains of rabbits, other species such as rats, guinea-pigs, dogs, and fowls are

(5) 1931 JACKSON, C. *17th Rept. Dir. Vety. Serv. & Anim. Indust.*, U. of S.A. II: 869-872. Anatomical Studies No. 26. Bilateral double ureter and congenital hydronephrosis in a pig.

(6) *Loc. cit. footnote* (1).

(7) 1931 BAYON, H. P. *Vet. Rec.* 11: 628-630. Avian tumours associated with retained yolks in the oviduct.

(8) These animals present a most interesting phenomenon: highly susceptible to natural skin cancer, they have in the hands of Thomas (1929. *15th Ann. Rep. Dir. Vet. Serv.* U. of S.A. II: 661-761. Skin cancer of Angora goats in South Africa) proved completely refractory to experimental carcinogenesis. Dr. Thomas and the writer plan to present a paper in this series dealing with the significance of this fact for the cancer problem.

either partially resistant or entirely refractory. The argument that the refractoriness of the skin of rats to the development of tar epithelioma is no proof of the operation of an hereditary factor in view of the fact that tar tumours (sarcomata) may be produced elsewhere than in the epithelium, may be refuted by pointing out, as Wells[9] has done, that this very fact is evidence of "an inherited species- (mouse, rat) characteristic difference in the susceptibility of different tissues (epithelium, connective tissue) to malignant transformation by a common agent (tar)".[10] The same author emphasises that the phenomenon of individual resistance in a susceptible species argues in favour of an hereditary influence.

The crucial problem of the operation of hereditary factors in human cancer has been approached from several aspects among which may be mentioned :—

(a) *Inference from the established fact of hereditary influence in lower animals.*—The legitimacy of this argument by analogy is one of the most strenuously opposed theses at the present time. Those who draw this inference, for which there is of course considerable *a priori* justification, have of course to admit that to whatever extent the hereditary factor may be *potentially* valid in man, in practice it is possible that it is, if not operative only in exceptional circumstances or special cases, at least less important than in animals, in which selective breeding is carried to an extent which rarely, if ever, is attained among human beings. We should, nevertheless, in assessing this evidence endeavour to free ourselves from any prejudice arising from anticipation of the practical implications of the operation of hereditary influence in man. Such impartiality is not easy of realization since our distaste for eugenic principles when it appears necessary to carry them further than their theoretical aspects is deeply rooted, as may be judged from the limited progress towards compliance with even the cruder and more obvious demands of Galtonism achieved during several decades.

(b) *Direct statistical investigation of the incidence of human cancer.*—The statistical evidence in regard to cancer in human beings is still far from being on a satisfactory basis, and indeed is still in rather bad odour on account of our lost confidence in the statistical methods of earlier investigators of "cancer families" and cancer ancestries, and the reliance which, quite unsoundly, was formerly placed on conclusions drawn from statistical evaluation of limited groups of subjects (hospitals, etc.). It must be said that the consensus of opinion is that the method has signally failed to demonstrate a positive hereditary influence in man—this in spite of what is perhaps the most irreproachable statistical

(9) 1932 WELLS, H. G. *Am. J. Cancer* (Suppl.) XV (3): 1919-1968. The nature and etiology of cancer.

(10) The explanatory interpolations (in brackets) are the author's.

investigation yet undertaken, that of the Committee for Investigation of Cancer of the Norwegian Medical Society, pointing to the conclusion " that it is proper to assume that the statistical study of known cancer records indicates that a hereditary predisposition does constitute a factor in the aetiology of cancer . . . . the evidence also points strongly to the influence of heredity on the localization of cancer."[11] Even as strong a supporter of the hereditary influence as Wells[12] considers the statistical evidence in the case of man to be practically worthless, although he concludes that " only on the basis of hereditary species susceptibility can we explain the facts that in mice the malignant tumours, especially of the mammary glands, are predominantly carcinomas, whereas in rats the tumours are mostly sarcomatous."

(c) *Miscellaneous.*—We must mention the occurrence of tumours in twins. Two types of observation are here concerned :—

(i) The occurrence of identical tumours in identical twins—which since the number of observed cases is small, may, although not very convincingly, be dismissed as pure coincidence ;

(ii) the appearance of dissimilar tumours in identical sites in twins : this seems to afford very strong evidence of the part played by heredity in determining the site of tumours.

It would appear that in man at least it cannot be regarded as proven that the rôle of heredity, while possibly of importance, is anything more than a predisposition, or rather a lack of resistance to proliferative processes becoming neoplastic. This statement, however, is not intended necessarily to include those special cases of neoplasms arising in tissues which, if they are to become neoplastic at all, must do so before that stage in their normal development is reached in which the constituent cells, through high specialisation, have lost the potentiality of carcinogenic transformation or indeed of reproduction. In the case of tumours such as retinal glioma, multiple neurofibromatosis, multiple cartilaginous exostoses (especially the first named) the hereditary influence seems inescapable.

It has further been remarked that the steady level of the cancer rate, not behaving as might an infectious disease, but rather as might with complete satisfaction be referred to the operation of an hereditary factor is, while a powerful argument against the infectious theory, much less convincing as evidence of heredity.

Blumenthal[13] contends that " the opinion that cancer is due to heredity of cancer cells, has been refuted by the experimental produc-

(11) 1932 EDITORIAL, *J.A.M.A.* 89 (19): 1656-7.

(12) *Loc. cit.* footnote (9).

(13) 1928 BLUMENTHAL, F. *Rep. Internat. Conf. on Cancer,* pp. 18-19. Cancer stimuli.

tion of tar cancer on the ear of rabbits, for here cancer is produced in a situation in which it does not occur spontaneously." This argument is not valid unless it can be shown that it is not more difficult to produce cancer on the ear than on other parts of the body ; but it is in fact true that it is actually easier to produce tar cancer on the ear than elsewhere. This would indicate that it is not hereditary resistance of the ear to cancerization that is responsible for the absence of " spontaneous " carcinogenesis in this region.

With regard to the mode of operation of the hereditary factor, it is at present not possible to arrive at a definite conclusion, all the recent evidence pointing to the fact that at least it is more complex than was originally thought (e.g. the idea of a simple Mendelian recessive being concerned). Ewing[14] considers that the hereditary influence operates essentially as "structural and physiological peculiarities in the organs which render them especially prone to develop tumours when exposed to particular exciting agents," an opinion which is echoed in an editorial[15] appearing in a leading American journal which concludes that "recent research supports the old view of chronic irritation by non-specific agents acting on tissues whose susceptibility is determined by heredity." If we add to this (and from this I see no escape) that in mice at least this predetermination may become so strong that universally present irritating factors, quite undetectable as ordinary departures from normal internal or external tissue environment, may suffice as the exciting cause, I think that we have fairly summarised modern opinion on the heredity problem in cancer. We are here following Loeb[16] who formularised the conception thus :—

$$H + S = C$$

where H represents the hereditary predetermination,
S the exciting stimulus, and
C the development of cancer;

and to this we are adding

$$\mathbf{H} + s = C \qquad \text{and}$$
$$h + \mathbf{S} = C.$$

where black type denotes intensity of the factor in question and lower case type that the factor may be of undetectable magnitude.

It must be admitted that this modern opinion has not satisfactorily met the objections of Blumenthal discussed above.

(14) 1928 EWING, J. *Rep. Internat. Conf. on Cancer,* pp. 1-13 The causal and formal genesis of cancer.

(15) 1932 *J.A.M.A.* 98 (19): 1656-7. The influence of heredity on cancer.

(16) 1928 LOEB, L. *Rep. Internat. Conf. on Cancer.* pp. 48-60. Heredity and internal secretion in the aetiology of cancer.

2. The Problem of Irritation.

The importance of chronic irritation in carcinogenesis is to-day more fully realised than ever before, and rests securely on both experimental and clinical data, especially if in the latter we include the extensive observations upon occupational cancers. It is quite impossible here to attempt any review whatever of the extensive recent work upon experimental carcinogenesis by irritation. What more especially concerns us is the mode whereby irritation acts to produce cancer. In this respect the study of the experimental cancers themselves has thrown very little light upon the subject, and the only satisfactory attempts to explain the mechanism have been certain forms of the cellular theory which at present are not susceptible of experimental confirmation. We must, however, point out that Twort and Bottomley[17] in dealing with the aetiology of breast cancer have recently advanced considerations on the basis of which an attempt, however unsatisfactory, may be made to bridge the chasm which has hitherto separated experimental and spontaneous carcinogenesis. The divorce of these two aspects of the cancer problem has been the despair of many workers, some of whom appear as a result well nigh to have lost faith in the value of animal experimentation and the validity of applying any results of experimental carcinogenesis in animals to the interpretation of "spontaneous" cancer of man. However, the well established irritational basis of many occupational cancers scarcely justifies this extreme attitude: the irritation theory in occupational and experimental cancers is so firmly grounded that it is unbelievable that it should prove of no use in the elucidation of the cancer problem in general.

Twort and Bottomley have attacked the difficult problem of the well known fact that cancer can be caused by a number of substances (e.g. tar, paraffin, arsenic, indol, analine dyes) which have apparently nothing in common with one another whereby their similar action might be explained on chemical or physical grounds. Their suggestion is that the essential is a group of compounds containing the carbon skeleton of phenanthrene acting in conjunction with sensitising unsaturated fatty acids which stagnate during hypolactation. This group of compounds is probably represented by Vitamin D, oestrin, and the carcinogenic substances chrysene and the 1.2 benzanthracene derivatives. While we doubt whether such ideas will be found acceptable, they are mentioned here as an interesting alternative to the more favoured idea that irritants act through more direct influences on the cells.

(17) 1932 TWORT, C. C. & BOTTOMLEY, A. C. *Lancet* 8/10/32: 776-780. The aetiology of breast cancer.

The patient and tedious research which has been carried out since Kennaway[18] indicated the possibility that the active carcinogenic principle of tar was a pure hydrocarbon has culminated in the proof last year by Cooke and co-workers[19] that pure hydrocarbons are carcinogenic. 1 :2 :5 :6 dibenzanthracene has been found to be the most effective of these agents, but since the rapidity with which this hydrocarbon induces skin cancers in mice is even excelled by certain tars, the search for a still more potent agent continues[20]. These experiments are a monument to the perseverance and scientific caution of the workers concerned.

Hammett's[21] chemico-cellular theory of cancer interprets the action of irritational factors on the basis of the sulphydryl content of chemical irritants (tar, oils, etc.) or on the ability of physical irritants (e.g. trauma) to cause liberation of sulphydryl in the tissues through autolysis. The demonstration of the carcinogenic potency of pure hydrocarbons is a refutation of this part of his theory. [This hypothesis, which has been further elaborated by Reimann[22], starts from the observation that the sulphydryl (HS) group which is considered to constitute the normal stimulus for cell division has been found experimentally to cause hyperplasias of tissues (e.g. mouse epithelium). Acting on favourable soil (cell rests, cells whose sensitivity or threshold response to sulphydryl has been enhanced through hereditary influence) an increased HS concentration such as may be brought about by the various well known cancer stimuli is capable of causing the uncontrolled proliferative process which we know as cancer].

Here we must mention the recent production of experimental tumours in the fowl by Burrows, using dibenzanthracene, and by Peacock,[24] by means of both tar and dibenzanthracene. The latter author draws attention to the histological similarity of such tumours to the filterable avian connective tissue neoplasms, but unlike Carrel,[25] who produced a sarcoma in a chicken by means of indol plus

(18) 1924 KENNAWAY, E. L. *Jnl. Path. & Bact.* 27: 233-238. The formation of a cancer-producing substance from isopyrene (2-methylbutadiamine).

(19) 1932 COOKE, J. W., HIEGER, I., KENNAWAY, E. L. & MAYNEORD, W. V. *Proc. Roy. Soc.* Series B. III: 455-484. The production of cancer by pure hydrocarbons, Pt. I.

(20) 1932 COOKE, J. W. *Ibid.* p. 485-496. The production of cancer by pure hydrocarbons, Pt. II.

(21) 1929 HAMMETT, F. S. *Arch. Path.* 8: 575-594. An interpretation of malignant growth based on the chemistry of cell division.

(22) *Loc. cit.* Footnote (4).

(23) 1933 BURROWS, H. *Am. J. Cancer* XVII (1): 1. A spindle-celled tumour in a fowl following injection of 1:2:5:6—dibenzanthracene in a fatty medium.

(24) 1933 PEACOCK, P. R. *Jnl. Path. & Bact.* 36 (1): 141-152. Production of tumours in the fowl by carcinogenic agents.

(25) 1925 CARREL, A. *Comp. rend. soc. biol.* 93: 1278. Un sarcome fusocellulaire produit par l'indol et transmissible par un agent filtrant.

embryonic tissue, he does not claim cell-free transmissibility for the growths.

Another most interesting result, to be referred to later in connection with the virus and cellular theories, is the claimed production of myeloid leukosis in fowls by intramyeloid injection of tar.[26] This observation urgently needs confirmation, and great caution is necessary before a result so significant for the interpretation of the nature of leukosis can be accepted. If true, however, it should throw a flood of light upon the relation between avian and mammalian neoplasms and between the leukaemias and the neoplasms.

As a matter of more popular interest we may refer to the recent work of Cooper and co-workers[27] who after an elaborate examination of the possibility of producing tobacco-tar cancer in mice obtained only one positive case. Many previous workers have had negative results also. Although these authors conclude that tobacco is a relatively unimportant factor in the causation of cancer, the clinical evidence for the importance of pipe-smoking in cancer of the lip, if not also of other parts, rests on very firm ground and cannot lightly be overthrown by negative observations in animals. The question of the role of cigarette smoking in the apparently increasing pulmonary cancer is still an undecided one.

At present most pathologists do not agree with the observations of Jorstad[28] who explained the pathogenesis of tar cancer by a migration of epithelial cells, the resultant crowding and reduced blood supply preventing the escape of growth-stimulating substances, as postulated by Burrows.[29] Most observers have found that histo-pathological study of tar cancers gives no positive clue whatever as to the mechanism involved, which is presumably either an intracellular one, a humoral one, or a combination of both.

We may summarise present opinion on the irritation theory by saying that irritation is universally recognised as an affective cause of tumours both in experimental animals and in man, although by many as little more than a predisposing cause. An outstanding problem has been the lack of similarity between the various irritating agents. Para-

(26) 1931 THOMSON, O. & ENGELBRETHHOLM, J. *Act. Path. et Microbiol. Scand.* (2): 121-184. Experimentelles Herforrufen von leukotischen Zuständen bei Hühnern.

(27) 1932 COOPER, E. A., BOLT, H. G., TIPSON, P. S., LANET, F. W. M., & SAUNDERS, E. *Jnl. Hyg.* 32: 293. Rôle of tobacco-smoking in production of cancer.

(28) 1924 JORSTAD, L. H. *Proc. Soc. Exp. Biol & Med.* 21:67. A study of the behaviour of coal tar in the tissues.

(29) 1924 BURROWS, M. T. *Proc. Soc. Exp. Biol. & Med.* 21: 94-110. Studies on cancer.

sitic causes of cancer are held to operate merely as chronic irritants, possibly through their toxins, not as specific causes. The irritation theory in its original form must be modified to harmonise with the much favoured cellular theories of the present day.

It is further widely accepted that the age incidence of cancer is explicable on the ground of the time necessary for the effects of chronic irritants to summate in the production of cancer. Most significant are the two facts that, if irritation cease, cancer may subsequently develop, indicating that already before the occurrence of malignant transformation some irreversible process has been set in operation which eventually leads to cancerization; and that the duration of irritation before cancer develops bears a direct relation to the life-span of the species in question (e.g. tarred mice develop cancer on an average after 6 months, i.e. ca. 1/6 of the span of life. The same fraction of the age expectancy in man, viz. 10-15 years, represents a good average period for the development of occupational cancers). Now this relationship is a very curious fact, and I can only attempt to explain it on the ground that possibly there is a further relation between the span of individual life and the span of cell life, so that the latent period of irritation cancer is in reality proportional to the duration of life of the individual cells (measured from one mitotic division to the next) of the species concerned. The significance of this conception for the cellular theory of cancer will be discussed later.

3. The Problem of Parasitism in Cancer.

While the rôle of gross parasites in the causation of certain neoplasms is firmly established, there is generally conceded to be no greater significance in these factors than can be explained on the ground of chronic irritation. Infection with schistosomes, spiroptera, trematodes, and the causal organisms of tuberculosis and syphilis is well known often to be followed by cancer, but the idea of a specific visible cancer parasite has been almost completely abandoned and is indeed in great disfavour. Nevertheless, as lately as 1930 and 1932 Koch[30 31] has continued to press his claims for a specific protozoan parasite as the universal cause of cancer. In view of the many occasions in the history of cancer research on which claims such as this have on close scrutiny been proved baseless, a heavy onus rests upon anyone postulating a specific parasite; this Koch has by no means discharged. His thesis will, therefore, find no support, but has been so interestingly and elaborately argued that brief mention of it appears

(30) 1930 KOCH, J. *Zbl. f. Bakt.* 118: 241. Ueber die Cellula cancrosa specifica s. parasitaria. 5 Mitteilung über die parasitäre Entstehung des Krebses.

(31) 1932 *Ibid.* 124 (7/8): 417-425. Kann eine parasitäre Ursache die gesicherten Ergebnisse die Lehre von der Krebskrankheit befriedigend erklären? 6 Mitteilung über die parasitäre entstehung des Krebses.

justified, especially as the articles in question may not have been available to a majority of readers.

He postulates in the aetiology of cancer (a) an age predisposition, (b) a local (epithelial) predisposition [in the form of (i) an epithelium damaged by chronic irritation, (ii) a "locally inferior" epithelium due to displacement or isolation (embryonic rests), (iii) a "physiologically inferior" epithelium (chronic inflammation), or (iv) physiological superfluity (organs which have lost their function)], and (c) infection with a specific protozoan ("Cellula cancrosa specifica") which—no more convincingly than earlier woikers—he claims to demonstrate histologically in and among the tumour cells. The histological appearances are quite easily referable to degenerative cellular changes and the structures described are quite easy to demonstrate in many cases of animal cancers which have been at our disposal in the pathological collection at Onderstepoort. It may also be remarked that authoritative modern opinion does not favour the operation of any age predisposition in the sense that senility itself constitutes a predisposing cause.

II. Contemporary Cancer Theories.

After these preliminary observations we may turn to a consideration of modern thought on what Ewing[32] has termed the formal genesis of cancer, i.e. "the nature of the tumour process itself as distinguished from the exciting factors initiating the process." It may at once be remarked that this distinction is by no means easy to maintain in the light of the data which are to-day presented to us. Indeed, one cannot peruse present cancer literature without being impressed by the inadequate appreciation of the nature of causation in general under which many contributors labour. From this discussion an examination of this question as well as a more detailed consideration of the virus theory and the transmissible tumours in their relation to modern cellular hypotheses have been postponed for a later essay.

At the discussion which followed the presentation of Lockhart-Mummery's recent paper[33] on the gene theory, Sir Lenthal Cheatle stated dogmatically that only two concrete theories of cancer were at present offered to science, the virus theory and the gene theory. It is surprising that this statement, beyond all question contrary to the great body of modern thought, was allowed to pass unchallenged, since Cheatle was patently elevating the gene theory to constitute the sole representation of the more important cellular theory as a whole. It is true that mutation theories of cancer have attempted to suggest a more detailed mechanism of the process of cancerization, but we cannot

(32) 1928 EWING, J. *Rep. Internat. Conf. on Cancer* pp. 1-13. The causal and formal genesis of cancer.

(33) 1932 LOCKHART-MUMMERY. *Lancet* I, : 618-620. Origin of tumours.

accept that this entitles them to an especial claim to concreteness, which from a scientific standpoint is perhaps the last quality we may assign to them. It is far more reasonable to contend that it is the virus theory and cellular theories which provide the basis for discussion.

A. The Virus Hypothesis.

The controversy which followed the work of Rous and Murphy on the filtrable avian tumours is at present more acute than ever before on account of the declaration by Gye[34] and later by Gye and Purdy[35] in favour of the transmitting agent's being a virus. In regard to the virus nature of this agent Rous never committed himself, while Murphy has consistently and strenuously opposed the views of Gye. Although the latest work of Gye and Purdy has not strengthened the position of the virus theory in contemporary opinion, I think we must give these workers all credit for a fearless attack on what has been the most disconcerting apparent anomism of the cancer problem—the transmissibility of certain tumours by cell-free filtrates. How many of our theorisers have been content to set up elaborate hypotheses accounting for what is merely a *convenient selection* of the whole range of available data, but to remain silent about facts which, though difficult or impossible to reconcile with their theories, nevertheless cried for explanation. Even those who would contend, to escape the difficulty, that the transmissible tumours represent an entity not comparable with cancer are in our opinion not remarkable for their intellectual candour, as any unbiassed investigator of the pathology of avian and mammalian tumours will be bound to agree. At all events the question of transmissible avian tumours embodies the central problem of the malignant transformation of the cell and to this extent it cannot be neglected by honest investigators. The problem of the leukaemias very probably falls into the same category. In this connection I would remind you that the leukoses of fowls are transmissible, that recent work[36] claims the same for leukaemia of mice, and of the claim already mentioned that a form of fowl leukosis may be set up by the use of known cancer-inducing irritants.

Criticism[37] of the work of Gye and Purdy may very justly be made on the following lines :—

(34) 1925 GYE, W. *Lancet* 2:109. The aetiology of new growths.

(35) 1931 GYE, W. E. G. & PURDY, W. J. *The Cause of Cancer.* London: Cassel & Co.

(36) 1931 FURTH, J. & STRUMIA, M. *Jnl. Exp. Med.* 53: 715. Studies on transmissible lymphoid leucaemia of mice. Still more recent work (1933 RICHTER, M. N. & MACDOWELL, E. C. *Jnl. Exp. Med.* 57 (1). Studies on mouse leukemia), which came to our notice while this article was in press, has not confirmed the results of these workers. Transmission was only attained with inocula containing living cells.

(37) For a competent commentary on the lengthy book of Gye & Purdy, see S.A.M.J. VI (4): 125-130.

(1) The setting up of a plurality of agency (virus plus specific factor) before experiments of complete irreproachability have forced one to exclude a single agency.

(2) The erection upon this already doubtful foundation of a superstructural virus hypothesis of mammalian neoplasms, based again on experiments open to the same doubts.

(3) The disregarding of the overwhelming clinical and experimental evidence of the non-contagious nature of both avian and mammalian neoplasms.

In our opinion the designation of the *ens malignitatis* of the filtrable tumours as a virus is a far less serious aspect of the conclusions of these authors. At present the term virus is little more than a convenient name for various entities whose nature is obscure, and we ourselves cannot regard the use of it in cancer as the deadly sin which to so many it appears to be, although the question of its desirability is open to doubt.

The virus theory has little or nothing to say on the mechanism of cancerization of the cell. Beyond postulating that the change occurs under the influence of an exogenous stimulus, it elects, perhaps with some justification, to leave aside this central problem as being at the present time probably incapable of solution. It is therefore by no means necessarily in competition with cellular theories and the uncompromising opposition between the two schools would seem to be a difference of opinion less on matters of fact than on what from the standpoint of scientific methodology constitutes a profitable line of investigation.

At the present time there is a considerable body of opinion which favours the interpretation of the transmissibility of filtrable tumours as a special form of transplantation, i.e. the tumour appears in the recipient not as a result of malignant transformation of the cells of the latter, but by a continued propagation of cells of the donor. To account for this one has to postulate

(1) unreliability of filters, or more plausibly

(2) their property of allowing passage of unsuspectedly large bodies,

(3) an unexpectedly large variation in the size of tumour cells, or

(4) a smaller viable unit than the cell; this last has been developed by proponents of the gene theory.

Those who adhere to the opposite view, viz. that the transfer of the tumour occurs by conversion of the cells of the new host through the influence of an *ens malignitas*, include the sponsors of the virus

theory and also those (by no means wanting in number) who not favouring the idea of an infection postulate some agent such as an enzyme or a hormone separable from cells and capable of causing malignant change in the cells of the new host.

It would appear that further light on this difficulty must await a closer study of the nature of both viruses and enzymes. In this regard we cordially echo the conclusion of Gye and Purdy "that the filtrable tumours provide a clue to the next great advance in our knowledge of the disease" and would add to this the importance of the general study of the nature of viruses. It seems quite clear to us that the modified implantation theory and the conversion theory as outlined above need by no means essentially involve a controversy. Although at first sight the problem of whether the newly appearing malignant cells belong to the donor or to the recipient may appear fundamental, on closer consideration one is bound to agree that there are limits to the conception of "ownership" of cells. We cannot here enter further into this interesting aspect of biological philosophy, but plan to make it at least part of the subject matter of a later paper under a more suitable title. We may ask, however, at this stage who is the "owner" of a virus which is attacking a given animal body, and point out that it would appear that for the time being the virus becomes part of, identifies itself with the body or the cells of the infected individual. In this respect there is a most interesting analogy between cancer and the virus diseases—the common feature of an attack "from within," the nourishment of alienised or dangerous cells by the tissues of the host itself, a fight against ones "own flesh and blood."

These interesting problems are borderline problems of biology and may be expected to advance hand in hand with our increasing grasp of physics and those fundamental aspects of biological philosophy which are attracting so much attention in our generation. We foresee that they will in the future play a large part in our knowledge of that subject of which we are at present witnessing the birth-pangs, the evolution of disease, in which will be incorporated the problem of the relation of growth to what are probably inevitable corrollaries of the growth capacity, under certain environmental conditions or on the attainment of a certain degree of complexity of structure, viz. hyperplasia, neoplasia, the separation of smaller viable units than the cells and the relation of this phenomenon to the virus, filtrable bacteria, hormone, and enzyme problems. With these questions are also intimately bound up those forms of infectious agents (Rickettsia diseases, virus diseases, diseases characterised by specific cellular inclusions) often characterised by dual phases of filtrability and non-filtrability, or visibility and non-visibility which provide such a stimulating clue to our present and future attitude on these fundamentals of biology.

B. Cellular Theories.

Cellular theories of cancer, in the widest sense, lay stress on the fundamental fact of the cancerization of a previously normal cell through agencies which are not extrinsic to the body, but which may be extrinsic to the cells themselves. These agencies may be held to include the following :—

1. *Intrinsic stimuli* : Bathmic influences have been held to explain the mechanism involved in the theory of cell autonomy, which ascribes cancer to a sort of reversion of somatic cells to the embryonic type and which sees in the normal cell a potentiality for cancerous proliferation which needs only the withdrawal of a restraining influence to become operative. In the light of this viewpoint the older and rather naïve idea of the cancer cell as one which has acquired unlimited proliferative capacity has been vigorously combated. Thus it is pointed out that in this respect the cancer cell exhibits no superiority to "normal" cells in tissue culture whose ability to reproduce themselves, when withdrawn from the restraining influence of their usual communal habitat and when their catabolic products are continuously removed from the medium, has been exhibited over periods extending into many years. Secondly, not even an increased rate of reproduction may be claimed as a characteristic of cancer cells ; for it is contended that even the most malignant of tumours do not show a rate of growth comparable with or superior to that of embryonic cells during normal ontogeny or of cells taking part in processes of hyperplasia and regeneration following injuries. The mutation theory, first enunciated by Boveri, and the later gene theory developed by Ludford and Lockhart-Mummery, also belong here. They attempt to explain the nature of the process on the grounds of nuclear changes involving larger (chromosomes) or smaller (genes) units of the chromatin of somatic cells. All agree that no new factor need be added to the cell to explain the conversion, but adherents[38] of the gene theory lay stress on the significance of the fact that some agents (e.g. X-rays), well known to produce experimental cancer, have also the power of inducing gene mutations in cells. As mentioned above, Lockhart-Mummery, in defending the gene theory against the virus hypothesis has recently gone so far as to suggest that the infective agent in transmissible tumours is actually the gene, for which he has postulated both filtrability and remarkable powers of resistance. The legitimacy of projecting what many regard as a purely conceptual entity, the gene, into the sphere of perceptual phenomena is open to question and would give grave offence to the positivists. It seems very hard at present to find out to what extent cytologists and geneticists may justifiably claim objective existence for the gene. In any

[38] e.g. MOTTRAM, J. C. *Br. Jnl. Exp. Path.* 12: 378-384. Experiments on the production of tumours on the somatic mutation hypothesis.

case this type of argument is prevalent enough in contemporary science to cause any apparent examples of it to come under suspicion.

Lewis and Lewis[39] have recently suggested that the mechanism of cancerization resides in the centrosphere and that any nuclear changes are merely secondary to the changes in this controlling centre of mitosis.

Endogenous stimuli have also been the essential in several biochemical theories of tumours. Of these the best known are that of Burrows[40] which ascribes cancerization to the operation of growth-stimulating substances and that of Warburg[41] who believes that an altered carbohydrate metabolism is the fundamental characteristic of cancer cells: these cells, in which anaerobic glycolysis (with production of lactic acid) has, as a result of selection, come to preponderate over the usual aerobic combustion of sugars, are by virtue of this enhanced source of energy capable of survival and neoplastic growth under conditions fatal to normal cells. Biochemical investigation of tumours has yielded valuable and fundamental knowledge, but the attempts made to construct cancer theories on the basis thereof have not met with great favour. Although Hammett (whose theory has been mentioned above) is very critical of the doctrines of both Warburg and Burrows, regarding them either as no explanation at all of cancer or alternatively as nothing more than observations on metabolic peculiarities which are the accompaniment rather than the cause of cancer, it must be remembered that the investigations of Warburg and his co-workers on carbohydrate metabolism have become almost classical and even their theoretical views are not to be lightly dismissed. Until we have some proof of an actual aetiological significance to be attached to altered metabolism of the cancer cell we cannot, however, feel confident that biochemical methods of investigation are capable of solving the cancer problem.

2. *Extrinsic stimuli.*—Here we must mention in passing such theories as ascribe the stimulus to an agency not the product of the cell which is to undergo malignant transformation. Some of these envisage the fertilization of a somatic cell, or of a germ cell by another cell, or parthenogenesis under the agency of other stimuli. Such, never having been able to adduce experimental evidence in their support, have not found favour, although some have been ingeniously extended to account for both benign and malignant tumours. It is possible to modify the virus theory in such a manner that it should really fall

(39) LEWIS, M. A., & LEWIS, W. H. *Amer. Jnl. Cancer* 16(5): 1153-1188. The malignant cells of Walker rat sarcoma No. 338.

(40) *Loc. cit.* Footnote (26).

(41) For a short summary of this work see 1925 WARBURG, O. *Jl. Canc. Res.* 9: 148-163. The metabolism of carcinoma cells.

under the heading of extrinsic stimuli, i.e. a cellular theory, postulating the operation of an agent which, although having a phase of extrincity from the cells, is nevertheless a product thereof. The question has been discussed above. Some workers believe that irritants (e.g. tar) produce their effects through a direct action on the cells, but most favour the opposite view, that the irritation merely initiates a cellular metabolic process through which intrinsic stimuli to cancerous transformation are developed by the cells themselves.

3. *Intrinsic-extrinsic factors* : Some forms of the cellular theory lay stress on an interaction between cell and environment. Such a theory has been ably developed in our own country by des Ligneris,[42] who sees in cancer the result of an alienation (as a defensive process against the rest of the body following slight injury to a cell or cell group) with subsequent gradual elevation of the resistance of an alienated cell to those forces of its environment which attempt to eliminate it from the society. It has the merit of reconciling the known facts with regard to the role of irritation with the problem of the "formal genesis" of cancer, it explains the absence of immunity in cancer and the consequent failure of serodiagnostic and chemotherapeutic methods while indicating a possible mode of attack on the therapeutic problem the development of which will be watched with interest by all in this country interested in cancer. Further it explains both benign and malignant tumours and even attempts (though here we think less successfully) a reconciliation of the problem of filtrable tumours.

It is well to admit that the state of our knowledge of fundamental cellular problems—growth, reproduction, mechanism of response to stimuli, etc.—being vague and as yet lacking in correlation, the so-called cellular theories of cancer can scarcely hope to escape the charge of being *ad hoc* hypotheses. Any attempt to elaborate a detailed conception of the processes involved in such basic biological processes must necessarily rely mainly on the imaginative powers of the investigator and be content with a minimal basis of fact. And a theory once having been set up, it is not a matter of great difficulty to bend the data of observation into a shape that will fit it.

One of the most hopeful signs is modern thought on the aetiology of cancer is that the most reputable of the cellular theories are not attempting to demonstrate the falsity of the best conceived of the older hypotheses. Our generalizations are being cautiously synthesized from both the latest data and the older established facts. They find a secure place for the well established theories of irritation, of embryonal rests, of heredity, and perhaps may be extended to include

(42) 1931 DES LIGNERIS, M. J. A. *S.A.M.J.* V: 767-776. Recent results of cancer research.

modified forms of what at present passes as the virus hypothesis. We regard this, by analogy with experience in other branches of science, as some assurance that work and thought on the cancer problem are "on the right track." It is important for us to realise, in considering the aetiology of cancer, what we mean by the correct scientific theory or law for which we are searching, viz. an abstraction which will be able to cope with or to summarise briefly the sequence of phenomena which we perceive in the problem presented to us. It is indeed in the highest degree unlikely that a theory, so well conceived and in such scientific spirit as e.g. the now famous one of Cohnheim, could be proved "false," any more than the new relativity of Einstein has proved the Newtonian laws of motion to be false. The worst that is likely to happen to conceptions based on such ingenious and scientifically tempered use of the imaginative faculty is that they will be shown to be of more restricted applicability than was originally claimed, that their terms require modification in order to be brought more into harmony with further progress in the subject concerned and in science in general, that while accounting satisfactorily for many of the facts they must now be extended to cover those subsequently brought to light, or finally that a new viewpoint will be found more serviceable to represent our increasing knowledge. Thus it may be the fate of even the best of theories, even of scientific laws, having served the purpose for which they were intended, to recede into an honoured and influential retirement.

Indeed, so important does this general principle of the faith that deserves to be reposed in any genuine scientific theory or law appear to us to be, that we are *a priori* sceptical of the worth of a new hypothesis which starts by dogmatically denying all its precursors, as though, forsooth, its sponsor were solving the problem quite independently of his predecessors, whose sole accomplishment has been to retard advancement by their stupid misconceptions. We refer here of course not to theories (of which we have all too many) erected on a basis of so superficial an acquaintance with the facts as to be deserving of the appellation "superstitions," but to carefully deduced conceptions arrived at in strict accord with all that is best in scientific method.

It is for such reasons that the questions asked by those seeking to be informed of the definite conclusions of modern thought on the cancer problem are often unanswerable to the satisfaction of the questioner. Often it seems almost as if we knew too much to be able to offer a categorical reply. An early or hasty conclusion to the problems we have been considering is indeed not desirable, except from the humanitarian aspect, and it is only from this standpoint that we can regard impatience as justified.

JL. S.A.V.M.A.
IV (3) 1933.

Is Powdered Glass "Poisonous" to Animals?

By A. D. THOMAS, D.V.Sc., and M. H. V. BROWN, B.V.Sc.;
Onderstepoort.

There exists in South Africa an extremely widespread belief that powdered or broken glass administered in the food to dogs produces very severe symptoms and certain death, and that this is one of the methods of choice employed by natives and even Europeans for maliciously destroying dogs and other animals.

That this belief is firmly ingrained in the minds of a large proportion of the population is evidenced by the fact that many dog owners, when asked about it, will readily relate the loss of a dog in this way, or at any rate will remember the equally "authentic" experience of some friend or acquaintance.

The symptoms usually described are gradual wasting away, with passing of blood in the faeces, great pain, and death after a variable period of time.

When one attempts to probe more deeply into the methods of administration of the glass, the replies obtained are somewhat hazy and conflicting. Some maintain that it is given in fairly coarse, jagged pieces, while others are equally convinced that certain results are to be obtained with the very finely powdered material. In connection with the latter method, the opinion (probably gathered from fiction) is often volunteered that this means will baffle the most searching post-mortem examination and analysis.

The paucity of reliable information induced us to carry out a few experiments in order to gain definite information on this matter.

Previous Work.

The only reference of value found in the literature was an article by Simmons and von Glahn.[1] These workers fed ten dogs on glass powdered or ground to various degrees of fineness. The dogs showed no untoward symptoms and on being sacrificed some time later showed entirely negative results at autopsy. The authors conclude, therefore, that "the ingestion of ground or powdered glass has no toxic effect and produces no lesions, either gross or microscopic, on the gastro-intestinal tract of dogs."

Lüdecke[2] describes a case which has some bearing on the subject. A professional glass-eater from a circus masticated and swallowed

(1) 1918 SIMMONS, J. S., & VON GLAHN, W. C. *J.A.M.A.* 71 (26): 2127-2128
(2) 1930 LÜDECKE, E., *Munch. Mediz. Woohenschr.* 77 (12): 496.

before him a glass tumbler. With every mouthful of glass he also swallowed a small pill, probably containing phosphorus, which was supposed to dissolve the glass or render it innocuous. The individual asserted that such a performance could be repeated daily over a long period. Unfortunately the case was not followed up.

An experiment was also carried out at Onderstepoort by Quinlan and de Kock in 1925, while investigating a somewhat mysterious but severe mortality amongst police dogs at the training depot in Pretoria. It was thought by the trainers that ground glass could possibly have been the cause of these deaths. The results of the experiment were unfortunately not published, but records show that five experimental dogs were fed with broken glass (and porcelain) of varying size classed as "coarse," "medium," and "fine." Each dog was fed with 15 gm. of ground glass or porcelain of the above grades of fineness. No symptoms of importance were noted and the dogs were all destroyed after one month. In all cases the post-mortem examination revealed no lesion of note.

Experimental Work.

Our own investigation comprised three experiments.

Experiment I.—Three dogs were dosed with glass powdered to various degrees of fineness. The amounts given, etc., are shown in Table I.

Table I.

Subject.	Dosage.	Glass recovered from faeces.	P.M. findings.	Effects on health.
1189	18.1.33. Fed 15 gm. "medium" glass.	9.8 gm. recovered from one defaecation 19.1.33.	Negative (gastro-intestinal tract).	None.
1193	18.1.33. Fed 3 gm. powdered glass "wool."	Trace only recovered in faeces available.	Not killed.	None: still alive and healthy, 30.6.33.
1194	18.1.33. Fed 5 gm. "medium" glass. 27.1.33. Fed 20 gm. very finely powdered glass.	Trace only recovered in faeces available.	Not killed.	None: still alive and healthy, 30.6.33.

The "medium" glass was that used in the Chemical Section for analytical purposes and consisted of very uniform-sized particles averaging 0.3 mm. in diameter, the majority being flattened, with fairly sharp edges.

Powdered glass "wool" consisted of long glass needles about 0.2 mm. in diameter pounded in a mortar to short lengths of a fraction

of 1 mm. to 2-3 mm. Under the microscope these particles were seen to possess at each end very sharp, tongue-like edges, such as are usually seen when a glass rod is broken roughly in two. The finely powdered glass dosed to dog 1194 was composed of a very fine chalky powder obtained by grinding broken glass in a porcelain roller mill for several hours.

The method of giving the glass to the dogs, which was similar in all the experiments, was as follows : thin slices of fresh mutton or beef were cut and small amounts of the powdered or broken glass rolled up in each of these. After being baited with a few untouched pieces of meat the dogs swallowed the glass containing pieces whole without any difficulty.

Of the three dogs dosed two are still alive (30.6.33) and are showing no ill-effects whatever. The third, No. 1189, died on 17.3.33 as a result of acute orchitis due to a bite inflicted by another dog; no lesions were observed in the gastro-intestinal tract on autopsy.

The faeces collected from dog 1189 the day after the glass was dosed represented one defaecation only, yet of the 15 gm. glass dosed no less than 9.8 gm. (i.e. 65%) was recovered, indicating a rapid passage of the glass through the alimentary tract. The powdered glass was recovered from the faeces by a process of panning with water—the faecal material was broken up and eliminated by successive washings, the heavier glass remaining at the bottom. It was then dried in an oven and weighed.

Experiment II.—The experiment was now repeated, this time using four dogs and glass powdered or crushed to four different sizes. The various grades of glass were as follows :—

"Fine"—glass powder with the particles varying greatly in size—from 0.2 mm. down to 0.01 mm. and even smaller, the majority being in the form of the smaller particles.

"Medium"—the same as used in Experiment I above, average size of particles 0.3 mm.

"Coarse"—the particles varied from 0.6 to 2.9 mm., fifty measurements, with an average size of 1.6 mm. The shapes most common were flattened or prismatic forms with sharp edges and points.

"Very coarse"—size of particles varied from 2 mm. to 17 mm., average 6.8 mm. One hundred were measured. Again the most common shapes were flattened and prismatic, with sharp edges and points.

Both the "coarse" and the "very coarse" grades were carefully sifted in order to ensure that the particles were as uniform in size as

possible. It was felt that feeding larger particles than those in the "very coarse" grade would simply constitute ingestion of foreign bodies with consequent obvious traumatic injury.

The doses, etc., are tabulated in table II below :—

Table II.

Subject.	Dosage (29.5.33).	Glass recovered from faeces.	Killed for autopsy.	Autopsy findings: gastro-intestinal tract.
1266	Fed 20 gm. "fine" ground glass.	Trace only recovered from faeces available.	13.6.33.	Negative.
1263	Fed 20 gm. "medium" powdered glass.	14.2 gm. recovered from faeces on 2.6.33	13.6.33.	Negative.
1260	Fed 20 gm. "coarse" broken glass.	1.06 gm. recovered from faeces on 1.6.33.	8.6.33.	Negative.
1267	Fed 25 gm. "very coarse" broken glass.	No glass recovered from faeces available.	8.6.33.	Negative.

Unfortunately not all the faeces from these dogs was collected with the result that the only appreciable amount of glass that was recovered was, as can be seen from the table, from dog 1263, and to a lesser degree from dog 1260. However, at post-mortem no trace of glass in the gastro-intestinal contents could be found, so that it can be inferred that all the glass had passed out with the faeces.

Experiment III.—With a view to ascertaining the actual position and distribution of the glass particles in the gastro-intestinal tract at stated times after dosage, a further two dogs, Nos. 1284 and 1285, were dosed on 22.6.33 with 20 gm. each of the same "very coarse" glass as used in Experiment II, and radiographs taken at various times after dosage. The glass showed up well on the X-ray film.

The first radiographs (taken half an hour after dosage) showed the glass in the stomach in both cases, in fact it appeared in the form of cylindrical masses as it was contained in the meat, the latter being at the time still undigested. The second radiographs taken the day after dosage showed much of the glass still in the stomach, but also quite an appreciable amount scattered throughout various parts of the intestine. The third radiographs taken on the fourth day after dosage showed no glass whatever in the gastro-intestinal tract. In other words, the glass had been eliminated within four days.

Some 18.7 gm. glass were recovered from the faeces of dog 1284; only 10.5 gm. from dog 1285 (presumably some of the faeces was lost).

Both dogs are still alive (30.6.33) and are showing no ill-effects whatever.

Discussion.

In the experiments described above an attempt was made to follow as far as possible the course of the ingested glass through the alimentary tract by checking the amount of glass passed out with the faeces. Great accuracy was not aimed at nor would this have been possible with the lack of suitable accommodation, but enough information was obtained by a rough method of panning the triturated faeces with water to show at what period the greater part of the ingested glass was passed out. This was clearly borne out by the radiographs taken in Experiment III, which show that all glass was voided 96 hours after ingestion.

Two of the dogs in Experiment I were kept under observation for over 5 months after being dosed in order to observe remote effects, if any. In view of our observations in Experiment III these could scarcely be expected, nor were any noted.

The animals in Experiment II were all killed and autopsied within 10 days after dosage, and in no single case was any lesion noted referable to the glass.

It is, of course, conceivable that sharp, jagged pieces of glass larger than 1 cm. may cause more or less severe traumatic laceration or even perforation of the oesophagus, or possibly of the stomach and intestines, but it must be remembered that no dog will normally swallow free pieces of glass, and a dog would have to be very hungry indeed unwittingly to swallow with meat pieces of glass sufficiently large to injure the alimentary tract.

Conclusions.

1. Contrary to popular belief, glass, powdered or broken to particles varying in size from very fine to fairly coarse, does not cause death when ingested by dogs.

2. The whole or by far the greater proportion of the glass given passes through the alimentary tract (when defaecation is normal) in the course of 96 hours without causing any ill-effects.

3. Incidentally it was found that glass foreign bodies in the gastro-intestinal tract could be demonstrated with great ease by means of X-ray photography.

Acknowledgement.

We are indebted to Dr. J. B. Quinlan of this Institute, for kindly taking a series of X-ray photographs for us.

JL. S.A.V.M.A.
IV (3) 1933.

Dogs and Human Migrations.*

By Captain R. D. S. GWATKIN, Permanent Force, South African Field Artillery, Roberts Heights.

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INTRODUCTION.

All writers on the subject of domesticated animals, are unanimous in recognising the dog as man's first ally. Some, going further, have realised too that, given the dog, man's work as a hunter was greatly reduced; but little further attention seems to have been paid to this important event as a critical one in man's career.

The first characteristic discovery of man was the control of wood and stone to form weapons and tools. Thereby he separated himself from the apes who irregularly use missiles offensively and defensively. The second big discovery, which dates back to Neanderthal man, was that of fire and the uses to which it can be put when under human control. A third and much more recent discovery was the control of animate nature beginning with the dog.

The great Baron Cuvier expressed the opinion that the dog exhibits the most complete and the most useful conquest that man has made. Each individual is entirely devoted to his master, adopts his manners, distinguishes and defends his property and remains attached to him even unto death, and all this springs not from mere necessity or from constraint, but simply from gratitude and pure friendship.

When man was first emerging from primeval darkness, he spent his whole days engaged in a not always successful fight in search of food for himself and those who were dependent on him. His only feast

*Edited and revised by Prof. R. A. Dart, University of the Witwatersrand, Johannesburg.

days and holidays were the rare occasions on which he was fortunate enough to encounter some large animal too sick to offer resistance, or already mortally wounded or dead from wounds received in conflict with some other more powerful animal.

Such rare occasions gave man and his family, or small tribal group, a respite from the daily round of hunting. The wild dogs and smaller carnivora eagerly hung round awaiting any scraps which, in his improvidence amidst plenty, man might cast away.

At night, like the Gorilla in its African fastnesses, the family took to the trees as a refuge from the many perils that beset them, making small platforms or nests in which to shelter from the elements. The head of the family, however, took up his position at the foot of the tree where his sensitive ears gave him timely warning of the approach of an enemy.

Skulking round, becoming bolder and bolder, the wild dogs soon recognised that man was a killer more successful than themselves and not always ferocious. They attached themselves to him, parasite-like, even as the jackals follow the fierce King of Beasts to-day. Man became accustomed to their presence and noticed that, owing to their superior scenting ability, they sensed danger more rapidly than he himself. He relieved the strain of the *qui vive* by trusting to his campfellows, realising that their intent gaze with ears keenly erect, hackles rising, and the sound of low suppressed growls were certain signs of the approach of somebody or something which required his immediate investigation. In course of time the bonds binding the dog closer to mankind became firmer.

Kipling has beautifully described the power primitive man possessed over other creatures by virtue of his control over fire. None but the hungriest or most savage animals approach him while his fire is large and bright. Dogs were the only exception; they became so accustomed to being in close proximity to man that even this fearsome ally failed to keep them farther than a respectful distance. It ultimately attracted them by its genial warmth. The youths and infants gathered round the fire while their elders rested, then, as now, threw pieces of meat to the dogs, and watched fights for the possession of each morsel. Emboldened by continual contact, the younger dogs and puppies approached nearer and nearer. A sudden rush and a too venturesome pup struggled in the arms of its captor. Boylike, he put a thong round the pup's neck and handled and petted it, plying it with food until its first fear had been overcome. Even if the pup was subsequently released, much of its suspiciousness (it had already lost its fear) had been overcome.

Again, a woman, robbed by death of her child, would eagerly press the soft mouth of one of a litter of puppies, discovered during the course

of the day's hunting, to her nipples to relieve the agony of her bursting breasts, a custom still practised by the womenfolk of some South American tribes.

Some of the maternal love is transferred to such a puppy. The woman protects and feeds it as it grows up, tamed and ready to come to the call of its protector. In some such manner the dog became man's first ally.

With the aid of dogs, the eternal hunt for food became less strenuous. Instead of wounding his quarry and having to follow it, perhaps for a matter of days (as the Bushmen do to-day) man, with the help of his dogs, hunted it down and brought it to bay in a matter of hours. With their assistance, he successfully attacked larger and more ferocious animals the carcases of which kept him and his canine retinue supplied with meat for a considerable period. Previously he and his family followed the spoor. The daily itinerary was in the direction taken by such quarry, the family camping and sleeping at the spot where the animal was eventually run down and killed.

With dogs, life entered a new phase. It was no longer necessary in the first place for women and children to accompany hunting parties. They, with the men spared for their protection, could remain in some selected spot. Thus man, thanks to the dog, became less uncertain of livelihood and more independent. In the second place the killer had sampled and enjoyed the milk from the udders of freshly killed female animals. He had perhaps discovered that such milk could be drunk with avidity by the sick and by the motherless babe when no other form of food could be taken. He had not, however, been able systematically to capture such females alive and unhurt, nor had he the power to keep them herded and to prevent them from straying and stampeding. His dogs, however, were able to run down and bring to bay young females which had recently given birth to young or which were too devoted to abandon their offspring. The more gentle of these, and more especially their young, could readily be tamed and herded by the dogs, could be driven along as the party moved, and could provide a daily supply of nourishing food. Thus the dog gave man his second and other domesticated animals and the full equipment of nomadic life.

With some of the dangers of starvation averted, folk became increasingly settled, moving about over a smaller area of ground where game, nuts, and roots for themselves and grass for their increasing flocks were most plentiful.

Thus man, however slow the process may have been, had, through the aid of the dog, at last firmly planted his feet on the ladder by which he was to climb to civilisation.

2. The Origin of Domestic Dogs.

i. *Early views.*

How and when this third and critical experiment of man's taming his first beast took place seems to be outside the possibility of exact discovery, though various hypotheses have been advanced.

Darwin himself found the solution of dog ancestry most difficult and said (in *Animals and Plants under domestication*) :—

> It is highly probable that the domestic dogs of the world have descended from two good species of wolf (***C.lupus*** **and** ***C.latrans***) and from two or three other doubtful species of wolves (namely, the European, Indian and North African forms); from at least one or two South American canine species; from several races or species of the jackal and perhaps from one or more extinct species.

Although there are many varieties of wolves, dogs, and jackals, there is relatively little anatomical difference between them in the general form of bones, and the number of teeth and toes. The three species vary chiefly in matters of size, body form, colouration and appearance of the coat, and the form of the pupil of the eye.

As Lankester says in the *Encyclopaedia Brittanica*,

> The origin (of the dog) is wrapped in obscurity. Some naturalists believe it to be a distinct species, descended from one that no longer exists in a wild state; others have sought to find its progenitors in some one of the wild or half-wild races, either of true dogs, wolves or jackals; while others again believe that it is derived from the mingling of two or more wild species or races.

The two Parkers pointed out in Cassel's *Natural History "Carnivora"* many years ago and were struck by

> the often recurring close resemblance between the domestic dog of a savage tribe and the wild species of Canis inhabiting the same district. Of this most important circumstance there are far too many instances to allow of its being looked upon as a mere coincidence. . . . .

As the Eskimo and (American) Indian Dogs resemble the North American Wolf (*C.lupus*), so the dog of the Hare Indians, a very distinct breed, resembles the Prairie Wolf (*C.latrans*). Another observer remarks that, except in the matter of barking, there is no difference between the black wolf-dog of the Indians of Florida and the wolves of the same country. The dogs also breed with the wild animals they so resemble. The Indians often cross their dogs with wolves to improve the breed, and in South America the same process is resorted to between the domesticated and wild dogs.

The same phenomenon is seen in many kinds of dogs in the Old World. The Shepherd Dog of the plains of Hungary is white or reddish-brown, has a sharp nose, short erect ears, shaggy coat, and bushy tail and so much resembles a wolf, that Mr. Paget, who gives the description, says he has known a Hungarian mistake a wolf for one of his own dogs. There is also a close resemblance between some of

the Indian pariah dogs and the Indian wolf. Some of the domestic dogs of Egypt both at the present day and in the condition of mummies, closely resemble the wolf of that country, "whereas the domestic dogs of Nubia, and certain other mummified dogs, have the closest relation to a wild species of the same country . . . . which is only a form of the common jackal." Dogs have, moreover, been known to cross with jackals as well as with wolves. Lastly, in Africa, some of the natives assert that their half-tamed dogs are derived from foxes, and the dogs of the Bosjesman have a striking resemblance to the black-backed jackal (*C.mesomelas*) which, as we shall see, is a South African variety.

The Parkers assumed from the repeated resemblances between domesticated and feral types a multilateral descent of dogs from wolves and jackals. The facts equally predicate a multilateral product of feral "wolves" and "jackals" from semi-domesticated dogs. By comparing the osteological, palaeontological, and historical records we can trace all the domestic dogs from antiquity to the present day to four essential strains, viz. :—

1. Egyptian jackal-like dog = prototype of the Peat-poméranian or kitchen-midden dog. *C. palustris.*
2. Asiatic (Indian) pariah dog = prototype of the Bronze age dog, the common hound or lurcher, and the dingo, all derivable from *C. pallipes.*
3. Egyptian (?Asiatic) greyhound = prototype of all greyhounds and represented in Neolithic period by *C. leineri.*
4. Asiatic mastiff = prototype of all the huge dogs through *C. molossus* from one or other of the Thibetan white and black wolves (*C. laniger and C. niger*).

It has therefore seemed valuable to put the analysis of the available evidence on record to illustrate the migrations of the dog and to serve as a background for the study of domestic dogs in general and of one South African dog in particular. By this approach I hope to show that in the present confused state of knowledge concerning feral and domesticated types more attention should be given to the ascertainable facts of dog migration which have rendered the study of the dog as complicated as the study of man, if not more so.

ii. *The European evidence.*

It will be valuable in the first instance to analyse the evidence concerning early dog domestication in Europe.

MacCurdy in *Human Origins* says :—

> The dog was the first animal to be domesticated and for a long time it was the only species in this class; it remains to this day the most completely domes-

ticated of animals. Remains of the domestic dog have been found in practically all Neolithic and Bronze Age deposits of Europe. By the end of the Bronze Age one finds several races developed, the most marked being a greyhound type in Austria and a mastiff type in Savoy. The greyhound type of dog is frequently represented in the art of early Egypt—a large greyhound with straight ears, consecrated to Anubis, which has its counterpart in ***Canis simensis,*** the present wild dog of Abyssinia and parts of the African interior. Aristotle (350 B.C.) mentions seven races of dogs. The bulldog is represented on a bronze situla from the Certosa at Bologna (proto- or pre-Etruscan). ..... The lake villages of Switzerland afford abundant evidence of the extent to which animals were domesticated during the Neolithic Period. The list includes the dog ***(Canis familiaris palustris)*** ..... The Bronze Age in Switzerland witnessed the introduction of several new species or varieties of domesticated animals and at least one new genus ***(Equus)***. The new elements include two new varieties of dog: (1) ***Canis matris optimae*** and (2) a wolfhound ***(Canis familiaris inostranzewi)*** ..... The Iron Age in Switzerland seems to have added nothing new to the list of domesticated animals except two varieties of dog: (1) a deerhound ***(Canis familiaris leineri)*** and (2) ***(Canis familiaris intermedius).***

Obermaier in *Der Mensch der Vorzeit* says that

The oldest domestic animal is the dog (***Canis familiaris***) and he appears for the first time in the Late Stone Age. The wild dogs of the Quarternary were only small races of jackal or wolf which were little noticed or regarded as enemies. The first house-dogs to be encountered in Europe are in the early neolithic Danish discovery-sites of Maglemose and in the so-called "mussel-heaps" of Denmark. Further east we meet a related race in middle Europe, especially in the area of pile-dwellings in the same neolithic time where they have received from Rutimeyer the name "Peat-dog" (***Canis familiaris palustris).*** It was fairly big and lightly built, and is, according to C. Keller's opinion, best designated as the "Peat-Spitz (Pomeranian)," which represents at the same time the original form of our present Pomeranian dog. Towards the end of the stone age several transformations into larger and smaller types are apparent, from which the obvious Pomeranian and Terrier were derived. Moreover the ancestral form has remained very constant with us until Roman times and persists strongly in the Siberian Tungus-Pomeranian. The ***Canis leineri*** has so far been known only from a single skull which Th. Studer described from the neolithic pile-dwelling of Bodmann at Bodensee; it represents a big, slender race and reminds one of the greyhound type. From the equally neolithic ***Canis inostranzewi*** from Ladoga Lake in Russia, Studer derives the Siberian and Eskimo dogs and even the Scandinavian elk-dog.

Further increase in the races took place in Middle and Western Europe at the beginning of the Bronze Age. The Bronze dog, the ***Canis matris optimae*** appears, which Jeiteles discovered in 1872 in Olmütz. It is present in almost all stations of that epoch, is very close to modern sheep-dogs, and was certainly their ancestor. According to C. Keller, the ***Canis intermedius*** described by Woldrich in 1877 is only a hybrid and the age of ***Canis familiaris decumanus,*** a very large housedog, is uncertain.

The dog enjoyed loving attention in the land of the Pharaohs where it had already been domesticated by about 4000 B.C. ..... There we meet an elegant race of dogs of the lightly built, stately, greyhound type with upright ears, delicate snout and shaggy tail ..... and also hunting dogs with hanging ears. Both of these, as C. Keller has recently shown, reached Europe across Crete and above all Greece during the Bronze Age. The reddish-yellow "Dachshund" is more rare, the "Spitzhund" (Pomeranian) is more common and the "Doggen" (mas-

tiffs) are completely absent. The latter, on the contrary, were the chosen companions of the chase amongst the Babylonians and Assyrians and were bred at enormous expense for lion- and wild horse-hunting. Later there apears in Assyrian sculptures a smaller dog with pointed snout which C. Keller places close to the Indian pariah dog.

The dogs of the Grecian and Roman periods were the objects of careful breeding and of detailed written records on the part of Columella and Varro. A wider source of study is afforded by the representations on sarcophagi, vessels, lamps and the like, and particularly the bodily remains. Greyhounds of Egyptian character appear on Sicilian coins, and South Russian vases; and, in addition to these, hunting, racing, and also sheep dogs were bred. The most imposing apparition, however, was the *Canis molossus*, which unquestionably is identical with the Old Assyrian mastiff, and apparently reaching Greece through Alexander the Great and from there to Rome and the Northern Provinces, thus for example to Vindonissa in Switzerland. Our Newfoundland dogs ultimately arose for certain from Roman breeding material. The poodle, already known to the Romans, on the other hand, is no derivative of the Bronze dog, but a spaniel bred for water-hunting (Th. Studer).

An analysis of the present knowledge concerning the distribution of types of dog in Europe during Late Stone Age times is to be found in A. E. van Giffen's paper "On the oldest domestic animal and its significance for palethnology," *Proc. Konink. Akad. v. Wetensch. t. Amst.*, Vol. XXXII, No. 3, 1929. He has discussed there the pre- and proto-historical dog types described by Jeiteles, Woldrich, Strobel, Troessart, Studer, Keller, Winge, Hilzheimer, Brinkman, etc. After a statistical analysis of the dogs from :

(a) Frisian and Groningen tumuli of Late Iron Age,

(b) Neolithic and Bronze-Age Swiss Lake Dwellings,

(c) Neolithic Danish-Cimbric kitchen middens, and

(d) Neolithic-megalithic settlement of Flintholm in the island of Alsen,

he has come to the following general conclusions :—

(i) that the "tumulus" dogs display less divergence in type than do modern dogs. There was a predominance then of large bull-dogs, hounds, and the like amongst them.

(ii) that compared with these "tumulus" dogs the "lake-dwelling" dogs display an enormous increase of divergence. The "lake-dwelling" dogs were of two well-defined classes—a large group of small dogs (of these he mentions three varieties : *C. palustris*, *C. de le merei* and *C. spalletti*) and a small group of large dogs (also three varieties : *C. matris optimae*, *C. leineri* and *C. inostranzewi*)—and the intermediate form *C. intermedius*. Further *the large dogs are absent in lake-dwellings with pure stone cultures* (i.e. in the earlier deposits).

(iii) that compared with these "lake-dwelling" dogs the "kitchen-midden" dogs display a considerable decrease of divergence. Their divergence agrees completely with that of the large group of small dogs (from the lake-dwellings), but they are somewhat larger than the small lake-dwelling dogs and also larger than the well-known European jackal-forms.

(iv) that the "kitchen-midden" dogs and the "Cimbric-megalithic" dogs more closely resemble one another than either group resembles the "lake-dwelling" dogs.

He points out that the group of larger dogs do not appear in Europe before the lake-dwellings of the bronze age. They would therefore appear to be an importation entirely foreign to Europe before that time. One of the large dogs (the so-called *Canis matris optimae*) is very similar to the earliest known Asiatic dogs (Anau in Turkestan). The earliest known European (i.e. kitchen-midden) dogs differ very little from one another, have nothing to do with the analogous Asiatic or African dogs, and do not descend from the *Canis palustris* (of the lake-dwellings), but may be progenitors of the prehistoric, Cimbro-megalithic (and recent arctic) dogs. He says too that it is difficult to derive them from a European or non-European jackal. They represent a *Canis verus*, descendants from a small wolf of which we know nothing in particular.

On the other hand Keller does not leave us in the dark concerning the origins of the first known domesticated European dog; for according to Obermaier :—

As the wild ancestors of the domesticated dogs we can only take into consideration the wolves and jackals, and indeed the first-named for the larger and the latter (jackal) for the smaller types. C. Keller is of the opinion that the "Spitzhunde" (Pomeranian dogs) with the Peat-Pomeranian (***Canis familiaris palustris***) as their oldest representative, were derived from a jackal and that Western Asia was their first taming ground. The Bronze dog (*Canis matris optimae*) according to the same authority, also arose in Asia and sprang from the delicately-built Indian wolf (***Canis pallipes***). The unlovely pariah dogs of Turkey and Egypt he says, go back to the jackal-wolf, the grey-hound and hunting dogs to the Aethiopian wolf (***Canis simensis***). The mastiff (***Canis molossus***) finally must be a present from Thibet and must have branched off from the Thibetan wolf; its most recent side-twigs are the Bull-dog and the Pug, the Bernhard and the Newfoundland.

3. The Most Ancient Domesticated Dog—*Canis palustris, seu verus.*

We may agree with Keller that, given then the Pomeranian, Pariah, Greyhound and Mastiff, it is not difficult to arrive at the modern breeds of European dogs. All four of these derive from Asia and chiefly from India. This may be correct but it is of value to enquire more carefully into the evidence.

The earliest evidence of domestication of the dog in Europe comes from the *Maglemosean* Danish kitchen-middens. The Danish *Magle-*

mosean corresponds with the *Azilian* and *Tardenoisian* of France. But since, according to MacCurdy, "the Azilians navigated the 8 kilometres (5 miles) of sea between the Island of Oronsay and the Scottish mainland" in their neolithic dugouts, it is quite apparent that the people of the kitchen-midden period were all open to extensive navigational contacts. That period may not be any older than (if as old as) the Neolithic Swiss lake-dwellings.

The Lake-dwellings, the Azilian sites and the Maglemosean kitchen-middens all owed their very similar dogs—now apparently introduced into Europe for the first time—to an external source as a result of the navigation then in progress. There is no evidence that any of these four "fundamental" types were evolved in Europe, on the contrary the evidence is all against such a view (with the single possible exception of the so-called Pomeranian, which is a close ally of the Eskimo breed.

The first fact that must be recalled in connection with all the domesticated animals (including dogs) which appeared in Europe during Early Neolithic period is that the maximum age that can be attributed to Neolithic deposits (vide Dawson *Age of the Gods*) in Europe is 5,000—4,000 B.C. The majority of them are far more recent—not more than 2,500—1,000 B.C. At the earliest time that can be attributed to Neolithic deposits in Europe the most flourishing and advanced seats of human enterprise were in the Fertile Crescent (*c.f.* Breasted *Ancient Times*) stretching from Mesopotamia through Palestine to the Nile Valley. In this prolific area man had already lost his nomadic habits and had by agricultural discoveries settled down to the beginnings of civilised community life. To what extent dogs had entered into that life in those remote times is indicated by the statement of M. Joly in *Man before Metals*:

> According to M. Toussaint the breeds represented on the most ancient monuments of Egypt are a greyhound with narrow ears, a mastiff, a poodle and a dog with hanging ears (see E. Toussaint *Etude sur l'origine du chien domestique.*)
>
> It is in Ancient Egypt that we find the earliest monumental records of the dog and other domestic animals. It is of the greatest interest that whereas the dog was regarded with abhorrence in other ancient countries, in Egypt it was venerated. In the Old Testament (whose Mesopotamian origin is recognised) the dog is an unclean beast, traffic in dogs was an abomination, and was forbidden as a sacrificial offering in the discharge of any vow. The Hindus "regard the dog as unclean and submit to various purifications if they accidentally come in contact with it, believing that every dog is animated by a wicked and malignant spirit condemned to do penance in that form for crimes committed in a previous state of existence. In every Mohammedan country the most scurrilous epithet bestowed on a European or a Christian is 'a dog' and that accounts for the fact that in the whole of the Jewish history there is not a single allusion to hunting with dogs."

In Egypt, on the contrary, there were two types of canine divinity Anubis and Ophios ("opener of the ways"). Anubis comprised two

beneficent gods of the necropolis, Ophios represented beneficent warlike divinities. They appear to symbolise the protective and offensive qualities exerted by the dog on man's behalf. Anubis was the servant, messenger and custodian of the gods. He was the principal god of the 17th-18th nones (or districts) and secondary god in the 13th and probably the 12th, but his cult was universal. He was the god of the dead, the cemetery and of all supplies for the dead and of embalming. In very early inscriptions the funerary prayers in the tombs are addressed to him almost exclusively, and he always took a leading place in them. He attends the balance in the weighing of the soul; he was the embalmer of Osiris; the attendant of the gods and the conductor of the dead. Figures of dogs appeared on the friezes of most of the temples. Herodotus says that the people of every family in which a dog died shaved themselves—their expression of mourning—an Egyptian custom even in his day. The overflowing of the Nile was heralded by the appearance of the star Sirius over the horizon. The people then removed their flocks to higher ground and abandoned the lower pastures to the fertilising inundation. They hailed the star as their guard and protector, called it the "dog-star" and worshipped it. In Ethiopia, not only was great veneration paid to the dog, but the inhabitants used to elect a dog as their king.

Elliot Smith in *The Evolution of the Dragon* has discussed the part played by the dog in ancient myths where he appears in various rôles of guardian and protector in birth as well as in death :—

> The divine dog Anubis is frequently represented in connection with the ritual of rebirth, where it is shown upon a standard in association with the placenta The hieroglyphic sign for the Egyptian word *mes*, "to give birth," consists of the skins of three dogs (or jackals, or foxes). The three-headed dog Cerberus that guarded the portal of Hades may possibly be a distorted survival of this symbolism of the three-fold dog-skin as the graphic sign for the act of emergence from the portal of birth ..... Rohde regards Charon as the second Cerberus, corresponding to the Egyptian dog-faced god Anubis .....
>
> What seems to link all these fantastic beliefs and customs with the story of the dog and mandrake is the fact that they are closely bound up with the conception of the dog as the guardian of hidden treasure .....
>
> At one time I imagined that the role of Anubis as a god of embalming and the restorer of the dead was merely an ingenious device on the part of the early Egyptians to console themselves for the depredations of jackals in their cemeteries. For if the jackal were converted into a life-giving god it would be a comforting thought to believe that the dead man, even though devoured, was 'in the bosom of his god' and thereby had attained a rebirth in the hereafter. In Ancient Persia, corpses were thrown to the dogs to devour ..... It has been claimed by some writers that, just as the jackal was regarded as a symbol of rebirth in Egypt and the dead were exposed for dogs to devour in Persia, so the vulture's corpse-devouring habits may have been primarily responsible for suggesting its identification with the Great Mother and for the motive behind the Indian practice of leaving the corpses of the dead for the vultures to dispose of. It is not uncommon to find, even in English cathedrals, recumbent statues of

bishops with dogs as footstools ..... The belief in the dog's service as a guide to the dead ranges from Western Europe to Peru.

The Egyptians seem to have been the first to domesticate the dog. Certainly amongst them we find recorded in their religious conceptions and ritual such an attitude as we might anticipate in the people amongst whom the sterling qualities of the dog were first recognised and prized. Their beliefs concerning the dog are a straightforward formulation of early man's reliance in life and death on the dog. The Egyptians were the most ancient to express those ideas and have the clearest claims to being regarded as the people who first recognised fully the real value of the dog and were the donors of the first dogs to mankind. The jackal-like dogs of the kitchen-middens, the Peat-Pomeranian or "Spitzhund," the *Canis familiaris palustris*, the common dog of Egypt and the first domesticated dogs of Europe, were the offspring of the jackal-like dogs of the Egyptian hieroglyphics. They were domesticated in Egypt very early and were used in the chase in the archaic or Pre-dynastic Period when weapons were restricted to bows and arrows, javelins, boomerangs, lasses, clubs and an occasional axe of copper as portrayed in the hunting scene of the cosmetic palete of that period (Obermaier). From Egypt they seem to have been dispersed along the Southern and Western coasts of Europe as far as Denmark while Europe was in a relatively pure "stone-age" condition and Egypt was not much better off. These (Eskimo-like) small, jackal-like dogs (the Egyptian poodles of M. Toussaint) were the first gift of domesticated animals given to the Stone-age barbarians of Europe by stone-age navigators from Egypt. This conclusion (which is at present hypothetical and is based on the evidence firstly of the hieroglyphics and secondly of the abrupt appearance of the dog as the only domesticated animal in the Maglemosean culture) will be confirmed or disproved when anatomical comparisons, that are greatly needed, are made between the kitchen-midden dogs and those of most ancient Egypt. It will probably then be shown that the *canis verus* (postulated by van Giffen) is the prototype of the two hieroglyphics.

Eastman writing on "Hunting dogs of the ancients" in *The American Museum Journal* (1916) says :

> That the origin of the Spitz is to be sought in the domesticated jackal admits of scarcely any doubt.. ..... As noted by Keller ' when our domestic spitz with lowered brush, and half-turned head, warily holds aloof from strangers of human kind ' he manifests the hereditary instincts of the jackal and even his whine and yelp are not dissimilar. Hilzheimer regards it as certain that several varieties of the North African jackal (subgenus *Thos* of Oken) were domesticated by the Ancient Egyptians. ..... Among the favourite varieties of spitz in antiquity were the Maltese and Etruscan strains and innumerable paintings of these appear in Greek ceramic art from the 5th century B.C. onward. As a household pet and lap dog, the Spitz was highly prized.

Given the domestication of the jackal dog (Pomeranian or Spitz) type in Egypt, it is clear that Europe received its first dog-population

from this source in Maglemosean (or even earlier) times and has continued to draw from that source for her jackal derivative types such as the poodles, spaniels, and the like. But the significance of this systematic Egyptian domestication must be far greater than the supplying of these varied dogs to Europe. Since the Eskimos received practically all of their material and cultural equipment from Magdalenian sources (*vide* Sollas *Ancient Hunters*) it seems hardly likely that they developed dog domestication on their own initiative. There is the closest relationship between Eskimo dogs and kitchen-midden dogs. The Maglemosean kitchen-midden culture is a degenerated form of Magdalenian culture. If the Ancient Europeans owed their dogs to external civilised (Egyptian) sources it is too much to believe that the Eskimos domesticated dogs on their own account. They must have secured them from the kitchen-midden people in Western Europe or through Asia.

It is also interesting *a propos* the question of the probable external source of Iberian pre-historic art that the original jackal-like type was slinking about man's haunts or following him when hunting in those days. "The drawings found at Alpera in Spain," says Scott Elliot (*loc. cit.*) "show, according to M. Breuil, that this was the case. Indeed, one drawing represents, according to him, a hunter encouraging his dog to follow the trail (*L'Anthropologie* 1912)."

By virtue of his accompanying man on land and sea the problem of isolating the original dog stocks is as difficult as that of isolating the ancestral stocks and sources of living human races. With the dog it is even more difficult than with man because of the ease with which the domesticated dog intermingled with any jackal or wolf stock he found indigenous to his new home and because of his capacity, even superior to that of man, for finding a living in a new environment, and by motility and fecundity, for rapidly spreading over his new geographical habitat.

(To be continued).

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On Fowl Cholera in South Africa.

By M. W. HENNING, M.R.C.V.S., and J. D. W. A. COLES, B.V.Sc., Onderstepoort.

The object of this short paper is to record the available information about the occurrence of fowl cholera in South Africa. The authors are indebted to Spreull for most of the historical information given. In November 1909, he investigated a rapidly fatal disease in fowls at Umzimkulu; after considering the symptoms and lesions presented by the affected birds he made a microscopical examination of the blood and diagnosed fowl cholera. Thorough disinfection of the affected premises could not be carried out and the scourge spread rapidly to several other fowl runs in the vicinity, attacking even his own poultry. In September 1910, and August 1911, Spreull again encountered the disease in Umzimkulu. In May 1910, Spreull and R. P. Jones diagnosed an acute form of the illness in fowls at Sea View, Elliotdale District. In June 1926, Spreull recognised the malady in fowls sent from Vredenburg, Malmesbury District. This outbreak was so virulent that it decimated the fowls of the village; the source of the infection could not be traced and the disease disappeared as mysteriously as it had come. In 1915 Curson studied an outbreak of the scourge in Capetown.

In December, 1932, Canham investigated an outbreak of a fatal disease among ducks at Colenso. The most important symptom shown was a greenish, watery diarrhoea and the most common lesions were pericarditis and tumor hepatis with several necrotic foci as large as a pin-head. About eighty chicks from two to six weeks old succumbed to the malady, but according to the owner several of the in-contact ducks never developed obvious symptoms. Blood cultures made from an affected bird were studied by the authors. These contained a pure growth of an organism which showed the following characteristics:—

Morphology.

A small ovoid bacterium about 0.25 μ broad and 1 to 1.5 μ long, markedly pleomorphic in culture. In blood and organ smears it is distinctly bipolar, especially when stained with Giemsa. It is non-motile and Gram-negative.

Cultural characteristics.

On *ordinary agar* growth is very slow; after 24 hours there are small round colonies 0.5 to 1 mm. in diameter, low, convex, and translucent with a smooth glistening surface. After a few days' incubation the colonies become confluent.

In *ordinary broth* there is a moderate growth with slight turbidity of the medium after 24 hours. If the culture is incubated for a few days a slight, powdery, flaky deposit is seen on shaking the fluid. Later more deposit is formed and a white filamentous pellicle appears on the surface of the broth.

On *blood-agar* the growth is much better than on ordinary agar but there is no haemolysis. In 24 hours the colonies are from 1 to 2 mm. in diameter. After about a week the centre of isolated colonies is depressed, while the periphery is raised and ring-like.

On *serum agar* the growth is similar to that on blood-agar.

On *liver agar* there is a fair growth and the colonies turn brown after a few days.

On *potato slant* there is a very poor growth after a week.

In a *gelatin stab* there is no liquefaction.

Biochemical characteristics.

Acid but no gas in glucose, mannite, saccharose, and maltose.

Methylene blue reductase : positive.
Catalase : positive.
Indol : positive.
Nitrate reduction : positive.
Litmus milk : no reaction.
Methylene red : negative.
Ammonia : negative.
Hydrogen sulphide : negative
Voges Proskauer : negative.

Pathogenicity.

Experiment I. Two ducks, *a* and *b*, were inoculated intramascularly with a 24 hours old bouillon culture of the bacterium, duck *a* receiving 5 cc. and duck *b* 2 cc.

Result. Duck *a* was dead after 24 hours, showing catarrhal enteritis and subepicardial petechiae. Blood smears contained numerous small bipolar organisms.

Duck *b* died 5 days after infection and showed slight catarrh of the intestines, nephritis, fibrinous pericarditis, and fibrinous peritonitis; the liver contained yellowish, necrotic foci up to 2 mm. in diameter and the spleen was about three times its normal size. Blood smears made after death showed only a few bipolar organisms.

Ordinary bouillon, blood-agar, serum-agar, and liver-agar seeded with heart blood from the ducks showed a pure growth of the bipolar organism.

Experiment 2. Two ducklings, *c* and *d*, were each dosed with about 2 cc. of the intestinal contents from duck *b* after keeping in the ice-chest for 3 days.

Result. Duckling *c* died two days later showing fibrinous pericarditis, slight pneumonia of one lung with aerocystitis of the adjacent abdominal air-sac, slight catarrh of the intestine, slight tumor splenis, and small, yellowish, necrotic foci in the liver. A pure culture of the bacterium was obtained from the heart blood.

Experiment 3. Two white mice were inoculated subcutaneously with a 24 hours old broth culture of the organism, the one receiving 0.5 cc. and the other 1 cc.

Result. Both mice died within 24 hours after the injection.

Experiment 4. Rabbits *a* and *b* were inoculated intraperitoneally with a 24 hours old broth culture, *a* receiving 4 cc. and *b* 2 cc.

Result. Both rabbits died within 24 hours showing a fibrinous peritonitis and degeneration of the liver. The blood swarmed with bipolar organisms. A pure growth of the bacterium was obtained in media seeded with heart blood.

Experiment 5. Chickens *a*, *b*, *c*, *d*, and *e* each received subcutaneously about 1 cc. of the infected blood from rabbits *a* and *b*.

Result. Chickens *a* and *b* were dead after 24 hours, showing a fibrinous peritonitis and slight degeneration of the liver. The blood of chicken *a* was swarming with bipolars while the blood of the other chicken contained very few. A pure growth of the organism was obtained in culture media seeded with blood from either chicken.

Chickens *c* and *d* died after 48 hours showing slight intestinal catarrh, slight tumor splenis, a fibrinous peritonitis, and an enlarged liver with small, yellowish, necrotic foci. In both cases blood smears revealed numerous bipolars and culture media seeded with heart blood yielded a pure growth of the organism.

Experiment 6. Chickens *f* and *g* were each inoculated with about 2 cc. of a 24 hours old broth culture of the organism isolated from the blood of duck *a*.

Result. After 5 days chicken *f* was lying down and could not stand up properly. The hock joints on examination were found to be hot and swollen. The bird was slaughtered and media seeded with synovia from the affected joints yielded a pure culture of the organism; smears made from the synovia showed a few typical bacteria. Apart from the arthritis no other visible alterations could be seen.

Chicken *g* showed a slight arthritis but made an apparent recovery.

Proved strains of *Pasteurella aviseptica* were not available so that serological tests could not be carried out.

Summary and Conclusions.

An organism isolated from a fatal disease in ducks at Colenso has been studied. It was found to be pathogenic for ducks, rabbits, white mice, and fowls. Morphologically, culturally, and biochemically it is indistinguishable from *Pasteurella aviseptica* (*avicida*) and the disease produced by it resembles fowl cholera.

There is evidence that an acute disease in fowls claimed to be fowl cholera has existed in different parts of South Africa during the last 23 years; that fowl cholera apparently exists in this country has been shown by the authors. The source of the infection could not be traced in any of the reported outbreaks and in each case the disease disappeared as mysteriously as it had come. It is not possible to explain why the scourge never assumes the same proportions as a disease like fowl typhoid.

Note.

One of us (J.C.) has had an opportunity of studying some cases of wattle oedema at Pietermaritzburg without making any cultural tests, but cultural examinations were made by other workers in the same laboratory with negative results. In England Warrack and Dalling claim to have obtained *Pasteurella aviseptica* in about 50 per cent. of the cases of wattle oedema studied by them, but not in the rest, while van Heelsbergen in Holland was unable to get any growth. How far wattle oedema and fowl cholera as they occur in this country are related to one another is a matter that requires elucidation.

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A General Survey of the Veterinary Act, 1933. (Continued).

By C. P. BRESLER, M.A., LL.B., Pretoria.

We now come to the provisions dealing with removal of names from, and restoration to, the register. These are embodied in *section* 13 and read as follows :—

13. (1) On the recommendation of the Veterinary Board the Minister may cause to be erased from the register referred to in section *seven* the name of any person who—

(a) has failed, within a period of three months from the date of an enquiry sent by the registrar by registered letter to the address appearing on the register in respect of him, to notify to the registrar his present address; or

(b) has requested that his name be removed from the register, in which case such person may be required to lodge an affidavit that no disciplinary or criminal proceedings under this Act are being or are likely to be taken against him.

(2) On the recommendation of the Veterinary Board the Minister may cause to be erased from the said register the name of any person whose name, before or after the commencement of this Act, has been removed from the roll, register or record of any university, college, society or other body from which that person received the degree, diploma or certificate in respect of the holding whereof he was registered and any registration certificate issued to such person shall be deemed to be cancelled as from the date of such erasure.

(3) No person whose name has been erased in accordance with this section shall be deemed to be registered unless and until, on application being made by him to the registrar, his name has been restored to the register by the Minister on the recommendation of the Veterinary Board, on payment of a fee of five pounds.

Now with regard to 13 (1) and 13 (1) (a) it may be pointed out that in England it is the Council that has the power to remove the name of any member who has ceased to practise or who has neglected to notify a change of address and is untraceable. Moreover for the purpose of exercising the power of removing a name from or restoring a name to the register it is provided by section 8 (i) of the Act of 1881 that the Council shall ascertain the facts by a committee with a quorum of three, and that the report of the committee, after hearing the person concerned if he so desire, shall be . . . conclusive as to the facts, but so that the Council shall form their own judgment on the case independently of any opinion of the committee. By Bye-law No. 50 the Council has delegated this duty to a committee which consists of all the members of the Council and no action can be taken for removing or restoring a name except by a special resolution. To the same committee is delegated the work of investigating cases falling under sections 16 and 17 of the Act. Bye-law 52 provides that at the hearing of any inquiry by the committee or an application for the removal of

a name from the register under section 6 of the Act the person against whom the complaint is made may appear in person or by his counsel or solicitor, and that nothing in the bye-laws shall be taken to prevent the committee from proceeding in the absence of either the party complaining or the party complained of, though not represented, it having regard to all the circumstances of the case they are of the opinion that such absence is immaterial or the result of gross negligence or of an intention to avoid or delay proceedings. The enquiry may, at the election of the accused, be held in public on ten days' notice being given to the secretary.

By section 8 (2) of the same Act a person whose name has been removed from the register or whose name the Council has refused to restore thereto has the right to appeal to the *Privy Council* and the *Privy Council* after communication with the Council of the Royal College and the Appellant may either dismiss the appeal or order the Council not to remove the name of the appellant or restore his name as the case may require. (See Bullock: *Law Relating to Medical, Dental and Veterinary Practice*). I have given the English procedure at some length because it will be instructive to compare it with the relevant provisions, if any, in the South African Act. It will at once be apparent that in South Africa the Act does not allow of an Appeal, but it will be advisable to traverse the whole matter in due course. I may here state that the power given to the Council in England to remove the names of members from the Register is defined and limited. The power may be exercised in respect of any person who is on the Register but in the following cases only:—

(a) At the request or with the consent of the person whose name is to be removed;

(b) where the name has been incorrectly entered or has been fraudulently entered or procured to be entered;

(c) where a person registered has been convicted of a misdemeanour or higher offence;

(d) where a person registered is shown to have been guilty of any conduct disgraceful to him in a professional respect.

In this regard it is interesting to note the South African provision, *section* 13 (2), which is very wide indeed, penalising even retrospectively a person in respect of removal of his name from the roll, register or record of any university, college or society to which he owes the degree, diploma or certificate whereunder he was registered. This provision is wider than the English provision (d) just quoted, but bears some analogy to it. *Section* 13 (3) is I feel rather more involved than it appears, because of the effect to be given to erasure. In England the disabilities resulting from erasure differ in the three professions of medicine, dentistry, and veterinary science. There a veterinary sur-

geon whose name has been erased may still practise if he avoids the use of a prohibited title, and in this respect being, like the doctor, no longer under discipline, he may extend his practice by unprofessional means. What would the position be in South Africa in similar circumstances and what procedure must be followed in order to be reinstated? *Section* 16 seems to be in point :—

16. No person shall be entitled to recover any charge in any court of law for any veterinary advice or attendance unless he is registered under this Act as a veterinarian or under the Medical, Dental and Pharmacy Act, 1928, as a medical practitioner.

It will be noticed that the section only deals with the recovery of charges *in any court of law* and may thus be susceptible of the interpretation that a veterinary surgeon whose name has been erased may practise and receive money from those who are prepared to pay without demur. Such veterinary surgeon, however, is precluded by *section* 17 from setting up practice and so forth, but one knows from experience that such provisions are frequently broken. In the result the position will in most cases resolve itself into one of prosecution criminally as recovery being specifically excluded by statute cannot be resorted to in a court and will not be resorted to *extra legem* where the client shows signs of repudiating. In any event, the provisions of the Act have been made as effectively as possible, and attempts at evasion, if successful, will have to be dealt with by legislation. The provisions as to restoration are brief enough but fail to indicate the procedure to be followed. In England the practice followed is that the applicant must submit a statutory declaration on a prescribed form declaring his identity with the member whose name has been removed, giving the date and cause of removal, together with a statement of the grounds of his application. This must be attested by a third party certifying to the identity of the applicant and his good character. The declaration must be signed by a commissioner for oaths or justice of the peace. The application is then considered by the Registration Committee of the Council which makes a report and recommendation. The Council considers the report and if a resolution is passed at a meeting when two-thirds of the members are present and with a majority of at least three-fourths of the members so present the Registrar is instructed to restore the name to the Register. I don't know to what extent Regulations have been considered in South Africa on the point, but if nothing has been done yet the English procedure may be studied with great advantage.

(To be continued).

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The Outbreak of Foot and Mouth Disease at Germiston.

By E. M. ROBINSON, Sub-Director of Veterinary Services, Onderstepoort.

In view of the outbreaks of Foot and Mouth disease in the Koedoesrand area of the Transvaal, close to the Bechuanaland border, and the numerous cases of the so-called pseudo-Foot and Mouth disease which have been diagnosed in the Transvaal and Orange Free State in recent months, a description of the outbreak of Foot and Mouth disease which occurred at Germiston in February of this year will be of interest.

In the present article it is proposed to describe only the cases amongst the cattle on the farm where the disease occurred and the subsequent confirmation of the diagnosis by the inoculation of guinea pigs.

The discovery of the outbreak was due to the fact that owing to the disease having been diagnosed in Union Territory in proximity to outbreaks in Bechuanaland, the Veterinary Officers in the Union were very much on the alert and all cases of disease in cattle with lesions in any way resembling those of Foot and Mouth were very carefully examined.

On February 11th, Mr. W. P. Hamlyn, Government Veterinary Officer for the Witwatersrand area, was called to inspect some cattle on the farm Rooikop, Natal Spruit, close to Germiston. On account of the very suspicious symptoms shown by the cattle, he asked for a further opinion. The writer accompanied by Mr. P. S. Snyman, Research Officer at Onderstepoort, visited the farm with Mr. Hamlyn the same afternoon.

The history of the outbreak is roughly as follows: The affected cattle were running in a camp on one side of a road which runs through the farm from the Johannesburg-Vereeniging main road. This road was much used by neighbouring farmers to get to the main road. In the camp in question there were 58 cattle, mainly oxen, some of which had been used the previous week to cart hay to Germiston. On 8th February, the owner noticed that some of the cattle in the camp were tender on their feet and salivating. On opening their mouths he noticed ulcerations on the gums. He treated a few of the cases by rubbing salt into their mouths but did not consider it necessary to report them, as in past years he had had cattle with sore feet acquired from walking in water which came from a supply contaminated by chemicals, probably sulphates, from the mines. The cattle had had access to such water earlier in the week, but as other cattle had drunk from the furrow

higher up and not developed lesions, the owner was not inclined to incriminate the water. No digestive disturbances were noticed in the cattle such as might have been attributed to the drinking of corrosive chemicals.

On the day of our first visit there were 22 cattle showing symptoms. All of these animals were tender on their feet, some were lying down, and the majority were salivating profusely. About 10 cases were picked out and pulled down in order that a careful examination might be made.

The lesions in the mouths of these animals were very extensive and were present on the tongue, the mucous membrane of the inside of the upper and lower lips, the gums, and the hard palate. They took the form of granulating surfaces of varying size, covered by a layer of greenish yellow necrotic material. In some cases the mucous membrane of the tip of the tongue came away, leaving a granulating surface The lesions were fairly localised, but in some of the cases the gums above the dental pad were ulcerated right across, showing ragged greenish yellow necrotic material at the edges. Some of the lesions were simply irregular granulating surfaces from about the size of a threepenny bit up to that of a shilling. The lesions on the tongues varied from small ulcers covered with necrotic mucous membrane to large granulating areas involving the whole of the tip of the tongue.

The lesions on the feet were seen in all four legs and were in the form of raw granulating surfaces in the interdigital spaces. The coronets were swollen and hot but did not show actual ulceration. In one case there were vesicles between the claws of both fore feet. These vesicles burst while being examined and discharged a clear watery fluid.

Several of the affected cattle showed temperatures between 105 and 107°F, but as the weather was very hot this may not have been of significance.

Owing to the very suspicious nature of the lesions and the number of cattle affected, the writer asked the Director of Veterinary Services to make a personal inspection. This he did on the following day, accompanied by Dr. de Kock, Messrs. Melck, Snyman, Hamlyn, and the writer. A further six cases had occurred in the interval and a careful inspection was made of the majority of the affected animals.

Owing to the severe nature of the lesions, there was a certain amount of doubt expressed as to whether the lesions were definitely those of Foot and Mouth disease. Keppel and the writer had seen cases of a somewhat similar type in May 1932, amongst cattle in the eastern portion of the Orange Free State bordering on Basutoland, but in those cases the foot lesions were either absent or not well marked.

On account of the danger involved in taking material away from the farm for diagnostic purposes, this was not done, but in view of the necessity for a definite diagnosis, it was decided to carry out inoculation experiments with guinea pigs on the affected farm.

On 14th February the writer again visited the farm in order to undertake the experimental inoculations. The affected cattle were again examined to see if fresh cases could be found giving material suitable for inoculation. A number of fresh cases were seen showing lesions similar to those seen three days previously. In one case there was an unruptured vesicle on the gum in front of the dental pad in the upper jaw. The fluid, which was slightly blood-stained, was withdrawn with a syringe and needle. In another case material was obtained from necrotic lesions on the dental pad. Blood was taken from both these animals which were showing temperatures between 105 and 107°F.

The experimental guinea pigs and two pigs were placed in an old disused house on the farm, which proved very satisfactory as a temporary laboratory.

Twelve guinea pigs were inoculated with material from the suspected cases and in addition two pigs brought from Onderstepoort and an apparently healthy calf purchased from the owner of the farm. Owing to the necessity for making a definite diagnosis as quickly as possible, some of the guinea pigs were inoculated in more than one way.

The scheme of inoculation of the guinea pigs was as follows :—

14.2.33.

Guinea pig 1. Vesicle material intradermally into both hind pads and intramuscularly.

Guinea pig 2. Vesicle material diluted 1 :10 with normal saline intradermally into both hind pads and intramuscularly.

Guinea pig 3. Vesicle material diluted 1 :10 into both hind pads intradermally.

Guinea pig 4. As No. 3.

Guinea pig 5. Emulsion of necrotic material from lesions into both hind pads intradermally.

Guinea pig 6. As No. 5.

Guinea pig 7. Emulsion of necrotic material intradermally into both hind pads and intramuscularly.

Guinea pig 8. As No. 7.

Guinea pig 9. Blood intramuscularly and intradermally into both hind pads.

Guinea pig 10. As No. 9.

Guinea pig 11. Blood intradermally into both hind pads.

Guinea pig 12. As No. 11.

The two pigs were each given 5 cc. of blood intramuscularly and a 2 cc. dose was injected up each nostril. The calf was given 10 cc. of blood intramuscularly and 5 cc. up each nostril.

On the 16th February, two days after inoculation, the animals were examined. Some of the guinea pigs were showing swelling of the pads and Nos. 1, 3, and 6 were showing definite vesicle formation on the hind portion of both pads. In Nos. 2, 4, 5, 7, and 8 vesicles were apparently forming in the pads. Those done with blood did not show lesions. Where vesicles were formed the pad was swollen and pale, and fluid could be seen to be present.

About 0.1 cc. of a clear fluid was withdrawn with a syringe and a fine needle from a vesicle on the pad of guinea pig No. 3 and two fresh guinea pigs were inoculated intradermally into both hind pads.

The guinea pigs were all re-examined on 17th February and Nos. 1 to 8 all showed definite vesicle formation in both hind pads. The vesicles obviously contained a clear fluid which tended to collect near the space between the pad and the claws. In all these cases the front paws showed a definite puffiness and hyperaemia on the pads, but no actual vesicle formation.

A final examination was made of the guinea pigs on 19th February, 5 days after inoculation. Vesicle formation was commencing in the hind pads of the guinea pigs done from guinea pig No. 3. In the majority of the first lot inoculated, the fluid in the vesicles had turned a yellowish white colour and in two of them some of the vesicles had burst leaving a raw granulating surface.

In three of the guinea pigs there was definite vesicle formation in the pads of the fore feet showing that generalization of the virus had occurred.

In guinea pigs 9 and 10, inoculated with blood intramuscularly and into the pads, vesicles were seen to be forming.

Up to this date neither the pigs nor the calf had shown any lesions of Foot and Mouth disease. One of the pigs showed marked muscular stiffness subsequent to the inoculation, but this was apparently not due to Foot and Mouth disease. The calf remained healthy up to the date of its slaughter a week later.

When it was realised that the condition was quite definitely Foot and Mouth disease, the guinea pigs and pigs were immediately killed and buried, and no further experimental work could be undertaken.

Owing to the energetic campaign undertaken by the Department to eradicate the disease and prevent its spread, no further outbreaks of the disease have occurred in the neighbourhood to date.

Summary.

An outbreak of Foot and Mouth disease occurred on a farm near Germiston in February of this year. The identity of the disease was confirmed by inoculation of guinea pigs which developed the classical lesions due to this infection.

Acknowledgment.

Mr. D. A. Lawrence, Acting Director of Veterinary Research, Southern Rhodesia, gave me valuable help in the interpretation of the reactions in the guinea pigs, of which he had had considerable experience during the outbreak of Foot and Mouth disease in that country.

Reference.

KEPPEL, J. J. G., & ROBINSON, E. M. (1932). *Jl. S.A.V.M.A.* III (4): 176-7. An outbreak of ulcerative stomatitis in cattle.

In the treatment of canine distemper, no matter how slight the attack, I never fail to apply an antiphlogistine jacket, renewing it daily for several days until I am certain that pneumonia has been avoided. Even in cases where pneumonia has developed, I find the application of an antiphlogistine jacket most effective; the dyspnoea is reduced, the pain relieved the absorption of the exudates encouraged.

Besides the efficacy of this measure, I believe that it makes a good impression on the owner, assuring him that everything is being done to bring about recovery of the patient. Before applying the poultice the hair, of course, is clipped quite short.

W. D. HOWATT, D.V.M.,
Mamaroneck, New York.

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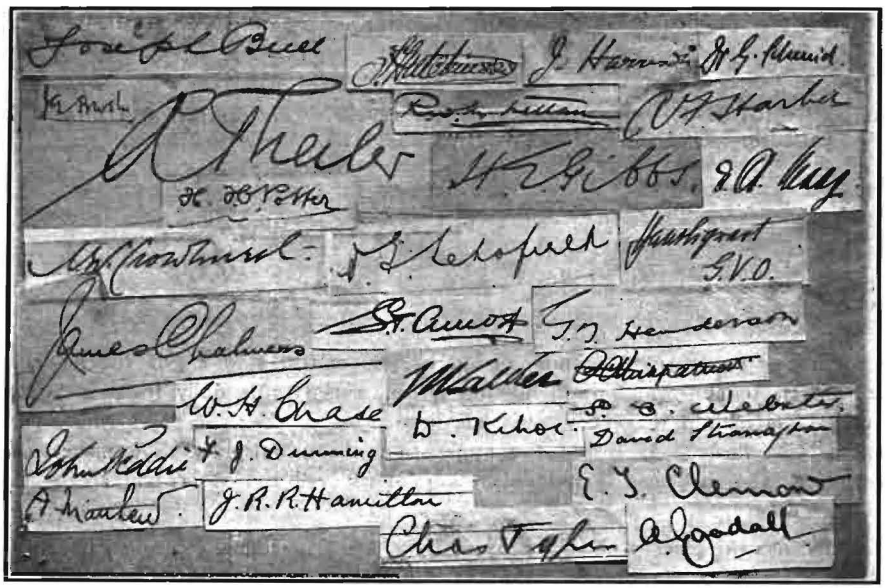
The Veterinary Profession in South Africa:
7. Autographs of Veterinary Interest.

By H. H. CURSON, F.R.C.V.S., Dr. Med. Vet., Onderstepoort.

The accompanying photographs show the autographs of 85 veterinarians, 2 medical men and 1 lay assistant. Most were collected from papers of no particular value, but the signatures themselves are interesting, especially those of pioneers such as Livingstone, Wiltshire, Hutcheon, and Sir Frederick Smith. Of the veterinarians only four have graduated subsequent to Union (31st May, 1910).

The names in italics are non-veterinarians. The abbreviation "Jl." stands for *Journal of the South African Veterinary Medical Association.* Other details are given below as follows :—



Name	Qualified	Died.
Amos, S. T. A.	London 1897 : Fellow 1909	
Appleton, A. F.	N.Ed. 1881	
Borthwick, J. D.	N.Ed. 1888	
Brogan, E. H.	London 1908	1931
Buck, J.	N.Ed. 1895	
Bush, J. G.	London 1902	
Carless, F. J.	London 1890	
Chalmers, J.	London 1900	
Clemow, E. T.	London 1904	

Name	Qualified	Died.
Collyer, J. B.	London 1897	
Conacher, P.	Edin. 1889	
Chase, W. H.	London 1901: Fellow 1907	
Crowhurst, J. W.	London 1887: Fellow 1893	
Cunningham, M.	Dub. 1911	
Dixon, R. W.	London 1886	
Duck, Francis (Sir)	London 1867: Fellow 1891	
Dunning, F. J.	N.Ed. 1901: Fellow 1911	
Dykins, W. A.	L'pool 1910	
Edington, A. (Dr.)	First Veterinary Laboratory Worker in South Africa (1891-1905)	1928
England, A.	Lond. 1891	
Ferguson, J. D.	Dub. 1908	
Fern, E.	N.Ed. 1891	

Forrest, J.	Edin. 1900	
Gavin, F. C.	London 1889	
Garraway, R. S.	Edin. 1899	
Gentle, A. H.	Edin. 1880	
Gibbs, H. E.	Lond. 1902	
Goodall, A.	Lond. 1902. Fellow 1921	1930 (Jl. I (4) p. 116)
Grist, A. G.	Lond. 1892	
Goulé, A.	Lond. 1871	1918
Gray, C. E.	Edin. 1890	
Harber, A. F.	Lond. 1897	
Hamilton, J. R. R.	N.Ed. 1894	
Harrison, J.	Lond. 1901	
Henderson, G. T.	L'pool 1907	

Name	Qualified	Died.
Henning, O.	Stuttgart 1887	
Hodder, A.	Edin. 1898	
Huston, P. D.	Dub. 1914	
Hutchinson, F.	N.Ed. 1889	
Hutcheon, D.	Edin. 1871	1907
Irvine-Smith, J.	Glas. 1898	
Johnston, S. I.	Edin. 1895	1929 (Jl. I (3) p. 87)
Jowett, W.	N.Ed. 1898: Fellow 1905	
Joyce, J. F.	Edin. 1899	1926
Kehoe, D.	Dub. 1909	1928 (Jl. I (2) p. 98)

Kellett, E. B.	N. Ed. 1889	1932 (Jl. III (4) p. 175)
King, B. L.	Dub. 1908	
Kirkpatrick, A. C.	Dub. 1910	
Lee, G. W.	Edin. 1893	
*Livingston, A. (Dr.)	His writings include references to Nagana, Horse Sickness, Anthrax and Rabies	1873
Maag, A.	Stuttgart, 1908: Doctorate 1911	1933
Matthew, A.	Edin. 1908	

*Autograph obtained from a letter addressed to J. A. Blair (the author's Grandfather) who was associated with the great explorer along the R. Zambesi in 1862.

Name	Qualified	Died.
McNeil, J.	Glas. 1896	
Mettam, R. W. M.	Dub. 1917	
McKie, W.	Glas. 1887	
Mitchell, D. T.	Dub. 1908	
Montgomery, R. E.	Edin. 1903	1932 (Jl. III (3) p. 147)
Moore, J.	N Edin. 1885: Fellow 1890	
Nuthall, C. E.	Lond. 1883	
Paine, R.	Lond. 1901: Fellow 1907	
Peddie, J.	Edin. 1893	1932 (Jl. III (3) p. 148)
Pilkington, J. K.	Lond. 1881	
Potter, H. H.	Assistant to Dr. Edington (1895) and Mr. Watkins Pitchford (1898)	
Power, W. M.	Lond. 1896	
Raymond, R. W.	Lond. 1883	
Revington, T. le B.	Dub. 1911	1928 (Jl. I (2) p. 98)
Robertson, W.	Lond. 1893	1918
Rowe, R.	Lond. 1869	1930
Schofield, W. E.	Lond. 1901	
Schmid, G.	Berlin 1905: Doctorate 1909	
Sharpe, C. M.	Lond. 1899	
Sigwart, H.	Stuttgart 1908: Doctorate 1911	
Sinclair, J. M.	Edin. 1895	
Skues, F. M.	Edin. 1897	1921
Smith, Frederick (Sir)	Lond. 1876: Fellow 1893	1929 (Jl. I (3) p. 83)
Spreull, J.	N.Edin. 1895: Fellow 1908	
Stranaghan, D.	Edin. 1890	1931 (Jl. III (1) p. 52)
Tate, J. M.	Lond. 1899	
Theiler, Arnold (Sir)	Switzerland 1889: Doctorate 1901	
Thurston, J. F.	Lond. 1897	
Tyler, C.	Lond. 1900 (one signature is in pencil, the second in ink)	
Verney, F. A.	Lond. 1896: Fellow 1905	
Walker, J.	Edin. 1896	
Walters, W. B.	Lond. 1860: Fellow 1883	1929
Webster, G. C.	Edin. 1908	
Wiltshire, S.	Lond. 1872	1923
Watkins-Pitchford, H.	Lond. 1889: Fellow 1894	
Wadlow, C. H.	N.Ed. 1903	

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Feeding for Egg Production.

By E. VAN MANEN, M.Sc., Agric., Onderstepoort.

In a former article in this journal evidence was presented to show that young chicks require a relatively large amount of protein during the first 8 to 10 weeks of life. For this period the amount of protein which will produce maximum growth lies in the neighbourhood of 20 per cent. During the developing period, i.e. from 10 weeks to maturity, chicks require less protein, and experiments indicate the requirements to be in the neighbourhood of 15 per cent.

In this article the author is concerned only with feeds in regard to the production of eggs.

Young maturing pullets should be placed in their respective laying houses when about four to four-and-a-half months old and this will give them the opportunity of becoming accustomed to their quarters and attendant so that they will settle down quietly before the onset of laying.

It is wise not to place the pullets on the laying ration too early. Their development should be carefully watched and when the owner is satisfied that they conform to all his expectations as regards growth and maturity, he may change to the laying ration.

It should be the object of every poultryman to obtain uniformity in his laying birds—uniformity especially in regard to development and maturity. So many poultrymen are influenced only by the age of the bird. Let the age only be considered in determining whether the pullets are responding in development. A system of segregation should be practised whereby backward pullets are removed from their more forward sisters and placed back from pen to pen. Birds which if left among the more advanced pullets would be prospective culls will under such management be quite in place among individuals of their own calibre. The ideal to aim at is one where all the birds in one house come on to lay at approximately the same time. Careful management on the part of the poultryman at the commencement of laying will result in more uniform production, a better average production per pen, than would be the case where segregation was not practised, and greater satisfaction in observing the results of such management.

Having had the young pullets on a reduced protein ration during the period preceding laying, it now becomes necessary to exercise a little care in changing to the laying ration. If a procedure has been followed where both the mash and the grain have been hopper fed, allowing the

pullets to eat more grain than mash, thus decreasing the amount of protein without necessarily reducing its proportion in the mash, the change may be accomplished by stirring into the mash quantities of the laying mash on a 50-50 basis, allowing a period of a fortnight to three weeks for the change. The hopper fed grain may also thus be reduced allowing the birds to consume a greater quantity of mash.

The pullets are thus brought on to the laying mash at the time laying commences, and with reasonable care they should continue to lay without being influenced by an out-of-season moult. The provision of sufficient nests and adequate feeding and drinking space will help a great deal towards the comfort and contentment of the pullets at this initial stage of laying.

A properly built-up mash must be kept before the birds all the time. The old idea of closing up the mash hoppers for a portion of the day is false economy. Laying birds will not eat too much, neither can they overeat on a balanced ration. Grain must be fed sparingly at all times; the amount necessary will depend partly on the season of the year and partly on the rate at which the birds are producing. Pullets producing at the rate of only 40 per cent. production will require much less grain than those laying 70 per cent. If the ration is balanced for equal parts of mash and of grain then an effort should be made to maintain this proportion as nearly as possible. The amounts of mash eaten can be regulated by the amounts of grain fed. A daily supply of grain is weighed out and fed; the amount of mash consumed for a similar period is computed from successive weighings of the mash supplied. By simple adjustment of the grain supply the proper proportion of grain to mash can now be maintained. As production advances the hens will eat more mash and thus may the grain be increased correspondingly.

In addition to a balanced ration of mash and grain, the hens will require a constant supply of oyster shell grit and an abundance of green food.

The Balanced Ration.

For high and continued egg production hens must be fed a well balanced ration. Besides being balanced as regards the different nutrients, the ration must also be balanced in mineral material and vitamin requirements. It has been determined that the following standard requirements must be met so that the laying hen will receive sufficient nutrient matter in order to carry on egg production. Stated on a percentage basis the ration must be met as regards the following: It should contain not more than 3.5 to 5 per cent. fibre; not more than 12 to 15 per cent. digestible protein, of which 4 to 5 per cent. should be of animal origin; and not more than 70 to 75 per cent. of total digestible nutrients. The total digestible nutrients (T.D.N.) include

digestible protein, digestible carbohydrates, and fats. T.D.N. is found by multiplying digestible fat by $2\frac{1}{4}$, and adding digestible carbohydrates, digestible protein, and digestible fibre (if any).

Nutritive ratio is the ratio, or proportion between the digestible protein and the combined digestible carbohydrates and fats. For purposes of all calculations we will continue to use the tables of feeds appearing in "Practical Poultry Management" by Rice and Botsford, and which include calculations from the Kaupp-Ivey tables (Bul. 22, N.C. Agric. Exp. Sta.).

There are many such tables of feeds in the literature, but the above mentioned are reasonably accurate and provide a very simple calculation for arriving at the end figures of a balanced ration. One is only concerned with three columns of figures all of which are on the digestible basis. The fibre column really does not enter into the picture except to serve as a guide in keeping the fibre content low, on the assumption that very little fibre, if any, is digested by the birds. By a simple subtraction and subsequent division the nutritive ratio of the ration is obtained :

$$\frac{\text{T.D.N.—Digestible protein}}{\text{Digestible protein.}} = \text{N.R.}$$

A ration for egg production should have a nutritive ratio which lies between 1 to 4 and 1 to 5. Some rations may be balanced to meet the requirements as regards the nutritive ratio, but they may be entirely unbalanced in respect of the various digestible nutrients. Care should therefore be exercised to see that the ration also meets the standard requirements noted above as regards the digestible nutrients.

The following ration meets the requirements for a balanced ration for egg production and should be fed in equal proportions of mash and grain :—

Mash :	100 lbs.	Wheat Bran.
	150 lbs.	Coarse pollard.
	150 lbs.	Finely ground yellow mealie meal.
	100 lbs.	Pure meat meal.
	3 lbs.	Salt.
Grain :		Cracked yellow mealies.

The only additions necessary to complete the mineral and vitamin requirements of this ration consist of oyster shell grit *ad lib.* and an abundant supply of freshly-cut green food.

Thus it becomes plain that there is no best ration for egg production, but that numerous rations can be computed by making use of various available feeds. Rations which are balanced for egg production may also

be fed to birds in the breeding pens as long as care is exercised that the birds are not unduly forced. For example, with the above ration, if twice as much mash as grain were fed, the ratio would become narrower and the ration would amount to forcing. Moist mash has a forcing tendency. The ration as given above may be fed summer and winter to breeders, layers and moulters.

Feeding Dry or Wet.

Dry mash means less labour in feeding, is generally quite safe, and gives all the hens an equal chance of eating. Wet, or rather moist, mash entails a considerable amount of daily labour. In all probability more eggs are obtained by feeding moist mash, but it requires more skill. The best system for the average feeder is to feed dry mash and to supplement it with moist mash at times when there is a slump in production such as in the late autumn. If one wishes to hasten pullets into production one may give a feed of moist mash once a day. Pullets which are not responding as they should may, if given moist mash, readily be brought back into production.

Hens in the breeding pens should receive the same ration as the layers but it is not wise to feed them moist mash. Milk may, however, replace meat meal in part or wholly, depending upon the amount of milk available. For breeders milk is a better source of animal protein than meat meal, which may be dispensed with if as much milk as the fowls will drink is available.

A Washington Experiment Station bulletin (May, 1932) states in a discussion on milk that there was "no advantage of one ration over the other, all pens giving uniformly high egg production of from 248 to 258 eggs per hen per year. With milk constantly before the pullets, they will consume the average amount of 51 pounds per day per 100 birds."

A suitable grain mixture for supplementing the milk is given as wheat 35 lbs., oats 30 lbs., and yellow mealies 35 lbs.

The day's routine for adult fowls should be: At 7 a.m. provide clean water and (if available) milk. Scatter a few handsful of grain in the litter to induce scratching exercise. About one-fifth to a quarter of the total daily grain allowance may now be given. At 10 a.m. give a plentiful supply of fresh green feed, and at 2.30 p.m. a supplementary feed of moist mash (if found necessary and included in the feeding schedule). At 4 to 5 p.m. Give the remainder of the grain in the scratching litter (or troughs) so that the birds may go to roost with full crops.

JL. S.A.V.M.A.
IV (3) 1933.

The Veterinary Profession in South Africa.

6: Theses for the Doctorate.

By M. H. V. BROWN and H. H. CURSON, Onderstepoort.

In a previous communication (Curson 1932) a list of theses for the Fellowship R.C.V.S. was given. As it is an advantage to have the titles of such contributions available for reference purposes, details regarding theses presented by veterinarians for the degree of Doctor are tabulated hereunder. Those which have appeared in the Reports of the Government Veterinary Bacteriologist, Transvaal, (1903-10) or of the Director of the Onderstepoort Laboratories are indicated by (1).

Name.	University	Thesis.	Year	Letters of Abbreviation
Theiler, A. Sir	Berne	Die Malaria des Pferdes.	1901	Dr. Med. Vet.
Frei, W.	Zurich	Zur Theorie der Haemolyse.	1906	Dr. Med. Vet.
Hartig, R.	Zurich	Vergleichende Untersuchungen über die Lippen-und Backendrüsen der Haussängetiere und des Affen.	1907	Dr. Med. Vet.
Meyer, K. F.	Zurich	Ueber die durch säurefeste Bakterien hervorgerufene diffuse Hypertrophie der Darmschleimhaut des Rindes (*Enteritis hypertrophica bovis specifica*).	1908	Dr. Med. Vet.
Schmid, G.	Giessen	Untersuchungen über die Beziehungen zwischen Geflügeldiphtherie und *Epithelioma Contagiosum.*	1909	Dr. Med. Vet.
Sigwart, H.	Giessen	Beiträge zur Frage der Identität von Geflügeldiphtherie und Geflügel Pocken.	1910	Dr. Med. Vet.
du Toit, P. J.	Zurich	Untersuchungen über das Synsacrum und den Schwanz von *Gallus domesticus.*	1912	Dr. Phil.
du Toit, P. J.	Berlin	Beitrag zur Morphologie des normalen und des Leucaemischen Rinderblutes.	1916	Dr. Med. Vet.
Zschokke, M.	Zurich	Beitrag zur Entwicklung der Zitze, unter spezieller Berücksichtigung der Zitze des Rindes.	1918	Dr. Med. Vet.
Schärrer, R.	Zurich	Vorkommen und Herkunft von Kohlensäure in der Skeletmuskulatur bei Haustierleichen.	1919	Dr. Med. Vet.

Name.	University.	Thesis.	Year.	Letters of Abbreviation.
Scheuber, J. R.	Zurich	Entwicklung der Haare und Drüsen auf der Rüsselscheibe des Schweines.	Dr. Med. Vet.	
Meier, H.	Berne	Digifolin, ein neues Digitalispräparat und seine Wirkung beim Pferd.	Dr. Med. Vet.	
Mönnig, H. O.	Zurich	Ueber "*Leuco-chloridium macrostomum*"-Ein Beitrag zur Histologie der Trematoden	1921	Dr. Phil.
Viljoen, P. R.	Berne	Das Vorkommen von Sarkosporidien in südafrikanischen Tieren (Haustieren und Wild)	1921	Dr. Med. Vet.
Robinson, E. M.	Berne	Die Virusträger beim Seuchenhaften Verwerfen des Rindviehs.	1921	Dr. Med. Vet.
(1)Neser, C. P.	S. Africa(2)	The Blood of Equines.	1921	D.Sc.
(1)Quinlan, J. B.	Hannover	Die Uebertragungsmöglichkeit von Abortusbazillen auf Kälber, die mit Milch von infizierten Kühen gefüttert werden.	1922	Dr. Med. Vet.
Kind, G. G.	Zurich	Beitrage zur activen Immunisierung gegen Milzbrand.	1922	Dr. Med. Vet.
(1)Andrews, W. H.	London	The so-called "Staggers" or "Pushing Disease" of Cattle in Natal: an intoxication due to the ingestion of *Matricaria nigellaefolia D. C.*	1922	D.Sc.
(1)de Kock, G. v.d.W.	Berne	Beiträge zur Kenntnis des Erregers, zur Haematologie, und pathologischen Anatomie und Histologie der infectiosen Anämie der Pferde, wie sie in Südafrika beobachtet wird.	1923	Dr. Med. Vet.
Meyer, K. F.	Zurich	The Bacterial Symbiosis in the concretion Deposits of certain operculate land Molluses of the Families *Cyclostomatidae* and *Annulariidae.*	1924	Dr. Phil.
Steyn, D. G.	Vienna	Zur aspezifischen Therapie bei septicaemischen Erkrankungen von Kaninchen und Mäusen.	1925	Dr. Med. Vet.
Curson, H. H.	Hannover	Die Behandlung von "Nagana" mit Brechweinstein in Zululand in den Jahren 1921—1923.	1926	Dr. Med. Vet.
(1)Quin, J. I.	S. Africa	Studies on Anthrax Immunity.	1929	D.V.Sc.

(2) The Faculty of Veterinary Science, established 1920, has always been part of the Transvaal University College, which from 1918-1930 was a constituent College of the University of South Africa (est. 1918). Since 1930 the Transvaal University College has been autonomous, being the University of Pretoria. The Veterinary Faculty colour in the former University was pink. It is now salmon.

Name.	University.	Thesis.	Year.	Letters of Abbreviation.
(1)de Kock, G. v.d.W.	W.W.Rand	A study of the Reticulo-Endothelial system of the sheep.	1928	D.Sc.
(1)Quinlan, J. B.	S. Africa	Researches into Sterility of Cows in South Africa.	1929	D.V.Sc.
(1)Thomas, A. D.	S. Africa	Skin Cancer of the Angora Goat in South Africa.	1929	D.V.Sc.
(1)Martinaglia, G.	Toronto	Diseases of Domesticated Animals in South Africa due to Organisms of the Salmonella Group.	1929	D.V.Sc.
(1)Robinson, E. M.	S. Africa	The Bacteria of the *Clostridium Botolinum* "C" and "D" types.	1930	D.V.Sc.
(1)Bekker, J. G.	Pretoria	The Administration of Phosphorus to Cattle in their Drinking Water.	1931	D.V.Sc.
Schulz, K.	Leipzig	Ein Beitrag zur Kenntnis der Pyometra des Rindes.	1931	Dr. Med. Vet.
(1)Fourie, P. J. J.	Utrecht	The Haematology and Pathology of Haemonchosis in Sheep.	1931	Dr. Med. Vet.
(1)Graf, H.	Pretoria	Comparative Chemical Studies on "Laked and Unlaked" Blood Filtrates of Domestic Animals in Health and Disease.	1932	D.V.Sc.
Parkin, B. S.	S. Africa	The Trypanosomiases of Domestic Animals of the Union of South Africa.	1933	D.Sc.

Doctorates given *honoris causa* are not included in the above list(3).

REFERENCE.

CURSON, H. H. (1932). Jl. S.A.V.M.A. III (2): 83-84. Theses for the Fellowship R.C.V.S. of interest to South Africa.

BOOK REVIEWS.

The series of works by the late Sir Frederick Smith on our professional literature in its historical aspects gives an excellent and comprehensive idea of the early history of veterinary literature with its British development. It is the only complete record in English of the

(3) Regarding the M.Sc., the following theses have been presented:

1920 MARTINAGLIA, G. Cornell University. "The direct isolation and cultivation of Human, Bovine and Avian Tubercle bacilli."

1923 METTAM, R. W. M. Witwatersrand University. "Snotsiekte; a disease of South African cattle."

rise of the profession and details concerning publication and scope may be summarised as follows :—

Volume.	First Published by	In	Scope.
I	*Jl. Comp. Path. Ther.*	1913-18	B.C.2000—A.D.1700
II	*Vct. Jl.*	1923-4	18th Century.
III	*Vet. Jl.*	1929	1800—23.
IV	Messrs. Bailliere, Tindall & Cox.	1933	1823—1860.

The profession is indeed indebted not only to the editorial committees of the journals mentioned above, but also to the generosity of those who made it possible for Volume IV[1] to be published. By their practical sympathy they have made available to the profession the results of one of the finest undertakings in veterinary research in its broadest sense.

The volumes naturally become more fascinating as we approach our own century, both on account of the greater accuracy of detail and also because the various characters and their subjects become more familiar.

The memoir of the author has been well summarised by Dr. Fred. Bullock, but a fact worthy of record, is that Sir Frederick by his enthusiasm and encouragement directly inspired many young men throughout the Empire to interest themselves in various aspects of veterinary investigation. Thus did he further contribute to our progress.

In the present volume we learn not only of the efficiency of Sir Frederick Smith, but also of the charming personality of Thomas Turner, the courage of Hodgson, the energy and genius of John Gamgee, the eloquence of Spooner, and the driving force of William Dick. Among Dick's students were James McCall, James Law, Duncan McEachran, Andrew Smith, William Robertson Sen., J. Hallen and W. Williams, all of whom became principals of veterinary colleges and several of whom bore the torch of veterinary progress beyond the confines of the United Kingdom. It is fitting at this stage to add that the time seems opportune for the recording of the early veterinary history of the various Dominions. As time passes, so are valuable documents destroyed.

A lesson is learned of the unfortunate results of personal animosity, and light is also thrown on the obstructive tactics of the London School during the middle of last century. It is sad to realise that it became

(1) The Early History of Veterinary Literature and its British Development, Vol. IV. By the late Major General Sir Frederick Smith, Edited by Fred Bullock, LL.D. Pp. xxiv + 162. Plates 12. Price 15/-. 1933. London: Bailliere, Tindall and Cox.

"the centre of political intrigue." Posterity must, however, learn not only from the pleasant but also from the disagreeable lessons of the past.

In a few words this valuable record of the march of the profession is a great work and should be in the possession of every veterinarian.

The publishers have to be congratulated on their share of the undertaking and it is hoped that Dr. Fred Bullock will continue his researches and later find it possible to issue a Volume V.

H. H. C.

* * *

A new edition of Hoare's Veterinary Materia Medica and Therapeutics[2] is to be welcomed as new additions to and changes in our knowledge of pharmacology are made almost daily. The introduction includes—diagnosis and the general symptoms of disease; the care, management, and nursing of sick animals; the actions and uses of drugs; prescribing and prescription writing; the administration of medicines; and veterinary pharmacy. Short chapters on biological assay, chemotherapy, and hypotheses of drug-action would have enhanced the value of the work.

The drugs are discussed under the following headings: Group I —Alkalies and Alkaline Earths; Group II—The Metals; Group III—The Metalloids; Group IV—The Non-metallic elements; Group V—Acids; Group VI—Water and Oxygen; Group VII—Carbon and its Compounds; Group VII—The Vegetable Kingdom; Group IX—The Animal Kingdom. The vaccine and serum therapy and the application of biological tests in clinical diagnosis are discussed. Under "Therapeutics" different diseases and their treatment are discussed. This is of great value not only to the student of pharmacology, but also to the physician.

In the Appendix a large number of prescriptions for the various ailments are given. Some of these prescriptions contain four, five, or even six active ingredients. It seems inadvisable to include more than two active ingredients in the same prescription (except in special circumstances) as our knowledge of the combined action of drugs on the system is very incomplete.

D. G. S.

THE ASSOCIATION.

Natal Branch of the S.A.V.M.A.: Meeting 30.6.33.

The Hon. Secretary-Treasurer (Mr. W. A. Dykins) reports as follows: A meeting was held of the Natal Branch at Allerton Labor-

[2]Hoare's Veterinary Materia Medica and Therapeutics. Edited and revised by J. Russel Greig, 5th Edition 1933. London: Baillière, Tindall and Cox, pp. viii + 510; 21/-.

atory, Pietermaritzburg, on 30.6.33, at which the following gentlemen were present: Messrs. de Kock, Carless, Sharpe, Amos, Osrin, Barnard, Thorburn, Dykins, Diesel, Footner, Green, Zwarenstein, Frean, van Rensburg, Allchurch, Neser, Sterne, Flight, Rossiter, van Heerden and Jackson.

New Members elected: F. B. Wright, M. M. Neser, W. J. B. Green, A. F. Harber, F. H. Hutchinson, H. G. Franz, S. W. J. van Rensburg, G. T. Henderson, C. H. Flight.

The following members who have been transferred from the Natal Province expressed their desire to continue their membership of the Natal Branch: Messrs. van Heerden, Dickson, Edwards, Wessels, Canham, van der Linde and Clark.

At the outset of the meeting the President, Mr. van Heerden, referred in very appropriate terms to the loss the profession had sustained through the death of Mr. G. H. Melck, and the meeting expressed its sympathy in the usual manner.

Election of Officers: Mr. W. A. Dykins proposed and Mr. Osrin seconded that Mr. S. T. Amos be elected President for the ensuing year, and this was carried unanimously. Mr. Diesel was proposed as Vice-President by Mr. Osrin and seconded by Mr. Barnard; this was carried unanimously. Messrs. Green, Sharpe, Osrin and Jackson were elected members of the Council. Mr. W. A. Dykins was elected as Hon. Sec. and Treas. and an ex-officio member of the Council.

The new President then occupied the chair.

Mr. F. J. Carless then read a paper on "The Cattle and Meat Industry in South Africa" which was very well received, and a comprehensive discussion ensued. Arising out of this paper the vexed question of the ethics of dehorning cattle was extensively reviewed, and with particular reference to an incident which happened in the Vryheid district when the Government Veterinary Officer in charge of the district, Mr. van Rensburg, was sub-poenaed to give expert evidence on the point as to whether any cruelty was involved in the operation. Mr. van Rensburg gave evidence to the effect that in this particular instance the operation had not been skilfully performed and that there was a grave element of cruelty involved.

While no resolution on this subject was passed, there was a preponderance of opinion which would go to show very clearly that the profession in Natal was not prepared to countenance any unnecessary cruelty.

Dr. de Kock then gave the meeting a most interesting address on the Foot and Mouth disease outbreaks in the Union. He gave the history of the different outbreaks, and made the position most lucid

and easy to follow by frequent references to a map which he had specially compiled for the purpose. Dr. de Kock stressed the multifarious difficulties that officers were encountering in the field, such as the handling of this grave problem in backveld areas, where one was confronted with the usual series of difficulties which are so inimical to the successful waging of any campaign, such as profound ignorance of the nature of the disease, lack of proper spirit of co-operation, and last but not least the "human element." Added to all these difficulties, which could not be divorced from the conduct of any campaign against the spread of a contagious or infectious disease in this country, another serious problem had arisen which had caused the Department a certain amount of concern and anxiety; this was the difficulty in diagnosis. Dr. de Kock in this connection referred to certain outbreaks of pseudo Foot and Mouth disease which had come to light, and owing to the fact that the symptoms of this disease so closely simulate Foot and Mouth disease proper, some difficulty arose in the initial stages of the campaign in arriving at a suitable means of differential diagnosis; but this had happily been overcome by means of the biological test.

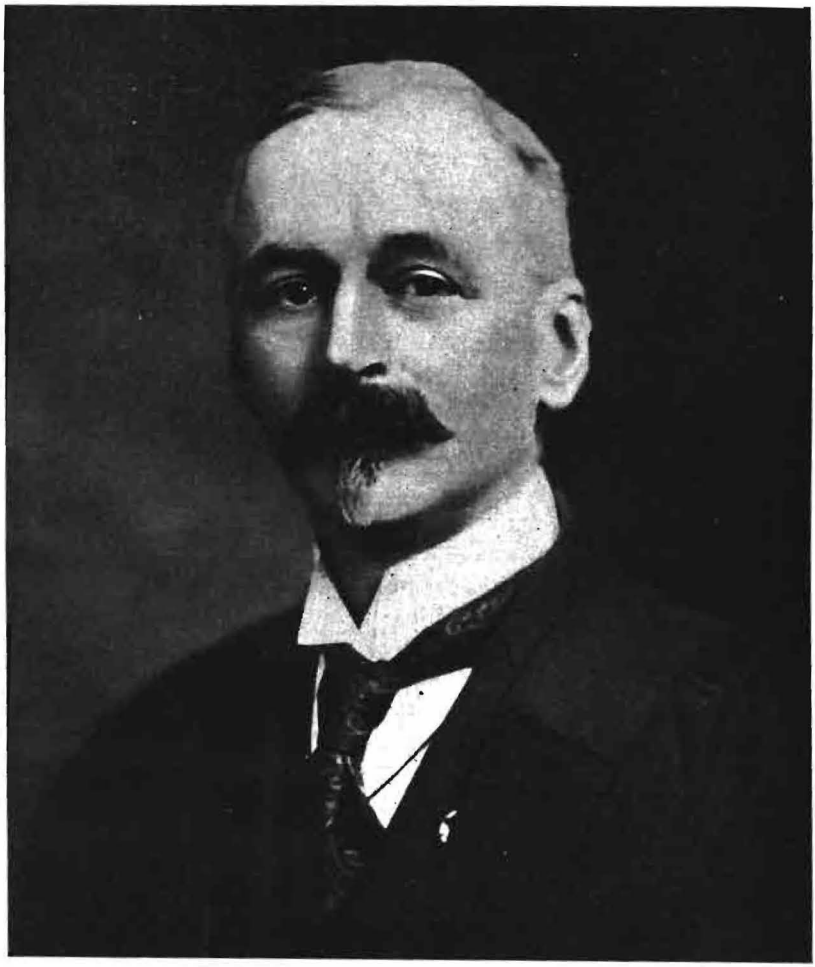
Mr. van Heerden then gave a short address on the important question of smear diagnosis. He explained how necessary it was to enlist the confidence of the farming community and thus eliminate to a large extent the unnecessary suspicion and mistrust which existed. There was absolutely no margin of error, as the handling of smears at the different laboratories was done with meticulous care. He instanced every phase of this important work by screening slides, and he expressed the opinion that the Government Veterinary Officers stationed in the different districts could do very useful work by this form of propaganda.

The Chairman in conclusion thanked those gentlemen who had contributed in such an able way to make this meeting a success, and the Secretary was requested to send a letter to the Director of Veterinary Services and Animal Industry thanking him for making it convenient for Dr. de Kock to be present for the purpose of delivering such a valuable address.

The meeting concluded at 5 p.m.

SEPTIMUS SISSON

(1865-1924).



No apology is necessary for reproducing the photograph of Dr. Septimus Sisson, whose name is a household word throughout the English-speaking veterinary world. No photograph of Sisson being available for the Onderstepoort collection, Dr. P. J. du Toit approached Mrs. Sisson, who kindly sent the photograph used for reproduction.

Sisson, who was born in England, emigrated to Canada in 1882, and graduated at Ontario Veterinary College in 1891. From 1901-1924 he was Professor of Anatomy at Ohio State University. For additional details regarding his career see *Jl. American Vet. Med. Assn.* Vol LXV, Sept. 1924, (New Series, Vol. 18. No. 6, p. 807).

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The Diagnosis, Treatment and Prevention of Vegetable Poisoning.*

By D. G. STEYN, B.Sc., Dr.Med.Vet.

I. DIAGNOSIS.

History.

In cases of suspected poisoning the information supplied by the owners of stock or by persons in charge of animals is of great value to the investigator. Sometimes such a person is unable to make a diagnosis in the absence of a reliable history of the cases investigated. It is obvious that the information supplied by stock-owners or their managers should not be accepted without reservations, but should be correlated with other findings at the conclusion of the investigation. Some knowledge of psychology, especially that of the farmer, is of great value in this connection. The experienced veterinarian, when speaking to the stock-owner concerned, usually knows at once to what extent the information supplied may be credited. In many cases the stock-owner has already made his diagnosis (i.e. decided what the cause of the disease is) by the time the former arrives and, wittingly or unwittingly, supplies only such information as will support his own idea.

Very few land-owners are prepared to acknowledge that their property abounds with poisonous plants, especially when such property is on the market. A land-owner, whose property is overgrown with poisonous plants, may be desirous of selling it, and obviously it is to his advantage not to disclose the fact that poisonous plants are present on his property. Should an outbreak of poisoning occur on such property, it is possible that only untruthful information will be given in an attempt to prevent us from tracing the responsible plant or plants.

Reliable information with regard to the history of suspected cases of poisoning is of great assistance. It is obvious that a good knowledge of the symptoms and post-mortem lesions induced by poisonous plants, minerals, and other common poisons is essential for correct diagnosis. The following points lead us to suspect plant poisoning:

(a) a large number of animals suddenly affected at the same time;

(b) time of the year (drought periods and spring are the most dangerous periods);

(c) when animals on trek, draught animals, and animals newly introduced are affected; and

(d) purging, nervous symptoms (clonic spasms, paresis, paralysis), abortions, and sudden death.

Paper read before the 25th General Meeting of the S.A.V.M.A.

Symptoms.

It is obvious that all the poisonous plants cannot be mentioned here and reference is made to the most common ones only.

In cases of "geilsiekte" (prussic acid poisoning) with hoven, pronounced dyspnoea, cyanosis, clonic spasms of different groups of, or all the muscles and sudden death, the first plants to be suspected are certain veld grasses (when wilted), certain species of *Dimorphotheca* (bietou) and *Sorghum* (Sudan grass, kaffir corn). If purging is in evidence our suspicion turns to members of the *Iridaceae* (tulips) and *Liliaceae*—berg slangkop—*Urginea capitata*, Cape slangkop—*Ornithoglossum glaucum*, Natal slangkop—*Urginea macro-centra*, and Transvaal slangkop—*Urginea Burkei*. Many other members of the *Liliaceae* are gastro-intestinal irritants.

Bovine staggers is associated with *Matricaria nigellaefolia*, dunsiekte in horses with certain species of *Senecio*, jaagsiekte in horses with *Crotalaria dura*, stiffsickness (elongated hoofs) in cattle with *Crotalaria Burkeana*, kaalsiekte (alopecia) in kids and lambs with *Chrysocoma tenuifolia* (bitterbossie), vermeersiekte with certain species of *Geigeria* and gousiekte with *Pachystigma (vangueria) pygmaeum* (gousiektebossie). Gifblaar (*Dichapetalum cymosum*) is almost too well known to need mention.

Post-Mortem Appearances.

What has been said with regard to symptoms of poisoning is also applicable here. The lesions caused by some plants are sufficiently typical to render a definite diagnosis comparatively easy, e.g. chronic myocarditis in *gousiekte*, cirrhosis of the liver in *dunsiekte* in horses and in Molteno cattle (or straining) disease caused by species of *Senecio*, kaalsiekte (alopecia) in kids and lambs caused by *Chrysocoma tenuifolia* (bitterbossie), and chronic desquamative and productive pneumonia in jaagsiekte in horses caused by *Crotalaria dura*.

Differential Diagnosis.

Information on the following points often renders a definite diagnosis possible : (a) history of the cases; (b) symptoms; (c) post-mortem appearances; (d) examination of the gastro-intestinal contents (see below); (e) histology (see below); (f) blood and organ smears; (g) inspection of the pasture, feed-licks, and drinking water concerned (see below).

In severe purging in cases of poisoning we have to differentiate between vegetable and mineral (arsenic) poisoning. This is done by chemical analysis.

Gallamsiekte, lead, or *Diplodia zeae* may be concerned in paralysis in stock. Examination of the feeds taken by the animals, bacterial examination of the caecal contents, and chemical analysis of the gastro-intestinal contents and organs will allow of a definite diagnosis.

In the differential diagnosis of gifblaar poisoning and gousiekte the histopathology of the myocardium is of value.

In cases of sudden death anthrax has to be considered (blood and organ smears).

Smears prepared from the endothelium of the jugular vein will assist in differentiating between heartwater and *Acokanthera* poisoning.

EXAMINATION OF THE GASTRO-INTESTINAL CONTENTS AND ORGANS.

(*a*) *Examination of stomach (ruminal) contents for presence of poisonous plants.*

It is obvious that this is of value only in the case of plants which exert their effects very soon after ingestion, since the portions of poisonous plants eaten are digested beyond recognition after a time and may be passed out. Hard leathery leaves are obviously more easily recognisable in the stomach contents than soft and juicy ones. Hard seeds may pass through the alimentary tract undigested (endocarp of the syringa berry, pips of species of *Cucumis*).

Gifblaar, *Acokanthera*, and tulp leaves are, comparatively speaking, easily detectable in the ruminal contents. It is scarcely necessary to state that the presence of portions of poisonous plants in the gastro-intestinal tract does not warrant a diagnosis of poisoning by that particular plant. The history, symptoms, post-mortem appearances, and histology should also be considered.

In the case of plants which exert their effects after a long period of latency (chronic seneciosis, gousiekte, *Matricaria* poisoning), the examination of the gastro-intestinal contents is of little or no value.

(*b*) *Chemical analysis of gastro-intestinal contents and organs.*

As far as our South African poisonous plants are concerned, chemical analysis of the organs and gastro-intestinal contents is of very little value as our knowledge of the active principles of indigenous plants is very incomplete.

Prussic acid is easily detectable in stomach contents provided they are examined soon after death. It is, therefore, an easy task to determine whether animals are dying from ingesting plants containing prussic acid (geilsiekte). (See below for test).

In the case of mineral poisons chemical analysis of the gastro-intestinal contents and organs is of great value.

(*c*) *Biological test.*

No diagnosis should be based only on the chemical properties of a poison isolated from the gastro-intestinal contents or organs. It is essential that such a poison be tested biologically.

Plants containing toxalbumins induce the development of antibodies in the body provided the animal concerned survives the poisoning for a week or more. In this case the serum, when mixed with an extract of the plant concerned, will become turbid (for example, in poisoning with castor oil seed—*Ricinus communis* and *Adenia digitata*).

VEST-POCKET TEST FOR CYANOGENESIS.

Requisites : (a) Strips of ordinary filter-paper about 1 cm. by 4 cm. These strips may be moistened with sodium picrate solution and should keep for about a week. It is, however, advisable to use strips of filter-paper prepared just before they are required as sensitiveness decreases with time.

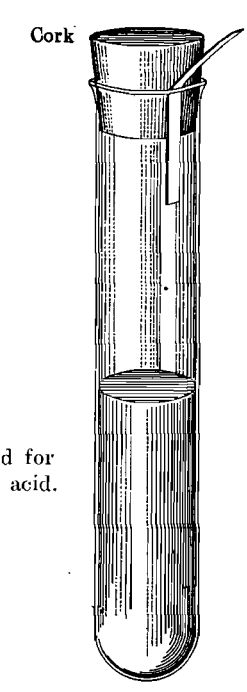


Fig. 2.—Test tube showing method of using picrate paper in test for Prussic acid.

(b) Sodium picrate solution. This solution is prepared by dissolving 5 gm. of sodium carbonate (washing soda) and 0.5 gm. picric acid in 100 cc. distilled water. In cold weather a precipitate may be formed. This solution keeps well for months in a stoppered bottle.

Test : About 5 gm. of the material (plants, stomach contents, etc.) to be tested are placed in a test-tube about 1 cm. in diameter and 10 cm. long. Plant material must be bruised in a mortar, minced, or finely cut up, or, if in a dry state, it must be ground and moistened. If two or three drops of chloroform are added, autolysis is hastened with the result that the enzymes responsible for the decomposition of cyanogenetic glucosides sooner come into contact with such glucosides. A strip of filter-paper, *which must be "perceptibly moist,"* is now inserted at the top of the test tube and fixed there by means of a cork. The tube is now placed in a water-bath at about 50°C or in the vest-pocket, and examined at intervals. If a large amount of prussic (hydrocyanic) acid is liberated the strip of filter-paper, which is lemon yellow in colour, turns dark reddish-brown within a few minutes. If after twenty-four hours the strip of paper is still lemon yellow the test can be regarded as negative. A negative result, however, does not mean that the material tested contains no cyanogenetic glucosides. Such glucosides may be present but may not be accompanied by the enzymes (ferments) necessary for their decomposition into prussic acid and other chemical compounds.

Histology.

In only a few cases of plant poisoning is the histology of value to us.

In *chronic seneciosis* (dunsiekte) the liver lesions are typical—cirrhosis and blood lagoons; and in gousiekte (*vangueriosis*) the myocard is frequently, but *not* always, cirrhotic and very thin (ventricles dilated).

Examination of Foodstuffs, Licks, Water, and Pasture.

If some or all the information collected as suggested above points to poisoning, we proceed further and examine the foodstuffs, licks, drinking water, and pasture of the animals concerned.

The smaller the area of grazing and the less the number of species of plants on this area the easier it is to make a diagnosis. The following points have to be considered in suspected plant poisoning : (a) the number of animals that have grazed on the area concerned, (b) the number of animals affected, and (c) the abundance of the plant. It is possible that the animals may have grazed the area concerned to such an extent that very few, or no plants, are recognisable.

In the course of our investigations we should, however, not place too much reliance on the fact that the suspected plant abounds also in other camps or on neighbouring farms where no cases of poisoning occur. A specific case that could be mentioned here is that of alopecia in kids and lambs. Although the whole Uniondale-Willowmore area and adjoining districts are overgrown with *Chrysocoma tenuifolia*

(bitterbossie, brandbossie, beesbossie, beeskaroo) the disease occurs only on certain farms. These farms are denuded of edible vegetation to such an extent that the animals are forced to eat large quantities of the bitterkaroo. On farms with good grazing the disease does not occur. Another factor that should be considered is the difference in the toxicity of the same plant growing in different localities. It is also of importance in the survey of pastures for poisonous plants to know where the suspected plant is likely to grow. Certain species of *Cotyledon* (krimpsiekte bossie) grow mostly under bushes on the shady sides of hills. Gifblaar favours hilly country and sandy ridges; tulps, *Matricaria* and horsetail (*Equisetum ramossissimum*) are found in vleis and marshy areas.

The plant responsible for the poisoning need not necessarily be growing on the farm where poisoning occurred. Chinkerinchee, tulps and *Crotalaria dura* have frequently caused poisoning through their presence in hay. Then again, in the case of poisonous plants with a period of latency, animals may develop symptoms of poisoning some considerable time after having been moved from the area where they have eaten the plant (chronic seneciosis (dunsiekte), crotalariosis, jaagsiekte in horses, gousiekte).

II. GENERAL PRINCIPLES OF TREATMENT.

The general principles of treatment of all cases of poisoning are embodied in the following rules:

(A) prevention of further absorption of the ingested poison,

(B) treatment of symptoms of poisoning, and

(C) promotion of excretion of the poison.

In addition further ingestion of the poison should be prevented.

Prevention of further Absorption of Poison.

The procedure here is (a) to prevent the animals from drinking water, (b) to render the poison still present in the gastro-intestinal tract unabsorbable, and (c) to remove it as rapidly as possible by the administration of purgatives and emetics or by stomach lavage. The absorption of poison still present in the gastro-intestinal canal may be retarded or prevented by administering chemical and physical antidotes. Tannic acid will, for example, cause the precipitation of insoluble alkaloidal tannates and is, therefore, of great value in preventing the absorption of poisonous alkaloids. Calcium hydrate (lime) combines with oxalic acid and oxalates to form insoluble calcium oxalate. Potassium permanganate will cause the destruction of many plant poisons by oxidation; it is said to be most effective when in acid solution. Furthermore, some poisons exert their toxic effects in an acid environment, whilst others require an alkaline medium. Animal and wood charcoal, raw linseed oil, and liquid paraffin may be used as

physical antidotes. Charcoal is an active absorbant of many plant and mineral poisons, and liquid paraffin, being absorbable to only a very slight extent, will in its passage through the gastro-intestinal canal, carry with it a certain amount of the poison present. When the administration of these two substances is followed by purgatives, the amount of poison absorbed can be appreciably reduced. The absorption of poisons from the gastro-intestinal tract can be retarded further by the administration of astringents (tannic acid, [4 grams for an ox and 1 gram for a sheep],lime water, bismuth subnitrate, alum). It is obvious that the purgatives to be used in cases of poisoning must be the most rapidly acting ones obtainable; and whenever possible the administration of purgatives which require water as a solvent must be avoided, as in many cases the introduction of water will facilitate absorption of the poison. In equines arecoline, pilocarpine, and eserine, administered subcutaneously, are valuable purgatives, whilst in cattle, sheep, goats, pigs, dogs, cats and birds, calomel, castor oil, and croton oil (15-30 drops in a table-spoonful of raw linseed oil for an ox) must be resorted to in the first place. For the reasons mentioned above it is inadvisable, notwithstanding the findings of Macht and Finesilver[1], to use saline purgatives in cases of plant poisoning.

As emetics the following may be used: apomorphine, veratrine, *rhizoma veratri albi*, *radix ipecacuanhae*, tartar emetic, zinc sulphate, common salt, sodium bicarbonate, and mustard. It is obvious that emetics are to be used only in those animals which vomit with ease, whilst corrosion of the stomach wall is a contra-indication.

In the irrigation of the stomach it is essential that substances be used which are likely to form insoluble compounds with the poison. In poisoning with plants containing poisonous alkaloids, tannic acid, and in oxalic acid and oxalate poisoning, calcium preparations should be used in stomach lavage.

Treatment of Symptoms of Poisoning.

In most cases we have to resort to the treatment of the symptoms as they arise (symptomatic treatment), as very few specific antidotes are known which will inactivate the poison in the blood stream and in the organs. Cramps and convulsions are treated with sedatives and narcotics (chloral hydrate, luminal etc.) and symptoms of paralysis with stimulants (strychnine, caffeine, camphor); whilst in prussic acid poisoning we have a specific antidote in some sulphur preparations (colloidal sulphur, sodium thiosulphate) forming the harmless sulphocyanide. The administration of heart, (caffeine or strong black coffee, camphor) and respiratory (lobeline and atropine) stimulants is essential

(1) 1922. Johns Hopkins Hosp. Bull. 33:330-338.

in many cases of plant poisoning. The digitalis series is contra-indicated in tulp and slangkop poisoning.

Furthermore, glucose should be administered to animals in all cases of poisoning especially where liver damage occurs, as the detoxicating effect of this organ is directly dependent on its carbohydrate content ($\frac{1}{2}$-1 lb. sugar once daily for an ox).

Gastro-intestinal irritation may in many cases be effectively treated with raw linseed oil or limewater, either alone or mixed in equal parts (carron oil). At Onderstepoort it was found that the beneficial effect of this mixture in the treatment of obstinate diarrhoea may be appreciably increased by the addition of tannic acid (1 gram for sheep and 4 grams for cattle). Other substances that have an alleviating effect in gastro-intestinal irritation are linseed and barley gruel and the white of eggs beaten up in milk.

Other essential points in the treatment of poisoned animals are to keep them out of the sun and to allow them as much rest as possible. Driving, especially in cases of animals suffering from poisoning with plants which affect the central nervous system (cynanchosis, cotyledonosis, equisetosis), in many instances causes the death of animals which would have recovered had they been left undisturbed. It is also essential that poisoned animals should receive a suitable diet.

Promotion of Excretion of the Poison.

Excretion of poisons may be facilitated by the administration of purgatives, diuretics, cholagogues, sialagogues, and diaphoretics. Many purgatives stimulate the secretion of the glands of the gastro-intestinal mucosa, which excrete many poisons. In addition such drugs by causing a quick passage of the intestinal contents prevent, to a certain extent, the reabsorption of bile, which carries with it poisons excreted by the liver. The kidneys are the most important organs concerned in the excretion of poisons, hence the value of stimulating renal secretion by means of diuretics is obvious. Further, the liver, salivary glands, and sweat glands are active excretors of many poisons. The fact that lactating mammary glands are very active excretors of poisons should be borne in mind, as cases of poisoning in human beings may arise from drinking the milk of poisoned animals.

Although the bleeding of animals suffering from poisoning is considered by some authorities to be of no value, it seems likely that much benefit may be derived from bleeding, followed by replacement of the volume of blood lost by physiological saline solution containing calcium gluconate, or by blood transfusion. Through the bleeding a certain proportion of the poison contained in the blood is removed from the body; calcium supports the fighting powers of the body against many poisons, and it has been established that the higher the glycogen content of the liver the more effective it is as a detoxicator.

In many cases of poisoning, especially when poisons causing haemolysis and (or) reduction in the oxygen carrying capacity of the blood are concerned, blood transfusions are of life-saving value.

III. PREVENTION OF PLANT POISONING.

This should be done on the following lines :

(a) Avoidance of overstocking.

(b) Attempts to eradicate the responsible plant or plants.

(c) Fencing-in of areas where poisonous plants occur, provided the plant is one which does not spread quickly and provided the carrying capacity of the farm is not seriously decreased.

(d) Utilisation of dangerous areas when edible vegetation in them is otherwise plentiful, or when the plants concerned are least toxic (the majority of plants are most toxic before and at the time of flowering—castor bean, species of Cucumis and Syringa berry are exceptions, the fruit being most toxic when mature).

(e) Utilisation of areas where poisonous plants occur as grazing for animals which are not or are only slightly susceptible to the plants concerned. Pigs are about eight times more susceptible than sheep, goats, and donkeys to syringa berry poisoning; it appears that *Matricaria* poisoning does not occur in animals other than cattle, whilst horses are much more susceptible than cattle to *Ornithogalum* (Chinkerinchee) poisoning.

(f) Feeding of licks which contain chemical antidotes to poisonous plants.

The Feeding of Licks.

It has been established, both experimentally at Onderstepoort and under field conditions, that sulphur is an excellent preventive of the prussic acid form of "geilsiekte." I need not go into details as pamphlets on the feeding of sulphur as a preventive of "geilsiekte" are available. The feeding of molasses also counteracts the effects of prussic acid.

The effects of plants causing poisoning through oxalates can be fairly successfully combated by feeding licks containing calcium carbonate and slaked lime ($C_a(OH)_2$as insoluble calcium oxalate is precipitated in the gastro-intestinal tract.

The Effect of Light on the Immunizing Properties of Formolised Horsesickness Virus.

By Dr. G. G. KIND, Johannesburg.

In this report I wish to record a few experiments which led me to conclude that formolised horsesickness virus is extremely sensitive to light.

At least four horses were used in each experiment, but for the sake of brevity I am quoting only one horse in every case, as results in the same experiments were consistent. To simplify matters further I am selecting experiments in which the same virus and the same dose of 10 cc. formolised virus were used. In doses of 5 cc. given intravenously the virus killed susceptible horses in about 5 days. In all cases the cause of death was horsesickness.

TABLE I.

No. of Exp.	Formald. Conc. 1 in:	Date of Preparation	Horse No.	Date of Injection	Immunity Test	Result
1	1000	17-3-29	1	25-3-29	4-4-29	died 10-4-29
3	1000	23-6-29	8	28-11-29	15-12-29	no reaction
4	1000	30-6-29	3	15-7-29	———	died 23-7-29
4	1000	30-6-29	62	7-3-30	———	died 19-3-30
7	1000	3-1-30	36	15-1-30	25-1-30	no reaction
8	1000	10-1-30	41	20-1-30	1-2-30	no reaction
10	1000	5-2-30	51	18-2-30	27-2-30	died 9-3-30
15	1000	1-4-30	78	30-4-30	8-5-30	no reaction
18	1000	13-6-30	89	19-6-30	———	Dikkop
20	666	15-7-30	95	23-7-30	1-8-30	no reaction
23	666	29-8-30	110	4-9-30	12-9-30	no reaction
26	666	4-10-30	124	13-10-30	21-10-30	died 29-10-30
27	833	7-11-30	127	13-11-30	21-11-30	no reaction
28	714	22-11-30	132	30-11-30	7-12-30	died 19-12-30
30	1000	6-12-30	139	12-12-30	20-12-30	no reaction
33	1000	19-12-30	154	26-12-30	3-1-31	no reaction
37	1000	24-1-31	173	30-1-31	7-2-31	died 16-2-31
39	1000	7-2-31	181	17-2-31	25-2-31	no reaction
40	1000	16-2-31	185	26-2-31	7-3-31	died 17-3-31
44	1666	25-3-31	206	4-4-31	———	died 11-4-31
45	1250	16-4-31	209	26-4-31	———	died 8-5-31
51	1000	14-8-31	235	22-8-31	30-8-31	died 7-9-31
52	1666	14-8-31	238	22-8-31	———	died 1-9-31
54	1250	13-9-31	249	24-9-31	2-10-31	died 10-10-31
58	1250	18-10-31	264	26-10-31	5-11-31	no reaction
59	1666	18-10-31	267	26-10-31	———	died 4-11-31
65	1000	16-12-31	293	24-12-31	1-1-32	died 8-1-32
66	1666	16-12-31	298	24-12-31	———	died 3-1-32
55	20%1666 / 80%1000	15-9-31	251	25-9-31	4-10-31	no reaction

This table shows that the first immunising experiments carried out in 1929 were unsatisfactory, but towards the end of that year results were consistently good. From 1930-31 they varied considerably and at the end of 1931 and the beginning of 1932 results were very discouraging. The formolised virus was always prepared in the same way; chemicals and distilled water were analysed for purity; chemicals from various sources were tried; it was thought that the temperature might have some effect; but experiments gave no conclusive results. During the 1931-32 season I used mixtures of various formaldehyde concentrations for immunising purposes; tests were more satisfactory. (Exp. 55).

The following observations led me to suspect the influence of light:

1. Results from batches prepared in winter seemed to be better. (Exps. 3, 4, 18, 20, 23).

2. Immunising results were better when I occupied premises on the south slope of a steep hill where the laboratory was situated partly underground in a double-storey house. (Exps. 1 to 45).

3. Results became infinitely worse after I moved to my present premises, a single-storey house standing on level ground and considerably more exposed to the sun. (Exps. 51 to 66). No direct sunlight entered the rooms as the windows faced south in both cases and I came to the conclusion that diffused light must have a deteriorating effect and that harmful rays had penetrated the roof in the latter premises; these harmful rays were not able to penetrate to the underground chamber of the double-storey building.

To exclude all sunrays the following batches were prepared at night. Glass bottles of different colours were used as containers of the finished product.

TABLE II.

Exp. No.	Colour of Glass	Formald. Conc. 1 in:	Date of Preparation	Horse No.	Date of Injection	Immunity Test	Result
96	colourless	1000	10-7-32	443	18-7-32	5-8-32	died 13-8-32
	blue	,,	,,	444	,,	,,	no reaction
	red	,,	,,	445	,,	,,	no reaction
	brown	,,	,,	446	,,	———	died 28-7-32
97	colourless	666	4-8-32	448	16-8-32	25-8-32	died 1-9-32
	blue	,,	,,	449	,,	,,	no reaction
	red	,,	,,	450	,,	,,	died 3-9-32
	brown	,,	,,	451	,,	,,	no reaction

Exp. No.	Colour of Glass	Formald. Conc. 1 in:	Date of Preparation	Horse No.	Date of Injection	Immunity Test	Result
98	blue	666	14-8-32	454	25-8-32	4-9-32	died 20-9-32
	blue	,,	,,	455	,,	,,	no reaction
	red	,,	,,	456	,,	,,	died 11-9-32
	red	,,	,,	457	,,	,,	died 12-9-32
	brown	,,	,,	458	,,	,,	no reaction
	brown	,,	,,	459	,,	,,	no reaction
100	colourless	666	11-9-32	469	29-9-32	9-10-32	died 14-10-32
	colourless	,,	,,	470	,,	,,	died 14-10-32
	blue	,,	,,	471	,,	,,	died 20-10-32
	blue	,,	,,	472	,,	,,	died 18-10-32
	brown	,,	,,	473	,,	,,	no reaction
	brown	,,	,,	474	,,	,,	no reaction
101	colourless	833	13-9-32	475	29-9-32	9-10-32	died 15-10-32
	colourless	,,	,,	476	,,	,,	died 15-10-32
	blue	,,	,,	477	,,	,,	no reaction
	blue	,,	,,	478	,,	,,	no reaction
	brown	,,	,,	479	,,	,,	no reaction
	brown	,,	,,	480	,,	,,	no reaction
	blue	,,	,,	512	15-11-32	25-11-32	died 6-12-32
	blue	,,	,,	513	,,	,,	died 7-12-32
	brown	,,	,,	514	,,	,,	no reaction
	brown	,,	,,	515	,,	,,	no reaction

In all these experiments the contents of the colourless bottles had become ineffective as also in the case of the red bottles, except in the lower formaldehyde concentration of 1 in 1000. Blue glass seems to protect the contents better, although results generally were not satisfactory. Brown bottles gave the highest protection, so high that the contents remained virulent in a formaldehyde concentration of 1 in 1000.

Towards the end of 1932 all the work was done in an artificially lighted underground chamber which was also used as a storeroom for the finished product.

In the following experiment, formolised virus in brown bottles wrapped in cotton wool and then packed with wood wool in a cardboard box (usual packing used for dispatch) was left on the back seat of a touring car for 3 weeks. The car stood in the open day and night and travelled about 2,000 miles during this time.

TABLE III.

Exp. No.	Formald. Conc. 1 in:	Date of Preparation	Horse No.	Date of Injection	Immunity Test	Result
114	714	16-12-32	593	17-2-33	7-3-33	no reaction
	,,	,,	594	,,	,,	,,
	,,	,,	595	,,	,,	,,
	,,	,,	596	,,	,,	,,

This proves that transport during the hottest season had no deteriorating effect on the immunising qualities of the virus.

On another occasion formolised virus in brown bottles packed in a cardboard box without any other wrapping was taken on a short journey. It was slightly exposed to diffused light during the afternoon and then used in the experiment hereunder :

TABLE IV.

Exp. No.	Formald. Conc. 1 in :	Date of Preparation	Horse No.	Date of Injection	Immunity Test	Result
114	714	16-12-32	614	4-3-33	25-3-33	died 2-4-33
	,,	,,	615	,,	,,	died 3-4-33
	,,	,,	616	,,	,,	died 2-4-33
	,,	,,	617	,,	,,	died 6-4-33

A few days later two horses were injected with formolised virus of the same origin. It was taken out of the storeroom after dark and injected the same night.

TABLE V.

Exp. No.	Formald. Conc. 1 in :	Date of Preparation	Horse No.	Date of Injection	Immunity Test	Result
114	714	16-12-32	623	10-3-33	31-3-33	no reaction
	,,	,,	624	,,	,,	no reaction

The last two tables also show that formolised virus is extremely sensitive towards light.

On account of bad field results after inoculation by farmers, the packing was altered. The brown bottles, containing the formolised virus, are now wrapped in lead foil, then placed in a wooden cylinder and packed in wood wool in a cardboard box with an outer covering of brown paper. The farmer is advised not to remove the bottle from the wooden cylinder when filling the syringe, and to cover the syringe with lead foil or brown paper to protect the contents against light. He is also advised to inject under cover of shade or better still at night.

In my opinion the widely varying results of different investigators* are to a great extent due to the formolised virus having been exposed to or protected from the light. I regard it justifiable to state that in future more uniform results will be obtained if light is excluded in the preparation and storage of formolised virus.

* Whitworth (1929) Memorandum on Horsesickness Immunisation. Panafrican Agricultural and Veterinary Conference, Pretoria 1929.

Du Toit and Alexander (1930). The immunisaion of horses against horsesickness by the use of formalized virus. 16th Report of the Director of Veterinary Services and Animal Industry. Pretoria 1930.

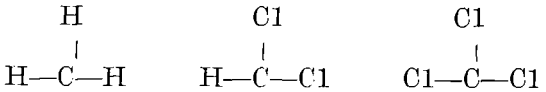
Recent Advances in the Knowledge of Anthelminthics.*

By H. O. MÖNNIG, B.A., Dr. Phil., B.V.Sc., Onderstepoort.

Considerable progress in the study of anthelminthics has to be recorded as a result of investigations pursued during recent years. Some workers have studied the actions and efficacy of known drugs, and find that quite a number of these, formerly considered to be very useful, are comparatively ineffective or even harmful and should be discarded. Others again have searched at random for new drugs, but this method of "having pot shots" at the worms with any drug that one can lay one's hands on has not been very fruitful.

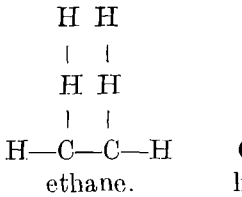
Only too few have attacked this problem in a systematic way by building up likely series of compounds and testing their properties. That the latter method of investigation certainly pays is shown by the fact that several very useful drugs have been discovered in this way.

Hall, having noticed the moderate anthelminthic effect of chloroform, started the investigation on chlorinated hydrocarbons and soon found carbon tetrachloride and later tetrachlorethylene. He and other workers, particularly Wright and Schaffer, proceeded on these lines to search for more useful drugs and the latter two investigators discovered n-butyl chloride and then n-butylidene chloride.



methane. chloroform. carbon tetrachloride.

ethylene. tetrachlorethylene.



ethane. hexachlorethane.

$C^4 H^9 OH$ n-butyl alcohol.
$C^4 H^9 Cl$ n-butyl chloride.
$C^4 H^8 Cl^2$ n-butylidene chloride.

* Paper read at the 25th General Meeting of S.A.V.M.A.

Another group of workers, to which I hope we here at Onderstepoort may soon belong, has been searching for a scientific basis on which to build the science of anthelminthics, by studying the metabolism of the parasites. What is known on this subject is mainly that the worms have an anaerobic metabolism, breaking down glycogen to fat and excreting the latter as a waste-product, in order to obtain energy. An outstanding example of this newer knowledge is the fact that tapeworms have very large calcium requirements, a finding which may prove very useful, since a suitable calcium compound may be built up which will be readily absorbed by the tapeworm and will kill the latter when it splits off the calcium to assimilate it. It is obvious that the last two methods of investigation mentioned open up a very bright future for this subject.

I have selected for this discussion a few of the older drugs of which I wish to say something that may assist you better to understand their actions, and I would also like to introduce to you a few of the newer drugs.

Carbon tetrachloride. Since its introduction in 1921, this drug has been very widely used in veterinary medicine, and over 15,000,000 human cases have been treated with it. Knowledge regarding its toxic nature has gradually accumulated and some now consider it to be so dangerous that, in Switzerland for instance, it is no longer used for human beings. This drug produces central necrosis and fatty changes in the liver. These lesions are accompanied by chemical reactions of a complex nature, which are not always commensurate with the extent of the visible liver lesions. Apparently there are three different but related reactions :

1. Bile pigments are retained in the blood and combine with the ionised blood calcium, being excreted in this form and leading to deficiency of calcium which results in haemorrhages in the serous and mucous membranes and sometimes tetanic spasms. This was at first thought to be the main reaction, but the work of Cutler especially showed that the following were much more important :

2. Guanidine accumulates in the blood and leads in some way to a marked hypoglycaemia and increase of lactic acid. This is as a rule the more dangerous reaction.

3. Guanidine further interferes with the normal conversion of glycogen to blood sugar in the liver.

Calcium is antagonistic to guanidine since it opposes the action of the latter in producing hypoglycaemia and in its interference with the formation of blood sugar in the liver. Moreover sufficient calcium will prevent a state of hypocalcaemia developing as a result of the first

mentioned reaction. It is therefore obvious that a diet rich in calcium and carbohydrates is very desirable to prevent carbon tetrachloride intoxication, while proteins which give rise to guanidine are to be avoided.

It can safely be said that the day of carbon tetrachloride is past. The drug is rapidly being replaced by tetrachlorethylene which is equally effective against most parasites, with the exception particularly of liver fluke in sheep and cattle. For this parasite in sheep the drug will continue to be used and, since only 1cc. is required, it is safe provided the usual precautions are observed. It is also safe for poultry. For cattle it is too toxic.

Tetrachlorethylene produces no liver lesions and is much safer than carbon tetrachloride, especially in the case of young animals.

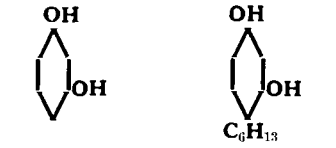
Hexachlorethane. This appears to be the best drug known at present for liver fluke in cattle and can be recommended especially for our conditions in this country, since male fern extracts (which are also useful) are more toxic and vary greatly in quality, especially on the South African market. Hexachlorethane has been used on a large scale in Germany for cattle, the dose being 20 gm per 50 kg. body weight divided into four equal parts which are administered on four successive mornings 2-3 hours before feeding, so that rumination does not occur soon after dosing. This repeated dosing is the greatest disadvantage. The drug is stated to taint the milk slightly and milk cows fed on concentrates may go off their feed or show mild symptoms of colic, but deaths do not occur. It is not advisable to feed only concentrates during the time of treatment.

n-Butylidene chloride is one of the anthelminthics recently discovered by Wright and Schaffer. When pure it is a clear, colourless liquid with a sweet taste and a pleasant odour, B.P. about 115°C, S.Gr.1.084, solubility in water 1 in 2000.

In dogs, in dosage of 0.3cc. per kilo, it removes 96-100% ascarids and about 100% hookworms, with a factor of safety of at least 33. In cats it is almost equally effective. In horses, at the rate of 0.2-0.3 cc. per kilo and followed after five hours by a dose of raw linseed oil, it is effective against large and small strongyles. In fowls in doses of 2cc. it removed all ascarids.

The drug may cause cloudy swelling of the liver and kidneys, and in some cases in which the animals were given very large doses or where they were already suffering from other ailments, fatty degeneration of the liver or acute nephrosis was seen. Young animals were more severely affected than older ones. This drug is decidedly less toxic than carbon tetrachloride and may become very useful when more is known about it.

Hexylresorcinol. After it had been shown that the introduction of alkyl radicles into the resorcinol molecule increased the antiseptic effect of the combination, Leonard found that the maximum effect was obtained with a chain of six carbon atoms. The resulting compound, hexylresorcinol, has been used for many years in olive oil as a urinary antiseptic and, although large doses were given, no case of intoxication has been reported. This drug was found by Lamson and his co-workers to be a powerful anthelminthic.

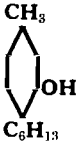


resorcinol hexylresorcinol

About 30% of the dose is absorbed and very rapidly excreted by the kidneys; the rest is passed in the faeces. It has a corroding or blistering action on the cuticle of the parasite. In man, at the dose rate of 0.1 gm per year of age up to 1 gm, it removes in single doses 90-95% of ascarids, 80-85% of hookworms, frequently 100% of either, and 40-45% of whipworms. Recently it has also been found to be very effective in the form of an enema against pinworms in man.

It has two disadvantageous properties: (i) it combines with protein forming a precipitate, so that it must be administered after thorough starvation, and (ii) it produces a local irritation on the mucosa of the stomach and intestine. Administration is difficult because the drug cannot be taken as a powder on account of its burning action on the buccal mucosa, it is inactive in oil and it decomposes gelatine capsules. It may be given in sugar coated pills or in freshly filled hard gelatine capsules. This drug may be very useful in enemas against nodular worm in sheep.

Lamson and his associates were, of course, not satisfied to rest at this stage and began searching for another drug which should have all the good and none of the bad qualities of hexylresorcinol. They have now apparently found this in a compound closely related to the latter, namely hexyl-meta-cresol—



In this way investigations are progressing and it can be confidently expected that within the next few years some very good anthelminthics may be discovered.

Breeding for Beef in South Africa.*

By J. H. R. BISSCHOP, B.V.Sc., B.Sc. (Agric.), Onderstepoort.

1. Historical Introduction.

The first immigrants to South Africa found a native or indigenous type of cattle in the possession of the Hottentots.

The presence of these cattle was not only of great immediate economic importance, because by supplying fresh and salted beef to passing ships, the colonists earned the greater part of their income, but the indigenous stock formed a foundation of a cattle industry not found in any other part of the New World. Neither North America, South America, Australia, or New Zealand possessed indigenous cattle types when discovered by Europeans. In fact, it was not until maritime transport had been developed to a stage where our larger domesticated animals could be kept alive during the long sea voyages to the New World, that cattle industries could be started on the continents mentioned above.

From a system of bartering cattle with the Hottentots and with Bantu tribes further afield, the early colonists became cattle breeders themselves. The first direction in which the cattle industry developed was the breeding for beef, for the simple reasons that there was little or no demand for dairy products and that the native stock possessed but poor milking propensities.

As the colony expanded the trek-ox became an important economic factor and during the Great Trek northwards and during the early development of the gold and diamond mining industries in the north, the breeding for oxen of superior draft and staying qualities became the first consideration of the cattlemen of those days.

It is true that sires and even dams of European breeds were imported for the improvement of our native stock during the 18th and 19th centuries and it is also true that their effect was being felt in the southern districts of the Cape Colony. However, it is safe to say that at the end of the 19th century their influence on our cattle population as a whole had been so limited as to be almost negligible. Our cattle still were overwhelmingly indigenous in their genetic make-up and external conformation.

Rinderpest and the Anglo Boer War left our cattle population sadly depleted. The best of the breeding stock was wiped out, sires were at a premium, and with the rapid increase of the white population after

* Paper read before the 25th S.A.V.M.A. Meeting at Onderstepoort.

the war, beef and dairy products had to be imported in enormous quantities to supply our internal demands.

A cry went up for the re-establishment of our cattle industry.

II. The Breeding Policy of the Last 30 Years.

The breeding policy of the last 30 years is to a large extent the work of experts imported from overseas. Seeing our native stock and comparing them with the greatly improved breeds of European creation, what was more natural than that they should import sires of European breeds to improve our indigenous cattle?

The last 30 years thus have seen the systematic and concentrated application of a breeding policy which aimed at the improvement of our stock by the introduction of the improved blood of breeds created in the temperate zones of Europe.

This policy had in view the attaining of a conformational and productive standard of excellence equal to that found in the countries in which the imported sires originated.

III. Questions to be Discussed in this Paper.

The questions which will be discussed in this paper are:

(a) *What have been the results of the breeding policy described above?* Many cattlemen to-day hold that as applied to our open range cattle, the policy has in general been a dismal failure. This opinion leads to the second question:

(b) *Why did the policy fail to fulfil the sanguine hopes of its instigators?* The answer to this question constitutes the major portion of this paper.

Obviously the last question which remains to be discussed is:

(c) *What breeding policy or policies can be suggested for the progressive and permanent improvement of our beef breeding industry on the open range?*

IV. The Questions Discussed.

(a) *The results of the grading policy based upon the use of exogenous blood.* In grading up, the first cross shows marked improvement in comparison with its maternal native parents. This improvement, however, is not maintained in the subsequent top crosses, even if due allowance is made for the effect of hybrid vigour in the first cross.

Instead of progressively approaching the conformational, productive, and reproductive excellence of their paternal breed in its own

environment, the high grades break away from the type aimed at and finally degenerate to a standard even below that of their unimproved maternal ancestors.

The experience on our ranches has been that, after two, three, or four top crosses, the high grades lose vitality and thriftiness. The calves do not thrive as well as the native or half-bred calves and they often show stunted growth, not only while still running with their dams, but especially after weaning, when they are forced to exist on the natural pastures only. Their development is slower. Conformationally they go off-type and become leggy, long, narrow and undeep of body, and long and scraggy of head and neck. The hairy coat becomes harsh, the skin dry and hard to the touch. Although with good pastures in summer they pick up rapidly in condition, they drop in weight much quicker during winter than do the native or half-bred animals. Production and reproduction decline. The oxen mature more slowly and carry less cover and finish, the breeding stock show lower calving percentages. The high grades are very susceptible to adverse climatic, nutritional, and disease conditions.

To sum up, such high grades, with a big proportion of exogenous blood infusion and very little left of the indigenous blood, have lost the vitality to withstand the limiting influences of the environment in which they have to live and function. This degenerative tendency is not only seen in grades. It is even more striking in imported pure-bred beef cattle kept under conditions of the open range.

To combat this progressive degeneracy, to maintain their stock as near as possible to the European standard of excellence aimed at, cattlemen continuously introduce new blood lines and sires of outstanding robustness. When this fails, they cross back with Afrikander bulls, i.e. bulls of pure indigenous origin. It is obvious that such a breeding practice cannot lead to permanent improvement of our open range cattle. It is equally obvious that any breeding policy which is to result in a progressive and permanent improvement will have to be based upon a thorough knowledge of the many factors which are responsible for the degeneracy observed.

(b) *Why did the policy of grading up with exogenous blood fail?* It would seem that an answer to this question is to be found in a comparative study of the complex factors which constitute our own environment and that of the British Isles whence we imported the exogenous beef blood with which to build up our native stock.

Let us first consider our own environment and do so under the four main headings into which Crew (1932) has divided that term.

1. *Climatic factors* :

The ranching areas of this country are mainly situated on plateaux, 2000 feet and more above sea level. Here the climate is one of extremes. Hot summers are followed by cold winters, hot days by cool nights. Summer rainfall predominates. The rainy season is short, the precipitation small in amount and torrential in nature. The run-off is high, the efficacy of the precipitation to plant life poor. Droughts are only too common, and even during so-called normal rainy seasons, precipitation is irregular, often too early or too late. Atmospheric humidity is extremely low for the greater part of the year, evaporation high. Although our sunshine and light are generally looked upon as distinct assets to animal life, the question may well be asked whether we have not too much of these commodities and whether the excess does not adversely affect such factors as longevity, production, and reproduction.

2. *Nutritional factors* :

Our ranching areas of necessity are confined to the more arid areas where soils are poor, vegetation relatively sparse, rainfall low; where agricultural pursuits are problematical or impossible, where land is cheap and the carrying capacity low.

Here the growing season of the veld is very short. For the greater part of the year the available pasture is dry, unappetising, and relatively unnutritious. Over and above the well known mineral deficiency, a protein deficiency definitely exists during these dry months. Under these conditions loss of weight and condition and retardation of development during winter are looked upon as normal and inevitable phenomena.

Surface water supplies are rare, boreholes are expensive to drill and equip. Hence adequate water supplies are the exception and not the rule.

3. *Sociological factors* (these determine animal and range management) :

The cost of land and the capital necessary to develop such land for ranching purposes and, on the other hand, the relatively low productive possibilities of this industry due to environmental limitations set very narrow limits to the warranted capitalisation of such an enterprise.

Little or nothing is known of the basal problems of animal and range management in this country. We know next to nothing of the feeding value of our natural pastures—of correct systems of grazing and veld preservation, of ecological plant successions under prevailing practices of grazing, of the effects of veld burning, soil erosion, under-

or overstocking, of the very growth habits of our grass and edible shrub species.

Malpractices such as overstocking, indiscriminate breeding, mixing milk and beef types, "dairy ranching," too early breeding, uncontrolled inbreeding, kraaling, herding, etc., abound. Due to this lack of essential basic knowledge, those responsible for the organisation of the beef breeding industry are not in a position to formulate a sound policy and are forced to give to breeders palliative instead of experimentally proved advice.

Lastly, it is necessary to mention that, of the approximate total of 11,000,000 cattle in the Union, 7,000,000 are ranch cattle and of these 4,000,000 are owned by natives.

To improve the management of the European owned cattle without giving equal attention to the native owned stock, would nullify all possible success of any otherwise sound policy.

4. *Disease factors* : It is no exaggeration to say that South Africa's cattle industry is dependent first and foremost upon the ability of its veterinary organisation to keep the cattle alive, i.e. upon its ability to

(i) control infectious diseases such as East Coast fever, anthrax, contagious abortion, foot and mouth disease, heartwater and other tick-borne diseases, nagana, quarter evil, tuberculosis, etc.,

(ii) combat the ever increasing menaces of sterility and poisonous plants, and

(iii) solve the problems of the nutritional deficiencies which exist.

More so than in most countries where cattle ranching forms the major part of the cattle industry, do prevalent diseases in this country influence the potentialities of this industry.

The above then is a brief description of the environmental factors under which our range cattle have to live and function. I fear no contradiction in stating that the beef breeds which were imported (mostly from Britain) to improve our native stock came from and had their origin in a far superior environment to our own. But why should the introduction of a sire from a better environment to a poorer one result in degeneracy of his grades with cattle native to the poorer environment? Crew, in the article already quoted, explains this so admirably that I wish to quote what he says.

His premise is that "Habitat and destiny create harmonious biological types" and he illustrates this statement as follows : "Ayrshires will continue to remain Ayrshires only as long as they live in Ayr, which is not a county of Scotland but a peculiar combination of human

stock, social organisation, husbandry, and climate. Transplant the Ayrshire and it will become different, better or worse, depending whether the conditions in its new habitat are better or worse than those in its own. Importations hence should be made from stocks of higher quality, measured by the prevailing local yardsticks, which have thriven in conditions as similar as possible to those of the country into which they are to come."

What did we do?

By using improved sires from a far superior environment on native cows we instilled into their offspring characteristics in harmony with and capable of finding phenotypic expression in that superior environment, but not in our inferior environment. By topcrossing we simply increased the disharmonious characters and decreased the harmonious characters of our indigenous cattle proportionally.

Results might still have been satisfactory if we had been able to raise our environmental level in keeping with the progressive infusion of the imported blood. This we did not, could not, do. The above statements are suggested as an acceptable explanation for the failure of the grading policy with imported sires on open range cattle.

(c) *What breeding policies can be suggested for the future?* In formulating breeding policies for the future of our open range beef industry, the potentialities of our indigenous stock should never be lost sight of. Of these potentialities the outstanding characteristic is that our native cattle are in harmony genetically with their environment; are genetically adapted to its limitations. Improvement of our open range cattle can be brought about in two possible ways :—

(1) *By improving our environment.*

If this were possible it would be the surest way of progress. If our environment could be raised to the level of that of countries where the highest improved beef breeds are found, then it would be policy to discard our native stock and import the best we can obtain. Such importations would come to a harmonious environment and would do well.

Although much has been done especially along veterinary lines and although much can still be done along the lines of animal and range management to overcome the limitations of our environment, the climatic and resultant nutritional factors which are beyond our control preclude all possibility of our attaining, on the open range, cattle of the standard of excellence found in Europe (especially Britain) and in the temperate parts of North America, South America, and Australia and in New Zealand. In fact recent researches would tend to show

that zootechnically the world can be divided into two main areas, namely,

(a) the temperate zones,

(b) the tropical and subtropical zones

and that the difference of environmental conditions of these demand separate types of cattle and standards of excellence.

(2) *By improving our own stock to the highest possible excellence permitted by the prevailing environmental limitations.*

It is obvious that in any policy which can be suggested under this heading the basis must be the harmonious genetical make-up of our indigenous stock. Several breeding policies can be suggested under this heading :—

(a) *A study of the still existing truly indigenous types of cattle, and the production from them of breeds of economic value by selection and rational methods of breeding* :

Not only does Southern Africa possess indigenous cattle, but these can be divided into a number of distinct types such as the Afrikander, Damara, Ngami, Barotse, Ovambo, Bechuana, Mashona or Makalanga and the Zulu, to name but a few.

In less than two centuries the British breeders have built up the premier beef breeds of the temperate zones of the world from foundation stock no better than our own. Why then cannot we build up equally good breeds for our subtropical environment by suitable methods?

The Afrikander breed represents the only one of our indigenous types which has been selectively bred for specific economic purposes. At first its main function was that of draft animals. For this purpose it has never been surpassed.

A little more than a decade ago the breeding policy for the Afrikander became modified and to-day its breeders are fast changing it to a beef animal of outstanding merit. The results of this change of policy have been astounding and I confidently predict that in the not distant future Afrikander beef will have a name of its own on the Smithfield market for its high quality and general excellence. But were the original Hottentot cattle the only type of indigenous stock capable of responding so well to systematic breeding practices?

The Damara is at least as big an animal as the Afrikander and possibly possesses heavier and more balanced hindquarters. The Zulu conformationally is not inferior to the Afrikander. Why then cannot

other breeds be built up out of existing native breeds which will be as good as, if not better than, the Afrikander?

The establishment of special research stations for the study and improvement of our remaining native cattle types is a matter of national importance; the more so because the introduction of exogenous blood is fast polluting the inherent potentialities of these types and changing their specific identities adversely.

(b) *Cross-breeding—Segregation and the selection of new types.* Experience has taught us that degeneracy sets in when the balance of indigenous and exogenous blood becomes upset in the direction of the latter. Up to a point the disharmonious blood infusion does improve conformation and production, while the proportion of indigenous blood still present is capable of retaining the necessary vitality and preventing degeneracy.

It is hence possible to use the blood of superior European breeds to some extent. It is equally possible to determine experimentally, under any set of environmental factors, the degree of exogenous blood infusion warranted. Once this has been done the blood proportions can be retained at a constant level by discarding the further use of pure-bred bulls and using only bulls containing the predetermined correct ratio of exogenous and indigenous characteristics.

To illustrate: By breeding say pure-bred Sussex bulls with native cows, the proportion of exogenous to indigenous blood in the half-breds will be 50 :50. One top cross with Sussex will change this proportion to *E*75 :*I*25. A cross back on such $\frac{3}{4}$-bred heifers with a pure-bred Afrikander bull would bring the proportion of *E*37.5 :*I*62.5, while a cross back of the $\frac{3}{4}$-breds with a $\frac{1}{2}$-bred bull would reverse this proportion to *E*62.5 :*I*37.5.

It is hence possible to change the blood proportions experimentally. Once the correct ratio has been experimentally established, it is kept there and by strict selection a new and for practical purposes homozygous breed can be produced.

That this is no mere theoretical possibility has been demonstrated by Kleberg, owner of the world famous "Kings Ranch" in Texas, who has produced a superior beef breed—the so-called "Santa Gertrudes Breed" by crossing Brahmin(Zebu) bulls with Shorthorns (Kelley, R.B. 1932).

Incidentally it may be mentioned here that it was Mr. Kleberg who, through Mr. W. H. Black, imported some 40 Afrikander bulls and heifers from this country about two years ago for the express purpose of trying to create new breeds by the method above described, between Afrikander x Shorthorn and Afrikander x Hereford cattle.

The two breeding policies described above will require basic experimentation for very many years, very large numbers of animals and the expenditure of much money will be involved, and results cannot be expected during the life-time of a single generation of research workers. Only the Government and large ranching interests can afford to put these policies into practice for the time being. The cattlemen in general will profit by these practices of breeding only when new and better breeds have been established.

Notwithstanding all this the policies suggested are the only ones which can ultimately lead to a progressive and permanent improvement of our open range cattle population. At the same time it must be borne in mind that the Afrikander breed is fast being developed into a beef breed and that judicious selection can overcome the few conformational weaknesses which are still common to the breed. I refer specially to the rather heavy forequarters and the rather light hindquarters. By selection and without breeding away the hump (if such were desirable and possible) the forequarters could be corrected and by selection, too, the twist could be deepened and the lower thighs made to carry more cover.

The question, however, arises: what breeding policy can be suggested for the immediate future?

(c) *The crossing back of high grades with Afrikander bulls.* From the economic aspect this policy suggested by Bosman (and adopted by most of the cattlemen to-day) appears to offer the best results for the immediate future. As soon as the grading up with exogenous blood reaches the highest ratio permissible to the remaining indigenous blood, Afrikander bulls are introduced to correct the balance. That such a policy cannot lead to permanent improvement and must lead to extreme conformational variation and lack of uniformity from the first back cross onwards will be obvious to all cattlemen.

Another breeding practice which is being practised to some extent and which is really a modification of the grading up policy is what may be called

(d) *The Limited Grading up Policy.* Here the basic breeding stock consists of selected native cows. These are crossed with a sire of an imported breed and possibly one top cross takes place, but the grading up never goes beyond the $\frac{3}{4}$-bred stage. When this stage has been reached, all the graded animals, both females and males, are disposed of as beef. The policy is quite sound and obviates degeneracy, but can be carried on only so long as native cows of the correct type remain available to replace the necessary culls amongst the basic breeding stock. It produces excellent carcases and good returns, but is really not a breeding policy in the strict sense of that word, as it contributes not an iota to the permanent improvement of our open range cattle population.

Conclusion.

I am hence of opinion that the "crossing back" and the "limited grading up" policies must be looked upon as palliative measures only. They cannot help us progressively to improve our stock and build up a stable cattle population of high excellence.

Our hopes for the near future in this respect lie in the improvement of the Afrikander in the points mentioned and in the intensive use of such improved Afrikander bulls upon our unimproved native stock.

Finally, our ultimate aim should be to produce new breeds either by straight selection within the still existing native types or by the limited use of exogenous blood and the subsequent retention of a fixed ratio of exogenous and indigenous blood.

Addendum.

(a) *Scrub cattle.* A discussion on beef breeding in South Africa cannot be satisfactorily concluded without some reference being made to our "scrub cattle."

"Scrub cattle" may conveniently be defined as those which have so deteriorated that they are no longer economical units of production and reproduction.

Scrub cattle may be classified into :—

1. *Indigenous scrubs.* In these the degenerative causes have been primarily nutritional in nature. Such animals, although truly indigenous and in harmony with their environment in respect to climate, have had to adapt themselves to conditions of a progressively deteriorating environment in respect to nutrition and management. This adaptation has found expression not so much in a change of conformational proportions, but in dwarfing. The indigenous scrubs are simply miniatures; unfavourable conditions have led to reduction in size, and not so much to a change of body proportions and symmetry.

Such scrubs can to-day be found in thousands, especially in the native territories where exogenous blood has played no rôle as yet, but where, due to overstocking and bad management, the natural carrying capacity has been enormously reduced without a commensurate reduction of the cattle population.

2. *Exogenous scrubs.* These are the products of our grading up policy with exogenous blood. The continuous infusion of superior blood without a commensurate improvement of our environment has upset the balance between genotypical potentialities and the possibilities of phenotypical expression of the inherited characteristics. This lack of balance, as already described in detail at the beginning of this paper, results in "off type" animals. First the grades become leggy, long,

narrow and undeep of body, long and scraggy of head and neck. Production, reproduction and vitality suffer. Finally too, dwarfing sets in, but the exogenous miniatures retain the asymmetrical body proportions just described.

In both types of scrubs there is a slow modification of genotypic make up to conform to the environmental limitations. In the indigenous scrub this modification is faster than in the exogenous scrub, because fewer characters are involved in the process of modification.

Regeneration of Scrub Cattle : It is beyond the scope of this paper to discuss possible regenerative breeding policies in any detail. The object of the few ideas expressed is to point out that there are scrubs and scrubs, and that any policies which aim at possible regeneration must be based on overcoming the separate complexes of causes responsible for the two types of scrubs described.

Lastly, a short note on :

(b) "*Hybrid Vigour.*" When a bull of imported stock is crossed with unimproved native cows, the general improvement of the ½-bred progeny, when compared with their maternal parents, is rather remarkable; in fact this excellence of the ½-breds usually decides the breeder in favour of continuing the policy of grading up with exogenous blood. Subsequent top-crosses, however, do not show further proportional improvement and ultimately degeneracy sets in. When such degenerated high grades are crossed back to indigenous bulls, i.e. Afrikanders, improvement is directly noticeable.

To retain the excellence of the European beef breeds, many cattlemen have tried crossing high breeds with degenerative tendencies back to bulls of another imported beef breed. The results have invariably been most disappointing.

From recent researches it would appear that "hybrid vigour" in cattle is manifested only when breeds of different types are crossed and not with the crossing of breeds belonging to the same type. This newer knowledge is obviously of great importance to practical breeders of cattle on the open range.

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The Occurrence of *Bdellolarynx uniseriatus* Malloch, a Blood-sucking Fly, in the Transvaal.

By Dr. OTTO NIESCHULZ (University of Utrecht) and
RENÉ DU TOIT, B.V.Sc., Onderstepoort.

During the course of field work conducted by us in connection with the transmission of horsesickness on the farm Kaalplaas (close to the Onderstepoort Laboratories) in February and April of this year (1933), we found a small bloodsucking fly belonging to the *Stomoxydinae*. According to the literature this species is closely related to *Bdellolarynx uniseriatus* Malloch. Some differences between the original description and our material seemed to exist, however, and one of us therefore communicated with Mr. D. Aubertin, Department of Entomology, British Museum (Natural History), London, with the object of comparing our specimens with the types of Malloch. According to him, our specimens belong to *B.uniseriatus;* the slight differences from Malloch's description being due to the fact that the type specimen seems to be rather more sombre in general colouring. We are much indebted to Mr. Aubertin for his kind assistance in the identification of our material.

The specimens of Malloch (1932) were collected at Epworth, Salisbury, and Balla-Balla in Southern Rhodesia. One specimen also came from Zululand in the Union of South Africa. Our material is the first to be collected in the Transvaal. Two other species of *Bdellolarynx*. *B.latifrons* and *B.angustifrons* Malloch have been described from the Union, both from Zululand.

According to our observations, *B.uniseriatus* appears to be quite a common species in certain localities. At Kaalplaas it was commonly met with on horses where it was well known to the natives. Shortly before and after sunset especially, it attacked our horses and mules in relatively large numbers, biting for preference on the belly and legs. Although this is the first description of this species from Onderstepoort, we do not think that it appeared there only recently.

In the course of our field work at Onderstepoort during last summer we encountered three biting flies, viz. *Stomoxys calcitrans*, *Musca crassirostris* (du Toit and Nieschulz 1933) and this *Bdellolarynx*. These three species, which have to be regarded as potential transmitters of diseases, were quite common and about evenly distributed.

B.uniseriatus is a small greyish fly, 3-5 mm. in length.

Head (cf. fig. 1): Proboscis black, shorter and not so slender as in *Stomoxys*. Palpi brown, almost as long as the proboscis, apical half considerably dilated and spatulate, dark brown to black, basal part slender, light brown. Arista with about ten long hairs on upper surface and three to four long hairs on lower surface. Frons in male

narrow, narrowest just below the ocelli, gradually widening to about twice this width at lowest point. At each side one row of ten to twelve inner vertical bristles. Ocellar and posterior vertical bristles poorly developed. In the females the frons about one-third of width of head. Interfrontalia of nearly the same width up the anterior margin. The orbits below the ocelli about as wide as the interfrontalia, at anterior margin about twice as wide.

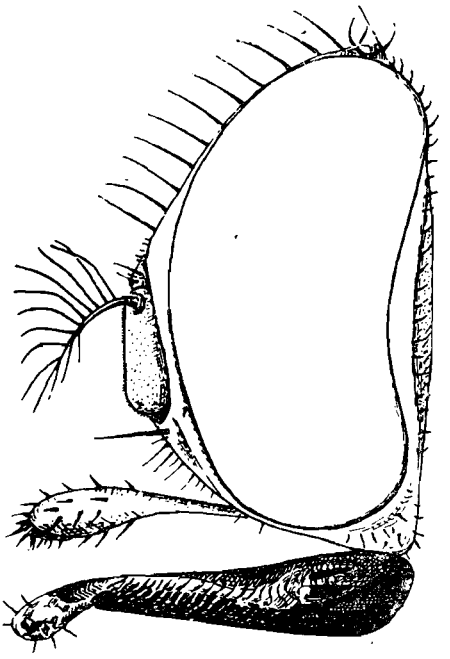

Fig. 1.—*Bdellolarnyx uniseriatus.* Head of male, lateral view. Orig.

Thorax light grey. In males (viewed from in front) with four broad, black, longitudinal stripes in two pairs, fused in front of suture and narrowly separated posteriorly. Inner pair of stripes gradually widening towards the scutellum, in front of which both stripes are connected. In the females the stripes are less distinct, shorter, and lighter coloured. Outer pair interrupted at suture.

Abdomen greyish brown. On the second and third segments a dark brown oval patch on each side of the mid-line, not reaching the apical margin. On basal half of second segment a small dark median stripe.

Legs black, greyish dusted. In males basal portion of all tibiae yellowish, in females almost the whole tibiae of the midlegs yellowish.

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Dogs and Human Migrations. (Continued.)

By Capt. R. D. S. GWATKIN, Roberts Heights.

4. The World-Wide Wanderings of the Pomeranian Varieties.

We have examined the historical and archaeological evidence concerning the jackal-breed and have indicated that the Eskimo dogs came from that source.

We have yet to learn whether the Arctic "wolves" in Europe and America are derived from or to what extent they have been bastardised by the Eskimo dogs which seem to be derivable from Egyptian "jackals." It was noted above how close is the relationship between wolf and dog in the same districts throughout the world to-day. It is also of fundamental importance in the amazing history of the dog to take into account the homogeneity of religious ideas concerning the dog that have been spread abroad amongst humanity.

We have noted that in Ancient Egypt the dog was worshipped. Acording to the Parkers (loc. cit.):

> In the New World, the Dog is or was held as an object of adoration by many of the natives; and dog-worship seems to have been a more ancient *culte* than the sun-worship practised by the Mexicans. Humboldt informs us that "when the Inca Pachacutec, in his religious wars, conquered the Indians of Xanxa and Huanca (the present valley of Huancaya and Janja), and compelled them by force to submit to the worship of the sun, he found that Dogs were made the objects of their adoration, and that the priests used the skulls of these animals as wind-instruments. It would also appear that the flesh of this canine divinity was eaten by the believers. The veneration of Dogs in the valley of the Huancaya is probably the reason why the skulls, and even whole mummies, of these animals are sometimes found in the Huacas, or Peruvian graves of the most ancient period. Tschudi, the author of an admirable treatise on the *Fauna Peruana*, has examined these skulls, and believes them to belong to a peculiar species, which he calls *Canis ingae*, and which is different from the European Dog." The Huancas are still, in derision, called "dog-eaters" by the inhabitants of other provinces. Humboldt also tells us that "the Peruvian Dogs were made to play a singular part during eclipses of the moon, being beaten as long as the darkness continued."

These dog-eating, dog-beating, dog-sacrificing, and dog-venerating practices are spread from Greece and Rome to Scandinavia in the West and through China, Japan in the East to Central America and South and North America even to Greenland.

> Before Christianity was established among the Danes, on every ninth year, at the winter solstice, a monstrous sacrifice of ninety-nine Dogs was effected. In Sweden the sacrifice was still worse. On each of nine successive days ninety-nine dogs were destroyed.
>
> (Youatt).

> The Emperor who sat on the throne when Haempfer resided in Japan was so extravagantly fond of them (dogs) that there has been a greater number of them in that kingdom ever since his reign (if we may depend on the veracity of this traveller) than in any other nation in the whole world. Every street is obliged to maintain a fixed and determinate number of them. They are quartered upon the inhabitants, and in case of sickness they are obliged to nurse and attend them. When they die they are obliged to inter them in a decent manner in the mountains and hills peculiarly appropriated for the interment of the people. It is looked upon as a capital crime not only to kill them, but barely to insult and treat them ill; and no one but the legal proprietor is allowed so much as to correct any of them. All this reverence and respect are owing to a celestial constellation which the Japanese call the Dog, under the influence whereof the aforesaid Emperor of Japan was born.
>
> (Picart : "Religious ceremonies of all Nations").

According to Franklin Parry and other Arctic navigators the Eskimos consider the Dog the father of the human family, the Chippewayan Indians had a tradition that they were sprung from the Dog (Parker, loc.cit). Various other Indian tribes have their "dog-dances," others again their "dog-eating" feasts, the latter for the purpose of assimilating the courage of the dog.

> A strange notion prevails among the Greenlanders that an eclipse is caused by the sun being pursued by his brother the moon. Accordingly when this phenomenon takes place, the women take the Dogs by the ears, believing that, as these animals existed before man was created, they must have a more certain presentiment of the future than he has; and therefore if they do not cry when their ears are pulled it is an infallible sign that the world is about to be destroyed.

These curious beliefs about dogs, which had already been elevated by the Egyptians to godly rank and to a celestial dwelling in the Dog-star, became strangely changed as they filtered from country to country to reach Scandinavia and Greenland meeting in the American Arctic the different yet similar cultural stream of ideas about dogs that encircled the Indian and Pacific oceans.

It is not our purpose here to analyse these ideas concerning dogs but merely to point out that the dogs themselves must have accompanied these culturally connected ideas about dogs. It is not necessary to attempt to prove that man transported domesticated dogs by sea as soon as he mastered the elements of navigation. The discovery of dogs in Australia, the islands of the Pacific, and even in such isolated places as the Falkland Islands (*C.antarcticus*) is sufficient proof. The object of search is rather to discover what dogs navigating man did transport.

Now the Chow-Chow dog of China is the one which is specially reared as a table delicacy. It is virtually a replica of the Spitz-Pomeranian and has unquestionably been derived from the same stock; and just as this Egyptian jackal-stock gave origin to the poodles and span-

iels of Europe there can be little doubt that the same stock gave rise to the Pekinese and Japanese spaniels and other similar types of the East. The Chow-Chow of China is intimately related to the Samoyede breed of North-eastern Siberia and through these we are led naturally to the "huskies" of Alaska and Canada. It has always been recognised that the Pomeranian is a close ally of the Eskimo breed. There is no inherent impossibility but indeed a great probability in the thesis that the Eskimo dogs and the Arctic "wolves" with which they freely mingle are derived from North-African jackal stock and largely through the medium of navigating mankind along the Western European and Eastern Asiatic coasts. If the arctic wolves were not so derived they have at least been woefully bastardised by the world-wide migrations of the Pomeranian stock.

The Eskimos are known frequently to practise interbreeding of their dogs with Arctic wolves and it is a matter of difficulty to determine the differences between some Eskimo dogs and their wild brethren. The resemblances of the "wolves" and "coyotes" of America to the dogs of the Red Indian tribes on the one hand, and to the Eskimo dogs on the other, are sufficient indication of their relationship to the Pomeranian stock either by direct derivation or by serious admixture.

It is evident therefore that both in story and in person the Jackal-Pomeranian stock encircled the world, and that, whether we consider the evidence historically (as in Egyptian monuments), stratigraphically (as in the European Neolithic deposits), or geographically, it was the first dog to be domesticated. It is also the stock that has given us the most varied derivatives and its present day representatives are the most favoured and pampered of domestic pets. It is the most ancient companion of mankind and probably owes to the intimacy of its human relationships the superlative intelligence that is found even in its dwarfed modern descendants.

(To be concluded.)

We learn with regret of Dr. Otto Henning's death at Grootfontein, S.W.A., on the 10.11.33.

An obituary notice will appear in our next issue.

The Possibilities of Private Practice in Rural Areas in South Africa.*

By A. MATTHEW, M.R.C.V.S., Bedford.

The question raised in the above title may appear to be easily answered by means of the word "none": at the first sight there appear to be no possibilities at all for the private veterinarian in rural areas. However, one should do something to show what openings may be made in these areas especially as more and more veterinarians are qualifying every year and not all can be absorbed by the Government Service.

Probably I have been asked to contribute this paper as one who was for some time in private practice in Scotland. At that time the motor car was not in general use and I kept three stabled horses and had plenty of work for them. Professional fees were reckoned in miles from the surgery at sixpence per mile, which was not very much, but the dispensing of one's own prescriptions helped to make up a fair living. Working such an average country practice entailed many long hours of riding or driving, but the experience gained in treating cases and dealing with the farmers compensated for the hard work.

In addition I have been stationed for some years at Bedford, a district in which there are many pedigree cattle herds—Friesland, Shorthorn, and Afrikander particularly. It is a well known fact that when well bred or pedigree animals are artificially reared and fed, in fact generally pampered, numerous diseases make their appearance and it is then that opportunities for the private practitioner arise.

I now wish to mention a few of the most commonly occurring conditions with which the private practitioner is called upon to deal. Preventive inoculations in all animals constitute a part of veterinary practice which could be developed greatly to the advantage of the country veterinarian. It is true that to-day most of this work is carried out by the Government Veterinary Officers, but once the farmers came to know the private man and appreciated his services a large proportion of the work would be diverted to him.

In cattle Tuberculin testing offers a wide field for the rural veterinarian, who should be an expert in this branch of his work. Dystokia, retained placenta, metritis, vaginitis, mammitis, milk fever, pneumonia, and anaplasmosis are conditions which one is very often called upon to treat. In addition, ringing bulls, trimming their feet, and also treatment of the numerous digestive disturbances to which calves are subject must be included in this list.

* Paper read before 25th General Meeting S.A.V.M.A.

The most common conditions met with in equine practice include amongst others lameness, the various colics, biliary fever, and injuries due to accidents. Castrations, also, provide a considerable amount of work.

In dogs the chief conditions encountered are biliary fever, distemper, and accidental injuries. On account of the fact that a sentimental value is usually attached to canine pets their owners are more willing to pay for their treatment and this part of veterinary practice is very promising, although not offering quite the same scope in the country as it does in the larger towns.

Poultry and the small fur-bearing animals constitute another sphere in which the private country veterinarian could interest himself, especially in view of the growing South African rabbit industry.

With regard to the remuneration to be expected an idea can be obtained by summarising my experience in Bedford over the last few years. On an average I have done 1,000 miles annually of private mileage (for which the Government charges ninepence per mile). It is as well to note, however, that the private man would very probably do much more than this as private work is very often fitted in with official work on the same trip and in my case much private mileage would be considered official.

Medical practitioners in this country charge, I believe, 3/6 per mile both ways and 10/6 per hour for time taken. I suggest that the veterinarian charge 2/6 a mile and 5/- an hour. On this basis then the annual turnover would amount to approximately £180.

The private veterinarian should of course do his own dispensing, both for the profit entailed, which is considerable, and on account of the indiscriminate use which chemists only too often make of the veterinarian's prescriptions. Turnover in this branch I estimate at £150, so that a total annual figure of £330 is reached.

To the question of whether the private veterinarian would make a reasonable income in a rural area I should be inclined, from the evidence in my own district, to answer "not at present." I consider, however, that the time has come when men should be placed in rural areas suitable for private practice on part time Government appointments. Their duty would be to control scheduled diseases only; apart from this they would have full liberty to do private practice. I suggest that £400 per annum be the salary for such part time appointments.

With regard to Veterinary Education I should like to make the suggestion that the Faculty should encourage students to see as much practice as possible, in town or country areas according to individual

preference. The practitioner would gain much advantage by hearing of the latest methods of treatment etc., and the student would reap the inestimable benefit of "experience" in varied cases.

In conclusion a point that merits mention is this :—that every veterinarian and especially the country practitioner should be a good horseman. Farmers are always interested in horses and a bond of contact is at once firmly established when they discover that the veterinarian is a good horsemaster.

DISCUSSION : MR. F. J. CARLESS.

The subject covered by this paper is perhaps the most important on the Agenda, dealing as it does with the prospects of the future S.A. graduates. The Veterinary Act of 1933 aims at giving protection to the qualified man as against the quack. To the town practitioner this protection will prove of considerable assistance, but the rural veterinarian is not faced with this competition to any great extent. The local blacksmith sometimes rasps molar teeth and treats cases of lameness. The chemist sells stock remedies and is not always too scrupulous in regard to the use he makes of prescriptions, in fact I frequently hear from clients that they have obtained my own, or one of the Government Veterinary Officers' "cures" for certain animal diseases. The prescription has been given in all good faith for a particular case, but the seller of drugs, by means of a few questions, can readily discover for what disease or condition it was given and farmers are not slow to avail themselves of the opportunity of getting second hand advice and drugs, etc., at the chemist's price.

But neither blacksmith nor chemist is such a serious competitor as the Departmental officer. The stock farmer looks to the Veterinary Division for advice and assistance and he has so long been indulged with free service, not only in the control of infectious disease but of the ordinary ailments of stock, that he considers himself entitled to advice on every occasion. It is true that the Department charges mileage in cases where a Government Veterinary Officer's services are sought for non-scheduled diseases, but the farmer usually circumvents the charges by suggesting a mysterious new disease which requires investigation, or the like. It would be interesting in this regard to learn how much revenue in fees is collected annually under this head.

The unfortunate private practitioner, therefore, is handicapped from the very start by the fact that he charges for services which can be obtained from the state officer free. I will give an instance which came to my personal knowledge quite recently, in a district in which dairying and cattle breeding constitute the main line of farming. Sterility in various forms is prevalent, as also is udder trouble. A private practitioner is available, whose fees are necessarily moderate.

A "Farmers' Day" was held and the G.V.O. was invited to lecture on "Vaginitis" and "Mastitis." So much information was imparted, including prescriptions for vaginitis and the address of a chemist in Pretoria where supplies could be obtained, that the private practitioner's assistance will not be required. In the case of mastitis the meeting was advised to use "Mulford" or "Cutter" polyvalent vaccines obtainable from drug stores. The lecturer was most popular and was detained for an hour or more after the lecture dispensing free advice on individual cases. No blame can be cast upon the G.V.O. He, as a state servant, could not well refuse to instruct the farmer regarding hygiene in the management of his stock and its importance in the control of disease, but the farmer is not satisfied with that, he wants a "cure" and the unfortunate Government Veterinary Officer, having gone so far, cannot refuse to give the coveted prescription.

Mr. Matthew does not take an optimistic view of the possibilities for the future rural veterinarian. The decrease in the number of pedigree herds and, what is more important, the steep fall in values in recent years, have certainly constricted the private practitioner's opportunities. Were it possible, however, to subsidise the veterinarian in return for services in controlling contagious disease and full liberty for private practice (on the lines of the District Surgeon) was given I believe there are a few openings in the more progressive stock raising areas; but without such aid, or other source of income, the veterinarian setting up his flag in country districts would be courting certain disaster.

An Unusual Route of Foreign Body in a Case of Traumatic Pericarditis.

By J. R. FREAN, M.R.C.V.S., Ladysmith.

On the 4th March, 1933, I was called to the farm Walkershoek, Klip River Division, to examine a cow that had died suddenly after dipping. At post mortem the apex of the spleen was noticed to be enlarged and adherent to both the reticulum and diaphragm. The adhesions were cut away and a fistula was discovered passing from the reticulum through the spleen, about four inches from the apex, and the diaphragm, into the thoracic cavity. The foreign body could not be found in the pericardial exudate which was typical of traumatic inflammation. It is assumed, however, that it was a bone splinter as the reticulum contained a number of other polished sharp-pointed splinters of this nature.

A Preliminary Note on the Occurrence of Bluetongue in Cattle (the so-called pseudo Foot and Mouth Disease).

By Drs. J. G. BEKKER, G. DE KOCK, and J. B. QUINLAN, Onderstepoort.

During the autumn of 1933 an undescribed disease, referred to as pseudo foot and mouth disease, made its appearance in herds of cattle scattered over an extensive area of South Africa. From evidence obtained it would appear that this disease is not a new condition, but that it has been observed for some considerable time. Unfortunately no serious notice was taken of it and it thus escaped the attention of veterinarians until 1933 when all available veterinary resources were organised to deal with a possible spread of foot and mouth disease throughout the Union.

In practically every case where this so-called pseudo foot and mouth disease broke out the owners considered it to be foot or mouth disease or were, at any rate, very suspicious of it. Since lesions appeared on the buccal mucosa, the feet and the udders, veterinarians experienced considerable difficulties in definitely excluding foot and mouth disease. It therefore became essential to undertake experimental investigations in order to ascertain the nature of this condition.

In the experiments undertaken it was possible to demonstrate in the blood of most of the cattle suffering from so-called pseudo foot and mouth disease the presence of the well known virus causing bluetongue of sheep. Very characteristic reactions of bluetongue developed in the experimentally infected sheep and, furthermore, the nature of the virus was established by immunological tests.

It was also shown that calves, although less susceptible than sheep, undergo a definite reaction when infected with virus originally obtained from cattle affected with this disease.

From the economic aspect the occurrence of bluetongue in cattle is apparently of minor significance, for in most of the outbreaks which were investigated only a small percentage of animals were affected and these cases usually made an uneventful recovery. It is from the viewpoint of the differential diagnosis, especially from foot and mouth disease, that the occurrence of bluetongue in cattle is of very great importance.

The knowledge that cattle are susceptible to the virus of bluetongue may ultimately throw further light on certain cattle diseases of South Africa where the aetiology is still somewhat obscure. This is especially the case in connection with sweating sickness of calves, the

alleged occurrence of malignant catarrhal fever, and some cases of the so-called three-day stiffsickness.

The details and results of the experiments carried out at Welgezegend and at Onderstepoort to prove the conclusions arrived at above will form the subject of an article which will appear in a forthcoming number of the *Onderstepoort Journal of Veterinary Science and Animal Industry.*

CORRESPONDENCE.

The Editor, Journal S.A.V.M.A.

AGE OF COWS.

Sir,—It would be interesting to know the experiences of other members regarding longevity of cows. Some time ago when the matter of the ages attained by horses was raised in Great Britain, some interesting, and at times almost incredible, ages were cited.

In order to start the ball rolling I give the following details volunteered to me by a local farmer, Mr. D. Sparks of Newlands, Klip River :—

On 24/2/1933 a cow died in her 26th year. She first calved in her third year, has since calved regularly every year, and at the time of her death had a calf at foot.

Her parents were a Friesland bull and an ordinary black cow. The latter being a survivor of the rinderpest epizootic must, therefore, have been a fairly old animal herself.—Yours faithfully,

J. R. FREAN.

Ladysmith, Natal,
3rd August, 1933.

A General Survey of the Veterinary Act, 1933 (Continued).

By C. P. BRESLER, M.A., LL.B., Pretoria.

A considerable portion of the Act is devoted to enquiry into charges of misconduct, matters for, and procedure upon enquiry by the Veterinary Board, and to offences, as will appear hereunder :—

14. The Veterinary Board shall have power to enquire, with the approval of the Minister, into any complaint, charge or allegation of improper conduct or disgraceful conduct against any person registered as a veterinarian under this Act and on conviction to impose the penalties prescribed by sub-section (1) of section *fifteen*: Provided that if any such complaint, charge or allegation forms or is likely to form the subject of criminal proceedings in a court of law, the Veterinary Board may postpone its enquiry until such proceedings have been determined.

15. (1) Every person registered under this Act as a veterinarian, who after enquiry held by the Veterinary Board with the consent of the Minister, has been found to have been guilty of improper conduct or disgraceful conduct, or conduct which when regard is had to such person's profession as veterinarian, is improper or disgraceful, shall be liable to one or other of the following penalties—

(*a*) reprimand and caution under the hand of the chairman; or

(*b*) suspension for a specified period during which period such person shall be deemed not to be registered as a veterinarian under this Act; or

(*c*) erasure of his name from the register referred to in section *seven*:

Provided that every person as to whose conduct as aforesaid enquiry is to be made shall be afforded an opportunity, by himself or his counsel or attorney, of answering the charge and of being heard in his defence.

(2) (*a*) For the purposes of any enquiry under this section the Veterinary Board may take evidence and may, under the hand of its chairman or the registrar, summon witnesses and require the production of any book, record, document or thing, and may through the chairman administer an oath to any witness, and may examine any book, record, document, or thing which any witness has been required to produce.

(*b*) A summons for the attendance before the Veterinary Board or for the production to it of any book, record, document or thing shall be, as nearly as practicable, and *mutatis mutandis* in the form set out in the Third Schedule to the Medical, Dental and Pharmacy Act, 1928 (Act No. 13 of 1928) shall be signed by the chairman or registrar and shall be served either by registered letter sent through the post or in the same manner as it would be served if it were a subpoena issued by a magistrate's court.

(*c*) Every person summoned as aforesaid shall be bound to obey the summons served on him. Any person who fails without sufficient

cause, to attend and give evidence relevant to the enquiry at the time and place specified in the summons, or who refuses to be sworn or to make an affirmation or declaration in lieu of an oath when the chairman desires to administer an oath or such affirmation or declaration to him, or to produce any book, record, document or thing which he has been required by summons to produce, shall be guilty of an offence and liable on conviction to a fine not exceeding twenty-five pounds:

Provided that every person so summoned shall be entitled to the same witness fees and travelling facilities or allowances (to be defrayed from public funds) and to all the privileges to which a witness subpoenaed to give evidence before a Provincial Division of the Supreme Court is entitled.

(*d*) Every witness who attends before the Veterinary Board and refuses to answer, or to answer fully and satisfactorily to the best of his knowledge and belief any question lawfully put to him shall be guilty of an offence and liable on conviction to a fine not exceeding twenty-five pounds.

(*e*) If at any enquiry under this section any witness who has been sworn or who has made an affirmation or declaration in lieu of an oath gives false evidence which is material to any matter forming the subject of such enquiry knowing it to be false, he shall be deemed to be guilty of perjury.

(3) Every enquiry held under this section shall be conducted in accordance with regulations made by the Governor-General regarding—

(*a*) the manner in which complaints or charges brought against a registered veterinarian shall be lodged;

(*b*) the method of summoning an accused person and the penalties for failure or refusal on the part of any such person to attend when summoned or for refusing to give evidence or for obstructing or interrupting the proceedings;

(*c*) any other matter incidental to the holding of such enquiry.

(4) The Veterinary Board may, with the approval of the Minister, appoint a legal assessor to be present at any enquiry under this section to advise on matters of law, procedure or evidence.

(5) On the recommendation of the Veterinary Board the Minister may terminate any suspension under sub-section (1) before the expiry of the specified period, or restore to the register any name which has been erased therefrom.

17. (1) Any person not registered under this Act as a veterinarian who pretends, or by any means whatsoever holds himself out to be a veterinarian (whether or not purporting to be so registered) or uses the name of veterinarian or veterinary surgeon or any name, title, description or symbol indicating or calculated to lead persons to infer that he possesses a degree, diploma or other qualification as a veterinarian or veterinary surgeon or in veterinary science or that he is registered as a veterinarian under this Act, shall be guilty of an offence and liable on conviction to a fine not exceeding fifty pounds.

(2) In any prosecution of any person under sub-section (1) the accused shall be presumed not to be registered as a veterinarian under this Act until he is proved to be so registered.

It is significant that the words of the South African statute relate to "improper conduct or disgraceful conduct" whereas the Veterinary Surgeons' Act, 1881, section 6, refers to "conduct disgraceful to him in a professional respect." In the exercise of its power to remove the name of a member from the Register for such conduct the Veterinary Council in England has made a by-law (No. 53) declaring that the following instances of professional misconduct will be held to be "conduct disgraceful in a professional respect within the meaning of the Act" :—

(i) Advertising, or causing or permitting other persons to advertise for him whether by paid advertisement or by editorial or other notice in the public press or distributing or causing or permitting to be distributed circulars, books, or cards relating to his professional attainments or abilities or charges or in respect of medicines or appliances prepared or sold by him.

(ii) Touting or canvassing for practice whether by himself or others.

(iii) The permission by a veterinary surgeon for his name to be used by an unqualified or unregistered person, or the doing or permitting any other act whereby an unqualified or unregistered person may pass himself off as or practise as a veterinary surgeon.

(iv) Meeting an unqualified person in consultation.

(v) Giving testimonials in favour of proprietary or patent preparations, medicines, or appliances.

This list is not exhaustive nor is it meant to preclude enquiry by the Council into any form of professional misconduct which would not fall within the general category herein set forth.

In order however to enunciate the principles generally by which it will be guided in those matters the Council has by resolution dated 1st July 1927, declared that the following principles will apply :—

(i) The contribution of signed articles on matters of public importance to the lay press will not be held to come within the sub-section unless :

(a) the circumstances indicate that the action was inspired by a desire to promote the member's own particular interests; or

(b) the action was detrimental to the interests of the profession.

(ii) This will not preclude a member from making application for professional appointments which are advertised as vacant. It does not preclude applying for or canvassing for professional appointments not vacant.

(iii) This prohibits the employment of an unqualified person (a) to conduct a branch practice, or (b) to carry out operative or other treatment requiring professional skill, or (c) in any other way calculated to lead the public to suppose he was qualified. It will not be held to preclude the employment of a student who is *bona fide* pursuing the recognised course of instruction at an affiliated Veterinary College nor the employment of dressers, grooms, kennel-maids, dispensers, attendants under the immediate personal supervision of a registered veterinary surgeon.

(iv) This precludes a registered veterinary surgeon from assisting an unregistered person, by his presence, countenance, advice, assistance, or co-operation to attend, treat, or perform an operation on any animal in respect of matters requiring professional discretion or skill.

The Council also declared that any veterinary surgeon who shall be shown to have signed or given under his name and authority a certificate or notification under the Diseases of Animals Acts, the Protection of Animals Acts, the Milk and Dairies Acts, the Coal Mines Act, Orders of the Ministry of Agriculture, or Orders of the Ministry of Health, which is untrue, misleading, or improper or which is given in respect of any matters not having received the personal attention of the member, will be liable to be called upon to show cause why his name should not be removed from the register for unprofessional conduct. (See Bullocks' invaluable *Handbook for Veterinary Surgeons*).

The South African Statute by the inclusion of the word "improper" probably aimed at giving the Board as wide a jurisdiction as possible and it will be interesting to note what regulations, if any, will be framed thereunder and to what extent the Board will follow English precedent. The keynote of the South African Act is the wide power vested in the Minister and in the Board and in consonance with that spirit one may well expect somewhat more arbitrary measures than obtain overseas. The procedure provided for seems full, but it is noteworthy that the power of appeal as such is nowhere even hinted at whereas by *sec.* 8(2) *of the Veterinary Surgeons' Act* 1881, members of the College have the right of appeal to the Privy Council against a decision of the Council to remove a name from the Register or not to restore a name thereto.

(To be continued).

CLINICAL NOTES.

Operation on a Lion Cub for Umbilical Hernia.

Dr. G. MARTINAGLIA and M. C. ROBINSON, B.V.Sc.,
Johannesburg.

The subject was a male lion cub about five months old having a large umbilical hernia, which caused pouching of the skin and formed the usual hernial sac. The hernial ring, about eight inches in circumference, was easily palpated, and the intestinal pressure was considerable.

Operative measures were decided on, the only alternative being destruction of the cub. After 12 hours starvation the animal was given 7½ grains of nembutal in meat. Following this, which appeared to have a slight sedative effect, the hind legs were drawn through an opening of the long narrow crate and 13 cc. of a 10% chloral hydrate solution were injected into the saphenous vein. After a mild degree of anaesthesia had been thus attained, the cub was removed from the crate and deep anaesthesia induced by ether administration.

The area of the hernial sac was shaved and painted with tincture of iodine and the usual antiseptic and aseptic precautions observed. A longitudinal incision was made through the skin and, adhesions being present, careful dissection was then required to separate the peritoneum from the skin. The peritoneal pouch was lifted with forceps and a purse-string suture made, the redundant portion of the peritoneum being removed. At this stage the breathing became shallow and the pulse weak. The mask was removed and artificial respiration given. The peritoneum was united with medium cat-gut; for the abdominal muscles strong cat-gut was used, while the skin was united with alternate cat-gut and silk suture. The wound was finally sealed, using collodion and iodoform.

After twenty hours small quantities of egg and milk were given daily, and progress was satisfactory until about the tenth day. Great difficulty was experienced in keeping the cub sufficiently quiet to enable a sound union of the muscles to take place, and unfortunately a slight recurrence of the hernia made its appearance on the eleventh day. However, the hernial ring was much smaller and it was assumed that only a portion of the tissues had united. After a month had elapsed a second operation was attempted, proceeding on similar lines to the first, excepting that nembutal was omitted and a larger dose of chloral hydrate given.

As anticipated, a smaller gap between the muscles was apparent. During the healing process, the edges of the remaining hernial ring had become enveloped in a strong fibrous band, which had to be removed before the scarified muscular surfaces were united. A broad leather collar was fitted to prevent the animal from interfering with the wound, and the cub was kept confined in a small narrow cage for a full month. Recovery was uninterrupted and the cub has been returned to the exhibition cage in the Zoological Gardens.

BOOK REVIEWS.

The appearance of the second edition of Kelser's "Manual of Veterinary Bacteriology"[1] will be welcomed by all those who have to teach this subject. The great advances which have been made in the subject in recent years have rendered the rewriting of the book imperative and have necessitated an increase in bulk of 27 pages.

The main descriptive scheme has remained the same in the new edition. The most striking addition is a chapter devoted to the subject of bacterial variation. One must heartily congratulate the author on obtaining this excellent review written by Major Simmons. No modern textbook on bacteriology is complete without a reference to this subject which is at present one of the most fertile fields for research in this domain.

The main portion of the book is devoted to a systematic description of the pathogenic bacteria of importance in veterinary science. Chapters on protozoa and the filterable viruses follow and the book concludes with chapters on practical serology, clinical blood examination, the preparation of veterinary biological products, and the bacteriological examination of milk and water. The sections dealing with protozoa and filterable viruses are naturally only very brief summaries of these subjects.

The chapter on infection and immunity, apart from the portion dealing with hypersensitiveness, has perhaps not been developed as much as it might have been to balance the elaborate description of the various bacterial types.

Amongst the anaerobic bacteria one does not notice any mention of *Cl. oedematiens*, an organism of growing importance to veterinarians. *Cl. chauvoei* is stated to produce a toxin pathogenic for guinea pigs, sheep, and cattle. This is contrary to the experience of most

(1) Manual of Veterinary Bacteriology by Raymond A. Kelser, D.V.M., A.M., Ph.D., Second Edition, pp ix + 552 Fig. 93, 27/6. London: Baillière, Tindall, and Cox 1933.

bacteriologists. If such a toxin is produced it is extremely difficult to demonstrate.

The book should prove of great value to veterinary bacteriologists and as a text book for students. It can be warmly recommended to veterinarians and others interested in bacteriological problems of veterinary science.

E. M. R.

Thanks to the courtesy of Messrs. Baillière, Tindall and Cox, it is possible to give further details regarding Vols. II and III[2] of Sir Frederick Smith's History of Veterinary Literature.[3]

These two volumes are most important in that they describe the transfer of the art of veterinary science from untrained men to the first generation of graduates of the London School (established 1791), the pioneer veterinary teaching institution in the Empire. In Vol. II (dedicated to William Moorcroft, veterinarian and explorer) Smith states that during the 18th century at least thirty medical men wrote on veterinary matters, "but their identity is sometimes intentionally concealed for the reason that it was considered derogatory for medical men to write on the subject of the diseases of animals." How different has the position become during the past forty years[4] when medical men are not only proud to contribute to the veterinary literature, but may even sue in any court of law for veterinary services rendered! Unfortunately, however, the majority of persons practising veterinary science during the eighteenth century were farriers (chiefly for horses) and cattle leeches (for cattle and sheep). The quality of the literature of the period can therefore readily be understood. Only five lay authors stand out, viz. R. Dossie, W. Marshall, Capt. Burdon, J. Lawrence, and the tenth Earl of Pembroke.

Vol. III (dedicated to William Youatt, animal husbandryman and veterinarian) describes the improvement in the veterinary outlook due to the benefits of education. "When the London School was created, the advancement of veterinary knowledge by means of research was provided for in its constitution..... An experimental committee was formed, and it was directed that the results of its labours should be published annually."

(2) The Early History of Veterinary Literature and its British Development. Vols II and III. By the late Major-General Sir Frederick Smith: Vol. II pp. viii + 244. Vol. III, pp. viii + 184. Plates vi (Vol. I out of print). Baillière, Tindall & Cox, London. Price 15/- per vol.

(3) For review of Vol. IV, see *Jl. S.A.V.M.A.* IV (3): 189.

(4) See "Some Medical Pioneers in Veterinary Science." In the Press.

The Army authorities quickly appreciated the value of trained men, and the supply being insufficient, suitable men were seconded from the cavalry to graduate as veterinarians. One of these officers was our own pioneer, Thomas Burrows of the 8th Light Dragoons.

The biographical notices are most helpful, in fact, as stated before, the History is so useful that it should be in the possession of every veterinarian. H.H.C.

THE ASSOCIATION.

25th General Meeting held at Onderstepoort the 4th-5th October, 1933.

Members present : Messrs. Elder, Bekker, Hamlyn, Quinlan, Graf, Flight, Coles, Walker, Mason, Robinson, Kirkpatrick, Matthew, Chase, Brown, Henning, Snyman, Quin, Green, Williams, Marais, Bergh, van der Vyver, Keppel, Mönnig, Schulz, Clark, C. Jackson, Allchurch, McIntyre, van der Linde, Smith, Steyn, Kind, Scheuber, Alexander, Sterne, Thomas, Neitz, Daly, Van Rensburg, Brummer, Frean, S. T. Jackson, Diesel, O. T. de Villiers, Jones, de Kock, Adelaar, Cloete, Edwards, Canham, Neser, van Heerden, Nicol, Simson, Curson, Fourie, P. J. du Toit, R. du Toit, M. C. Robinson.

Guests : All non-member professional officers at Onderstepoort and members of Pretoria Medical Association (Dr. Pyper attended).

Apologies for absence : Messrs. Carless, Chalmers, Verney, Wadlow, and Martinaglia.

Owing to the absence of the President as a result of ill-health, Dr. Curson, the Vice-President, took the chair. The chairman, in welcoming the delegates, expressed the gratitude of the Association to the Secretary for Agriculture and the Minister, General Kemp, for allowing the attendance of so many Government Veterinary Officers.

(a) *Minutes of the 24th General Meeting* (published in Journal) were taken as read.

(b) Matters arising out of these minutes :

(i) *Benevolence.* The Secretary explained that Council was considering a scheme which will in all probability be placed before the next General Meeting for decision.

(ii) *Presentation Dr. H. Reitz* : Suitable articles have already been selected, and the presentation to Dr. Reitz will be made in the near future by Drs. du Toit and de Kock.

(iii) *Veterinary Representation on the Protechnical Section* of the Public Service Association has been agreed to, and in terms of

a decision by Council the Secretary of the S.A.V.M.A. will represent the Association.

(c) *New Members* : The following new members were duly elected : Messrs. P. Robertson, W. E. Hearn, J. F. Dalling, T. Zichu, E. T. Perossi, P. R. B. Smith, W. Orr, General Butler, T. Cannon, J. H. Schoeman, F. C. Simpson.

(d) *Treasurer's Report* : At the end of the half year there was a credit balance on current account of £63 :2 :10, and a sum of £24 :14 :11 with the Goldfields Building Society. Against this there was an unpaid account of £64 :7 :6 for the last Journal. The cost of the two further journals must still be met from this year's revenue, and the probability is that very little, if any, surplus will be shown at the end of the financial year.

(e) *General* : (1) Correspondence—Dr. Otto Henning. The Secretary referred to a letter from Dr. Henning who intimated that he would donate certain old journals to the library of the Association. This action was very much appreciated by members and the meeting instructed the Secretary to write to Dr. Henning particularly in view of the fact that he was dangerously ill in hospital.

(2) Dr. Curson proposed that Dr. Parkin be the Association's representative at the next International Veterinary Congress to be held in America in 1934. This was agreed to.

(3) A report was received from the Status Committee and a combined meeting of Council and Status Committee will be held to go fully into the matters raised therein.

(4) Dr. Quin asked what the position was in regard to veterinary representation on the Public Health Council. He was informed that the matter was left by Council in the hands of Drs. Viljoen, du Toit, and de Kock.

(5) Dr. Bekker referred to the fact that the Journal drained practically the entire annual revenue of the Association.

Messrs. Alexander and Coles proposed that the activities of the Journal be not in any way curtailed. This was carried unanimously.

Prof. Henning proposed that the Association take definite steps to increase its revenue, so that the entire annual revenue of the Association need not be used solely to pay for the Journal—carried unanimously.

(6) The question of S. & T. was raised by Mr. van Rensburg. It was suggested that all field men interested in the question should hold a meeting at 8.30 a.m. the 5th October, in order to discuss the whole question with the S.V.O.'s present.

(7) The meeting learned with regret that Mr. Chalmers had refused to reconsider his resignation from Council and as a member of

the Status Committee. As no Council meeting was held prior to this General Meeting, the Chairman asked the meeting to elect a member of Council in place of Mr. Chalmers. It was unanimously decided to take the candidate coming next at the last election. This candidate was Mr. C. Jackson, who was then declared elected to this vacancy.

The Chairman expressed to the Director of Veterinary Services the appreciation of the Association for the facilities to hold this scientific meeting at Onderstepoort and asked him as host to take the chair during the scientific discussions that were to follow The following papers were then read and discussed :

Rabies—Dr. Thomas and Mr. Neitz.

Dourine—Major Keppel and Dr. Robinson.

Meat inspection with special reference to meat export—Mr. Kirkpatrick.

Animal (beef) breeding for meat export—Mr. Bisschop.

Demonstrations : Blood transfusion shock—Dr. Fourie.

Operation : Ovario-hysterectomy in the bitch—Dr. Quinlan.

Pseudo-Foot and Mouth Disease—Drs. de Kock and Bekker.

Theileriosis—Dr. P. J. du Toit.

East Coast Fever—Mr. van Heerden.

Diagnosis and Differential Diagnosis of Plant Poisoning under field conditions—Dr. D. G. Steyn.

Recent advances in the use of anthelmintics—Dr. H. O. Mönnig.

Bloedpens in South Africa as compared with lamb dysentery in Great Britain—Dr. Robinson and Mr. Mason.

The possibilities of private practice in rural areas—Mr. Matthews.

Demonstration : Dehorning—Mr. N. T. van der Linde.

The papers, most of which are published in this journal, were very much appreciated, particularly on account of the large amount of information of great practical value which they contain. It has unfortunately been found impracticable to record any of the discussions which took place and which undoubtedly greatly added to the value of these meetings.

At the conclusion of the meeting, Mr. Chase, on behalf of adjoining territories, thanked the Minister of Agriculture, and the officials of the Department, for the facilities granted to hold such a successful meeting.

Major Keppel, on behalf of the visiting members, thanked the Onderstepoort staff for the hospitality extended to them.

The Chairman thanked the various members who read papers. He stated that there was no doubt as to the great value of these meetings and was of opinion that they could, so far as he was concerned, be looked upon as a regular annual institution.

Before the conclusion of the meeting a series of resolutions was unanimously passed, with the instruction that they be submitted to Council for action. These are :

1. Rabies—Dr. Curson and Dr. Thomas.

   That this Association, while appreciating the efforts that have been made to combat Rabies, views with alarm the continued spread of this fatal disease, and recommends that (a) research work be launched by the Division of Veterinary Services in regard to the habits of the veld carnivores, and (b) more systematic endeavours be made by the Department of Agriculture to limit the infected areas.

2. Dourine—Major Keppel and Dr. Schulz.

   That this meeting of the V.M.A. of S.A. wishes to emphasise the importance of the eradication of dourine from equines, and fully endorses that the policy of control and eradication as adopted by the Department should be rigidly adhered to and carried out to obviate the spread to clean areas, so further endangering the horse breeding industry.

3. Private Practice—Milk and Meat Hygiene. Messrs. Matthews, van Rensburg, Quin, and Fourie.

   In order to encourage private practice this Association

   i. Earnestly requests the Director of Veterinary Services to ascertain if the work of Government Veterinary Officers encroaches on private practice and if that is the case to be good enough to take the necessary steps to avoid this in areas served by private practitioners.

   ii. Requests the Department seriously to consider the introduction of part-time Veterinary Officers in a few selected districts, in order to test out the possibilities of private practice under such conditions.

   iii. Appeals to all veterinarians to ascertain what possibilities there are in their respective areas for the employment by Municipalities of veterinarians in milk and meat hygiene.

   iv. Urges all directors of municipal abattoirs to make the necessary propaganda in order to employ veterinarians as meat inspectors whenever a post falls vacant.

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