Jl. S.A.V.M.A. 27 (1), 1956

INFLUENZA IN RACE-HORSES

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Under the above heading I will describe a condition observed in thoroughbred horses in racing stables in Cape Town, during 1950-52, and in the Natal Midlands and in Durban, during 1952-55. It is not intended to give the history of equine influenza or the occurrence, symptoms and therapeutic measures adopted to combat outbreaks previously recorded in South Africa.

The condition now to be described is an acute, febrile, contagious disease which attacks race-horses in training stables in the centres indicated. It is apparently a septicaemia, probably caused by a specific virus. It manifests itself by lethargy, catarrh of the mucous membranes, oedema of the extremities and frequently of the sheath and scrotum in stallions.

I have previously seen an acute outbreak of influenza, or what would closely resemble "Pink Eye", amongst the horses used for experimental work at Onderstepoort Laboratory. However, the symptoms of the two conditions were not quite similar. The disease now being described is not so virulent as a rule, but it is nevertheless of such economic importance that it warrants close attention by those private practitioners whose work includes the diseases of race-horses in training.

Occurrence: The disease appears at any season of the year, although it would appear to be more prevalent during the rainy seasons, winter in Cape Town and spring and summer in Natal. Most frequently it has occurred sporadically with two or three cases in a stable. However, in one stable, 50% of the horses showed the condition in an acute or sub-acute form. Although it is usual to find only one or two cases in a stable, it may occur in many stables in the same area, so that there may be quite a number of horses affected at the same time.

Both in Cape Town and Durban the racing stables are confined to a small area. However, in Cape Town, the stables are well isolated. But in Durban several hundred horses are stabled in a communal stable controlled by one of the Racing Clubs. In Mooi River racing centre in the Natal Midlands, the training stables are far apart. However, there is always direct or indirect contact amongst race-horses at the big racing centres. There is a communal training ground in Durban and Cape Town and even horses from the Natal Midlands visit Durban for racing on race-days. Many horses are brought by horse-floats, but others come by

train. However, before and after racing, they are housed in communal stables at the course or close by. Consequently, under the prevailing environmental conditions, isolation of horses is not possible.

It is not uncommon to find the disease in an isolated stable where there was no previous history of the disease, and then only a single horse or two or three horses will be affected.

Etiology: It is probably caused by a filterable virus, although I have done no experimental transmission, nor has any been attempted in South Africa. The value of the animals which are dealt with by the private practitioner precludes transmission experiments. Besides the prevailing local environment does not lend itself to exact experimental work where isolation and freedom from flies and mosquitoes are a prerequisite. The results of experimental work on so-called influenza of humans as well have not encouraged us to proceed with similar experimentation with equines.

It is not clear how the causal agent enters the body. It would appear that direct or indirect contact such as a communal watering trough is important, although since the disease does appear in stables in the Natal Midlands where neither direct nor indirect contact can be proved, the possibility of air-borne transmission cannot be overlooked.

The virus of influenza is known to remain in the body for a long time in a virulent state. Affected stallions may transmit the disease during coitus, for two years (Hutyra and Marek, 1922). Neitz (1955), in a private communication, says that the spermatozoa of a stallion have been known to harbour the virus for six years. Recovered mares may remain carriers of the virus for a couple of months at least.

PATHOGENESIS

The causal agent apparently causes a deterioration of the vessels in the conjunctiva and the nasal mucosa, resulting in petechiae and ecchymoses. The oedema of the ventral abdominal wall, sheath, scrotum and limbs is, no doubt, due to the same cause. There would appear to be a biliary catarrh, since there is a general icterus. This ever present symptom appears more likely to be due to biliary catarrh than to erythrocytic breakdown, although I have no chemical evidence to support either view. Similar to human influenza the preparation of the mucous membranes for secondary invaders is evident. Pharyngitis and laryngitis are constant symptoms, while in neglected cases bronchitis and enteritis have been observed. Orchitis has been encountered in the stallion.

Since all the cases observed have recovered, post mortem recording of anatomical changes has not been possible.

Symptoms: The incubation period is not known, although it

appears to be as short as 2 days. There is a very sudden rise of temperature, 105°F - 106°F is not uncommon. A horse that appeared well and worked well one morning may be affected the following morning. The trainer's barometer is a horse's appetite. When horses do not feed they are temperatured. When a febrile condition is present professional advice is sought. However, it is unlikely that a horse with a temperature will work satisfactorily. For this reason the sudden onset is assumed. The horse appears fatigued and dejected with the head hanging, frequently over the manger or the water bucket. Respiration is increased in frequency, up to 20-30 per minute. It is frequently somewhat laboured and abdominal, indicating some pulmonary oedema. The coat of some affected animals is staring, although not in all. Sometimes there are sweat patches in the flanks and axillae. The appetite is lost completely, or green food or teff hay may be taken spasmodically. The hind legs from the hocks to the coronets are usually swollen. The swelling is non-painful and pits on pressure. The fore-legs may be similarly affected. When these oedematous swellings are large, movement is stiff. Coughing is a constant symptom, although it is not frequent in the early stage. There is a clear, watery mucous nasal discharge, which is as a rule not profuse. Sneezing is frequent, giving the nasal discharge a somewhat foamy appearance. The nasal mucosa is hyperaemic and very moist. There is slight lachrymation, the exudate being clear and watery. The conjunctiva is hyperaemic and it rapidly becomes icteric. There are some ecchymoses and it is swollen and oedematous. In mares the vulvar mucosa becomes icteric, the discolouration is pale, dull yellow in colour. This applies to the conjunctival as well as the vulvar mucosa. This dull yellow discolouration allows of a differential diagnosis from tickborne biliary fever, where the icteric membrane is bright yellow. Swallowing movements may be frequent and slight foamy mucus may be present on the tongue, indicating the onset of pharyngitis. Pressure over the thyroid wings causes coughing. The faeces are firm as a rule. The pulse is soft and the rate increased to 50-60 per minute, or even higher.

These are the symptoms observed in cases where early therapeutic measures are adopted. However, where therapy is not begun early, exaggeration of symptoms is the rule. Lethargy is marked, the head and ears hang. Respiration increases, and although I have not seen pneumonia as a sequel, auscultation reveals a harsh bronchial sound: Bronchitis usually follows laryngitis and tracheitis. At this stage it is not possible to differentiate it from infectious bronchitis, if they are not the same disease. There is complete inappetence and loss of condition is rapid. The flanks are markedly sunken. The oedema of the legs and ventral abdominal wall becomes more extensive, the sheath and scrotum become swollen and orchitis may supervene in stallions. Coughing becomes frequent and painful. Conjunctival

and nasal exudates become muco-purulent. The intermandibular lymph glands become swollen. The temperature remains high throughout. The urine is cloudy and viscid. Enteritis sometimes supervenes, resulting in profuse watery diarrhoea, which may be foetid.

There is little doubt that some of the more acute cases would have ended fatally had energetic therapeutic measures not been adopted.

Course: Cases treated in the early stage have recovered rapidly. The temperature has dropped within 24 hours to three to four days. Thereafter complete recovery took a few days. Precautions were taken to prevent relapses. Horses were not put back to work for two weeks. In more severe cases and those not treated early the course was more prolonged and severe, acute symptoms were evident for several days and convalescence was protracted. The horses could not be put to work for three to four weeks.

In no case have the sequelae described by others been seen, namely broncho-pneumonia, mono-plegia (N. faciatis, N. trigeminus, N. recurrens, N. ischiaticus), urticaria, keratitis, nervous lesions, laminitis, tendo-vaginitis, arthritis, ophthalmia, etc.

Differential diagnosis: It closely resembles piroplasmosis (biliary fever). However, experience of the two conditions, as seen in South Africa, helps considerably in making a diagnosis pending a microscopic examination of blood smears. The discolouration of the mucous membranes in influenza is distinct. It is pale, dull yellow, while in piroplasmosis it is bright yellow. The pulse is soft in influenza, while in piroplasmosis it has a definite character which one recognises by experience. In influenza the urine is not haemoglobin stained. It may be in piroplasmosis. The marked lethargy is not present in the early stage of piroplasmosis. However, it is always advisable to confirm the diagnosis as early as possible by blood examination. When such blood examination is not possible within 12 hours and where evaluation of mucosal discolouration is reduced by unsuitable light, as during a clinical examination at night, it is better to assume piroplasmosis and treat accordingly. Delay in the treatment of acute biliary fever can have grave sequelae in race-horses. Recurrent laryngeal paralysis is a most common sequel in cases where the febrile condition persists for three or four days. It is most unlikely that the type of influenza described here can be mistaken for anything except piroplasmosis. However, contagious equine bronchitis and pneumonia must not be overlooked. Pneumonia occurring as a sequel, has not been observed in any of the cases which I have treated.

Prognosis: The prognosis is favourable. No fatal cases have been observed. However, in acute cases, and those in which

therapeutic measures are introduced late, laryngeal paralysis may present a serious problem although it has not been observed as a sequel in my cases. Race-horses thus affected are, of course, useless until curative surgery is resorted to.

Treatment: Therapeutic measures consist in preventing secondary infections on a body prepared for them by the causal agent. In addition ideal environmental conditions, with suitable food, produce a mild course and a rapid, complete recovery. The horse should be suitably clothed and placed in an airy stall, with clean dry bedding. Fly repellents should be used in the stall and on the bedding to ensure comfort. Cotton wool bandages from the coronet to the knees and hocks are desirable. These should be removed and renewed twice daily, the limbs being massaged for half-an-hour at each removal. Clean water should be available at all times, being renewed several times a day. Two or three ounces of Epsom Salts and one dram of saltpetre should be added to the water daily. This is best done at night for obvious reasons. Fresh green food, in small quantities, should be provided. If uneaten, it should be renewed frequently. Appetising mashes of oats, bran and linseed, in small quantity, should be provided frequently. If uneaten they should be removed within half-an-hour. Teff hay is greatly appreciated by horses and a quantity kept in the stall in a teff-net, may be eaten when a horse refuses all other food. The horse should be unclothed and cleaned at least twice daily. In inclement weather this can be done piece-meal, while in warm weather a very light blanket only should be used to prevent sweating. Cold sponging is useful, over the limbs, to reduce temperature. It also has a refreshing effect. To prevent complications the use of penicillin appears to be very valuable or a combination of penicillin and streptomycin can be used. In no case where antibiotics have been used early has the disease run otherwise than a rapid course with complete recovery inside five to six days. When the faeces have been dry prostigmin has been given daily in small doses. For intestinal involvement with diarrhoea, aureomycin has been given with Kaylene in flour gruel. Cases that do not respond to the treatment can have aureomycin or chloromycetin intramuscularly and intravenously. To combat dehydration, in cases of profuse diarrhoea, 10% glucose saline has been employed twice daily by the jugular route. For prolonged refusal of food the stomach tube is used for feeding and general stimulation.

During treatment the horse was not removed from the stall, nor for 24 hours after the temperature had become normal. After five to six days cases which ran a normal course could be taken for short walks if the weather was favourable. In more severe cases, with a protracted course, the horse has remained a week or more in the stall. Exercise was introduced very gradually. In no case have these horses been allowed anything but moderate exercise for a month.

During convalescence, rest and suitable nourishment would be essentials. By rest is meant gradually increased walking exercise, commencing with 15 minutes twice daily, nothing faster. The horse should not be fatigued. For cases that were not progressing rapidly towards complete recovery during convalescence the use of vitamin B complex in the form of "Uneco" or "Plebex", given in daily doses of 10 c.c. intramuscularly, for a week, has added the necessary stimulus.

Prevention: In view of the unknown characteristics of the causal agent and the economic difficulty of producing ideal environmental conditions of isolation for race-horses on our local race-courses, little can be done beyond isolation of affected horses and the disinfection of stables, horse-floats, railway trucks and saddle cloths after each meeting. This recommendation would need the co-operation of Racing Clubs, Railway officials, owners, trainers and native assistants. Since the disease is not fatal the necessity for strong preventive measures are not likely to receive much sympathy from laymen. However, its economy to individual owners cannot be overlooked. A race-horse cannot be maintained and raced at less than £30 per month. Affected horses do not recover their highest racing potentiality for a couple of months after having had an attack. In cases of protracted recovery it may be several months. The economic loss to individuals is, therefore, easily appreciated.

The preventive measures of isolation and disinfection suggested are not likely to be enforced until such time as an extensive outbreak causes a discontinuing of racing activities. Only those closely connected with breeding and racing and the millions of pounds involved with the loss to breeders, owners, trainers, employees of racing clubs and native assistants, can appreciate what a discontinuing of racing for even two to three months, would mean to those concerned.

References

Hutyra, F., and Marek, J. (1922). The special pathology and therapeutics of the diseases of the domestic animals, vol. I, p. 183. Translated from the fourth enlarged and revised German Edition by J. R. Mohler and A. Eichhorn, Chicago, U.S.A. Alexander Eger, 1922, Neitz, W.O. 1955 Personal communication (2.11.55).

OVER-EATING ON FRUIT BY BOVINES

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The Western Cape Province has as its foremost agricultural pursuit the growing of grapes for wine. It may be thought anomalous that a veterinary surgeon should practise in a fruit growing area, but as a matter of fact there are several pedigree dairy herds in the district where stud breeding is the main theme. These are excluded from the following discussion.

The presence of the fairly large number of cattle other than those used for stud purposes, is explained by the need of the fruit farmers for large quantities of kraal manure. In the past there have been some farmers who kept a few cows or pigs for composting vine clippings and other waste materials in their kraals, but to a large extent fruit farmers relied on sheep kraal manure obtained from the Karroo. This source of supply has diminished lately possibly owing to the fact that not so many sheep are kraaled in the Karroo as in the past because most of the sheep grazing is now surrounded by jackal-proof fencing and therefore kraaling is no longer necessary to prevent losses from vermin. We should like to think that another reason for the discontinuance of kraaling is to save the sheep walking to and from the grazing, to the detriment of the sheep and the topsoil of the country. The high price of £11 per truck load of Karroo manure is another factor tending to increase the number of animals kept by local farmers so as to produce their own farmyard manure.

Most big wine farmers have large herds of milk cows whose primary function is to provide compost from vine clippings. The milk cheque in one instance reached in one year the not inconsiderable amount of £1,800 net, this being virtually pocket money.

Other animals kept for compost-making are pigs, fowls (especially broiler cockerels housed in arks which are moved around the orchards) and sheep, one or two farmers having up to 700 sheep.

Fruit farmers in the Elgin area are now exploring the practicability of fattening oxen on their farms, again with the compost idea as the main-spring. The method envisaged is roughly as follows: Animals will be allowed into the orchards when the cover drop is ready, and this will be grazed down and the animals removed just before the final pruning. At this pruning, parts of trees damaged by the animals will be removed. The compost will be made in situ, and thus a lot of transporting of compost will

be avoided. The cover crops are rye, oats, gousblom, barley and of course the lupin. The clovers are important, too, and a summer variety is shortly to be tried, that is on those farms where irrigation is possible. There will be a surplus of cover crop not grazed, and this may be ensiled. As it happens, the wine tanks will be emptied of wine by the time it is necessary to ensile the cover crop, and the "silos" will be emptied and cleansed by the time the next lot of grapes will have to be pressed. Wooden vats have given way to a certain extent to cement-plastered brick tanks for the storage of wine, and it is in these that the silage will be made. While the silage is being consumed, the animals will be in kraals, and when the fruit has been harvested and the cover-crop is up, then the animals will return to the orchards.

One word must be said about irrigation. Especially during the first three years a large number of dams have been built in this area. One wonders what the effect of this will be on the encouragement of certain vectors, as for example mosquitoes and Culicoides, with the possibility of outbreaks of Bluetongue, Horsesickness and Rift Valley Fever. During September this year the mosquitoes have been quite a problem when one was working just around sundown on certain farms.

Some of the farmers who keep cattle as composting machines are good cattlemen; others not so good. Even the former have trouble from overfeeding on grapes, apples, peaches, pears, vine-clippings, sweet potato stalks, grapepeels, pips and "na-trossies". Then too occasionally a gate is left open, or a fence broken down and one or more animals overeat on fruit. These animals are often in need of veterinary assistance, and the history may or may not be of value in arriving at a diagnosis. The time of the year is important, most cases being seen during the period December to March. One should bear in mind however that many farmers have cold storage or large refrigeration rooms, and that these are periodically examined, and the damaged or spoiled fruit removed. Such damaged fruit is apparently particularly dangerous when eaten excessively. Some farmers will not admit that their animals have eaten fruit, until the examination reveals the fact that the faeces are riddled with grape pips or other such incriminating evidence.

The cow is the chief sufferer, and for convenience the symptoms will be grouped under three subheadings.

SYMPTOMS

i) *The mild form* is characterized by ruminal lethargy or atony, a variable degree of anorexia, a drop in milk yield and slight depression.

ii) *The intermediate form* shows more severe ruminal symptoms and greater involvement of the central nervous system. There

is a greater mass of fermenting ingesta, the rumen is more severely paralysed, and hoven may be a complicating factor when the fluid level is above the oesophageal entrance. The animal may show pain, and the central nervous system symptoms may be hypo- or hypersensitivity. In the later stages of this form diarrhoea is apparent, with dehydration and more severe depression. The animal staggers and appears drunk.

iii) *The comatose form* is seen where vast overloading has occurred, or where fermentation is more rapid as with bruised, rotten or ex-coldstore fruit. The animal is recumbent in the milk-fever attitude, the extremities are cold, and the pulse rapid and weak — up to 110 per minute. The temperature is subnormal. The corneal reflex is weak or absent, and indeed it is a matter of opinion as to whether a local anaesthetic is necessary when rumenotomy is performed, as the animal appears to all intents and purposes to be under general anaesthesia. Spontaneous vomition has rarely been seen. Visible mucosae are injected and in a case in extremis. pallid.

In cases of hoven it is necessary to test the oesophagus for patency as peaches in particular are liable to cause obstruction.

Diagnosis is often greatly assisted by the history, but a negative history should never be accepted as final without due consideration. The symptoms are often very helpful but a diagnosis may only be arrived at when apples or pears are palpated in the rumen through the rectum. Passing the stomach-tube may cause vomition, and up will come the offending matter and the diagnosis is made. Sometimes the diagnosis is only confirmed at rumenotomy.

DIFFERENTIAL DIAGNOSIS

Differentiation from milkfever is the first consideration in the comatose form, and differentiation from acetonaemia in too heavy meal feeding in high producing animals on Official Milk Record is next in importance. The milder forms have to be distinguished from other forms of inappetence, not neglecting an examination of the mouth. When a horse does not eat it is always the mouth which is first examined, but when a cow stops eating the last place usually examined is the mouth, for some unknown reason. Traumatic reticulitis is often suspected where there is only one animal on a farm, or where only one animal is affected amongst a group. When several animals develop symptoms at once a diagnosis is more readily arrived at. By the same token the central nervous symptom producing form is not only of academic interest in its differentiation from mania purpuralis, the demented forms of acetonaemia, cerebral cystercosis, meningitis, tetanus and last but not least sinisutis, especially in dehorned animals. Poisons, especially "Folidol", should be excluded on account of its para-sympathetic symptomatology. This is a commonly used spray on fruit farms.

Medicinal treatment consists of laxatives in early and mild cases, including mag. sulph. and "Altan" (May Baker), which is less dehydrating. Vinegar, acetic acid, sugar, molasses, and sodium thio-sulphate are very useful by the mouth, and are best given by stomach tube for fear of foreign body pneumonia in the nervously deranged animal. The stomach tube in use is a 7 ft. length of $\frac{1}{2}$ in. or $\frac{3}{4}$ in. plastic hose pipe, used with a wooden gag. The jaws should be firmly bound round the gag to prevent the animal chewing the tube. A foal stomach tube is used through the nostril when the animal resists the gag and hose too much through fear and nausea. Laxatives should only be used in early, mild cases, and in strong animals, for fear of causing super-purgation, when the animal will die from dehydration. When the fermenting material is moved out, the diarrhoea may be checked by starch of which 2 lbs. may be given t.i.d. per os, with or without other intestinal astringents and insoluble sulphonamides. Of the stimulants, coffee and sugar are rewarding. Parenterally, calcium-borogluconate q.v.oz. iii b.d., 40% Dextrose, 450 cc b.d., and hypo are most rewarding, along with antihistaminics and cardiac and respiratory stimulants. A warm stable, lots of bedding and plenty of fresh or limed water are worthy adjuvants.

Surgically rumenotomy should be undertaken in a large proportion of cases. In animals that are down or have large masses of doughy ingesta, or are weak from other causes, or in the heavily pregnant animal, there should be no hesitation in operating immediately. It is a good plan to have a wheelbarrow or several large buckets handy into which to place the offending ingesta upon removal as they are very much in the way especially when operating upon the recumbent animal. In one case a cow was down, and when opened, six well laden four-gallon paraffin tins of export quality grapes were removed, and the cow rewarded us with viable twin heifers two and a half months later. A generous incision should be made, and the hand and arm used to evacuate the ingesta should be continually lubricated, otherwise the ruminal lining which is everted through the flank incision suffers severe attrition. A technical point as described by Dr. Basson of Cape Town is used in rumenotomies in this practice. This is as follows: Deliver part of the rumen into the flank incision, and before opening the rumen, roll a 3 in. wide strip of cottonwool around the projecting rumen, completely filling the gap between it and the musculature-cum-skin incision. The projecting rumen is kept delivered by Lane's tissue forceps instead of the more commonly used tapes. It has been found that the most likely portal of entry of ingesta into the peritoneal cavity, should this accident occur, is the ventral commissure. A useful modification therefore is to suspend a bovine cervical retractor from the rumen at the ventral commissure, to retain its everted position and save the assistants one hand. The amount of ingesta removed will depend on the proportion of fruit therein. All the fruit should be removed. An

interesting point was mentioned to me by C. H. van Niekerk of Riversdale. In rumenotomy for the relief of grain engorgement, van Niekerk, after practically emptying the rumen, introduces a rubber tube into the omasum, through which he runs a vegetable oil. This loosens the ingesta between the folds. This is not indicated in the more fluid fruit engorgement.

Having removed the offending ingesta, some or other combination of the following are tipped into the rumen: starch, sugar, molasses, hypo, kaolin, and a few gallons of warm water. Healthy ingesta from another rumen is of course the ideal. As soon after the operation as possible, ingesta are collected from the abattoir and the fluid extract is run into the rumen with a stomach tube. The recumbent animal may remain down for as long as three days after the operation and still recover. Bed sores are especially rapid in developing in these recumbent cows, due perhaps to the low blood pressure, circulating toxins and the pressure. Excise necrotic tissue as soon as possible. Assist demarcation of healthy and necrotic tissue by fomentations.

The evaluation of findings is difficult, and a prognosis is accordingly difficult. Never give up an animal without an attempt at surgical intervention, as the most alarming cases of intoxication and advanced symptomatology have lived. Of course, others where one was quite optimistic, have been disappointing.

In cases of choke where the probang fails to shift the obstruction, it is advisable to do a tracheotomy, and the animal is left with the canula sewn in position. When the obstruction is in the cervical oesophagus, massage at one's leisure is often rewarding. When thoracic, relief of tympanitic panic may relax the oesophagus over a few hours, together with ½ to 1 gram of procaine hydrochloride intravenously, or 10 to 15 cc Pethidine intramuscularly is also well worth trying.

SOME PRACTICAL NOTES ON THE CONTROL OF WORMS IN DOMESTIC ANIMALS

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Introduction

In order to carry out any balanced programme or measure for the control of Helminthiasis in the domestic animals, horse, cattle, sheep, goat, pig, poultry, dog and cat, it is imperative to have a working knowledge of the life cycles, distribution and seasonal population fluctuations of the helminths requiring attention: Be able to recognise the eggs and adults of the more important pathogenic species and the diseased conditions they set up in their hosts of selection; be familiar with and selective in the choice of the anthelmintic so that the right remedy is used at the right time at the correct dosage rate, in the form in which it is most effective, observing all necessary precautions that may be recommended for the worm remedy used; carry out good husbandry measures and balanced feeding that will limit or prevent worm re-infestation and promote quick recovery of the treated stock.

Epidemiological Influences

It is pleasing to record that during the last 10 years considerable laboratory and field research work has been carried out on this worm problem. Particular attention has been paid to host-parasite relationship, the influence of climate and vegetation on the seasonal cycles of worms and their distribution, the influence of nutrition and animal management on parasitic infestations, the development and actions of chemotherapeutic agents and the planning of strategic and selective use of these anthelmintics.

Generally most of this work has been done on parasitic gastro-enteritis of cattle and sheep in Great Britain and Australia and the papers by the British scientists Taylor (1), Parnell (2), Wilson (3), Spedding (4), Crofton (5) and the Australian workers Gordon (6), Roberts (7), Forsyth (8), Pullar (9) and Stewart (10) are worthy of close study.

Although the same comprehensive surveys have not yet been carried out in Southern Africa, from the published work done by Veglia (11), Laurence (12), Monnig (13) and Ortlepp (14) and field observations over the last 25 years, it would appear that most of the findings recorded by these British and Australian workers follow a similar trend in Southern Africa.

The practical application of these findings indicate:-

1. That in the host-parasite relationship, clinical parasitism is the cumulative effect exhibited by the host of the interaction of its own resistance. Furthermore this resistance of stock to worm attack is the result of exposure to infestation and that this exposure period plays the important part in the development of immunity or "self cure". For example, in calves the greatest incidence of the common tape worm *Moniezia expansa* is when they are 4 to 7 months of age but incidence decreases with age and generally very few are found in adult cattle, evidence that the resistance developed through early infestation is definite and permanent in nature.

2. Clinical studies, worm egg surveys and autopsies have indicated that pathogenic infestations of worms mainly affect the young animal. Thus the most susceptible age for dairy cattle is between the ages of 4 to 12 months, beef cattle 8 to 22 months especially at weaning and teething and sheep from 5 to 12 months. In the case of horses, pigs, poultry, dogs and cats the most susceptible ages are from birth to 18 months of age especially from infestations of the *Strongylus, Ascaris* and *Ancylostoma* species.

3. Individual worm counts are not completely reliable as an indication of the degree of parasitism but serial counts made throughout the year provide a fairly reliable picture of the fluctuations in the degree of infestation.

4. That worm parasites reproduce continuously but certain seasonal conditions favour rapid increases by influencing the rate and extent of the development of eggs and larvae (free-living stage) on the veld or pasture. Thus the eggs and larvae of the Wire Worm require warmth and moisture for their development so that infestations can be expected in mid-spring, summer and mid-autumn. The eggs and larvae of the Nodular Worm likewise depend on the same climatic factors as the Wire Worm. However, due to the fact that large numbers of larvae migrate and live for weeks in the mucous membrane of the gut wall — "the histotropic phase" — they only enter the lumen of the bowel to resume their adult development when there is a reduction in the numbers of the adult worm burden already present in the bowel. This naturally prolongs the adult infestation period so that its peak infestation may be greatest in the Autumn-Winter months. In contrast to these two Round Worm species of ruminants, the eggs and larvae of the Bankrot Worms, especially the *Trichostronglus* spp., the Brown Stomach Worms, *Ostertagia* spp., the Hook Worms, *Bunostomum* spp., the Large Mouthed Bowel worm, *Chabertia ovina,* and the Lungworms, *Dictyocaulus* spp., thrive best during the cool months of the year. Infestations with these worms therefore are severest in the Autumn-Winter and Winter-Spring months. These findings explain the severe outbreaks of Wire Worm that occur in October-December and February-April,

Nodular Worm in April-June, Bankrot and Brown Stomach Worms in August-October, Hook Worms in March-May and Large Mouthed Bowel Worm and Lung Worms in April-June. Likewise it offers an explanation why Spring lambs and calves do not do as well as the Autumn progeny, although nutrition and climatic conditions are more favourable for their immediate survival. The Autumn yield is exposed to heavy worm infestation when it is still suckling and is weaned when veld conditions are good, whereas the Spring lamb or calf when weaned encounters the heavy worm infestations of late Summer and early Autumn when forced to graze from a veld that is dry and of little nutritive value.

This same nutritional factor in Autumn of course plays its part in rendering more susceptible other age groups and species of herbivorous stock to veld acquired parasitic infestations, particularly those Autumn infesting species, unless provision is made to provide supplementary concentrates, good hay or green feeding off pastures or oat, wheat and lupin lands.

In connection with adult stage infestations of Cestodes and Trematodes affecting our domestic stock, it is the presence, prevalence and ingestion of the intermediate hosts of these worms that mainly determines the period and degree of infestation in the host animal. The small mite, intermediate host of the cestode *Moniezia* sp., that lives in the grazing, thrives best under the hot moist climatic conditions of Summer, although it can be present the whole year round. Adult stage tapeworm infestation in calves therefore can be expected to be most severe during this period. Similarly in the case of the dog and cat Tape Worm *Dipylidium* sp., infestation is greatest in the warm months of the year when the flea, the intermediate host of this cestode is in greatest numbers.

In the case of the Trematodes, particularly the flukes, their intermediate hosts, the snail species, are dependent on moist conditions for their development, so are in greatest numbers during the wet months of the year. Infection by the host animal therefore is acquired during these months but due to the fact that it takes approximately 3 months for the cercariae to develop to the mature adult stage in the animal host, greatest infestation of these mature flukes occurs in the late Autumn to early Spring months.

5. The development and survival of the free-living stages of many of our worm species, especially *Haemonchus, Ostertagia, Trichostrongylus, Bunostomum* and *Chabertia* do not appear to be dependent on rainfall only for their moisture requirements. The severe parasitism from these nematode worm species that can occur in sheep and cattle in the arid areas of the Transvaal, Free State and Cape Province is indicative that adequate moisture in these areas is supplied by pans and dams or present in sufficient amount in sandy soils, particularly if supported by some rain during the Spring and Summer months.

6. Nutrition's main role is concerned with the development and maintenance of resistance in animals to the effects of worm infestations rather than to the infestation itself. In support of these observations, trials have shown that a well fed animal may pick up the same number of worms as a less nourished animal but the two animals will react differently to this infestation. This relationship is particularly apparent with infestations of Wire Worm, Bankrot Worm and Nodular Worm. Nutrition undoubtedly can play the major role in the host's susceptibility or resistance to internal parasitism and has been aptly referred to as "the keynote in parasite control". In the consideration of this nutritional factor, however, due regard must be given to both the mineral and vitamin requirements of stock. The copper deficiency in the coastal districts of the Cape Western Districts is well known but recently such a copper deficiency in grazing was found in stock kept on the Vaal Hartz Settlements. There is little doubt that as our knowledge increases on this subject of mineral deficiencies, especially trace mineral deficiencies in our natural and pasture grazing, more and more areas in Southern Africa will be found to be deficient in one or more of these elements.

Worm Control

(A) *General Factors.*

Unquestionably field research and experience over the years has shown that the control of helminthiasis and the improved health of the domestic animal lie rather in better methods of husbandry in its fullest sense than in the administration of anthelmintics. Under conditions of good stock management and feed — lightly stocked camps, rotational grazing and good nutrition — the immunity responses induced by either actual infestation or resistance to infestation conferred by increasing age, will often adequately protect stock without any need for dosing. One classical test done in Australia showed that sheep even when grazed continuously on green feed oat were able to throw off their burden of Nodular Worm without a single dose, whereas a parallel test done on sheep running on natural grazing of low nutritive value exposed to identical worm infestation had to receive two doses of phenothiazine over the same period of trial.

The main objects of worm control should be to keep the worm burden low and the resistance of the animal at as high a plane as possible. However, in the carrying out of this desirable objective in Southern Africa, the results generally have been far from satisfactory. There is still the tendency to overstock on grazing that is of poor nutritional value most months of the year. Most farmers do not carry enough camps to permit balanced rotational grazing. Few farmers make adequate provision for supplementary winter feed. The result is that the stock in most parts of these territories is not kept at that nutritional plane that is conducive

to the establishment of a natural resistance to worms. The administration of anthelmintics therefore is still not only necessary but at most times highly desirable.

These worm remedies, however, should not be selected and given in a haphazard manner. The right remedy should be used at the right time and at the recommended efficient dosage rate for the worms requiring attention, if optimum benefit is to follow its administration. It is equally important not to wait for the recognition of clinical cases of helminthiasis before commencing treatment. By then the disease is well established, control measures will prove less effective and the treated animals will take longer to recover. Spedding (4) records that parasitism in young sheep may have an adverse effect on liveweight gain, wool production and carcass quality for periods up to one year. Roberts (7) considers that the effects of parasitism appear to persist in cattle to a greater extent than in other domestic animals and calves frequently remain in a poor stunted condition for a considerable period after their infestation has been reduced to negligible proportions. Lastly, it is always a wise measure to move dosed stock to spared camps or clean quarters and provide them with good food to permit the animals to recover and build up some resistance in an environment away from one heavily parasitised.

(B) *Anthelmintics.*

It is not the intention of this paper to deal in detail with all the worm remedies available today, but to selectively refer to points of practical importance on the established efficiency and the administration of certain of these and comment later on some of the adverse effects that can follow on their use.

(C) *Phenothiazine.*

This remedy is the one most widely used in the world at present, because of its outstanding efficiency against many of the more pathogenic gastro-intestinal round worms affecting domestic animals. Present day evidence shows the following percentage efficiencies against the round worms for which it is generally prescribed.

CATTLE, SHEEP AND GOATS: *Haemonchus* (100%), *Ostertagia* (80%-90%), *Trichostrongylus axei* in abomasum (80%), *Trichostrongylus* spp. in small intestine (40%), *Cooperia* spp. (60%-70%), *Bunostomum* and *Gaigeria* (40%-50%), *Oesophagostomum* (80%-90%) and *Chabertia* (50%-70%).

HORSE AND MULE: The small round worms *Trichonema* spp. (80%-100%) and the red round worm *Strongylus* spp. (90%-100%).

PIGS: *Oesophagostomum* (80%-100%).

POULTRY: *Heterakis* (90%-100%).

This remedy is generally available on the market in three main forms, dispersible powder, liquid suspension and tablet.

Critical tests have shown that the liquid suspension form is the most effective of the three, possibly because the phenothiazine powder used in its preparation has to be of good quality and of fine, even particle size. Then each fluid ounce of its contents contains not less than 10 grammes phenothiazine, usually $12\frac{1}{2}$, so that a standard efficient dose is always given. The tablet form is least effective due to the fact that its dispersion in the animal is not as good as provided by the other two forms and because tests have shown that up to 10% of tablets can be voided by ruminants within an hour of administration. Generally it can be said that the efficiency of phenothiazine is directly proportional to its degree of dispersion.

Of recent years, products containing phenothiazine with the trace elements Copper and Cobalt, Phenothiazine combined with hexachlorethane and the trace elements Copper and Cobalt in balanced proportions, and phenothiazine combined with lead arsenate in drench form, have appeared on world markets. The tests done with the Phenothiazine-plus remedy have shown the benefits of incorporating the two trace elements with this efficient nematode dose in areas where deficiencies of these two elements exist, are marginal or are suspected. The combination of the nematode and trematode drugs phenothiazine and hexachlorethane not only reduces the number of collections and treatments of ruminants in areas infested with both gastro-intestinal round worms and fluke, but hits both these types of infection at one and the same time with obvious advantage. The combination of phenothiazine with lead arsenate is to provide a single dose for control of both round worms and tape worms.

It is of interest to mention that dosing trials with phenothiazine on sheep and cattle reveal no significant advantage in prestimulation of the oesophageal groove by copper sulphate in sheep and sodium salts in cattle. Further, the work by Riek (15) in Australia on calves indicated that sodium bicarbonate gave the best stimulus of the oesophageal reflex used at a dosage rate of 60 ml. of a 10% solution and that sodium chloride was the next in efficiency among the salts tested and that copper sulphate, which causes satisfactory closure in sheep, had little value when used in cattle. In this connection Rossiter (16) in work carried out in the Eastern Transvaal, was of the opinion that the usual dose ($2\frac{1}{2}$ ml.) of 10% copper sulphate solution used for oesophageal stimulus in sheep was too small and that a better stimulus was given by the use of a dessertspoonful of this solution, 10 ml.).

Phenothiazine administration can affect the value of egg counts in ruminant faeces for up to 14 days and up to 10 weeks in equine faeces. It should be remembered that a single dose of phenothiazine will not rid ruminants of *Oesophagostomum* spp. nor equines of

Strongylus spp. on account of the known histotropic phase in development of these nematodes, because as one lumenful of adult stage worms are removed by treatment, their place is taken by the 4th stage larvae that leave the mucous membrane wall to mature in the lumen. Gibson (17) has much to say on this in his work on anthelmintic treatment of horses with phenothiazine. Work done in Kentucky, United States, over the last five years has shown the benefits and safety factor in daily 2 gramme doses of phenothiazine compared to spaced interval treatment with maximum dosages of this drug. In addition these trials proved that this small daily dose over this long period of test had no adverse effects on the treated horse nor induced nematode tolerance to this remedy. Reference will be made later to some accidents following on the use of this product.

TETRACHLORETHYLENE.

This is probably the second most widely used anthelmintic and is prescribed for the specific control of hook worms in ruminants and dogs, besides being effective against the wire worms, brown stomach worms, bankrot worms and tape worms of cattle, sheep and goats. Trials at Onderstepoort showed that this remedy was definitely superior to phenothiazine as a hook worm dose.

Prestimulation of the oesophageal groove prior to dosing with tetrachlorethylene is essential for optimum efficiency and Rossiter (16) recommends that the 10% copper sulphate solution used for this purpose in sheep should be increased to 1 dessertspoonful.

When first brought on to the market for use, this drug was recommended for late afternoon administration when the sheep had filled themselves. Rossiter (16) found this a dangerous procedure and prescribes its use in the morning after the sheep to be dosed had been kraaled early the previous afternoon.

CARBON TETRACHLORIDE.

This remedy has been in use for many years. It is dosed mainly to sheep and goats for the specific control of liver fluke but it also effects good control over wire worm and hook worm and provides some control over the conical fluke. For the horse it is prescribed for the large *Strongylus* round worms and *Ascarids* of the intestines, against which phenothiazine has only a low efficiency, and the *Gastrophilus* larvae in the stomach. In poultry it is used against the fowl *Ascaris* in the small intestine.

In sheep, prestimulation of the oesophageal groove immediately prior to carbon tetrachloride administration with copper sulphate solution is necessary, as for tetrachlorethylene at the rate prescribed by Rossiter[16], for the control of wire worm and hook worm but is not necessary and even undesirable when treating for liver fluke or adult conical fluke. This drug should never be used on cattle because of its toxicity hazard.

Just recently a worker in Russia, Demidov[18] used carbon tetrachloride subcutaneously at a dose of 2 ml. to 3 ml. against *Fasciola hepatica* in sheep and found it as effective as when introduced by the mouth and into the rumen. He used this method of treatment on 1,018 sheep without any complications and considers that this method should be recommended.

Likewise tests done in Australia with carbon tetrachloride on a mouse *Strongylus* have indicated that this drug stimulates the worm to move and leave its mucus coating and so get carried out in the gut contents. This may lead to some interesting developments because it is suspected that it is this problem of overcoming this mucus coating that renders many of the smaller ruminal nematodes resistant to phenothiazine.

NODULAR WORM REMEDY.

This is a popular remedy in Southern Africa, being a copper arsenate, copper tartrate mixture and mainly used for the control of nodular worms in cattle, sheep and goats, being also effective against the wire worm and tape worms of these animals.

Prestimulation of the oesophageal groove is likewise recommended prior to its administration at the dosage rate prescribed by Rossiter[16]. This remedy should only be used when the stock to be treated have grazed on green feed so that the bowels are working freely.

HEXACHLORETHANE.

This comparatively new anthelmintic came on to world markets shortly after World War II, although tests done with it before this showed its promise against liver fluke in ruminants. Today it is the drug of choice for use in liver fluke in cattle, being very much safer than carbon tetrachloride besides being as effective as carbon tetrachloride against *Fasciola* in sheep and goats. Recent tests have indicated that it has a high efficiency against *Haemonchus,* being of the order of 90%.

It is mainly offered as a dispersible powder but some liquid suspensions are available overseas. As mentioned under Phenothiazine, a composite powder containing both hexachlorethane and phenothiazine plus the two trace elements copper and cobalt, is now marketed for combined effects against both fluke and gastro-intestinal round worms.

It is important to follow closely the recommendations and precautions listed, when using Hexachlorethane for best results and safe administration. Some mention will be made later to the toxicity hazard in the dosing of this product if these are not observed.

SODIUM FLUORIDE.

This salt has become well established of recent years as an ascarifuge for pigs. It is not very effective against the nodular

worm in this animal, and it is unsafe for treatment of ascarids in poultry. Toxicity can follow its administration if the regulation dose is absorbed too quickly, as when given in a liquid such as swill, milk or wet mash, or when given in a capsule. The safest method of usage is mixed in sufficient dry feed so that the dose is taken up slowly over a 12-24 hours period.

PIPERAZINE COMPOUNDS.

Since the first recorded use of piperazine as an anthelmintic in 1949 by Fayard[19], piperazine compounds have received a lot of attention, particularly on account of their general low toxicity, high anthelmintic value, and because there is no need to prepare the animal in any way prior to treatment. Amongst a host of workers, Cross[20] worked on the toxicological and pharmacological properties of piperazine adipate. Poynter[21] of the Animal Health Trust proved the efficiency of this same compound against *Ascaris equorum* and the small strongyles of the horse. Lee[22] in Nigeria, showed that adipate was a safe remedy to use in calves, providing 100% control over *Neoascaris vitulorum* and Leiper[23] recorded that V.19, a stable compound a piperazine and carbon disulphide was an effective vermifuge for the removal of *Ascaris lumbricoides* and *Oesophagostomum dentatum* in the pig.

Present day information indicates that certain of these piperazine compounds are the drugs of choice for the control of all ascarids in the domestic animals. The following anthelmintic values are claimed for piperazine adipate:-

HORSES: The common large round worm *Parascaris equorum* (100%), Pin worms *Oxyuris equi* (90%), and the small strongyle worms *Trichonema* spp. (95%), *Triodontophorus* spp. (70%) and the *Strongylus* spp. (50%).

CATTLE: The calf ascarid, *Ascaris vitulorum* (100%).

PIGS: The large round worm, *Ascaris lumbricoides* (100%) and the pig nodular worm *Oesophagostomum* spp. (98%).

POULTRY: The large round worm, *Ascaridia galli* (100%).

DOGS AND CATS: *Toxascaris leonina* (100%), *Uncinaria stenocephala* (95%), *Toxocara canis* (50%) and *Toxocara mystax* (50%).

In the horse, Piperazine has the advantage over phenothiazine in that it is readily taken in the feed, is absolutely safe and controls the ascaris worms and pinworms against which Phenothiazine is relatively ineffective. In poultry, for ascaris worm control, this compound again has the safety advantage over other anthelmintics, is easy to administer as it is readily taken in feed and causes no taint of the flesh, nor drop in egg production. In the pig it is replacing sodium fluoride for ascaris worm control because of

its high efficiency against both the ascaris and nodular worms, its safety factor and ease of administration.

Additional advantages of Piperazine Adipate are that it can be administered to puppies and kittens at 4 weeks of age, piglets at 7 weeks old and foals at 3 months old, and pregnant animals can be dosed up to 14 days before parturition, provided that the subject is carefully handled.

SMALL ANIMAL ANTHELMINTICS.

There are a number of proprietary remedies on the market for the control of the tape worms, hook worms and round worms (*Ascaris*) in dogs and cats. For tape worm control the popular ones are based on arecoline-acetarsol, arecoline-chenopodium or "G-4" (dihydroxy-dichloro-diphenyl-methane). For hook worm and ascaris worm control, tetrachlorethylene and hexylresorcinol were favoured, but today the piperazine compounds are gradually taking their place, because of their greater safety factor and the early age at which they can be given.

RECOMMENDATIONS AND PRECAUTIONS IN THE USE OF ANTHELMINTICS

Dosing accidents will always occur as long as anthelmintics are used, but there is no reason why these cannot be materially reduced in number and severity by a more intelligent, selective and careful use of the products available. Firstly, very few stockmen carefully read and carry out the instructions on the labels or leaflets of the product. Secondly, they often select and use a product that is known to be dangerous to the species, the age group or the physical state of the animal. Lastly, most of the reported losses in stock that follow dosing are due to some other cause.

It is therefore important that the veterinarian, when investigating dosing accidents, should be very sure of his clinical and post-mortem findings before placing the blame on the worm remedy. In the development of modern products, these generally have been subjected to complete toxicological and biological study by qualified workers before they are released for sale, so that if used as directed, toxicity from their use is most unlikely.

Phenothiazine when it was first used on a large scale was blamed for many losses in sheep. Today a reported loss from this drug is very rare due to the fact that the stockman now knows how to use it and is not so prone to blame this remedy for any losses he may suffer from a coincidental condition, such as Enterotoxaemia. This bacterial disease is purposely mentioned because there is an association between the dosing with phenothiazine and the onset of *Clostridium welchii* intoxication, unless effective vaccination against this infection has been done. The collecting and penning of sheep in kraals until dosing is com-

pleted, often without food and water, plus the fact that phenothiazine has a constipating effect causing stasis of the intestinal contents, can certainly create conditions favourable for multiplication of these bacteria with resultant infection.

Then again, dosing may have been left too late to prevent the onset of symptoms and death in some animals from helminthiasis. On the other hand, the remedy may have been used against the helminths for which it is ineffective, with a like result. Definite cases of this nature have been investigated, in which phenothiazine has been incorrectly blamed for the losses from such causes.

Recently the two trace elements, copper and cobalt, included in a phenothiazine remedy, have been blamed for mortality in sheep after administration, but repeated tests with either or both of these minerals with and without phenothiazine, at four times their dosage rates, have failed to cause any ill effects. Further, it is very difficult to cause copper poisoning in sheep from any single dose and cobalt is known to be a safe inert mineral to ruminants.

The main toxic effects recorded for phenothiazine have been when dosed to ewes within two to three weeks of lambing with consequent high abortion rate, given to lambs and calves on hot summer mornings with resultant photosensitization, and when administered with a dosing gun with an oesophageal tube attachment that caused serious damage to the throats of the dosed animals with death from a gangrenous pharyngitis. The last named type of case has been very numerous over the last year so that some active propaganda should be carried out to advise farmers of this danger in the use of this oesophageal tube if due care in its insertion is not observed.

All these losses could have been avoided if the stock owner had simply read the precautions reflected on the label of the phenothiazine product used, or been careful in his dosing.

Tetrachlorethylene. Rossiter[16] has shown that the main danger from tetrachlorethylene administration is when it is given on a full stomach and so advises early kraaling the afternoon before treatment. Other contributory causes of toxicity are stated to be a high protein diet and a calcium deficiency.

Carbon Tetrachloride. Losses from the administration of this drug can be in the neighbourhood of 25% in sheep and very much higher in cattle. In fact, it is too dangerous a remedy to give to cattle as many farmers have found to their cost. Evaluated toxicity tests on sheep with this anthelmintic showed that susceptibility was increased by a high protein diet, adiposity and sometimes by fatigue from travel, that herd idiosyncrasy to this drug can be a factor and that poisoning is often confined to one area. An unusual symptom that can follow carbon tetrachloride treatment is photosensitization.

Hexachlorethane. Since the introduction of this liver fluke remedy, very few serious accidents have been recorded, compared to carbon tetrachloride. The cases of poisoning investigated have involved either dairy cows in the flush of their lactation or adult animals that had been dosed with the last of the bulk drench mixture. In all cases the cattle affected were in phosphate deficient areas, had received supplementary feed of either root crops or concentrates, and in three accidents out of the four had been dosed for the first time with this remedy.

Work done on this problem soon revealed that lactating animals were definitely more prone to the toxic effect from this drug; that in the preparation of large bulk drench mixtures containing this dispersible powder, the last lot of the mixture could contain up to 4 times the recommended dosage rate so that the last few animals dosed were liable to receive excessively high quantities of the active ingredient, unless very thorough stirring of the drench mixture had been carried out throughout the dosing operation. Diets rich in protein, such as provided by root crops and supplementary feed concentrates, should be withheld for at least one week before and after treatment. Herd or flock idiosyncrasy to this remedy can be expected.

The lessons learnt from these accidents stress the need for closely observing the following recommendations and precautions when dosing with hexachlorethane or any compound containing it:-

1. First dose a few of the best and worst animals and observe for 48 hours to see whether their reaction is normal before dosing the remainder.
2. Carry out individual dosing when treating dairy cows in milk, pregnant animals and stock in weak, anaemic condition and when treating such animals give only half the normal recommended dose, following by the other half a week later.
3. Do not dose females a week before and after service, pregnant animals 4 weeks before and after parturition, ewes and goats when suckling, nor calves, lambs and kids under 6 months old.

General

The remedies to which reference has been made, provide a very useful range from which to draw for the treatment of single or mixed infestations of the common worms that parasitise domestic animals. With them a balanced dosing programme over the year can be evolved especially for the control of the nematodes, cestodes and trematodes that infest cattle, sheep and goats.

In conclusion it is necessary to remark that the final word on "Worm Control" has not yet been written, but today we have the benefits of the facts revealed by extensive and painstaking

field research on the biology and seasonal occurrences of our more common and pathogenic worms and the use of some very effective and comparatively safe anthelmintics. This knowledge, if intelligently applied and the right remedy used correctly at the strategic time, will certainly keep worms under control, so that our stock will not only survive, but become truly productive despite this greatest of all menaces to animal health.

References

(1) Taylor, E. L. (1943) "The Interaction of Nutrition and Parasitism with Special Reference to Parasitic Gastritis". Vet. Rec. 55, pp. 117-119.

(2) Parnell, I. W., Rayski, C., Dunn, A. M., and MacKintosh, G. M. (1954) "Some Observations on the Worm Egg Counts of Scottish Hill Lambs". J. Helminth. Vol. XXVIII, Nos. 3/4, pp. 205-219.

(3) Wilson, A. L., Morgan, D. O., Parnell, I. W., and Rayski, C. (1953) "Helminthological Investigations on an Argyllshire Hill Farm". Brit. Vet. J. 109, pp. 179-190.

(4) Spedding, C. R. W. (1954) "The Persistence of the Effects of Worm Infestation in Sheep". Empire J. Expt. Agric. Vol. 22, No. 85, pp. 55-58.

(5) a. Crofton, H. D. (1954) "Nematode Parasite Populations in Sheep on Lowland Farms — I — Worm Egg Counts in Ewes". Parasitology, Vol. 44, pp. 465-477.

b. Crofton, H. D. (1955) "Nematode Parasite Population in Sheep on Lowland Farms — II — Worm Egg Counts in Lambs". Parasitology, Vol. 45, pp. 99-115.

(6) Gordon, H. McL. (1953) "The Epidemiology of Helminthiasis in Sheep in Winter-Rainfall Regions of Australia". Aust. Vet. J., Vol. 29, No. 12, pp. 337-348.

(7) Robertson, F. H. S., O'Sullivan, P. J., and Riek, R. F. (1952) "The Epidemiology of Parasitic Gastro-Enteritis of Cattle". Aust. J. Agric. Res. 3 (2), pp. 187-226.

(8) Forsyth, B. A. (1953) "Epidemiology Studies on Helminthiasis of Sheep in Southern N.S.W." Aust. Vet. J., Vol. 29, No. 12, pp. 349-356.

(9) Pullar, E. M. (1953) "The Epidemiology of Helminthiasis in Sheep in Winter-Rainfall Regions of Australia". Aust. Vet. J., Vol. 29, No. 12, pp. 357-362.

(10) Stewart, D. F. (1953) "Studies on Resistance of Sheep to Infestation with *Haemonchus contortus* and *Trichostrongylus* spp. and on the immunological reactions of Sheep exposed to infestation. V. The Nature of the 'Self-Cure' Phenomenon". Aust. J. Agric. Res. 4, pp. 100-117.

(11) a. Veglia, F. (1915) "The Anatomy and Life History of the *Haemonchus contortus* (Rud)." 3rd and 4th Repts. of the Dir. of Vet. Res. U. of S. Af., pp. 347-500.

b. Veglia, F. (1928) "Oesophagostomiasis in Sheep (Preliminary Note)". 13th and 14th Repts. of the Dir. of Vet. Ed. and Res. U. of S. Af., pp. 755-797.

(12) Laurence, G. B., Groenewald, J. W., Quin, J. I., Clark, R., Ortlepp, R. J., and Bosman, S. W. (1951) "The Influence of Nutritional Level on Verminosis in Merino Lambs". Onderstepoort J. of Vet. Res. Vol. 25, No. 1, pp. 121-132.

(13) a. Mönnig, H. O. (1928) "Check List of the Worm Parasites of Domesticated Animals in South Africa". 13th and 14th Repts. of the Dir. of Vet. Ed. and Res. U. of S. Af., pp. 801-837.
b. Mönnig, H. O. (1930) "Studies on the Bionomics of the Free-Living Stages of *Trichostrongylus* spp. and other parasitic nematodes". 16th Dept. of the Dir. of Vet. Ser. and An. Ind. U. of S. Af., pp. 175-198.
c. Mönnig, H. O. (1949) "Veterinary Helminthology and Entomology". 3rd Ed.

(14) a. Ortlepp, R. J. (1939) "Observations on the Life-history of *Bunostomum trigonocephalum*, A Hookworm of Sheep and Goats". Onderstepoort J. of Vet. Sc. and An. Ind. Vol. 12, No. 2, pp. 305-318.
b. Ortlepp, R. J. (1955) "Worm Control with reference to sheep on artificial pastures". S. Af. Stockbreeder and Farmer, pp. 29-31.

(15) Riek, R. F. (1954) "The Influence of Sodium Salts on the Closure of the Oesophageal Groove in Calves". Aust. Vet. J. Vol. 30, No. 2, pp. 29-37.

(16) Rossiter, L. W. (1953) "A Field Campaign Against Worms in the Ermelo Area". J. S.A.V.M.A. 24 (3), pp. 149-153.

(17) Gibson, T. E. (1953) "The Effect of Repeated Anthelmintic Treatment with Phenothiazine on the Faecal Egg Counts of Housed Horses, with some observations on the life cycle of *Trichonema* spp. in the Horse". J. Helminth, Vol. 27, Nos. 1/2, pp. 29-40.

(18) Demidov, N. V. (1954) "Treatment of Fasciola Infection in Sheep with Carbon Tetrachloride". Vet. 31 (4), pp. 16-18.

(19) Fayard, C. (1949) "Ascariodiose et Piperazine". These. Paris. Abstr. Sem. Hôp. Paris. 35.

(20) Cross, B. G., David, A., and Vallance, D. K. (1954) "Piperazine Adipate: A New Anthelmintic Agent — Part II — Toxicological and Pharmacological Studies". J. Pharm. London 6 (10), pp. 711-717.

(21) Poynter, D. (1955) "Piperazine Adipate as an Equine Anthelmintic". Vet. Rec. 67, 159.

(22) Lee, R. P. (1955) "The Anthelmintic Efficiency of Piperazine Adipate against *Neoascaris vitulorum* (Goeze, 1782)". Vet. Rec. 67, 146.

(23) Leiper, J. W. G. (1954) "The Piperazine Compound V.19 for the Removal of *Ascaris* and *Oesophagostomum* from the Pig". Vet. Rec. Vol. 66, No. 40, pp. 596-599.

SERVICE PETS

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Introduction

Major T. J. Edwards in his book on *Military Customs* (1950) of the British Army, gives a good account of the adoption of pets

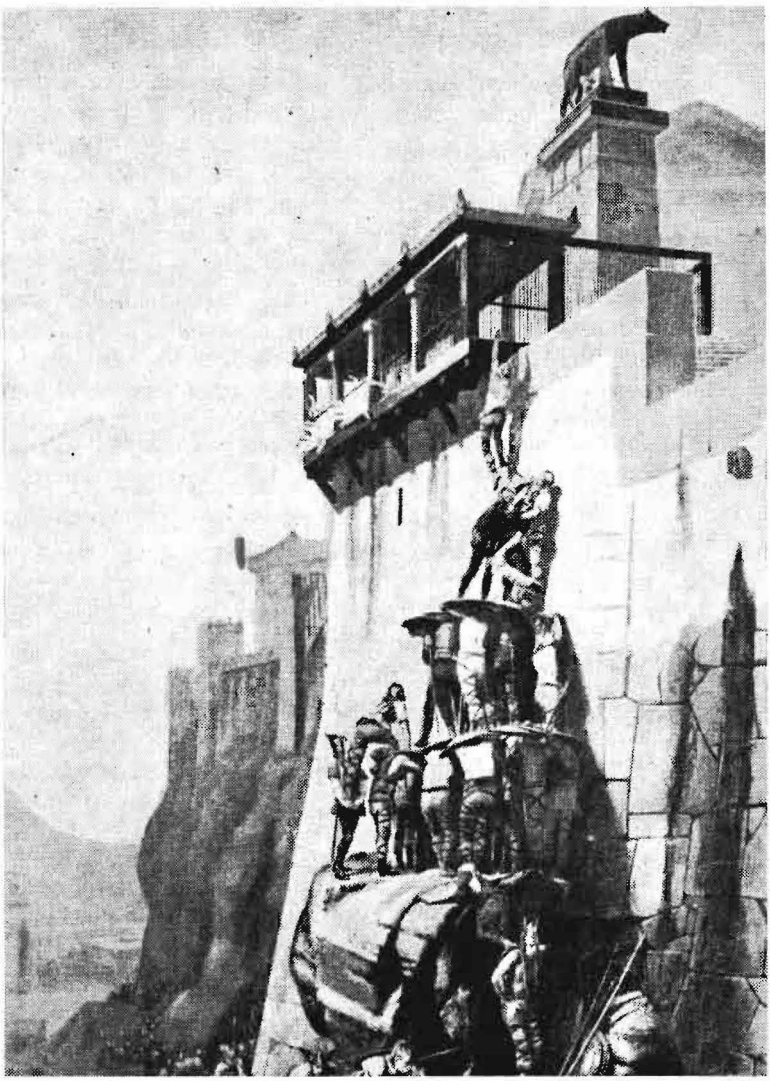


Fig. 1.
From "The New Book of Knowledge" by Sir John Hamerton.

by regiments. He mentions that the origin of the custom is not certain, but that "the earliest record . . . is a goat which belonged to the Royal Welsh Fusiliers . . . and was present at the Battle of Bunkers Hill on 17-6-1775" (p. 121).

There is little doubt but that the practice goes back to earlier days and that other armies have adopted pets e.g. one of the units of the Air Corps of the United States during the Second great war adopted "Isobar, a little brown and white dog, who had attached himself (to the unit) and had made a place for himself in the men's hearts" . . . He was made a sergeant and respected by the men to the extent of getting a sweater from voluntary wartime Christian Science workers! (*The Story of Christian Science Wartime Activities,* 1939/46/1947).

The writer remembers once seeing an illustration of a Roman soldier on sentry duty accompanied by a goose. It is more than probable that the sacred geese, which are reputed by Livy V. 47(1) to have, by their cackling saved Rome from the Gauls in 390 B.C., were or became the pets of the legion on garrison duty. See Fig. 1 taken from *The New Book of Knowledge,* Vol. viii, p. 3511 (Waverley Book Co., London).

In South Africa little or nothing has been recorded on the subject, but that there were unit pets, especially of the British garrison (1806-1914), is certain as will be shown. Nothing exists about the pets of Republican commandos or Colonial regiments of pre-Union days, but that is understandable as it would be only units of some permanence that could keep a pet.

The animals to be described are as follows:-

Horse

(1) The earliest record of what apparently was at first a tyrant and later, due probably to old age, acknowledged as a pet was "Cracker" of the Natal Police whose early history is described by Holt (1913):-

> "The first pack-horse purchased (1874) for the force was known by the name of 'Cracker', and he spent many years of his life at headquarters, being employed chiefly as a punishment mount for obstinate recruits. Many of us who rather fancied ourselves as horsemen were considerably taken down when the Sergeant-Major gave us a dose of 'circle' at the trot, with the stirrups crossed, on this horribly rough animal. We used to take the beast out of the stable at night and tie him up to a tree in the square in the hope that he would contract horse-sickness, but he only thrived on an

(1) Thanks are due to Professor T. J. Haarhoff for data on this subject (letter 31-8-53). Livy states that the Gauls climbed so silently that not only the sentries but also the dogs . . . were deceived. "But they could not elude the vigilance of the geese, which being sacred to Juno, had not been killed, in spite of the scarcity of provisions.

outdoor life. A man named Haynes tried to shoot the animal one day at mounted pistol practice, but missed his mark and was unseated owing to the animal shying. Any man who gave his horse a sore back was mounted on 'Cracker' so it is easy to imagine how we nursed our steeds", (p. 26).

Later he apparently mellowed, according to reports of old ex-Natal policemen.

(2) Major Edwards includes in his book the story of the Regimental pony of the Imperial Light Horse, indeed, he reproduces an illustration (p. 139) showing "Queen's Hussar I" with the Pony Master in his smart undress "blues".

The Stallion was bred at Kopjes in the Orange Free State in 1934 by J. Wright Esq., an uncle of the former O.C., Lieut.-Colonel J. M. Blake. When the Royal Family visited the Union in 1947, *Hussar* (who received that name because the I.L.H. is allied to the 4th Queen's Own Hussars) was on parade with the unit when on duty at the City Hall, Johannesburg. The Royal Family was interested in the pony, His Majesty suggesting the title Pony Master instead of Pony Boy for the Corporal who leads the animal. "As a mark of appreciation of Her Majesty's special interest . . . he (was) renamed *Queen's Hussar I*, which also emphasises the regimental alliance."

Fig. 2.
King George V and Queen Elizabeth at Johannesburg in 1947, inspecting "Queen's Hussar I" regimental pet of the I.L.H.

Edwards adds that the pony at first was fractious, but soon became accustomed to military ceremony, especially enjoying the band. "On parade he wears a special ceremonial harness, consisting of a white leather bridle, green saddle cloth with the regimental badge emblazoned on both sides and white surcingle".

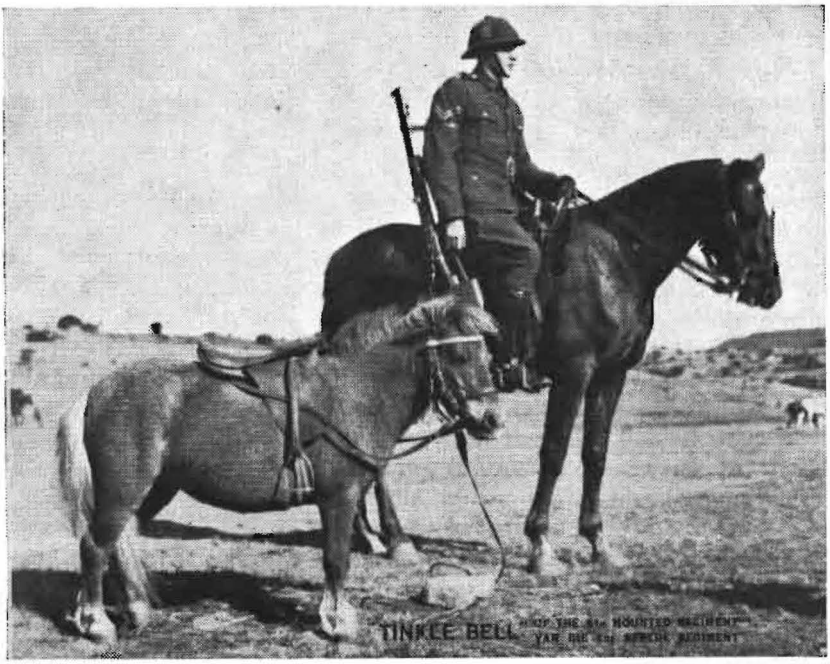


Fig. 3.
Subject of Xmas Card, 1940, from Capt. J. L. Dickson, S.A.V.C.

Fig. 4.
Two Shetland ponies, regimental pets 1940-41. Capt. J. L. Dickson and his daughters mounted.

A plume in green and gold (the unit colours) appears on the top of the bridle.

According to a communication dated 20-1-54, the Shetland Stallion was still fit and then under the care of ex-R.S.M. Newberry of Turffontein. (See fig. 2.)

(3) During the Second Great War six Mounted (Commando) Regiments were formed, and 6th M.R. had as a pet "Tinkle Bell", who appears in fig. 3 with a corporal of the Regiment. The photo was reproduced from a Christmas card issued by the unit in 1940 from Ladysmith, Natal.

(4) Fig. 4 shows two Shetland ponies adopted by two of the other mounted regiments at Ladysmith during 1940/41. They are carrying the daughters of Capt. J. L. Dickson, Veterinary Officer at the camp.

Baboon

Being lively and intelligent, baboons are popular pets, but unfortunately they are liable to be teased by those of less intelligence. To such an extent is this persecution sometimes carried out that the animals often become vicious and have on occasion bitten their tormentors. In such cases the frequent fate is destruction "because the animal was ferocious." If properly treated baboons make excellent pets.

(5) Dr. "Hookey" Walker, formerly of Onderstepoort Veterinary Laboratories, once related to the writer, while discussing his service in the S.A.L.H. (1899-1902), the story of the regimental baboons. Strangely in July, 1953, and thanks to the kindness of Mrs. A. M. Pill of Louis Trichardt, the Military Archives came into possession of an album of photographs collected by the Veterinary Officer of the S.A.L.H. *viz.* Capt. W. G. Steele, whom Walker naturally knew.

Stranger still, was the fact that one of the photographs (fig. 5) showed "Jacko" and "Krige", each on a chain, taken with a detail standing in front of Capt. Steele's Cape cart, apparently somewhere on the Highveld!

It can be imagined that in whatever manner the baboons were admitted to the unit, they soon became fast friends with the Light Horsemen. The photograph shows *"Jacko"* drinking from a bottle while *"Krige"* disappointedly looks away!

(6) Major T. J. Edwards, in an air-mail letter received on 10-2-1954, gives the following account of a baboon "we had in the 6th M.I. Regiment at Standerton in 1907-8."

"He was a real terror and had to be kept on a strong chain in a compound. Once he got loose and raided the dry canteen, eating everything that he could and smashing everything that he could not. When he got loose on another occasion the whole

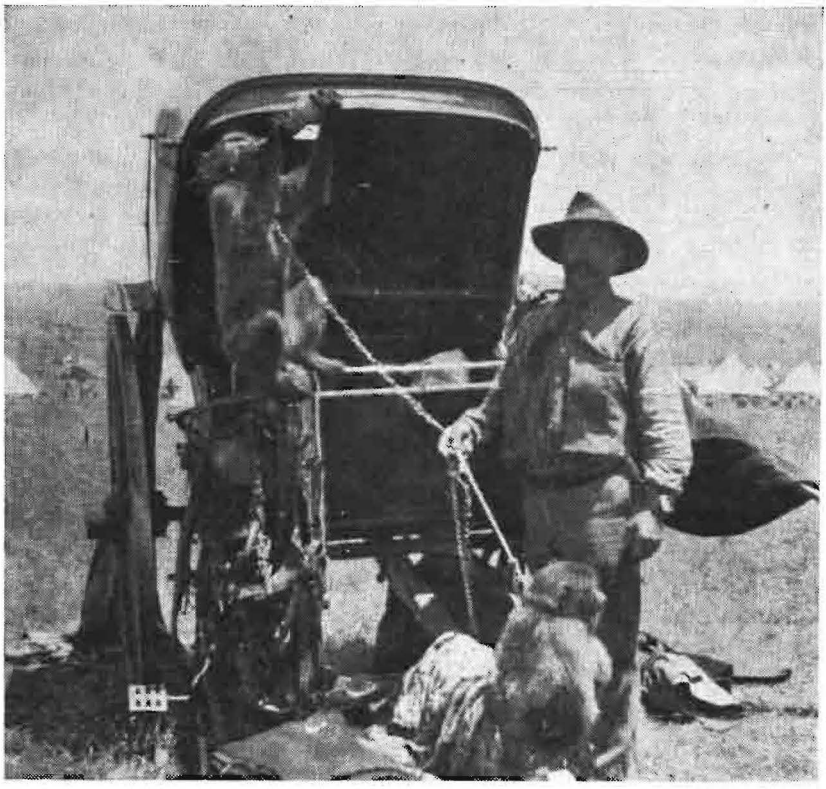


Fig. 5.
S.A.L.H. Jacko and Krige, 1901. Jacko drinking, Krige disgusted.

regiment turned out to catch him. We followed him from a respectful distance: When he stopped we stopped; if he advanced towards us we backed. This comic performance went on for an hour until a kaffir boy — a groom — calmly walked up to him, took up the end of his chain, led him quietly back to the compound and tied him up. Perhaps he knew the baboon's language; we certainly didn't."

(7) During the First Great War, the 3rd South African Infantry adopted from Pte. Albert Marr, the owner, his baboon named "Jacko" or "Jackie".

According to correspondent in *Home Front* (July, 1950, p. 7) his story may be summarised thus:-

"Jackie" accompanied his master on a troopship to England and then to Egypt. Pte. Marr was wounded at the Battle of Agagia (26-2-1916) and taken to a General Hospital at Alexandria, the baboon being his constant companion. *Home Front* (p. 7) has a photograph showing Marr in hospital "blues" holding "Jackie" erect and in the saluting position on a chain. Both "returned to the Regiment in France where he (Marr) and

"Jacko" were twice wounded". Apparently "Jackie" was then adopted by the 3rd S.A.I. and the correspondent (Moth W. H. C. Brink) adds that he was informed by the O.C., Col. Thackeray, that the baboon "at the Lord Mayor's Show, collected about £2,000 in one day towards war funds. They both returned to South Africa . . . and 'Jacko' was handed over for safe keeping to the Pretoria Zoo, where he later died". It would appear that the 3rd S.A.I. Regimental Association "put up a bronze memorial . . . on his cage. The cage was pulled down and the memorial cannot be traced . . ."

(8) In a file at D.H.Q. is a statement dated 28-7-1941, and made by W.O.II H. L. Engelbrecht, requesting "Authority (to) be granted for the retention of (a baboon as the official mascot of the |Oudtshoorn) depot."

It appears that a tame baboon, originating from East London, was brought to Oudtshoorn Military Camp with details sometime in 1937. Being well cared for and good natured in disposition, he became popular with the troops and was unofficially recognised as the Depot mascot.

Fig. 2.
Jackie within Depot at Oudtshoorn 1940.

As the individual who had personally taken care of the baboon, S. M. Engelbrecht was perturbed when, in terms of certain Cape Provincial Legislation (Ordinance No. 10 of 1927 as amended), he was "approached by the civil authorities to destroy the animal" since the permission of the Administration is essential to keep wild animals. The reason is that the Administration might become liable for damages in the event of any accident (through a bite, etc.) occurring to a third party.

The matter was duly referred to the A.G., Pretoria, whose decision was that "permission cannot be granted for the baboon to be recognised as a camp mascot, and any orders by the civil authorities for its disposal must be complied with".

Shortly afterwards "Jackie Witkin" (the full name of the baboon, the surname Witkin being that of the soldier who took over the care of the animal after W.O. Engelbrecht had been transferred), broke his chain, raided the nearest pantry and was shot.

His photograph appears at fig. 6.

Springbok

(9) The 4th S.A. Infantry (S.A. Scottish) 1915-19, owned a springbok "Nancy", which was presented in August, 1915, by Mr. D. McLaren Kennedy of Driefontein, Orange Free State. She accompanied the 4th to Egypt (Buchan p. 47) "where she escaped, but was recaptured. She was ill going by sea to Mersa Matruh. In Marseilles she was much admired, and at Armentieres she had a horn broken during the shelling of the transport lines. She died at Hermeton on November 28th, 1918, having accompanied

Fig. 7.
"Nancy", Regimental Pet of S.A. Scottish 1915-1918 (Buchan).

the Battalion right through the war. Her skin was cured and stuffed in London and sent to Sir William Dalrymple", the Hon. Colonel (Juta, 1933, p. 121).

The illustration of "Nancy" in Buchan's book is taken from a photograph in the possession of the Imperial War Museum.

Two years ago Col. Maurice de Villiers, who had acted as Officer in Command, Witwatersrand Command, informed the writer that the stuffed exhibit, which had been kept in the Drill Hall, had deteriorated (probably through poor preparation) to such an extent that authority was received to "write it off". It is, however, understood that the remains of "Nancy" are still at the Drill Hall. (See fig. 7.)

Fig. 8.
S.A.E.C., Second Great War, Abyssinia. (Dr. R. Bigalke.)

LESSER KUDU

(10) Major H. R. Roberts of No. 35 (Works) Company S.A.E.C., in a report dated 2-12-51, mentions that "the Company brought its mascot, a beautiful 'Nyala' ewe, back (from East Africa) and left it at the Pretoria Zoo. This handsome creature had been with the Company since 18-2-1941, and had travelled many thousands of miles". Dr. R. Bigalke, Director of the National Zoological Gardens, adds the following note: "On 27-8-1942, we purchased this animal for the sum of £40 from Sapper A. Atkinson, Pretoria. He was of the opinion that the antelope was a Mountain Nyala, but I was doubtful of this identity. The animal injured one limb and died on 19-8-1943, from acute congestion of the lungs. After its death I was able to establish that it was a Lesser Kudu.

"Mr. Atkinson stated that the animal was injured by a shell near Kismayu in Italian Somaliland and sought refuge in a camp of the S.A.E.C. He took charge of it and nursed it back to health." (Letter 520/54 of 3-3-1954).

Dr. Bigalke kindly provided fig. 8.

Himalayan Bear

(11) "On 20-10-1903, a Himalayan Bear was presented to the National Zoological Gardens by the Royal Inniskilling Fusiliers. The animal was in the Zoo until 1921." (Letter from Dr. R. Bigalke.)

Pig

(12) Thanks to Col. P. J. Jacobs, formerly second in command 7 Recce. Battalion and now Commandant of the South African Military College (1953-54), the following story is available of "Honkie", the unit pig.

Honkie was a black "Kaffir" pig (male) who, as a suckling attached himself to the unit while on manoeuvres near Ladysmith

Fig. 9.
"Honkie" of 7 Recce Bn., Marcopolis. From Col. P. J. Jacobs.

in 1941. When about 2 months old the 7th Recce. Battalion (O.C. Lieut.-Col. P. J. Grobbelaar) was ordered "up North" and Honkie was smuggled on to the ship and duly arrived in Egypt. Owing to the attention of the regimental cook, he was liberally fed and soon grew into a fine specimen.

It so happened that the Regiment was sent to the Gazala Line, the northern part of which was held by the 1st S.A. Div.,

which at the time was under the command of Major-General D. H. Pienaar. Owing to the constant patrolling activities of the unit and Honkie's propensity to wander from the camp kitchen, he was lost on one occasion; but much to the joy of the troops he was soon found.

Incidentally the pig was very sharp of hearing and became uneasy on the approach of enemy aircraft, and so warned his "friends" of possible enemy activity. It is not clear whether he could distinguish between British and German planes, but in those days most planes were German.

One sad day Honkie finally disappeared. He was "annexed" by a British unit and used for the pot.

From then on (so the non-European troops maintain), troubles arose which later affected the whole Eighth Army! Rommel attacked at the end of May, Bir Hacheim had to be evacuated on 11-6-1942, and the withdrawal from Gazala ("Gazala Gallop" to the troops) began in earnest. Ultimately Tobruk fell on 21-6-42, and the 7th Recce. Battalion also went into the "bag".

Fig. 9 shows Honkie near the unit kitchen, with geese, at Mareopolis, near Alexandria.

Lion

(13) In *The Nongqai* of February, 1944, appears the following story of "Bunty", the pet of the Regiment de la Rey during the Second Great War.

"In the early part of 1941, a lioness cub was presented to the regiment by Mr. MacDonald, a Game Reserve Warden at Barberton. She was given the name of "Bunty", and with her foster mother, "Jenny", a black bitch which had been loaned to the Regiment for the period of "Bunty's" cubhood, accompanied the Regiment wherever it went. During the Unit's stay at Piet Retief, "Bunty" became seriously ill. She was carefully nursed through her illness; but expert opinion maintained that she would not survive a fatal weakness which resulted from that illness. It was therefore decided to destroy her at Barberton in June, 1942.

On hearing this the Supply Officer at Barberton offered to take her over, maintaining that, if she were kept in a suitable climate such as that of Barberton, she might recover completely. She was handed over to him.

Unfortunately she escaped from custody and having grown to an awkward and dangerous size, it was considered necessary to shoot her. She was buried with full military honours."

(13a) Comdt. G. N. Robertson, of D.H.Q., has informed the writer that during the last Great War the 2nd Bomber Brigade S.A.A.F., while at Nanyuki, Kenya, had a lion cub as a pet, which proved an embarrassment. Being in lion country, its playful

habit of stalking officers, especially at night, led to the cub being shot.

LEMUR

(14) It is understood that quite a number of units, when in Madagascar in 1941, adopted specimens of the friendly "Madagascar Cat". No details, however, are available of unit, period and fate of these gentle creatures.

GOAT

(15) The Pretoria Regiment, while on active service in South West Africa (1914-15) came into possession of a white goat which was trained to lead the band. On return to Pretoria the goat was left at the Zoo.

(16) The R.L.I. once had a white goat as the unit pet; but further details are not available.

ADDENDUM

RAND LIGHT INFANTRY

PETS

The regiment has had a number of pets during its fifty years of existence.

The first one was "Susie", a monkey, which was given to the R.L.I. when the regiment left Johannesburg for German South-West Africa in 1914. It was enveloped in a miniature Union Jack and proudly graced the broad shoulders of one of the sergeants as the train steamed out. It proved to be an excellent sentry during the campaign. It occupied a dog kennel and, for some curious reason, hated all the officers! She unfailingly predicted the coming of an enemy 'plane, for she became very restless, worriedly climbing up her pole and sliding down it over and over again. Nobody knows what become of her.

"Ferdie", a tame chicken, was acquired by one of the men at Sonderwater some time in October, 1940, and by the time the R.L.I. moved to Barberton, it was a ful-grown fowl, but very tame. It insisted on sleeping in the guard-room only, perched on a plank with its face to the wall. It refused to be budged and written instructions were pinned up for the guard commander to feed it each evening! Wherever "A" Company went, "Ferdie" went too, and so, when in January, 1941, "A" Company went to Komatipoort for a week's detached duty of guarding the border, "Ferdie" went too. Then one day it vanished and there was a rumour that one of the regimental chefs cooked it!

During this period "Danko", the regimental Alsation mascot, was acquired, but it died of biliary fever in January, 1941.

"Tiger", another dog, of no particular breed, was another regimental mascot in 1940 and 1941 and originally belonged to C.S.M. G. Trobridge of Support Company. It was his wish to take "Tiger" to North Africa when the regiment sailed, but it was not allowed to go. "Tiger" died in Johannesburg in 1947.

In North Africa a small black and white dog, "Gypsy", was obtained from the Arabs and, during the Battle of Bardia, she bore a litter and the pups were remarkable for whenever enemy planes came over (once theye were a few months old) they would also take refuge in slit trenches. Some of these pups were in the Battle of El Alamein and, while the regiment was waiting at Qassasin to come back to the Union, they were given away to members of permanent units in the neighbourhood.

Towards the end of 1947, a white Angora Ram was presented to the regiment as a Regimental Mascot. It was promptly named "Billy". Its one and only public appearance was at the annual Regimental El Alamein service on October 21, 1949. Some time after this event it was involved in a fight and had to be destroyed. Since then the regiment has had no pets.

Dog

Undoubtedly dogs are the most popular of pets, for apart from their intelligence and happy response to good treatment, they require less attention than other animals. They can, however, be a confounded nuisance, especially in war, as recounted by Pte. Wheeler in his *Letters* (1951), as edited by Liddell Hart (p. 79).

The fact is recorded on 8-4-1812 that between Albuera and Salamanca, accompanying Wellington's army in Spain, were about 200 dogs which the friendly "Tommies" of that day had collected. These in the presence of the enemy were a decided menace, in fact their barking in night attacks was a danger and led to confusion on more than one occasion.

It is in connection with canines that a sharp line must be drawn between personal and regimental pets, for there are hundreds of the former and only dozens of the latter.

Instances of personal (military) pets are:-

(a) the fox terrier which followed his owner, Major Plumbe, Royal Marines, during the Battle of Graspan (25-11-1899). When his master was shot, the faithful dog kept watch for hours until he was picked up and taken away by a Field Ambulance (Wilson, H. W., 1900, p. 151, Vol. I).

(b) a recent example of a much loved dog, whose escapes are recorded in a book, is "Pompie de Bono", whose master, Lieut.-Col. Bob Preller, D.S.O., wrote *My Hond, die*

Oorlog en Ek, after his experiences in the East African Campaign of 1940-41[2].

The South African examples of *unit* pets (dogs) are the following:

(17) Major Edwards (letter of 21-1-1954) refers to Dick of the 24th Foot at Rorke's Drift (22-1-1879); but details at present are not available.

(18) In a second photograph of Capt. Steele's old album appears yet another regimental pet *Scout* (fig. 10), with the comment, "who followed the Regiment throughout the war until accidentally shot August, 1901." No further details are available except that the officer fondling a pup, presumably the progeny of *Scout,* is Lieut. J. E. Steele, brother of the Veterinary Officer. Seated is Capt. Wilson-Fox, also of the S.A.L.H.

Fig. 10.
Bitch "Scout", S.A.L.H.. 1907. Capt. J. E. Sheil holding pup, officer seated, Capt. Wilson Fox.

(19) The Hon. O. Pirow, Minister of Defence in 1936, presented to the unit he formed, Special Service Battalion, two Great Dane dogs, "Colonel" and "Major". The R.S.M. at the time was "Papa" Brits (later Lieut.-Col.). Having spent a period with the Grenadier Guards, he at once appointed a dog major for each

(2) Besides this book two other well known dogs have had biographies compiled. The first is *Jock of the Bushveld* by Sir Percy FitzPatrick and the second is *Just Nuisance,* whose story follows.

of the animals, their duty being to care for and train them. Any neglect was severely dealt with. Unfortunately one day on parade at Roberts Heights, a snake bit "Colonel", who died, and the dog major was accordingly punished — 14 days C.B. (See fig. 11.)

Fig. 11.
"Major" S.S.B. (Drum Major D. A. Steenkamp).

"Major", the remaining Great Dane, then became a firm favourite, and for some years proudly marched at the head of the band. Later he was trained to allow "Tickey", a vervet monkey, to ride on his back and the pair were most popular and efficient unit pets!

When the S.S.B. proceeded north on active service in 1943, "Major" remained at Kaffirskraal, where soon after he died.

Fig. 12 shows "Tickey", who is entertaining a kitten, and Sgt. Brits, S.S.B. He was presented to the unit by Mrs. van Dam (wife of Col. van Dam) about 1940. He was well cared for and popular, but any cruelty was severely punished, e.g. a detail once received 14 days C.B. for kicking him!

When "Major" went to Kaffirskraal and the S.S.B. to Italy, "Tickey" was given away and so was lost touch with.

Appreciation is expressed to Drum Major D. A. Steenkamp, not only for the above note but also for photographs.

(20) In 1943 the Youth Training Brigade had a dog of mixed breed, Great Dane predominating, which took its duties as regimental pet very seriously. "Bull" was trained during Lieut.-Col. Swarts' period of command (1943) and always marched proudly with his "master" (dog major) at the head of the band. He possessed a special coat on to which later were sewn his sergeant's chevrons.

Fig. 12.
Sgt. Brits and " Tickey ". S.S.B. circa 1940. (Drum Major D. A. Steenkamp.)

At reveille "Bull" also undertook the task of awakening the men with a bite, at first playful; but as he grew older, it became more severe. On one occasion, while leading the band, he espied some natives standing and joking at the roadside, which incident so displeased him that he rushed at them and drove them off! Finally in 1948 he became bad-tempered and having on one occasion "cornered" an officer, he was given away, much to the regret of the unit.

(21) The Y.T.B. in 1949 "became" the Permanent Force Training Centre[3] and it was not long before the unit possessed

(3) Youth Training Bridage until 31-3-46, was a unit of the A.C.F., then in terms of Proc. 100 of *U.G.G.* 3-5-46, it became a *Bn.* of the P.F. As the result of Proc. 204 of *U.G.G.* 18-10-46, the Y.T. Bn. was altered to Permanent Force Training Centre, which in terms of Proc. 3 of *U.G.G.* 13-1-1950, was disbanded w.e.f. 31-10-49 and a new P.F. unit, Military Gymnasium, established as from 1-11-49.

a pair of ridgebacks, "Monty" and "Rusty", which were trained to parade with the band. As "Rusty" was frequently ill and "Monty" was not a success alone, the dogs were given away.

Able Seaman Just Nuisance, R.N.

(22) Nuisance was a Great Dane born on 1-4-37, his first master being Mr. H. Bosman of Rondebosch. At the age of eleven months he was given to Mr. Benjamin Chaney of the United Service Institute at Simonstown, but who resided at Mowbray. At the tip of Nuisance's tail was a wound which did not readily heal and as he was a friendly dog and frequently wagged his tail, it can be imagined what a trial he was in a house with blood marks on the walls, beds, etc. It can also be understood how appropriate was the "surname".

Mr. Chaney kept Nuisance at Simonstown and the happy young dog soon made friends with the ratings, and accompanied them on their walks. As would be expected "the habit grew and his master took second place in his affection. The sailor's uniform impressed itself so indelibly on his mind that everyone wearing it immediately became a friend" (p. 12). The walks about Simonstown developed into train journeys to Cape Town with ratings on leave. Nuisance, of course, travelled illegally and on account of his large size it was not easy to conceal him. As a consequence the dog was often put off the train by railway officials. So fond, however, was he of his sailor friends that Nuisance persisted with his train journeys. Ultimately came the warning that if found on railway property he would be destroyed.

Mr. Chaney then considered selling the dog and giving the proceeds to the Speed the Planes Fund; but just at that stage (December 1940) "it was decided that (he) would become a full time member of the Navy" (p. 14).

Early in 1941 forms were completed for Able Seaman Just Nuisance, R.N., and he was quartered at Froggy Pond, near Simonstown, his O.C. being Commander C. B. O. Shakespear, who wrote a preface for Mr. Steyn's booklet on the dog.

A special bunk was provided for Just Nuisance, but with the urge to accompany his friends to Cape Town, it was not long before similar facilities were provided at the Union Jack Club in Cape Town.

Later, the dog enjoyed "the privilege of occupying an entire seat when in the train and in the last bus from Simonstown to Froggy Pond. He was loved by all and became an institution" in the Cape Peninsula. When travelling by rail or by bus in the winter he never lacked the extra warmth of a sailor's coat.

In the course of time, as with all well known characters, many stories were told of the faithfulness of the dog to his naval comrades. It was said that when not quite sober, Just Nuisance

would take a firm grip of (the) sleeve and lead the wearer along gently! An occasion is described when a certain bluejacket had imbibed too freely and was incapable, that the faithful dog stood on guard and would not allow anyone, military or police, to approach the helpless man. Only when a naval patrol arrived would he yield. Of daily occurrence was the awakening of seamen by Just Nuisance on the arrival of the train at Simonstown!

Thanks to Commander V. W. Pearce, R.N. (Retd.) of Glencairn, the writer has obtained a copy of Just Nuisance's career along with an addendum. Commander Pearce mentions that at the close of 1943 it became evident that the dog was ill "brought on mainly through overwork". He was given a full-length cot at the Royal Naval Hospital and after rest and treatment improved and was discharged "fit for duty".

A month or so later there was a relapse and it was clear the dog was seriously ill. A veterinary surgeon attended to him for three months, but there was no lasting improvement and at length it was decided by the veterinarian and a medical officer that Just Nuisance "would never be fit for duty again". He was therefore quietly put to sleep by a medical officer of the Royal Naval Hospital. And so the faithful animal breathed his last on 1-4-44, the anniversary of his birthday.

He was taken to Klaver Camp where a grave had been prepared, wrapped in the White Ensign and buried with naval honours. "All available officers and men attended the funeral, a firing party from the Royal Marines fired the last volleys and a trumpeter played the last post, as our old shipmate was lowered into his grave".

A gravestone was later erected with the following inscription:-

"GREAT DANE JUST NUISANCE

A.B. R.N.

H.M.S. 'Afrikander'

1940 - 44.

Died April 1st, 1944,

Aged 7 years."

"There he lies overlooking Simonstown and the bay, loved and remembered by all naval people who had the privilege of his friendship". — Commander V. W. Pearce, R.N. (Retd.).

Appreciation is also expressed to the naval authorities, H.M.S. "Afrikander" for placing the writer in touch with Commander Pearce. It is interesting to know that the noble animal's collar and papers are still with the Naval Secretary at Simonstown.

Conclusion

The collecting of these notes had been made possible by the co-operation of several friends and thanks are due to all for their help. Capt. H. du Toit, Staff Officer, Military Archives, kindly arranged certain facilities, e.g. photography, for which I am much indebted.

It is clear that, of pets, dogs come first in the estimation of servicemen, for reasons already given. A striking fact in South Africa with its colour consciousness is that dogs frequently acquire the same complex, "Bull" of the Y.T.B., probably being in his youth such an example.

References

Buchanan, J. (1920) *The South African Forces in France.* T. Nelson & Sons, London.

Edwards, T. J. (1950) *Military Customs.* Gale and Polden, London.

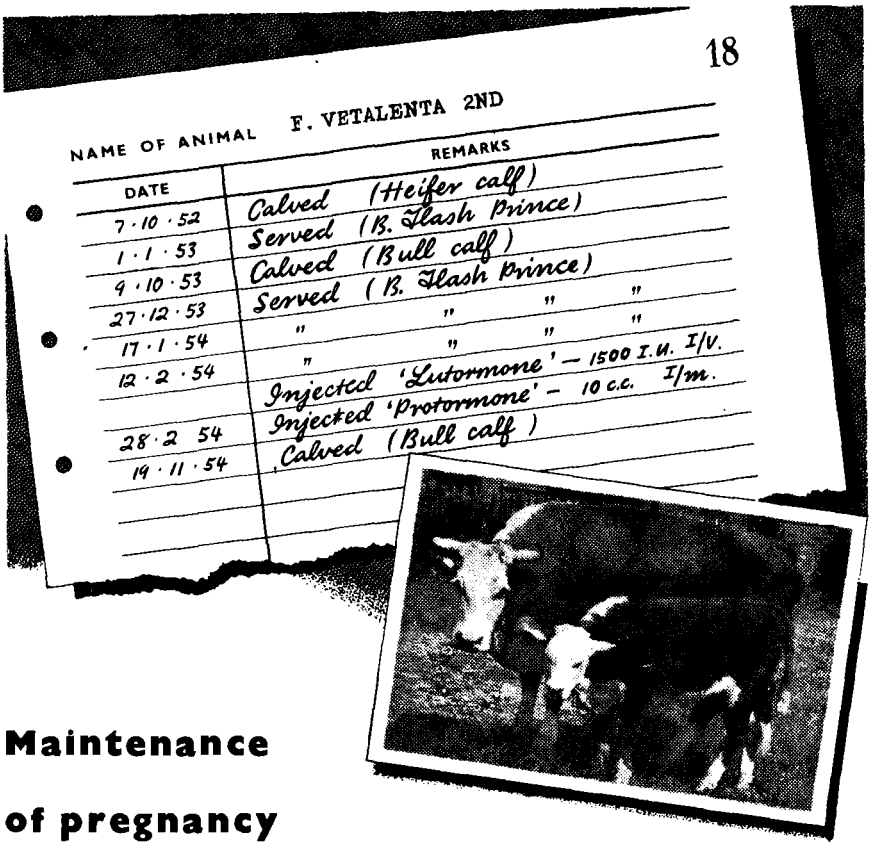
Holt, H. P. (1913) *The Mounted Police of Natal.* John Murray, Natal.

Juta, H. C. (1933) *The History of the Transvaal Scottish.* Hortors Ltd., Johannesurg.

Preller, Bob. (1945) *My Hond, die Oorlog en Ek.* Nasionale Pers, Cape Town.

Steyn, L. M. (194) *Just Nuisance.* Stewart Printing Company, Cape Town.

Wilson, H. W. (1900) *With the Flag to Pretoria.* Volume I.



Maintenance of pregnancy

Mild luteal deficiency in the cow results in abortion or resorption of the fœtus. Until recently the common method of correcting this condition was to inject 'Lutormone' brand Luteinising Hormone at the time of service and then to give further doses until the cow was at least 12 weeks in calf.

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CONJUNCTIVITIS IN A PIGEON DUE TO PSITTACOSIS CASE REPORT

J. D. W. A. COLES

Onderstepoort

On two previous occasions I drew attention to psittacosis (or ornithosis) causing conjunctivitis in pigeons. A third report may serve to emphasize how necessary it is to consider the possibility of psittacosis when confronted with uni- or bilateral conjunctivitis in any bird.

On 9 January 1956 we received one live, ten weeks old representative of a fancy variety of domestic pigeons from Coalbrook in the Orange Free State. The owner allowed his birds to fly around and complained vaguely of trouble only with this one variety.

Apart from being very slightly listless, the bird suffered to a considerable extent from conjunctivitis of the right eye, but the lids were not stuck together. A little conjunctival epithelium was scraped off with a small bone curette and spread over a glass slide. The smear was dried, fixed with 90% alcohol and finally stained for one hour with an aqueous solution of Giemsa.

Typical colonies of L.C.L. granules, both initial and elementary bodies, were seen in some of the white cells and particularly the foam cells. They did not occur in the conjunctival epithelial cells.

At autopsy, the larger air-sacs were found to be moderately inflamed and clusters of L.C.L. bodies were present in the yellowish exudate.

Ten white mice were injected intracerebrally with a saline suspension of conjunctival material. On the third day one was dead and three were seriously ill and were killed. A meningoencephalitis had developed in all and characteristic colonies of L.C.L. bodies were found with ease.

The remaining mice were destroyed.

Conclusion. A case of unilateral psittacotic conjunctivitis in a domestic pigeon has been described. The possibility of this disease should not be over-looked when the cause of conjunctivitis in any bird is being investigated.

COLES, J. D. W. A. (1943) A review of Psittacosis in Domestic Birds with a Note on a Case of Conjunctivitis in a Pigeon probably due to Psittacosis. Jnl. South African Vet. Med. Assoc. 14(2) : 47-58.

COLES, J. D. W. A. (1951). Acute Psittacotic Conjunctivitis in the Domestic Pigeon. Jnl. South African Vet. Med. Assoc. 22(4) : 189.

THE OPERATION FOR RETROVERSION OF THE PENIS IN THE STALLION

C. W. A. BELONJE

Middelburg, Cape

INDICATION

According to Jockey Club rules, notification of all services of registered thoroughbred mares is compulsory. Even if services are infertile and another stallion has been substituted within a short period during the same breeding season the resultant foal is registered as the progeny of both sires. The above operation is for the purpose of preparing a stallion in such a way that he can run with non-pregnant thoroughbred mares and act as a teaser without fear of coitus.

TECHNIQUE

A three-year-old Basuto-type stallion was kept from food and water for 24 hours. On 27-5-53 the following freshly made solution was administered intravenously at the rate of 1 m.l. per 2.5 pounds body-weight as a general anaesthetic.

Chloral hydrate	60 grams
Magnesium sulphate	60 grams
Nembutal solution	30 m.l.
Distilled water	500 m.l.

The animal was placed in the dorsal position and the operation field shaved, cleaned and disinfected. The penis was extended full length and the external preputial ring was incised along its circumference, and loosened from its adnexure.

About six inches above the scrotum a triangular piece of skin was removed having a base of three inches wide and the apex pointing to the perineum. With blunt dissection the penis was loosened through this opening and the organ withdrawn backwards. The external preputial ring of the penis was sutured to the edge of the skin of the triangular opening by means of interrupted catgut sutures and silk tension ligatures.

Bleeding during the operation was negligible and, except for some swelling, healing was uninterrupted. The swelling involved

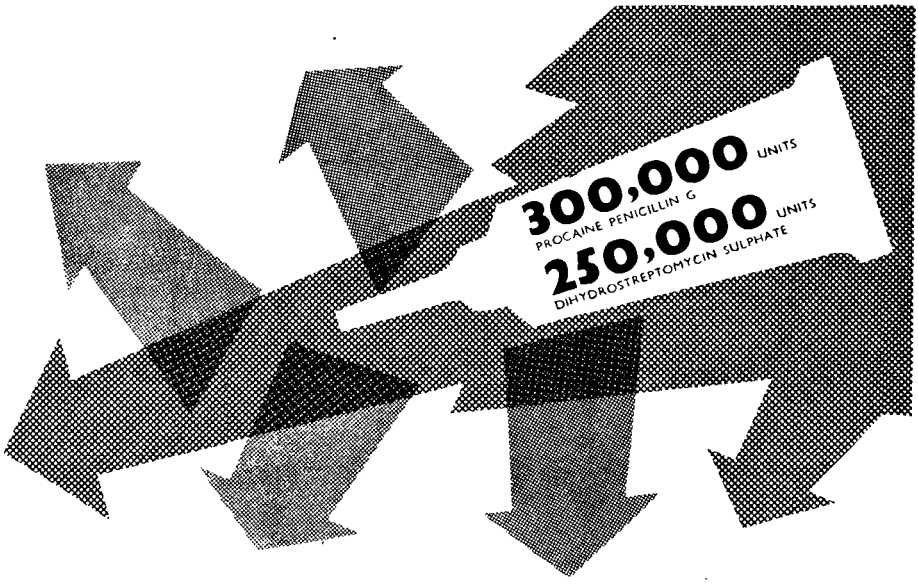
the external sheath and extended slightly forwards under the abdomen. The internal preputial ring now formed the external opening of the new sheath (see fig. 1). During erection the penis was directed ventro-posteriorly. (See fig. 2.)

Summary

The operation of retroversion of the penis in the stallion is described. The psychological and physiological influence of running such a stallion with non-pregnant thoroughbred mares will be discussed in another article.

Photo I.
Operation performed 27.5.53. Photo taken 3.7.53.

Photo II.
Photo taken 2.9.53, i.e. 3 months after the operation.



CONCENTRATED ATTACK

In most cases of bovine mastitis it is impossible to diagnose the type of infection from the clinical examination of the udder and it is therefore of great importance that the treatment used should be effective against as many organisms as possible. 'Wellcome' brand Penicillin and Dihydrostreptomycin Intramammary Injection, a suspension containing 300,000 units Procaine Penicillin G and 250,000 units Dihydrostreptomycin Sulphate in a bland base, provides the veterinary surgeon with a powerful weapon against such cases. At this concentration a high level of the antibiotics is maintained in the udder for a sufficient time to eradicate not only the common types of bacteria met in bovine mastitis but also organisms sensitive only to large concentrations of the antibiotic.

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THE INFLUENCE OF RUNNING A STALLION WITH NON-PREGNANT THOROUGHBRED MARES

C. W. A. BELONJE

Middelburg, Cape

INTRODUCTION

The effect of the presence of the ram on the ovarian activity of ewes has been studied by Schinckel (1954) and others; they are of the opinion that the presence of the male, acting as an exterio-ceptive stimulus, promotes ovarian activity in such ewes.

The low fertility percentage in equines is a well known fact and has been commented on by many research workers the world over, 50% being the general figure. (4 . 6 . 9.)

For Great Britain, Day (1939) gives the following fertility rates in different horses: heavy horses, 59 per cent; light horses, 52 per cent; thoroughbreds at study, 68 per cent, and ponies running wild, 95 per cent. The high fertility rate recorded for ponies in Britain is not regarded by him as due to any inherent characteristic of the breed as such, but, rather to the more favourable environmental conditions, such as climatic and nutritional factors, under which they reproduce.

Van Rensburg and Van Heerden (1953) observed at Onderstepoort that 24 mares left to run with the stallion settled very readily even when kept under less optimum climatic and nutritional conditions than before, and give an 87.5 per cent conception rate. They ascribe this high fertility rate to psychological factors, in particular the courtship and love play between the two sexes when left to breed in the natural state.

The General Stud Book of South Africa lays down that . . . . . the ageing of thoroughbreds south of the equator is taken from the first day of August. With the demand for well-grown yearlings by buyers it follows that the breeder is most anxious to breed an early foal so that the breeding season normally extends from about the 8th of September to about the middle of December.

Quinlan and others (1951) found that ordinary mares stabled at night at Onderstepoort commenced breeding in August but that the best results were obtained in November when 55.6 per cent became pregnant.

Küpfer (1928) working on mares kept under ordinary veld conditions in South Africa observed that the breeding season

extends from the end of October to the end of March, but qualifies this by remarking that the season will vary from year to year in as much as both the beginning and the end of the active season are subjected to influences determining the condition of the animal.

Discussion

In thoroughbred breeding it is impossible, impracticable or too dangerous to allow the sire to run with the mares. Oestrum is normally detected by bringing mares to the teaser stallion behind a barrier, a process which is not very satisfactory. To reproduce the natural psychological contact for breeding it was decided to run a stallion with retroverted penis with the non-pregnant mares. Intromission and accidental impregnation became impossible as erection was directed ventrally and posteriorly.

It was decided to run this stallion with the mares two months before the start of the mating season, commencing early in July, i.e. midwinter. Conditions prevailing in the Karroo Midlands at this time of the year are against successful breeding. The decision to run the stallion two months before the actual mating season was based on the observation that mares normally require several oestral periods before conception can take place.

Caslick (1937) also noted that in Kentucky, U.S.A., the thoroughbred mare required 2 or 3 oestral periods before conceiving. The explanation for this experience may be that in the majority of studs, mares are subjected to teasing, i.e. the extroceptive influence of the stallion at or just before the commencement of the breeding season and that two or more oestrums are required to obtain synchronisation between psychological sex development and physiological maturity of the sex genitalia. These two phenomena are frequently dissociated in equines as heat may be unaccompanied by ovulation, or ovulation may take place in the absence of heat.

Results

The operated stallion was run with the mares two months before commencement of the breeding season. The psychological effect was most remarkable as most mares evinced symptoms of heat within a fortnight after his introduction, although rectal examination revealed the ovaries to be non-functional in several. Many of the mares had two or three heat periods prior to the 8th of September, and were in this manner conditioned for successful breeding.

1. During 1953 fourteen mares were run with the operated stallion and bred during the heats following 7th September until 28-10-53. Six mares settled during September and eight in October.

A. MAIDEN MARES:

1. One mare: 2 heat periods: duration 16 and 22 days: 5 services
2. One mare: 1 heat period: duration 11 days: 2 services
3. One mare: 1 heat period: duration 5 days: 1 service
4. One mare: 1 heat period: duration 6 days: 3 services

B. NON-PREGNANT MARES:

5. One mare: 1 heat period: duration 15 days: 1 service
6. One mare: 1 heat period: duration 11 days: 1 service
7. One mare: 1 heat period: duration 8 days: 1 service
8. One mare: 1 heat period: duration 9 days: 1 service
9. One mare: 2 heat periods: duration 7 and 5 days: 2 services
10. One mare: 1 heat period: duration 21 days: 2 services
11. One mare: 1 heat period: duration 18 days: 5 services
12. One mare: 3 heat periods: duration 12, 6 and 5 days: 4 services
13. One mare: 1 heat period: duration 12 days: 3 services
14. One mare: 1 heat period: duration 9 days: 2 services

All fourteen conceived and carried to full-term.

2. During 1954, nine mares were run with the operated stallion and bred during the heats following the 7th September with the following results:

A. MAIDEN MARES:

1. One mare: 2 heat periods: duration 8 and 8 days: 4 services
2. One mare: sent out to another stud: in foal
3. One mare: 2 heat periods: duration 7 and 4 days: 2 services

B. NON-PREGNANT MARES:

4. One mare: 1 heat period: duration 7 days: 2 services
5. One mare: 1 heat period: duration 2 days: 1 service
6. One mare: 1 heat period: duration 11 days: 2 services
7. One mare: 1 heat period: duration 20 days: 2 services
8. One mare: sent out to another stud: in foal
9. One mare: sent out to another stud: in foal

Mare number 3 was a maiden mare rising three-year-old and failure to conceive is ascribed to sexual immaturity.

CONCLUSION

The exterio-ceptive influence exerted by the presence of the stallion upon the psychology and reproductive physiology was studied for two seasons on a limited number of non-pregnant thoroughbred mares. It is concluded that the presence of the male had a decided influence in provoking early oestrum and in this manner conditioning the mares to earlier breeding than is normally possible during that time of the year.

References

1. Caslick, E. A. (1937) Cornell. Vet. 27 : 2, 187.
2. Day, F. T. (1939) Vet. Rec. 1 : 581-587.
3. De Croutte (1937) Rev. Zootech. 8 : 99-109.
4. Küpfer, M. (1928) 13th and 14th Rep. Vet. Res. S. Afr. 2 : 1211-1270.
5. Marshall, F. H. A., and Hammond, J. (1949) Bull. 39. H.M. Stationery Office, London.
6. Quinlan, J., van Rensburg, S. W. J., Steyn, H. P. (1951) Onderstepoort Jl. 25 : 105-119.
7. Schinckel, P. G. (1954) Aust. J. Agric. Res. 5, 465-469.
8. Theunissen, G. H. B. (1945) Tydschr. v. Diergeneesk. 70 : 42-64.
9. Van Rensburg, S. W. J., and Van Heerden, J. S. (1953) Onderstepoort Jl. 26, 2 : 285-303.

CASE REPORT

FACIAL PARALYSIS IN BOVINES

J. J. JACKSON

Liebig's Ranch, Southern Rhodesia

During the past 12 months 17 cases of unilateral deep facial paralysis were seen in bovines. Seven of these cases are known to have ended fatally, either by destruction of the affected animal in extremis or by eventual starvation. Due to the size of the ranch on which these cases occurred and the large number of cattle (32,000) it is obvious that only a small portion of the sick animals are seen, so that these above-mentioned 17 cases are probably only a portion of the total number of cases of facial paralysis there may have been.

All cases have been sporadic — in cows and steers. The paralysis was not confined to one side of the head. The course of the condition varied in different cases.

CASE 1. *Afrikander Cow.* The first day it was noticed there was a unilateral, deep facial paralysis with the muscles of the ear, the eyebrow and cheek on one side paralysed. This gave the eye a swollen appearance. The mouth on the affected side was dirty due to the lack of control of food in the mouth by that cheek and the ear hung limp. This cow's condition rapidly deteriorated. As the condition progressed the cow started to hold her head to one side and was inclined to circle. Within a week she was so bad that she kept on falling. She had partially lost her balance and was always inclined to fall over to one side. Within two weeks the cow was so bad that she lay prostrate and could not even get on to her sternum.

She was then destroyed and the cranium opened. A small abscess the size of a pea was found in the facial nerve just after its origin from the brain. No other lesions were seen. The vestibular organ was not examined.

CASE 2. A three-year-old steer was seen with typical deep unilateral facial paralysis and in poor condition. It was destroyed and the cranium opened. There was an abscess about $1\frac{1}{2}$ c.m. in diameter in the facial nerve just after its origin from the brain. The abscess was thick walled and contained thick creamy pus. The abscess was in the nerve itself and appeared to have originated from the neurilemma. A smear of this pus showed the presence of streptococci.

CASE 3. Cow in very poor condition indeed, with typical signs of unilateral deep facial paralysis. This cow was inclined to circle — held its head skew with the affected side lowest, and often fell. The cow was destroyed and the cranium opened. No abscess was found within the cranial cavity, but on following the course of the facial nerve, on breaking open the petrous temporal bone stinking pus came running out. So this abscess was in the canal in the petrous temporal bone through which the facial nerve runs. A smear of this pus revealed the presence of streptococci.

CASE 4. Pedigree Afrikander cow developed this facial paralysis with the typical symptoms. Within 3 days it started losing its balance. On the third day a course of 5 mill. units penicillin each day for 3 days was started. The cow did not get any worse, but started recovering slowly. Within 2 months the cow was completely normal, without any sign of facial paralysis and its condition was good.

CASE 5. Three-year-old steer, with typical facial paralysis, given 4 million units penicillin a day for 3 days, also recovered completely. This case was not seen personally but was treated by a section manager who knows the condition.

Case Number 1 mentioned above did not respond to penicillin treatment.

CASE 6. One old standing case was seen. It does not improve or get worse. The case is about 3 months old and the cow's condition fair.

In two cases very small maggots were found in the affected ear. At first it just appeared to be a discharge giving the impression that the cow was suffering from an otitis. On closer examination it was seen that this discharge was swarming with very small maggots about 2 m.m. long and very thin. Obviously due to the paralysis the cow could not keep the flies out of its ear.

A suggestion as to the cause of these cases of facial paralysis is as follows:-

The animals on the ranch are often handled in a crush pen. One often gets animals running in the crush pen, they get caught around the neck by the baler and then jerk their heads back with a terrific force thus getting a hard bang on the base of the ears. This concussion on the hard petrous temporal bone which is at the base of the ear must cause some damage to the softer tissues attached to it and especially to the facial nerve running through it, thus forming a focus predisposed to infection via the blood stream. It must be said however that the above cases were not noticed to have occurred just after the animals were handled in a crush pen. We hope that by cutting the arms of the balers to the shape of the neck and by padding with rubber we may cause a decrease in the incidence of these cases.

MEMORANDUM

INFECTIOUS ATROPHIC RHINITIS IN RELATION TO THE IMPORTATION OF PIGS FROM EUROPE INCLUDING THE UNITED KINGDOM AND FROM THE U.S.A. AND CANADA

Prepared by

A. M. DIESEL

December 12th, 1955

1. The History and Incidence of the Disease in Europe and North America

According to a very comprehensive article by William P. Switzer, D.V.M., Ph.D., Ames, Iowa, appearing in the October, 1955, issue of the Journal of the American Veterinary Medical Association —

> "Infectious Atrophic Rhinitis has been recognised in Germany for a century and a quarter. Franque (1830) published the first report of this disease, referring to it as *Schnüffelkrankheit* (Sniffling disease).
>
> "He recorded the observations of two Veterinarians in the mountainous region of Nassau who noticed that affected swine did not fatten, developed an atrophy of the nasal and ethmoid turbinates, a malformation of the nose and in severe cases, nasal haemorrhage. It was speculated that short-nosed pigs were more susceptible and that rachitic pigs rooting in stony ground might develop this condition. Franque thought it more likely that the condition was hereditary although it spread gradually through the entire herd.
>
> "Several articles on this disease were published during the next 75 years, most of them presenting ideas similar to those of Franque, with emphasis on heredity, nutrition or infection as the cause."

The disease was probably described in Sweden as long ago as 1842. It was certainly known in Sweden later in the 19th Century. It has been recognised in Denmark for many years. It appears to have been observed in Germany and some Central European countries long before, and since, the Second World War.

In recent years cases have occurred in Sweden and Denmark and probably in Norway, Germany and France.

The disease is not notifiable in Sweden and in most European countries and any reference to current incidence cannot be recognised as official.

In communications dated 17-8-54 and 29-8-55, the Director of Veterinary Services of the Netherlands, states that the disease is *not present* in Holland and that importations of live pigs from countries where the disease exists (e.g. Sweden and England) are entirely prohibited into the Netherlands.

In a communication dated 14-9-54 the Director of Veterinary Services, Copenhagen, states that the disease has been known in Denmark for years but that Denmark *prohibits the exportation of pigs and live boar sperm.*

In a communication dated 31-8-54 from the Director of Veterinary Services, Bonn, it is stated that the disease is not known in the German Federal Republic and that there need be no concern that the disease will be imported into the Union via pigs from the Federal Republic.

In a communication dated October 15th, 1954, the Chief Veterinary Officer, Canada, states that while the disease is present in 8 of the 10 provinces, the importance of the disease seems to have been greatly overrated, and that like so many conditions when they are first uncovered, it became all the rage in spite of the fact that it was difficult to obtain infected herds when these were required for investigational work. The report further indicates that there has been confusion with a congenital malformation of the face resulting in prognathic jaw which was wrongly attributed to rhinitis. The condition (rhinitis) has admittedly been severe in some herds due probably to secondary infections or predisposing factors, but these seem to have been the exception according to the report. From another source I gather that some Canadian Veterinarians believe that Atrophic Rhinitis was introduced into Canada through the importation of Danish Landrace breeding stock.

In a communication dated 18-10-54 from the Chief of the Bureau of the United States Department of Agriculture, it is stated that there are no figures which are all accurate on the incidence of Atrophic Rhinitis in the U.S.A. — it is presumably extensive.

According to a communication from Britain dated 24-5-54, the disease was recorded for the first time on or about 20th May, 1954, and that there is little doubt that the infection was introduced by an apparently healthy Landrace pig imported into England from Sweden during September-October 1953. According to the returns submitted by the Animal Health Division of the British Ministry of Agriculture and Fisheries the following outbreaks have occurred in Britain:-

For	the	fortnight	16	—	31-5-55	.....	.....	.....	3 outbreaks
,,	,,	,,	1	—	15-9-54	.....	.....	.....	1 ,,
,,	,,	,,	16	—	31-5-55	.....	.....	.....	1 ,,
,,	,,	,,	16	—	30-6-55	.....	.....	.....	1 ,,
,,	,,	,,	1	—	15-8-55	.....	.....	.....	2 ,,
,,	,,	,,	1	—	15-9-55	.....	.....	.....	1 ,,
,,	,,	,,	16	—	30-9-55	.....	.....	.....	1 ,,

Up to the 10th September, 1954, there had been four outbreaks of Atrophic Rhinitis in Britain (the first in May, 1954). The animals found infected were all involved in the progeny of imported pigs from Sweden.

In a communication dated 25-7-55 it was intimated that a further case of the disease had occurred in Britain as the result of pigs imported from the Isle of Man. (Normally the importation of animals from any country except Ireland, the Channel Islands, the Isle of Man and Canada, into the United Kingdom is prohibited and must be arranged by Special Order.)

2. The Nature of the Disease

Atrophic Rhinitis is an apparently infectious disease of pigs, the full nature of which is not clearly understood in spite of the very extensive research work which has been and is still being undertaken in many parts of the world. Although transmissible by contact or installation of intra-nasal washings from clinical cases, the nature of the pathogen is still obscure. Trichomonads, Pasteurella (particularly P. Multocida), Pleuropneumonia-like organisms (P.P.L.O.), Actinomyces Necrophorus, Spherophorus Necrophorus, Corynebacterium Pyogenes, and other organisms have been incriminated by workers on the disease but seemingly none of these organisms in pure culture has consistently reproduced the disease experimentally.

One worker (1953) considers the disease to be due to a nutritional deficiency and that secondary bacterial invaders produce the turbinate atrophy.

Commonly the disease passes from an infected dam, which may not show clinical symptoms, to her piglets. There seems to be no indication that the piglets are born infected. Any method of sterile delivery of piglets which arranges their reception into sterile containers (described later) and their immediate removal from the mother, seems likely to prevent the piglets from contracting the disease. According to a Canadian worker, pigs do not develop lesions, even when infected via the nasal route, unless they are young. When older pigs are exposed to infection few or no clinical symptoms may be seen, but such pigs may be capable of transmitting the disease to susceptible contacts.

The disease may be difficult to detect in adult pigs but is fairly readily recognisable in young pigs. In an infected litter all

piglets may not show symptoms but all may be found to be infective as adults. When affected at an early age the most constant symptoms observed are sneezing and snuffling — quite commonly bleeding from the nostrils — and a general unthriftiness. One of the first changes to be noticed is the formation of crusts inside one or both nostrils, which plug the air passages. As the condition develops, there is a progressive deformity and atrophy of the turbinates and septum nasi. In some cases there is a twisting of the snout and distortion of the facial bones. This deformity is obvious in some pigs; in others very careful observation is necessary. Some piglets can be found dead and not seem noticeably sick. It is in the more chronic cases that facial distortion and undershot lower jaw are noticed. The most susceptible age is one to four weeks. Spread of the disease in herds is slow and it does not assume spectacular proportions until the F2 generation is approaching weaning age.

Clinically normal gilts from affected litters must therefore be presumed carriers until they have reared a normal litter.

If the infection is widespread in a herd the animals will usually show unthriftiness and a slow rate of growth even in spite of antibiotic feeding.

Some pigs will walk around with their heads held high in an attempt to obtain air — others will hold their heads to one side, suggesting an ear disturbance.

Rubbing the nose against an object in an attempt to remove the nasal crusts or scratching the snout with the feet are also common. If Atrophic Rhinitis has existed in a herd for 2 or 3 years there is usually poor fertility in both boars and gilts, particularly if the infection is severe.

One of the most difficult problems seems to be to differentiate between normal and abnormal turbinate structure, and atrophy due to Atrophic Rhinitis on the one hand, and on the other to causes such as heredity, unbalanced feeding, etc. In the case of Atrophic Rhinitis, the post mortem findings vary from shrinkage to complete decalcification of the dorsal and ventral turbinate bones, seen on longitudinal and transverse section of the head. The nasal septum may be curved, misshapen or thinned. The lungs may be extensively damaged with haemorrhage, pneumonia and foci of necrosis due to the inhalation of fragments of material from the upper respiratory tract. If the secondary infections are swallowed, and they usually are, there may be extensive enteritis. There is no method of protective inoculation and seemingly no treatment although aureomycin and streptomycin are stated to be useful.

3. Susceptibility of the Different Breeds

There is considerable diversity of opinion regarding the susceptibility of the different breeds of pigs to Atrophic Rhinitis. Some

workers claim that the disease is more severe in short nosed pigs than in long nosed, and vice versa. It is considered that ordinary born piglets 1-4 weeks of age would be susceptible. In the United Kingdom the cases confirmed have been Landrace with the exception of one or two pigs which were crossbred Landrace, or contacts. A worker in the U.S.A. refers to the appearance of the disease in purebred Berkshires. This breed is noted for its normally dished snout.

4. THE SWEDISH ATTITUDE

1. The authorities do not accept that Swedish Landrace pigs introduced Atrophic Rhinitis into England.
2. They consider it possible that the disease existed in England before and since the introduction of the Swedish Landrace pigs into England. (During the last years about 125 sows and boars of Swedish Landrace were imported from Sweden. The last importation of 104 animals was made in August, 1953, to England.)

   They point to transmission experiments with material from English pigs, undertaken by Mr. J. T. Done of Weybridge, during December, 1954, and to a report by Dr. O. Swahn, State Veterinarian of the State Veterinary Medical Institute, Sweden, who visited England, together with Mr. Lars Larsson (Sveriges Lantbruksförbund) during May-June, 1954, as evidence of this.
3. The Swedish Authorities consider that it is safe to import Swedish Landrace pigs into the Union from certified breeding centres in Sweden for the following reasons:-

   (i) Only the Breeding Centres (of which there are approximately 200 and of which more than 70% consist of Swedish Landrace — the others being Swedish Large White, the only other breed of pig in Sweden) are permitted to breed and sell boars and registered females within the country and for export.

   (ii) In 1942 (amplified in 1944 to comprise piglet-production centres) a special health control activity was started at the Breeding Centres, led by the Royal Institute of Veterinary Medicine in collaboration with the veterinary sections of the Agricultural Societies and the Pig Breeding Association. The object of this health control was to raise the quality of the animals sold from these herds and to prevent the spread of disease within the herds and within the country.

   From 1st January, 1955, only Breeding Centres which possess a health certificate are permitted to test their animals at the pig progeny testing stations. Since it is only permitted to sell the progeny of tested pigs, only

Breeding Centres which possess a health certificate can breed and sell them for breeding purposes. The health certificate is not given unless the veterinary authorities, as far as it is possible at the present scientific level, are satisfied that the herd in question is free from Virus Pneumonia, Atrophic Rhinitis and other pig diseases such as Mange, etc. The Breeding Centres are visited regularly (about once a month) by a veterinarian from the Institute of Veterinary Medicine or from the Veterinary Section of the Agricultural Society in question who make a close examination of all pigs and advise on the best methods of disease control, etc. In addition a continuous pathological, and if necessary, microscopic examination is made of all lungs and nose muzzles of all pigs delivered from the breeding centres for slaughter. The Veterinary Authority can also order the Breeding Centre to slaughter any suspected pig for pathological examination of lungs and nose muzzles. If any suspicion or fact exists of the presence of Virus Pneumonia or Atrophic Rhinitis the herd in question is cut off from all further sales until it has been definitely established that the disease does not exist in the herds.

(iii) A 14 days (or longer if necessary) quarantine can be arranged at the Port of Malmö.

(iv) It can be stipulated that the animals chosen for export, in addition to having complied with the foregoing requirements, must originate from such pedigree stocks which have had a clean *Bill of Health* for at least a year. This implies that the stock comes under the Swedish official Pig Health Control and that so far as can possibly be ascertained by modern diagnostic methods, is free from Virus Pneumonia and Atrophic Rhinitis and is generally healthy. A special certificate in this regard will be given which will read as follows:-

CERTIFICATE REGARDING PIG BREEDING

The undermentioned Pig Breeding Stocks from which animals have been chosen for export to the Union of South Africa, have for more than a year been in possession of a Clean Bill of Health Certificate issued by a Veterinary Officer of the Official Pig Health Control in Sweden:

Stock I .....

Stock II .....

Stock III .....

.....

Royal Board, Stockholm.

The .....19.....

(v) The Union Veterinary Authorities can, upon arrival of the pigs in the official Government Quarantine Stations in South Africa, extend the quarantine period and apply the following tests, each importation being specially isolated:-

(a) *Gilts in pig* shall farrow in quarantine, with the necessary isolation facilities, hygiene, etc. If the gilt is infected the disease will be seen in the piglets. As a control measure a piglet when about 3 weeks old could be slaughtered for post mortem and pathological examination of the turbinates and sinus nasalis. The lungs, too, could be examined for Virus Pneumonia.

(b) *Young Boars and Gilts not in pig.*
A litter of newly born piglets, part of a litter from an in-pig sow imported at the time, to have free access to the pen where the young boars and young giets are kept. At the age of approximately 3 weeks one of the piglets could be slaughtered for veterinary examination. If this examination is negative, the young boars and gilts, etc., can be released from quarantine.

The last importation of 104 pigs made into England from Sweden during August, 1953, were from Swedish breeding herds, which had taken part in Swedish pig progeny testing schemes and were thus considered by the Swedish Veterinary Authorities to be free from Virus Pneumonia and Atrophic Rhinitis.

5. The British Attitude

(i) The British Veterinary Authorities consider that pigs could be imported from the United Kingdom under the following conditions:-

(a) A certificate from the Animal Health Division of the British Ministry of Agriculture & Fisheries stating that the pigs to be exported have not been imported from Denmark or Sweden and have not been in contact with any such pigs.

(b) That they have been examined by a Veterinary Officer of the Ministry and found to be healthy.

The British Veterinary Authorities explain that very full enquiries are always made before such a certificate is given.

(ii) They consider that the criterion of freedom from Atrophic Rhinitis of any pigs which originate in a country where Atrophic Rhinitis exists, must be a certificate that the pig in question has produced and raised a healthy litter.

6. The Dutch and German Attitude

These countries maintain that they are free from Atrophic Rhinitis. All pigs are quarantined for 30 days at the Hook of Holland and Hamburg Quarantine Stations respectively. This is a standing requirement to prevent the introduction of Foot and Mouth disease.

7. Quarantine Measures

(i) Should the disease appear in the Union, it would seem that the only effective control measure would be the application of the slaughter policy, as applied in the United Kingdom.

One American worker gives as an alternative method, the isolation of the breeding sows, and the removal of the litters into isolation for 5 months — from the litters which appear normal the breeding stock is selected. He considers that the local and systematic treatment of the sows with streptomycin to be an aid to the elimination of the infection but agrees that this might result in resistant strains.

(ii) The harvesting of piglets directly from farrowing sows is regarded as a possible means of securing piglets free from Atrophic Rhinitis, Virus Pneumonia and other pig diseases which are transferred from the mother to the piglets after they are born. An article by J. T. Done in the Veterinary Record of August 20th, 1955, discusses this subject. This approach is still in the experimental stage in Britain and in the United States of America sows are farrowed in crates and the piglets caught up in sterile containers (e.g. enamel basins — in U.S.A. sterile canvas bags). The newborn piglets are then dried with sterile towels, put into a clean box with a hotwater bottle and the umbilical cord tied. The piglets are then transferred to a suitable place of isolation where they are kept warm with an infra-red bright emitter and fed on homogenised and pasteurised cows milk, their diet supplemented and generally attended to. They can be bottle fed or taught at once to drink from the trough.

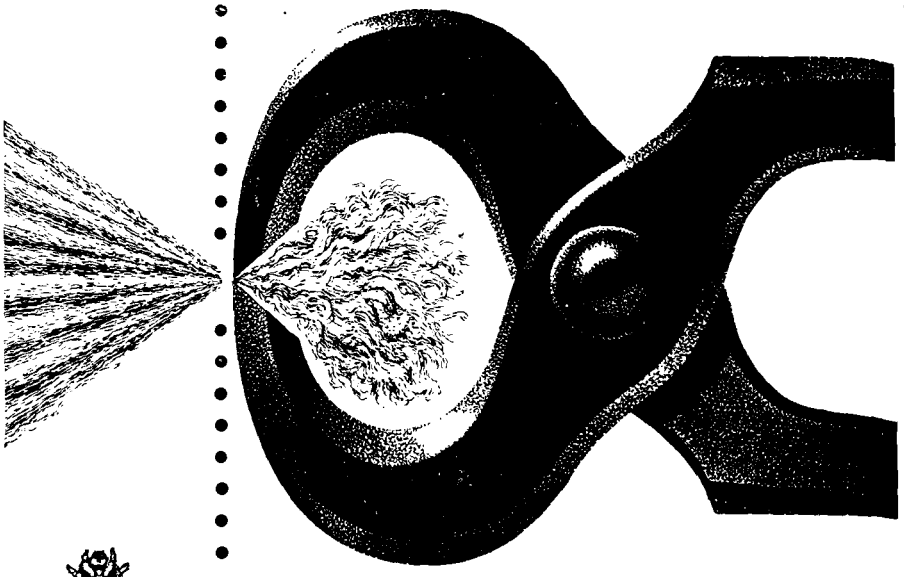
8. Importation of Landrace Pigs into the Union since 1952

Calendar Year	Sweden	U.K.	Holland	Germany	S. Rhodesia
1953	9		17 + 35 piglets		
1954	8 + 51 piglets		6		
1955	—	6	28 + 53 piglets	5	2
	17 + 51 piglets	6	51 + 88 piglets	5	2

No further importations of Swedish Landrace pigs from Sweden allowed after 5th June, 1954.

No importations of pigs from United States of American since 3-3-52.

No permits for pigs from United Kingdom, Holland and Germany given during the last six months, but persons holding such permits at the time when the ban was placed, were permitted to introduce them — all these have now arrived except those for a breeder near Pretoria which are about to arrive.



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LETTERS TO THE EDITOR

The Editor,
Jnl. S.A.V.M.V.,
Onderstepoort.

Sir,

Regarding the article entitled "Amerikaanse Reisindrukke", I have received the following personal letter — prepared for publication by the writer at my request — from Professor Robert E. Habel. In order to correct any erroneous or unbalanced statements, to avoid the possibility of misinterpretations of the text of the original article and to indicate the grounds for different viewpoints, where these can be said to exist, I shall be indebted to you for publishing this letter.

It is gratifying to realize that Afrikaans is understood in the United States thanks to the linguistic ability of men like Professor Habel, and that he has taken the trouble to write to me.

The question implied in the last paragraph of the letter will have to remain unanswered, as conditions are so entirely different in the two countries. Our Surgeon-General's office informs me that any scientist or administrator that may be concerned with such matters, has free access to any medical information our military organisation may possess, upon request to the Surgeon-General. There is unfortunately no official military medical collection.

Yours faithfully,

H. P. A. DE BOOM.

Department of Anatomy,
New York State Veterinary College,
Cornell University, Ithaca, N.Y.
October 10, 1955.

Dr. H. P. A. de Boom,
Faculty of Veterinary Medicine,
Onderstepoort,
Union of South Africa.

Dear Doctor de Boom,

It was too bad that your visit to our department came at the time when I was away and Dr. Miller was ill. I have just read your "Amerikaanse Reisindrukke" and I believe that you were misled on several important points. I have very pleasant recollections of our brief meeting in Utrecht and I share the high regard of the Cornell Veterinary Faculty for the research reports that come from Onderstepoort. Therefore I am deeply concerned over the picture you have presented. At the risk of seeming quarrelsome, I hasten to take issue with you.

Your remark about the reliability of American research papers was too generalized. There is no pressure to publish prematurely in the veterinary college. Most of our researchers are very conservative in publication. The drive to make a name is more prevalent in the non-professional fields, which are badly overcrowded because they have no educational standards.

Veterinary research is constantly making use of the fundamental scientific principles, but I do not think it is our duty to evolve these principles. We, and we alone, have the professional training to apply them to veterinary problems. We have the domestic animals available to work with. Why should we waste our energies on rat and chick research that can be done as well in medical research centres? Furthermore, it is my belief that as many fundamental concepts have been derived from purposeful research as from "pure" research. All we need is enough vision to recognize the great ideas when we stumble over them.

The fact that our new students lack a basic grasp of animal structure, in so far as it really is a fact, is the fault of the zoologists who have tried and failed to teach it to them in the preveterinary course. This is one of the best arguments for *not* hiring zoologists to teach veterinary anatomy. I have observed a tendency among non-professional teachers in the veterinary college to insist that the incoming students are not well grounded on fundamentals. This is nothing but an apology for teaching their courses on an elementary rather than a professional level. Veterinary anatomists should adopt a more comparative approach than they have had in the past, but within reason. The adoption of the comparative nomenclature for the vertebral processes, for instance, would be absurd.

As for the position of histology in American veterinary colleges, there are 18 English speaking veterinary schools in North America. Histology is taught in the veterinary anatomy department in 13 of these; it is taught in other departments of the college in three; and outside the college in two. You have pointed out the disadvantage to veterinary research resulting from the failure to teach histology. As you can see, this is a minor loss involving only two schools, one of which is Cornell. The greatest loss is to the students who have to study veterinary histology in a zoology department under men who know nothing of veterinary gross anatomy, physiology, or pathology, and refuse to recognize the importance of species differences in veterinary histology. Another serious deficiency is that American zoologists have no interest in the vast European literature of veterinary histology.

Embryology and histology are taught as a combined course in ten veterinary schools in America, and as separate courses in eight schools.

The American College of Veterinary Pathologists does not provide special training. Its only function is to examine candidates and to certify that their training has met the requirements of the society.

With regard to our security regulations, I am curious to know whether unauthorized aliens, or even South African laymen, are permitted to study military collections in South Africa.

Yours sincerely,

ROBERT E. HABEL, D.V.M., M.Sc.
Associate Professor,
Department of Anatomy,
New York State Veterinary College.

PERMANENT COMMITTEE FOR THE INTERNATIONAL VETERINARY CONGRESSES

Utrecht,
Biltstraat 168,
November 11th, 1955.

Nr. 3554 JJ/CS

To the Members of the Permanent Committee for the International Veterinary Congresses.

Dear Colleague,

I beg to inform you that the American College of Veterinary Pathologists and the "Arbeitsgemeinschaft für Veterinärpathologen" have decided to establish an International Association of Veterinary Pathologists in the frame of the Permanent Committee for the International Veterinary Congresses.

Prof. Dr. A. Hjärre, Stockholm, was elected interim President of the International Association of Veterinary Pathologists until the next International Veterinary Congress. He will represent the Association on the Permanent Committee.

The statutes of the International Association of Veterinary Pathologists are in course of preparation.

Please inform your National Committee of the above.

With kind regards, yours sincerely,

JANSEN.

VETERINARY REVIEWS AND ANNOTATIONS

Prepared by the Commonwealth Bureau of Animal Health

and

Published half-year by the Commonwealth Agricultural Bureau,

Farnham, Royal, England. Price ....

In the field of Animal Health the Commonwealth Agricultural Bureaux have provided the Veterinarian with two publications viz. the Veterinary Bulletin and the Index Veterinarius, which have become completely indispensable to any worker who wishes to keep abreast with the progress of Veterinary Science.

But in spite of the very great value of these abstracts in focusing attention to publication on a particular subject, the reader is often handicapped when he is not in a position to consult the original article. Veterinary Reviews and Annotations now provide him with a succinct but comprehensive collation of the information available on different subjects in animal health.

In the first part of volume I the subjects reviewed and the authors have been well-chosen. There are three contributions in Part I:

(1) Intestinal Diseases of young animals with special reference to infection with *Bacterium coli*, by Professor R. Lovell of the Royal Veterinary College, University of London.

(2) Coccidial and other forms of parasitism in their relation to poultry husbandry by Dr. C. Horton-Smith of the Poultry Research Station, Animal Health Trust.

(3) Euthanasia by Dr. Phyllis G. Craft, Group Laboratory, Mill End Hospital, London. The publishers must be congratulated on the excellent standard of the contributions in Part I of Volume I. If the same standard can be maintained the future of this new publication will be assured.

It is hoped that such intestinal diseases of calves as paratyphoid and coccidiosis which play havoc among calves in many countries will in due course form the subject of further reviews.

M. W. HENNING.

REFRESHER COURSES IN PHYSIOLOGY No. 1.

THE MECHANICS OF THE RUMINANT STOMACH

R. CLARK,

Onderstepoort.

The various compartments of the ruminant stomach exhibit several distinct types of co-ordinated contractions, all of which are essential for the function of these organs. These contractions are carried out by plain muscle which is innervated by the vagus nerves. It must be remembered that this plain muscle exhibits no spontaneous activity and therefore all motility of the fore-stomachs, and abomasum, is dependent on an intact nerve supply. The co-ordinated reflex contractions to be described are initiated by a reticulo-ruminal motor centre situated in the brain and identified by Iggo as being caudal to the intercollicular plane. Afferent impulses are received by this centre (or centres) from the digestive tract, mainly via the vagi, as well as from other parts of the central nervous system. The centre is also apparently affected by variations in the composition of the blood flowing through it. The distribution of the branches of the vagi over the stomach is shown in Figure 1.

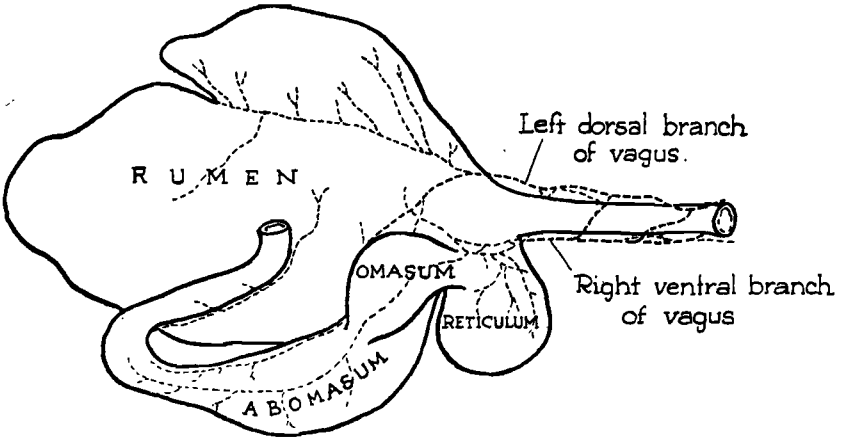


Fig. 1.
THE INNERVATION OF THE FORE-STOMACHS
(Adapted from Mangold and Klein. Bewegungen und Innervation des Wederkäumagens, 1927)

It is intended to follow this article with at least two others, namely, "The Microbiology of the Rumen" and "The Rational Approach to Ruminal Disorders". Should this series prove to be of value to members it might well be extended to other subjects. The opinion of members and suggestions for topics is invited — Ed.

It should be noted that the left branch of the vagus supplies the greater part of the rumen while the right supplies mainly the reticulum, omasum and abomasum. Cross fibres between the vagi are present in the thoracic region.

The Partition of the Ingesta in the Rumino-Reticular Sac.

The ruminal ingesta is normally a semi-fluid mass, containing food particles of varying physical consistency, and tends to separate into layers as follows:—

(i) *Free Gas.* The dorsal part of the rumen almost invariably contains a certain amount of free gas.

(ii) *Suspended Particles.* Freshly ingested plant material tends to float on the surface of the fluid. As the particles become finer and more macerated they sink to the bottom.

(iii) *Heavy Particles.* Heavy particles, such as grain (and also pieces of metal), sink immediately to the lower layers and particularly to the reticulum. From here grain frequently passes directly down the tract thus by-passing the rumen.

The Movements of the Rumen and Reticulum.

(i) *The Mixing Movements.* A wave of contraction passes over the entire sac at regular intervals, churning and mixing the ingesta. This is essential for complete bacterial action throughout the mass and also aids in the mechanical breakdown of the food. It also assists in absorption through the wall by constantly bringing fresh fluid into contact with it.

The mixing movement starts with a double contraction of the reticulum. A wave of contraction then passes in a backward direction over the dorsal wall of the rumen while at the same time the rumino-reticular fold and the anterior pillar contract strongly almost dividing the rumen into two separate compartments. The contents of the reticulum and anterior dorsal sac of the rumen are poured over this ridge into the posterior and ventral parts. As the contraction reaches the posterior dorsal sac the reticulum relaxes and some of the ingesta rushes back into it. At this stage there is frequently a slight pause before the posterior ventral sac contracts, throwing the ingesta upwards and forwards. The rumen then relaxes and is quiescent until the next contraction.

These mixing cycles can easily be felt by pressing the fist into the left upper flank. As the anterior rumen contracts the increased pressure in the posterior dorsal sac causes the flank to bulge outwards. This is followed by a sinking of the flank as the posterior dorsal sac itself contracts. During rest, i.e. in the absence of feeding or rumination, from four to eight contractions over a five minute period can be considered normal. Their frequency is, however, affected by various factors which will be discussed later.

The Passage of Ingesta into the Omasum. Being situated low down, the reticulum only contains finely divided, well macerated

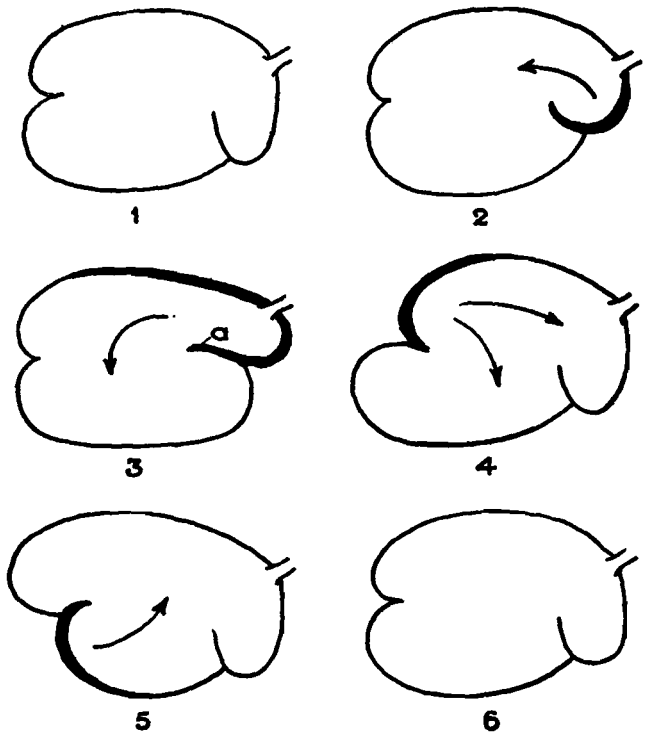


Fig. 2.

THE MIXING CYCLE

1. Quiescence; 2. Contraction of the reticulum. (This is actually a double contraction); 3. Spread of the contraction wave to the anterior dorsal sac and the rumino-reticular fold; 4. Contraction of the posterior dorsal sac; 5. Contraction of the posterior ventral sac; 6. Quiescence. (Adapted from Phillipson. Quart. J. Exp. Phys. 1939)

food particles and heavy grains. The contents are always very fluid, containing large amounts of saliva. During each mixing movement a gush of this material passes into the omasum. This occurs when the reticulum is contracted and its contents raised to the level of the reticulo-omasal orifice. The simultaneous contraction of the rumino-reticular fold prevents the coarser particles in the rumen from passing on. (See phase 3, figure 2). The fact that the passage of ingesta from the rumen is dependent on ruminal motility is extremely important as the cessation of ruminal motility is invariably accompanied by stasis of the ingesta.

The Eructation Reflex. The gas formed in the rumen is removed either by absorption through the wall into the blood and subsequent elimination through the lungs or by eructation or belching. That considerable amounts of carbon dioxide can be absorbed is shown by the accelerated breathing seen soon after the ingestion of large amounts of rapidly fermentable food such as lucerne. Gases such as methane, nitrogen and hydrogen can of course only be carried

in the blood in simple solution and the amounts so removed will be negligable.

Efficient eructation is essential to prevent bloating when gas production is at all rapid. This involves the co-ordinated action of the rumen, reticulum and oesophagus. In the normally filled rumen the cardiac orifice is below the level of the ingesta. Under these conditions eructation cannot take place unless the gas is moved downwards and forwards to the cardia. This is brought about by a special contraction of the ruminal wall which starts in the posterior dorsal sac and travels forwards. At the height of this contraction the level of the fluid over the cardia is suddenly lowered, probably by a rapid relaxation of the reticulum and possibly also of the anterior ventral sac of the rumen. At the same time the cardiac orifice is dilated by contraction of the pillars of the rumino-reticular fold. The gas is normally expelled through the nose with very little sound, an audible grunt indicating inefficient or abortive attempt at eructation.

THE SEQUENCE OF THE ERUCTATION MOVEMENT

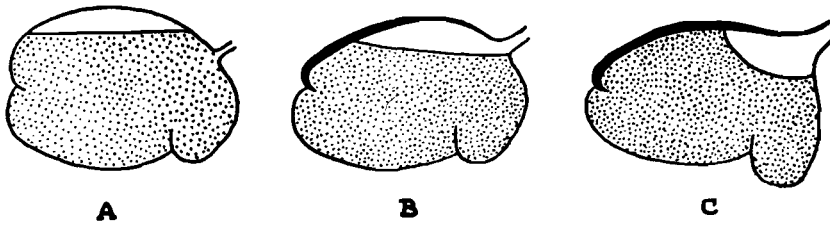


Fig. 3.

THE SEQUENCE OF THE ERUCTATION CONTRACTION
A. The resting rumen. Note that the free gas lies above the cardia.
B. Contraction of the posterior dorsal sac forcing the gas forward.
C. Relaxation of the reticulum and opening of the cardia.

Eructation usually occurs immediately after a mixing movement has subsided. The stimulus for the reflex is pressure in the posterior dorsal sac of the rumen but contractions frequently take place despite a negative pressure in this region. The frequency of eructation depends on the amount of gas present and may vary from once after each mixing movement (1-1 rhythm) to once after each second or third movement (1-2 or 1-3 rhythms). During very rapid gas formation an extra eructation contraction may be interposed between two mixing cycles while in the fasting animal eructation may only occur at long intervals.

The importance of the relaxation of the reticulum in eructation depends on the degree of filling of the rumen at the time. When the rumen is relatively empty the level of the fluid may be below that of the cardia and under such circumstances eructation can take place without active reticular relaxation. In the

normally filled rumen however, reticular activity is essential to bring the gas over the cardia.

The posture of the animal also plays an important role in determining the relative positions of the free gas and the cardia. In the prone position the cardia cannot be cleared and eructation is impossible. Even when the animal is lying normally on the sternum, the level of the ingesta is raised and eructation becomes relatively more difficult. Standing on a slope with the fore-quarters raised brings the fluid level nearer to the cardia and so facilitates eructation while the opposite effect is obtained when the hind-quarters are raised.

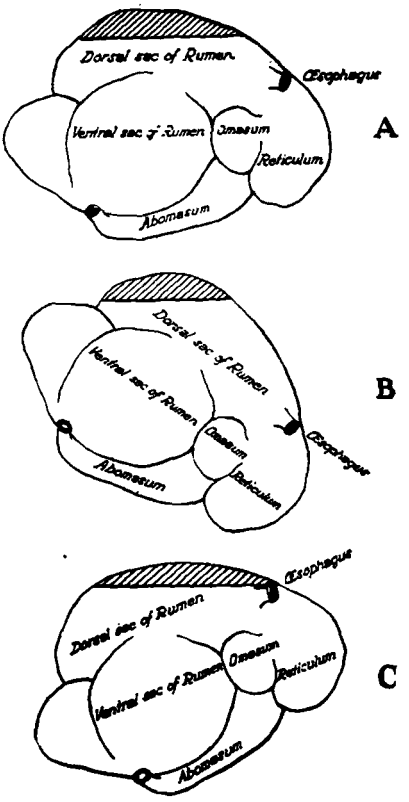


Fig. 4.

THE EFFECT OF POSTURE ON THE RELATIVE POSITIONS OF THE FREE GAS AND THE CARDIA

A. Animal on level ground.
B. Facing downhill.
C. Facing uphill.

(Reproduced by courtesy of the D.V.S. Onderstepoort, from "Physiological Studies of Eructation in Ruminants", by Weiss, K. E. (1953). Ond. J. Vet. Res. Vol. 26, No. 2.)

Rumination. When feeding, cattle chew very imperfectly. Later the food is regurgitated from the rumen and rechewed. This characteristic action is known as rumination.

Regurgitation occurs immediately before the mixing movement which is then preceded by an extra or third ruminal contraction which serves to keep the cardia flooded. At the same time the animal makes a forced inspiratory effort with the glottis closed, causing a marked negative pressure in the thoracic cavity. Some of the semi-fluid ingesta is thus sucked into the oesophagus and is carried to the mouth by retroperistalsis. As already explained, coarse newly ingested fibrous material tends to float near the surface of the ingesta and is therefore mainly regurgitated. When it arrives in the mouth the fluid portion of the regurgitated material is pressed out between the tongue and palate and immediately reswallowed. The solid matter is then chewed thoroughly and deliberately between the large tables of the molar teeth by side to side movements of the lower jaw. While chewing the animal frequently swallows expressed fluid and saliva. The rechewed mass itself is swallowed shortly before the following mixing cycle occurs. The relationship between rumination and the mixing cycles is of importance. The material is brought up just before a cycle, i.e. after the food has had time to settle into layers and the coarse material has come near the surface from whence it is caught up. The rechewed mass is swallowed and immediately sinks to the deeper layers. It will be noted that contraction of the ruminal wall takes no part in regurgitation and that the act is not accompanied by any rise in intra-ruminal pressure. It can take place despite large open ruminal fistulae and has even been observed during complete ruminal paralysis. Rumination is therefore basically different from vomiting which is mainly brought about by an increased pressure in the stomach. Tracheal intubation interferes with rumination by preventing the development of a negative pressure in the thorax.

The stimulus for rumination is the presence of coarse particles in the anterior rumen and the time spent on it therefore depends on the nature of the diet. On an ordinary diet 7 to 8 of the 24 hours are spent in rumination. This occurs in some 14 periods distributed over the 24 hours and each period varies from a few minutes to an hour or more in duration. Cattle kept on finely ground foods ruminate very little if at all.

The rumination reflex is inhibited by nervousness, fright and anger and is suppressed in most febrile diseases and digestive disorders. Normal rumination is generally a sign of well-being.

The Oesophageal Groove.

As already explained, contraction of the lips of the oesophageal groove causes the food to pass directly from the oesophagus to the omasum and thence to the abomasum. This reflex is governed by the vagus nerve and is brought about mainly by stimuli from the pharynx. It plays a very important role in the suckling animal as will be described later. The activity of the groove decreases with age and it appears to play little role in the adult animal. Certain chemicals, when applied to the pharynx, tend to cause

closure of the groove but the response decreases with age and is never constant. It is, however, made use of when dosing remedies which are desired to pass directly down the tract and so avoid dilution in the rumen e.g. intestinal worm remedies and purgatives. According to Wester the groove can be closed in cattle of up to two years of age by dosing solutions of sodium chloride, sodium bicarbonate and sugar. Of these a 10% solution of sodium bicarbonate would appear to be the most effective. In sheep copper

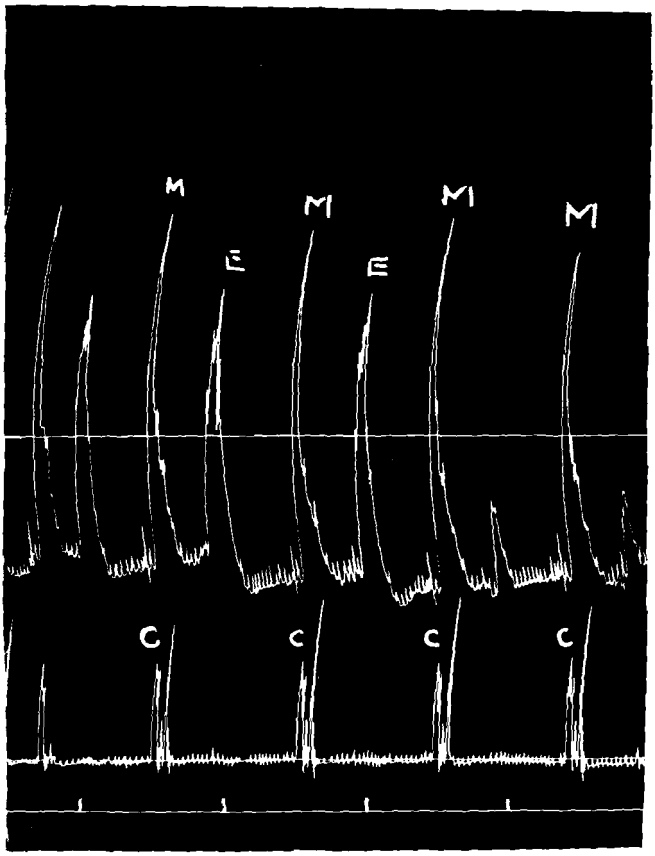


Fig. 5.

THE PRESSURE CHANGES IN THE RUMEN AND RETICULUM DURING NORMAL MOTILITY

RUMEN

Atmospheric pressure.

RETICULUM

Time 1 minute.

Note the normal subatmospheric pressure in the rumen during rest. Mixing cycles are marked M and eructation contractions E. Each mixing cycle is preceeded by a double reticular contraction. The third sharp reticular contractions marked C each coincided with the bringing up of a cud.

sulphate (10%) is usually used. The response is usually immediate but may be delayed for up to 8 seconds. It usually lasts only one or two minutes but the groove may remain closed for as long as 11 minutes. The remedy should therefore be given about 10 seconds after the preliminary dose.

The Recording of Ruminal Motility. The movements of the fore-stomachs have been studied by various means including direct observation through large fistulae, X-ray photography and screening and by recording the pressure changes which accompany contraction. The recording of pressure changes is the simplest and provides permanent records. It is done by means of tambours connected to balloons in the various compartments or simply to the free gas space in the posterior dorsal rumen. Examples of such tracings are shown in figures 5 and 6.

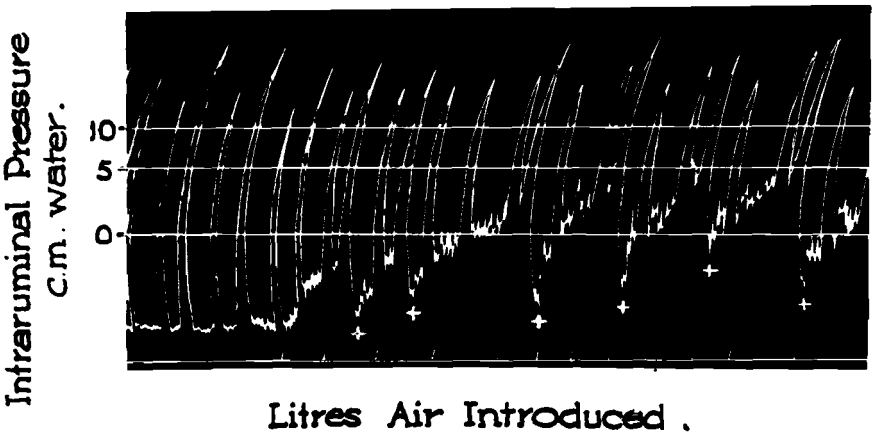


Fig. 6.

THE PRESSURE CHANGES IN THE RUMEN DURING ERUCTATION

Air was forced into the ruminal mass during the recording as shown by the marker. Note the drop in intra-ruminal pressure at each eructation (marked +) which follows an extra (eructation) contraction.

The Omasum

The exact function of the omasum is not yet known and its total removal is reported to have little effect. From radiographic observations Phillipson suggests that as ingesta enters the omasum the superior pole relaxes drawing the material up between the leaves. The organ then contracts and the fluid part of the ingesta is squeezed out and flows into the abomasum together with the more liquid matter from the lower pole. Liquids may pass directly through the omasal groove. It would therefore appear that the omasum regulates the passage of the ingesta and traps coarse particles which might injure the delicate mucous membranes of the abomasum and small intestines. Such particles are probably ground fine between the leaves before escaping with the fluid. Owing to this

squeezing action, the contents of the omasum are normally much drier than those of the rumen and reticulum. A considerable amount of water is also absorbed by the omasal mucosa.

The Motility of the Abomasum.

The abomasum shows regular peristaltic waves brought about by vagal activity. The right ventral branch of the vagus also supplies the pyloric sphincter causing its relaxation. As will be seen later, damage to this nerve results in permanent closure of the pylorus. (In the dog and man the vagus nerve is not essential for pyloric relaxation.)

Factors Affecting the Motility of the Stomach

As the movements of the stomach are entirely dependent on impulses from motor centres in the brain transmitted via the vagus nerves, they may be influenced by (i) factors affecting the centres, (ii) interference with the transmission of the nerve impulse or its transmission to the musculature and (iii) paralysis of the muscle itself. The governing centres themselves are affected by afferent impulses arising from various parts of the digestive tract (and possibly from other organs) as well as by the composition of the blood. The action of the vagus may be affected by drugs and traumatic injury while the musculature may be paralysed by fatigue and poisons.

The following are the main factors affecting motility of the stomach.

Feeding. During feeding the mixing cycles are increased to some five contractions per minute. This is brought about by stimulation of nerve endings in the pharynx and not by the arrival of the food in the stomach as it also occurs in "sham feeding", i.e. by animals with oesophageal fistulae. The object of these extra contractions during feeding is to mix the newly ingested food with the main mass and to clear the cardia. On the cessation of feeding the frequency of the mixing cycle gradually returns to normal over some five to ten minutes. The eructation reflex is also stimulated by feeding, through distention of the rumen by the food and by the increased amount of gas formed.

Fasting. Normal animals that have been fasted for 24 hours show little or no change in the frequency or strength of the mixing cycles but the eructation reflex is suppressed due to the absence of gas. With prolonged fasting there is a gradual decrease in ruminal motility.

Rumination. The mixing cycles are increased during rumination probably by reflexes initiated by the actions of chewing and swallowing. The thorough mixing of the ingesta during rumination ensures that the same material is not regurgitated repeatedly.

Stretch of the Ruminal Wall. Distention of the posterior dorsal sac of the rumen is the main stimulus for the eructation reflex but

stretch of the ruminal wall in general also causes an increase in the frequency and strength of the mixing cycles.

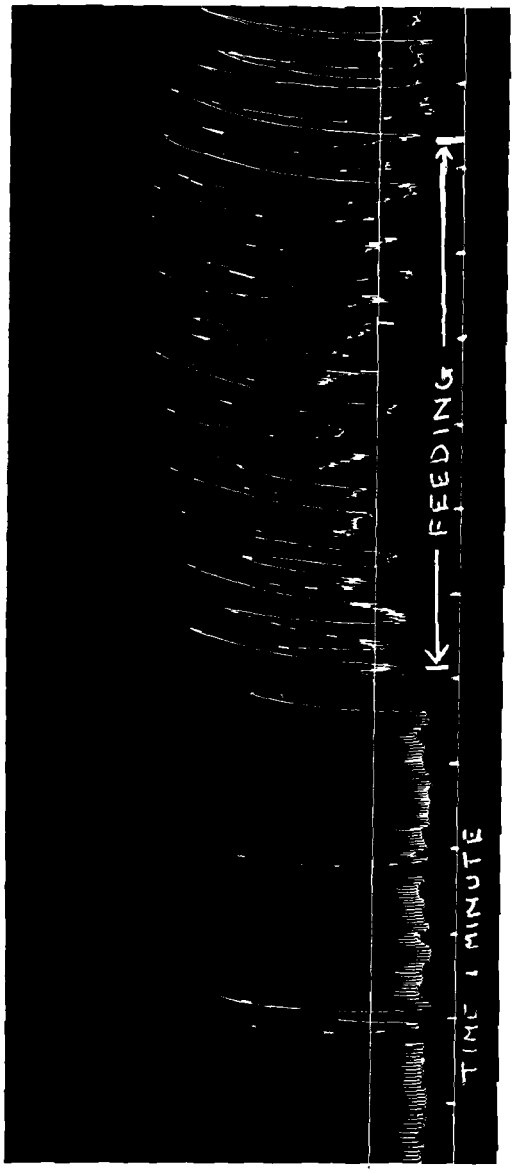


Fig. 7.
THE EFFECT OF FEEDING ON RUMINAL MOTILITY

Roughage. Rumination is stimulated by the presence of coarse particles in the anterior rumen. Some workers hold that roughage is also necessary for the maintenance of normal ruminal motility and eructation. This would not appear to be strictly true as animals kept for months on soft green lucerne tops have shown no signs of ruminal hypomotility or suppression of the eructation reflex

(See figure 8.) Nevertheless it is well known that adequate roughage, about 10 lbs. per day to the bovine, is essential to the welfare of the ruminant. This is probably largely due to the increased salivary flow brought about by the gastro-salivary reflex but it has been shown that ruminal motility is increased by the consumption of a hard hay. Roughage would therefore appear to play an important role in stimulating rumination, salivation and general ruminal motility. Its action in the prevention of bloat will be discussed later.

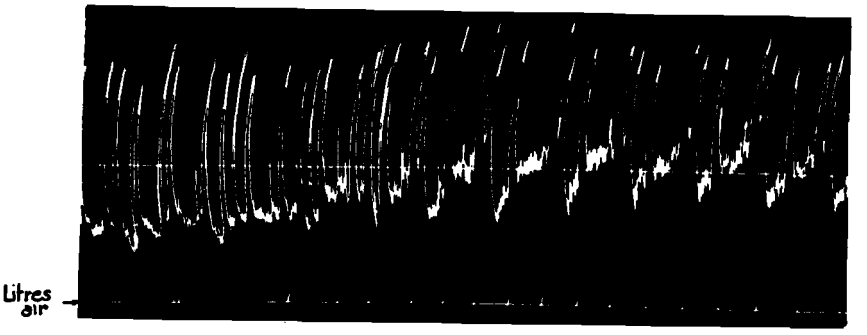


Fig. 8.

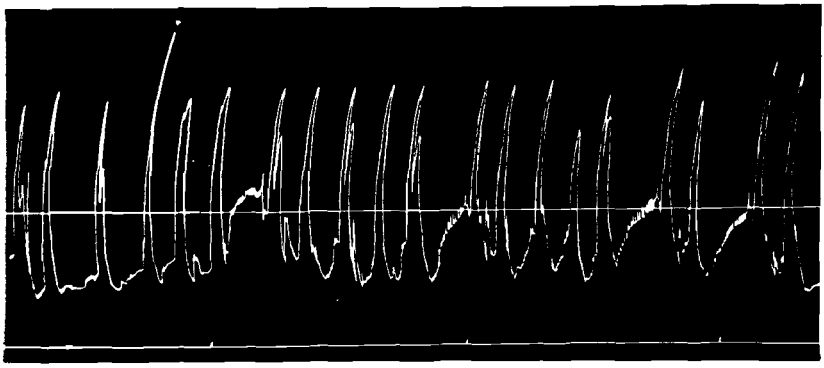
NORMAL MOTILITY AND ERUCTATION IN A BOVINE ON A NON-ROUGHAGE DIET

Note the normal motility and efficient eructation of introduced air despite the absence of roughage. (Weiss, 1953).

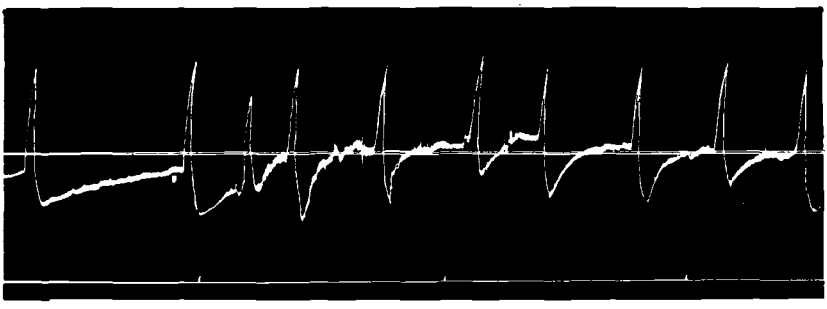
Distention of the Abomasum or Caecum.

The artificial introduction of either gas or fluid into either the abomasum or caecum causes reflex inhibition of the ruminal mixing cycles and paralysis of the reticulum. This corresponds to the entero-gastric reflex of other animals and prevents the further passage of food into the lower digestive tract while it is overloaded. The reticular paralysis however, decreases the efficiency of eructation especially when the rumen is well filled.

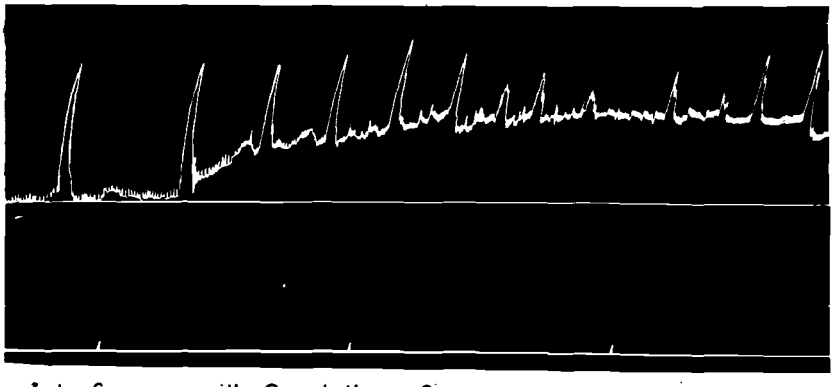
Alkalosis. The administration of alkali into the rumen causes a marked decrease in the strength of the mixing contractions and the efficiency of eructation. This latter effect is probably again due to reticular paralysis. Exactly the same results are obtained immediately after the intravenous injection of weak alkaline solutions (either NaOH or NH_4) indicating that the effect is brought about by central inhibition caused by alkalosis. Further evidence in favour of this theory is supplied by the following facts. Ruminal paresis following the dosing of alkali is not directly correlated to the pH of the ingesta and may occur when the pH is still below 7. Furthermore the paresis usually persists for several hours after



Normal Eructation – Abomasum not distended.
Rumen relatively empty.



Eructation after Abomasal Distention –
Rumen relatively empty.

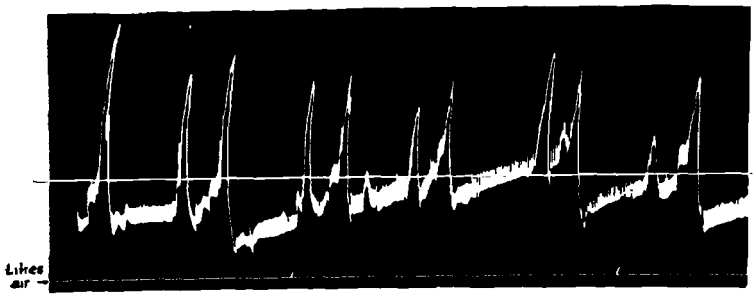


Interference with Eructation after addition of 2 litres water
to rumen . Abomasum distended .

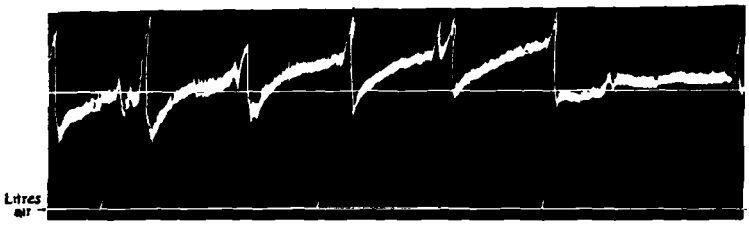
Fig. 9.

THE EFFECT OF ABOMASAL DISTENTION ON THE MOTILITY OF THE RUMEN AND RETICULUM

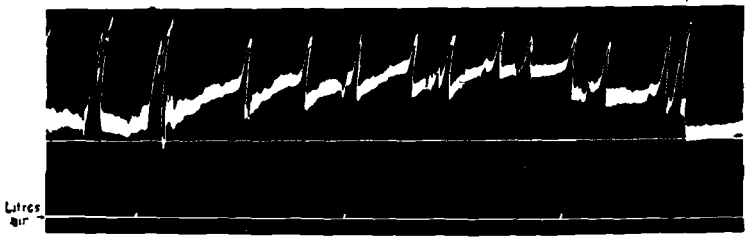
Air was introduced into the rumen at a standard rate during all three recordings. In the centre tracing, note how distention of the abomasum completely inhibited the mixing cycles but did not affect the ruminal eructation contractions. As the rumen was relatively empty the concurrent paralysis of the reticulum did not affect the efficiency of eructation. When the rumen was filled (bottom tracing) eructation could not take place owing to the reticular paralysis. (Weiss, 1953)



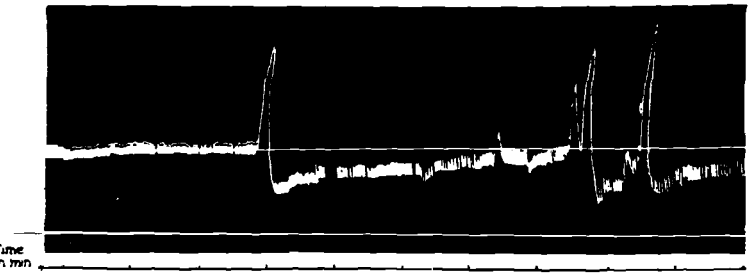
Normal eructation and rumen motility. Caecum not distended. Rumen relatively empty.



Effect of caecal distention. Abolition of backward contraction. Forward contraction still present with efficient eructation. Rumen relatively empty.



Inefficient eructation after addition of 2 litres water to rumen. Caecum still distended.



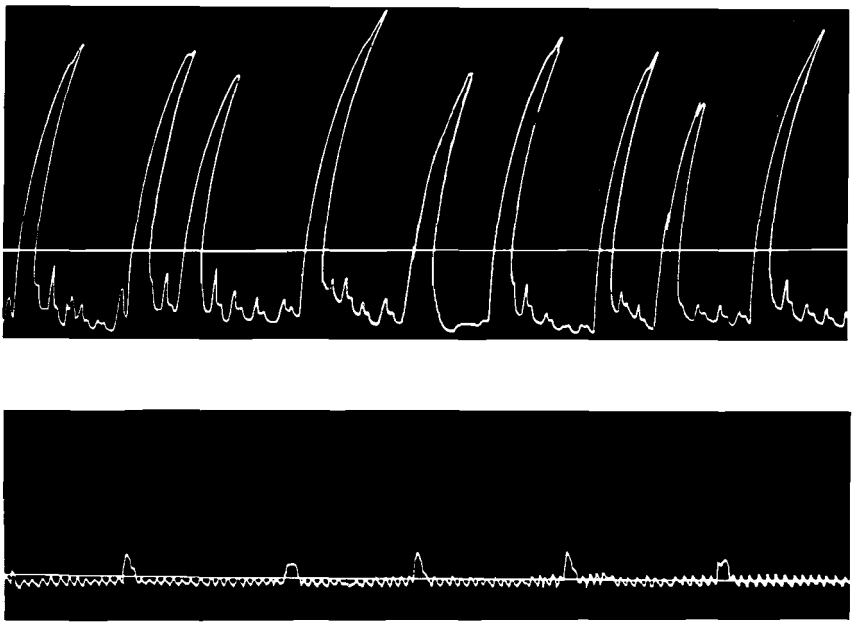
Inhibition of rumen contraction due to caecal distention in the absence of intraruminal pressure.

Fig. 10.

THE EFFECTS OF CAECAL DISTENTION

Note that the effects of caecal and abomasal distention are identical. (Weiss, 1953)

the reaction of the ingesta has returned to normal. The effect would therefore appear to be brought about by the absorption of the alkali. The paresis is overcome by the stimulus of feeding and by the injection of carbamylcholine, indicating that the musculature itself is not affected.



Top.—Normal contractions at pH 7·0.

Bottom.—Ruminal paresis 6 hours after dosing 40 gm. Na_2CO_3. pH 7·8. Time of each tracing 5 minutes.

Fig. 11.

THE EFFECT OF DOSING SODIUM CARBONATE ON RUMINAL MOTILITY

(Clark and Lombard: Effect of the pH of the ruminal contents on ruminal motility. Ond. J. Vet. Res., Vol. 25, No. 1, 1951)

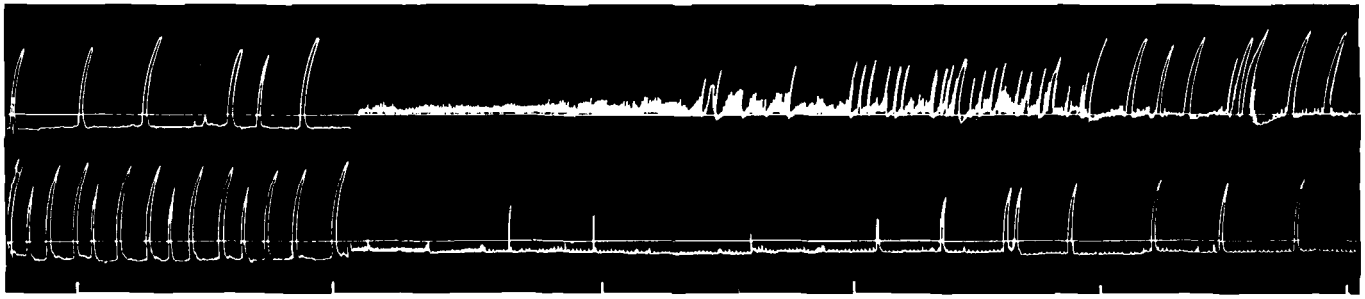
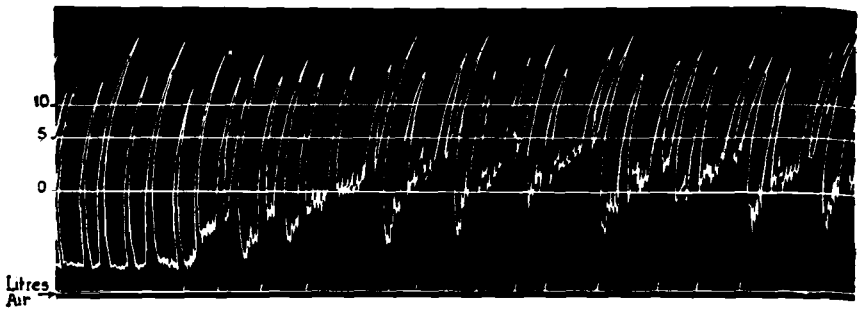


Fig. 12.

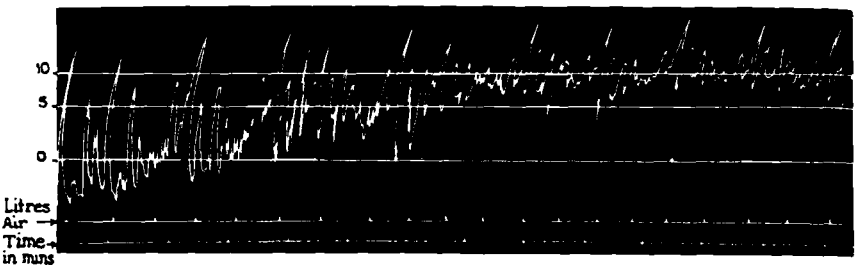
THE EFFECT OF THE INTRAVENOUS INJECTION OF ALKALI

Above —
A. Normal.
B. Paralysis immediately after intravenous injection of 100 c.c. 1.3 per cent NaOH.
C. and D. Gradual return of movements with hyperpnoea and restlessness 5 to 15 minutes after injection.
E. Recovery one hour later.
Below —
A. Normal.
B. to E. Continuous recording after intravenous injection of 150 c.c. of 1 per cent *ammom. fort.* in saline.
Note immediate paralysis and rapid recovery.

(Clark and Lombard, 1951)



Normal Eructation on mixed diet.



Interference with eructation caused by dosing 150 gm. Sod.carb., Rumen pH6.9
0, 5, 10 = Pressure in cm. water.

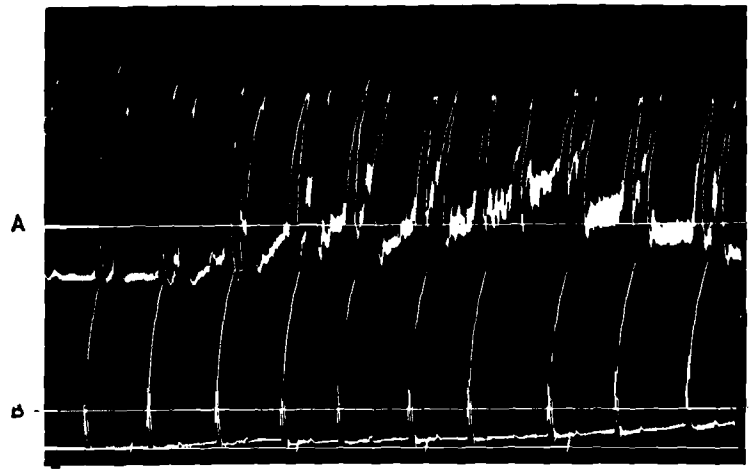
Fig. 13.

THE EFFECT OF ARTIFICIAL ALAKALINITY ON ERUCTATION IN THE BOVINE
(Weiss, 1953)

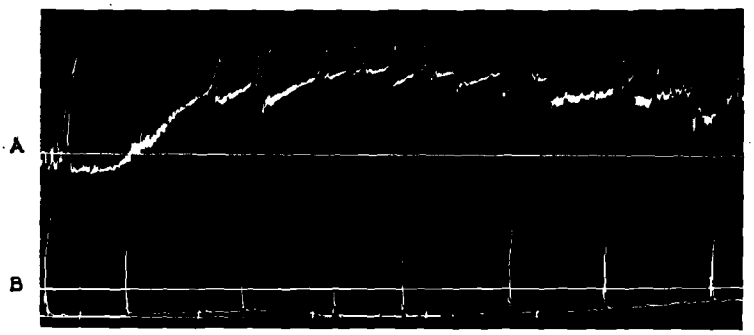
Acidity. An increased acidity of the rumen may occur after the ingestion of excess starch. When the pH drops below 5 there is inhibition of ruminal motility.

Sympathetic Activity. The injection of adrenaline causes a transitory paresis of the fore-stomachs which again affects mainly the mixing cycles and the reticulum, thus interfering with eructation. This is the basis of the so-called psychic effects on ruminal motility and will be discussed more fully under the question of bloat.

The Effect of Adrenaline
on Eructation Efficiency in Sheep



Normal Eructation
A : Ruminal Motility . B : Reticular Motility .



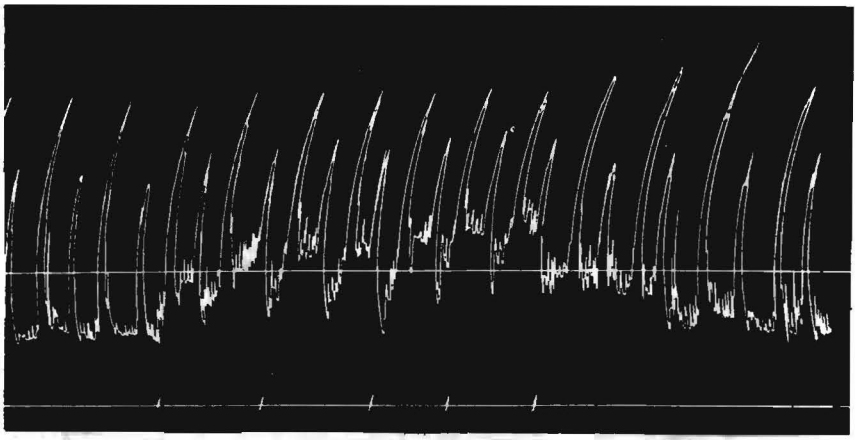
Eructation after 1c.c. Adrenaline hydrochloride (1:1000) injected intravenously .
A : Rumen motility : note inefficient eructation .
B : Reticular Motility : note temporary inhibition and recovery coinciding with return of eructation efficiency

Fig. 14.

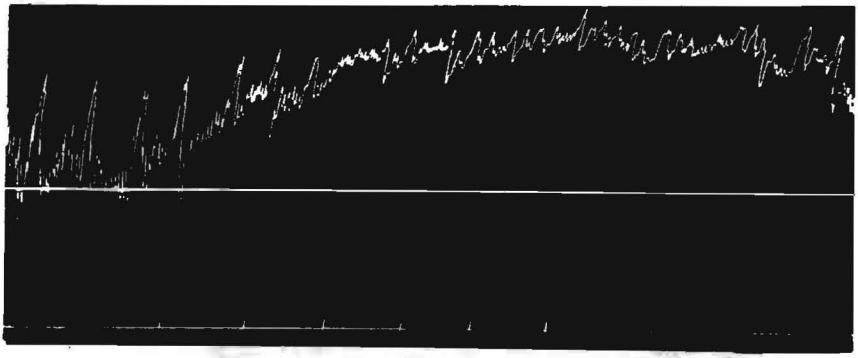
(Weiss, 1953)

Histamine. The administration of histamine causes paralysis of the rumen and reticulum with marked inefficiency of eructation.

The Effect of Atropine on Eructation Efficiency in Sheep.



Normal Eructation



Interference with Eructation 20 mins. after Subcutaneous injection of 30 mgm. atropine sulph.

Fig. 15.
(Weiss, 1953)

Lesions Involving the Nerve Supply. The distribution of the branches of the vagus nerves which supply the various compartments of the fore-stomachs has already been described. These nerves may become involved in lesions of peritonitis caused by the penetration of foreign bodies especially in the region of the reticulum. According to the site and extent of the involvement of the nerves, the animal may show partial, total or intermittent paralysis of various portions of the stomach with consequent impaction and bloating. Where the right ventral branch is affected there is paralysis of the reticulum with a tendency to chronic bloat and permanent closure of the pyloric sphincter with enormous distention of the abomasum. The abdomen becomes distended in the right lower flank as shown in figure 16.

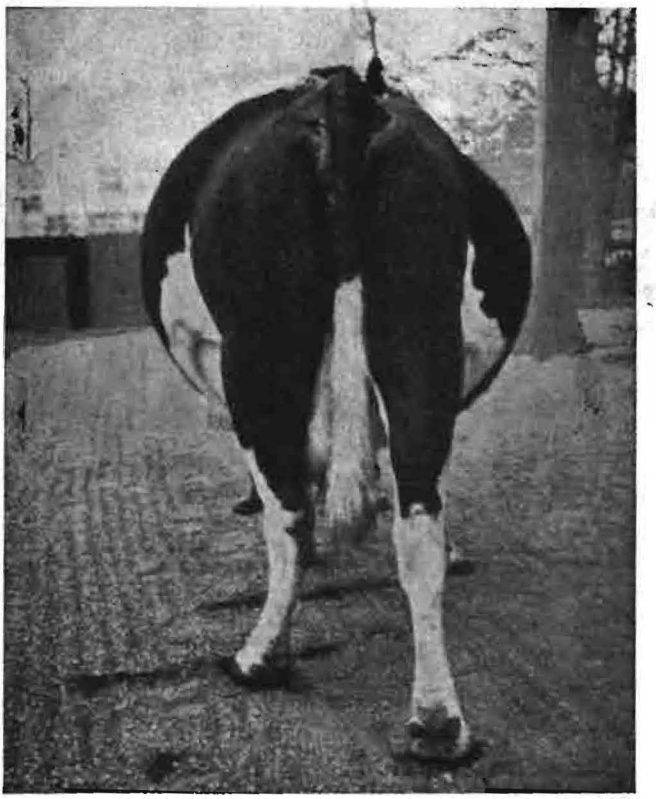


Fig. 16.

ABOMASAL DISTENTION FOLLOWING INVOLVEMENT OF THE RIGHT VENTRAL BRANCH OF THE VAGUS

Spontaneous case due to traumatic peritonitis. Note the distention of the right side of the abdomen.

(From Svensk Veterinärtidskrift. Supplement zum 45. Band. S. Hoflund, 1940)

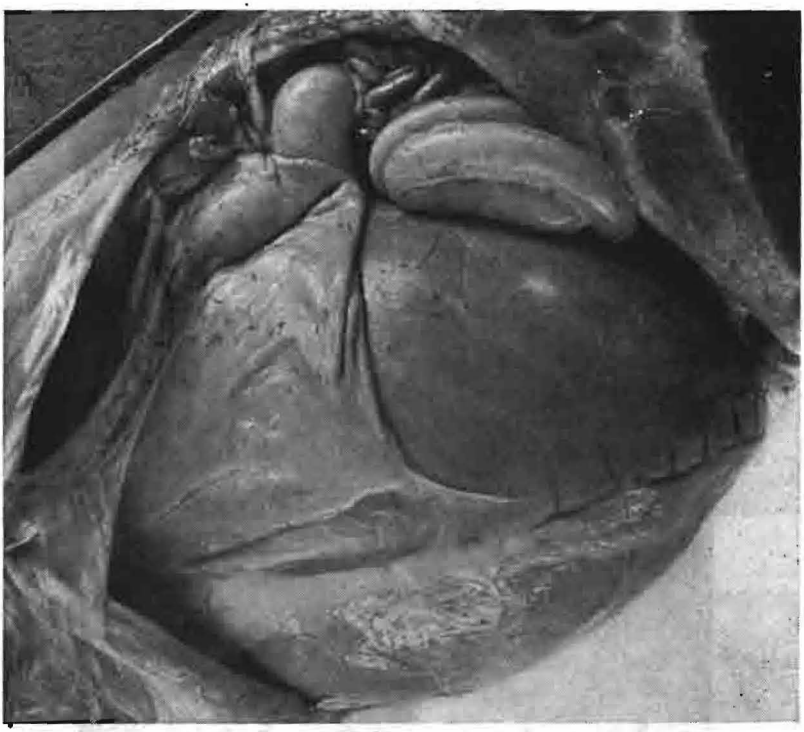


Fig. 17.

ABOMASAL DISTENTION FOLLOWING SECTION OF THE RIGHT VENTRAL BRANCH OF THE VAGUS

Abdominal organs of a goat 3 weeks after section of the right ventral branch of the vagus. The large organ occupying almost the entire cavity is the abomasum. (Weiss, 1953)

Febrile Diseases. Paresis of the rumen is a frequent complication to febrile diseases. The condition is so common in anaplasmosis of cattle that it forms an important part of the usual syndrome of the disease. The exact pathogenesis of such secondary paresis is not yet known.

Drugs Affecting Ruminal Motility

Stimulants. Parasympathetic stimulants increase the motility of the whole digestive tract including that of the stomach. Those acting directly on the musculature, e.g. carbamylcholine, tend to cause unco-ordinated spastic and functionless contractions of the rumen and paralysis of the reticulum. The mechanism of the latter action is unknown. They frequently cause spontaneous bloat owing to their interference with eructation. The anti-cholinesterases, such as physostigmine and neostigmine, increase the strength of each contraction without upsetting the rhythm or co-ordination.

Veratrine causes violent spastic contractions of the rumen and emesis.

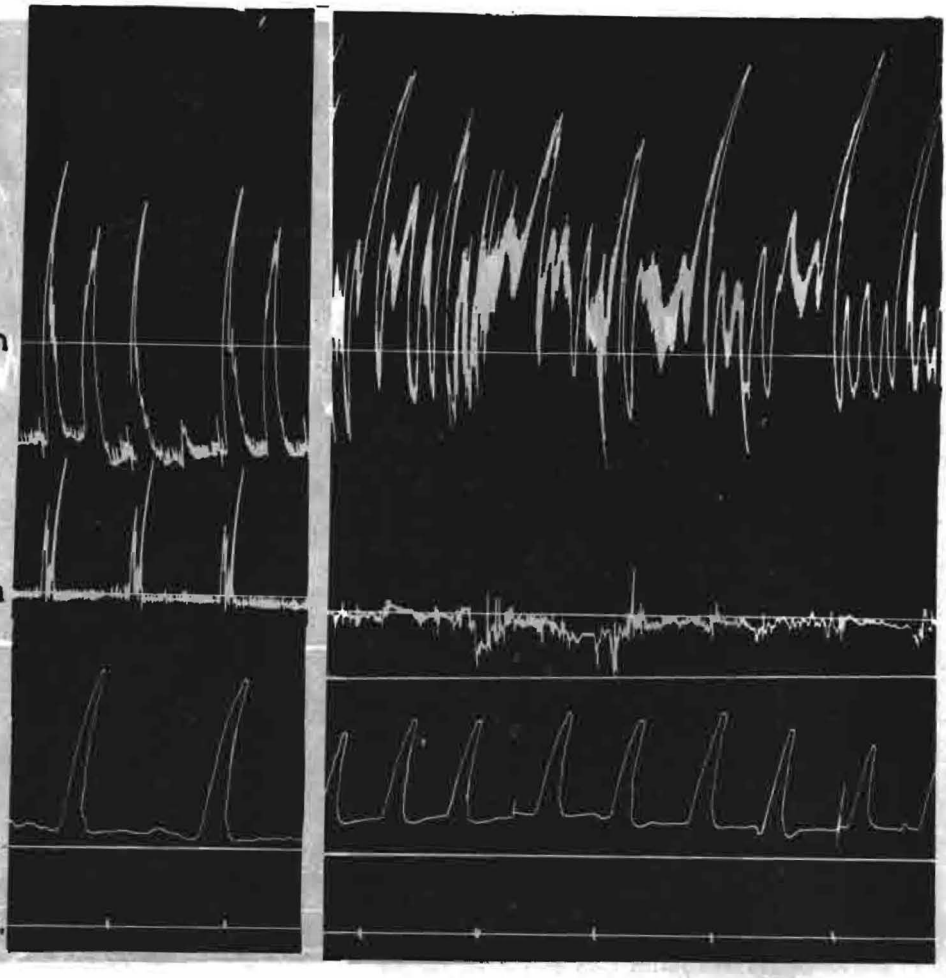


Fig. 18.

THE EFFECT OF CARBAMYLCHOLINE ON THE ALIMENTARY TRACT OF THE SHEEP

Before.

After the injection of 1 mg. carbamylcholine subcutaneously.

Note the inco-ordinated contractions of the rumen and the rise in intra-ruminal pressure, inhibition of the reticulum and increased motility and tone of the caecum.

(From Clark and Weiss, "Studies on the comparative actions of carbamylcholine, physostigmine and neostigmine in different specie of domestic animals". Ond. J. Vet. Res., Vol. 26, No. 4, 1954)

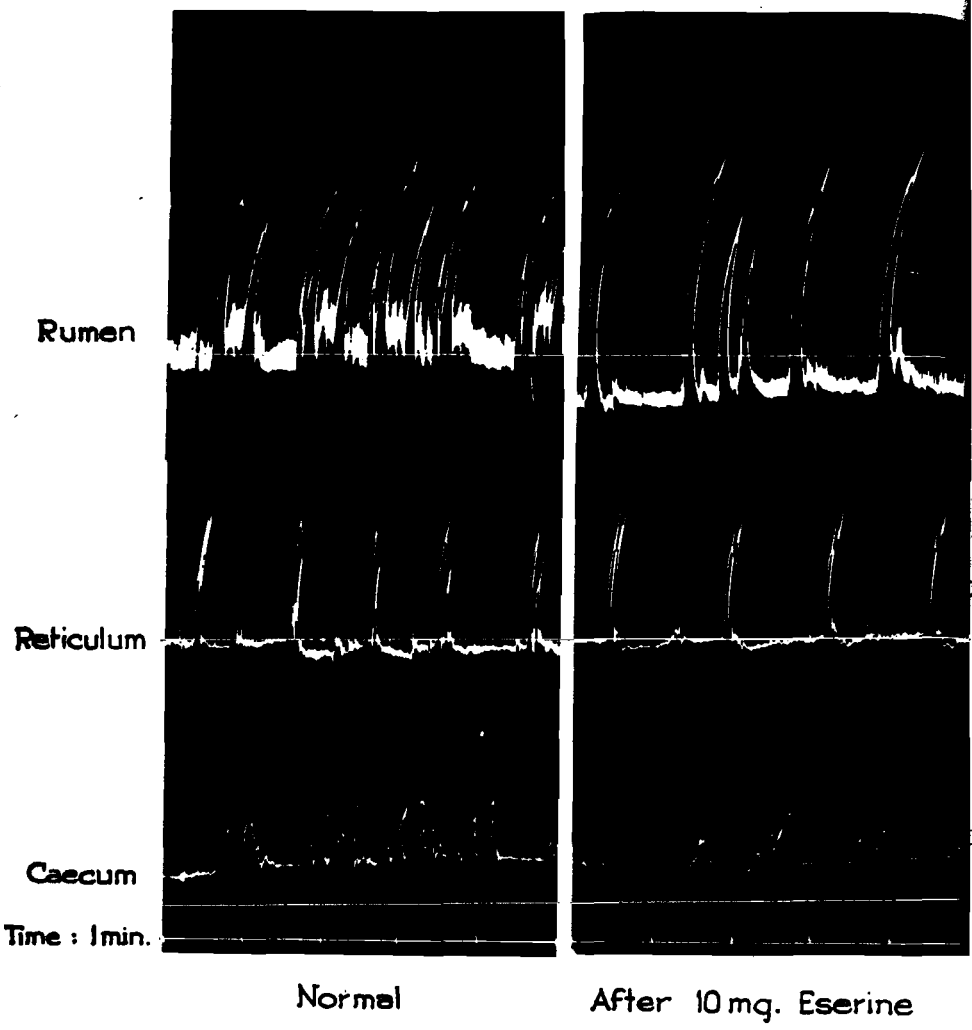


Fig. 19.

THE EFFECT OF PHYSOSTIGMINE ON THE ALIMENTARY TRACT OF THE SHEEP

(From Clark and Weiss, 1954)

Note the normal nature and increased strength of the ruminal contractions and the decrease in intraruminal pressure, the absence of interference with reticular activity and little effect on the caecum.

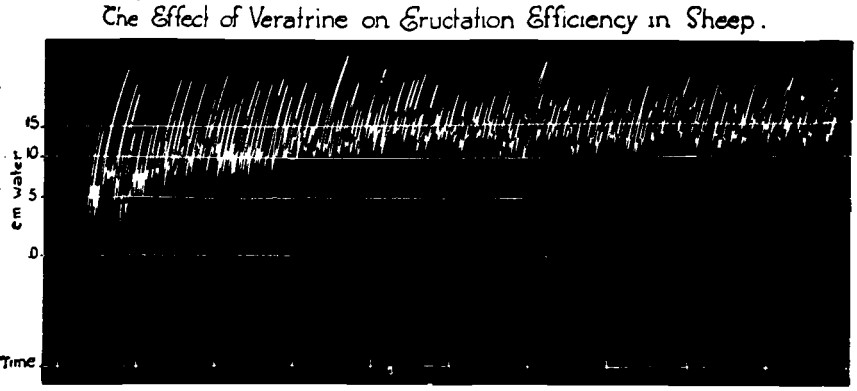


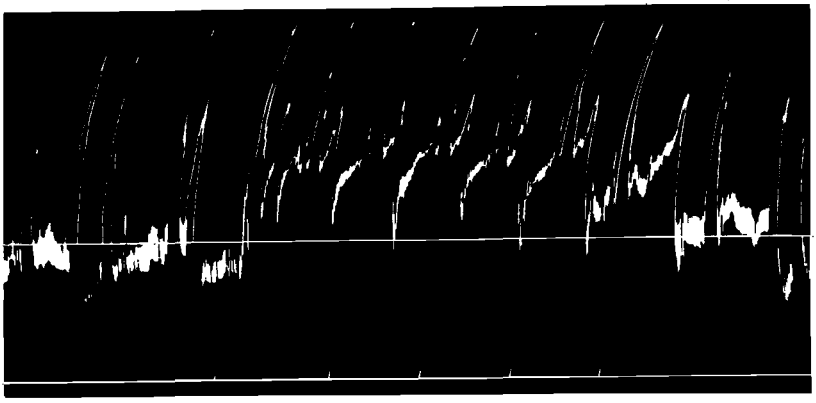
Fig. 20.

Note the spastic contractions and marked rise in intraruminal pressure with absence of eructation. (Weiss, 1953)

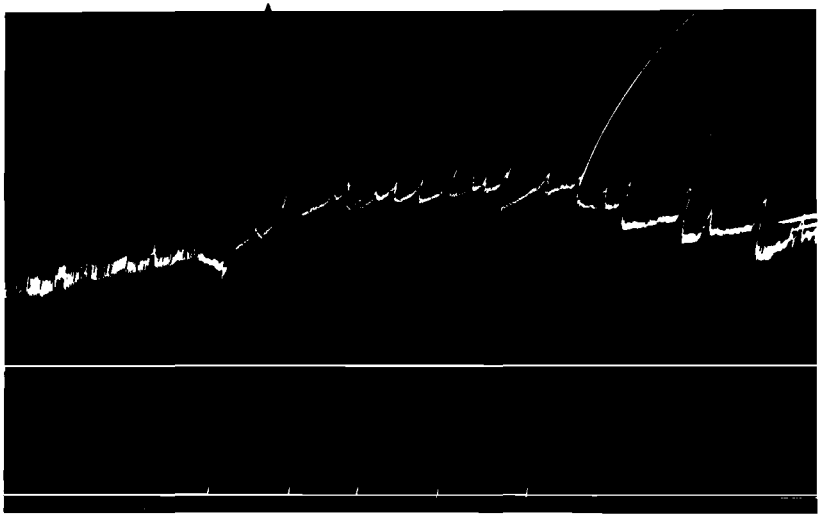
Drugs Causing Paralysis. By blocking the action of acetylcholine, atropine causes paralysis of the fore-stomachs.

Prussic acid also causes ruminal paralysis affecting first the mixing movements and the reticulum. This effect is obtained with doses too small to cause any general symptoms but the reticular paralysis reduces the efficiency of eructation and may thus lead to bloat if other conditions are favourable for its production. In higher doses there is complete ruminal paralysis and bloat therefore almost invariably accompanies acute prussic acid poisoning.

The Effect of Histamine on Eructation Efficiency in sheep.



Normal Eructation

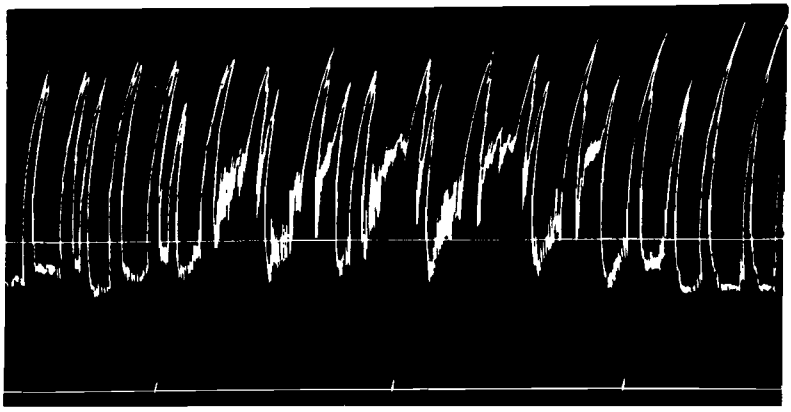


Interference with Eructation after intravenous injection of 2mgm. Histamine.

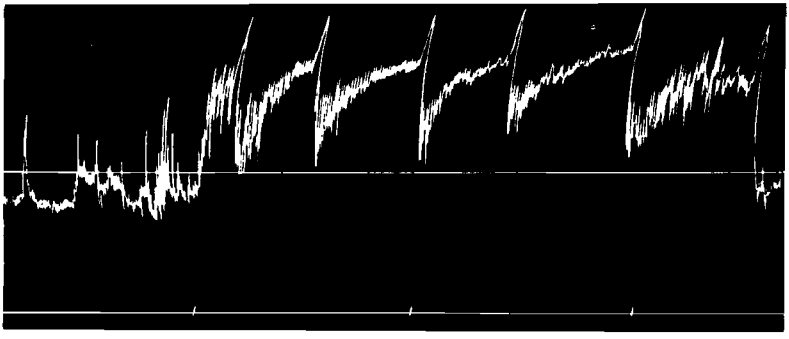
Fig. 21.

(Weiss, 1953)

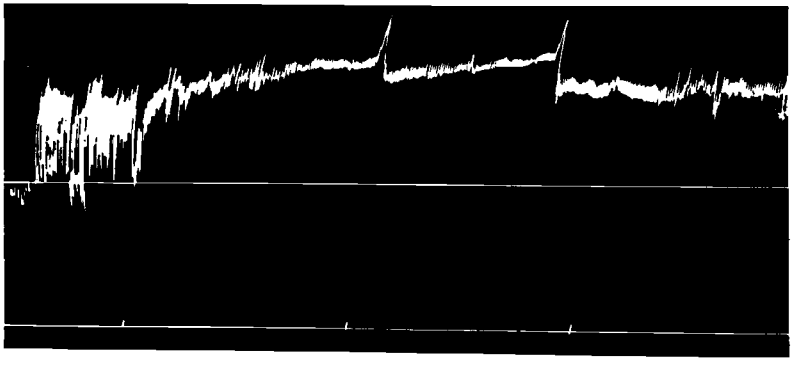
The Effect of K.C.N. on Eructation Efficiency in sheep.



Normal Eructation.



Eructation 5 mins. after dosing 150 mgm. KCN.



Interference with Eructation 5 mins. after dosing another 50 mgm. KCN. (Total dosage 200 mgm. KCN)

Fig. 22.

THE EFFECT OF POTASSIUM CYANIDE ON THE ERUCTATION EFFICIENCY OF SHEEP

Air was introduced into the rumen throughout all three tracings. In the centre tracing note the inefficiency of eructation due to reticular paralysis. In the bottom tracing there is almost complete ruminal paralysis, the pressure changes on the left being due to dyspnoea caused by the prussic acid. (Weiss, 1953)

Emesis.

Vomition does not occur normally in ruminants and it has been postulated that they do not possess a vomiting centre. Veratrine, however, not only causes an increased intra-ruminal pressure due to contraction of the ruminal wall but also typical retching efforts with contraction of the abdominal muscles which would indicate a central action on a vomiting centre. The vomiting produced is, to all appearances, the same as seen in other animals and Wester has advocated its use in overeating indigestion in cattle.

In South Africa sheep also show vomition when poisoned by "vermeerbossie" (Geigeria species).

Acknowledgements

The author wishes to thanks the Director of Veterinary Services for permission to reproduce the tracings originally published in the Onderstepoort Journal of Veterinary Research.

STUDIES ON THE HAEMAGGLUTINATION REACTION

E. M. ROBINSON,

Onderstepoort.

During the last few years the writer has been engaged in studies on tuberculosis in domesticated animals and has made considerable use of the haemagglutination test in the course of his work. It was first introduced for the diagnosis of tuberculosis by Dubos and Middlebrook (1948). On the whole it appears that the test is not very reliable as a diagnostic method for tuberculosis in cattle. Gray (1953) found the margin of error too great and considered the test to be unsatisfactory as a diagnostic method. A very large number of articles have appeared on the value of the test in man and although a few workers consider it of value, the majority regard it unfavourably.

The purpose of this article is to record a few observations on the haemagglutination test made by the writer during his work on tuberculosis. There were a number of aspects of the test which were thought to be worth investigating and which will be dealt with.

Influence of the tuberculin test on the haemagglutination test in cattle:—

Ten available cattle from the station were inoculated with tuberculin from a routine batch. Five were done intradermally with the standard .1 c.c. dose and five were given 5 c.c. subcutaneously as done in the so-called Gregory test, the dose actually used there being 4 c.c. or 40 times the intradermal dose. The animals were bled ten days before the inoculations were done and the sera subjected to the haemagglutination test. All proved negative, though two reacted in a dilution of 1:4, the positive titre being taken as 1:8. Eighteen days later they were re-tested and two of the large dose animals reacted at 1:16 as did one of the .1 c.c. dose animals. These reactions had to be considered as positive. A month later the two animals which received the large dose were still positive but the .1 c.c. dose animal had become negative. It would appear therefore, that the normal .1 c.c. dose does not produce any lasting reaction but the 5 c.c. dose may.

Gray (1953) mentions that the ordinary dose of tuberculin does not affect the reaction.

Variation of the reaction with the corpuscles of individual sheep.

As the possibility existed that there might be some variation in the results of the tests if corpuscles from different sheep were used, comparative tests were carried out with washed corpuscles from six different sheep, all merinos of approximately the same age. Three positive cattle sera and one negative one were used as

controls. Of the six lots of corpuscles no difference in the test result could be observed in five, but in one the reaction was positive in one higher dilution. It would appear that the results with corpuscles of different sheep are very uniform.

The effect of the inactivation temperature.

The usual temperature for the inactivation of sera to be tested is 56°C. for half an hour. In comparative tests carried out after inactivation at a higher level it was found that a temperature of 60°C. reduced a positive reaction in one case from 1:64 to 1:16 and in another from 1:32 to 1:16. Inactivation of the same positive sera at 62°C. for half an hour completely destroyed the power of the sera to react. It would appear that 56°C is the most satisfactory temperature for inactivation.

Effect of haemolysis in sera on the reaction.

Dubos and Middlebrook (1948) mention that sera for the test should not show haemolysis. In a few tests carried out by the writer with four positive sera, and the same sera haemolyzed to varying degrees, it was found that slight haemolysis in the sera did not affect the reactions but when it was well marked the reactions were very greatly reduced.

Tests with corpuscles from different animal species.

Testing sheep corpuscles as a control, washed red corpuscles were obtained from horses, cattle, goats and fowls, sensitized, and used in tests with positive and negative sera. It was found that equine corpuscles could be substituted for ovine, but bovine and caprine corpuscles were of little value, the results with positive sera being very weak or negative. Avian corpuscles gave good results but were inclined to give non-specific haemagglutination. In one test six normal horse sera were tested, using sensitized equine corpuscles, with positive bovine sera as controls. One of the samples gave a reaction at 1:8 and two others at 1:4 so one may consider equine sera with sensitized equine corpuscles as liable to give non-specific reactions.

Tests with normal sera of different animal species and sensitized sheep's corpuscles.

In order to see what reactions would be obtained with normal sera of domesticated animals, a number of tests were carried out using sensitized sheep's corpuscles and positive cattle serum controls.

Of 11 normal *sheep* sera tested two gave reactions at 1:8 which must be considered positive. Of 10 normal *goat* sera, one gave a positive reaction at 1 : 8. Of 10 normal *fowl* sera three gave positive reactions but in two further lots of six and eight sera respectively, the results were negative.

Tests with normal cattle sera and sera reacting positively to the agglutination test for contagious abortion.

As a large number of bovine serum samples for the agglutination test were always available a representative selection of positive and negative sera were subjected to the haemagglutination test for tuberculosis. Occasionally a serum from either lot would give a positive reaction, but it may be stated definitely that positive sera, even reacting very strongly to the agglutination test for contagious abortion do not react to the haemagglutination test as a rule. There was no information available as to whether the animals were tuberculin reactors or not.

Comparative haemagglutination tests using antigens made from different Mycobacterium tuberculosis types and sera of animals infected with the different types.

A large number of comparative tests were carried out but the results were rather unsatisfactory in that the reactions with either human, bovine or avian antigens did not allow of the differentiation of the different positive sera. With sheep and goats infected with either the bovine, human or avian types the reaction with a human strain antigen were about equally strong. These tests have been repeated at roughly monthly intervals over a year and the results were always very similar. In a few tests carried out with a bovine strain antigen the reactions with all three types of sera were very similar. Several different avian antigens were used and with some, avian infected animals gave better reactions than either human or bovine infected ones but with others no real difference could be noted. It does not seem therefore that it will be possible to differentiate the human, bovine or avian antigens by testing them with sera of animals infected with the different strains.

The value of the haemagglutination test for the diagnosis of tuberculosis.

The writer has been able to carry out a considerable number of tests on cattle reacting to the tuberculin test and must agree with the findings of Gray (1953) that the test is not satisfactory enough for much reliance to be placed on it. Unfortunately in the tests carried out by the writer it was only occasionally possible to confirm the results by post mortem examination. In one case (Robinson and Osborn, 1951) an opportunity occurred to test the sera of 42 cattle on a large ranch which had reacted to the tuberculin test and were subsequently slaughtered. In 24 animals the haemagglutination test proved positive and lesions were found. In eight cases the test was negative but lesions were found. In five a reaction occurred at 1 : 4, or less than the titre considered positive and lesions were found. In six cases the reaction was negative, and no lesions were found. These results cannot be considered very satisfactory on the whole.

In fairness it must be stated that the controls in all the tests which were done were definitely infected and gave positive reactions

consistently, over some years in a few cases. In addition, in some experiments carried out on bovine and human infections in sheep and goats (Robinson 1955) the animals reacted strongly and did so consistently over a period of about a year. The infections were confirmed at post mortem subsequently.

Summary

Various factors which may influence the haemagglutination test for tuberculosis infection are discussed.

For the accurate diagnosis of tuberculosis the test has not been found to have much value.

REFERENCES

DUBOS, R. and MIDDLEBROOK, G. (1948): Specific serum agglutination of erythrocytes sensitized with extracts of tubercle bacilli. *J. Exp. Med.*, 88, 521-528.

GRAY, D. F. (1953): The significance of haemagglutination in bovine tuberculosis. *Aust. Vet. J.*, 29, 11.

ROBINSON, E. M. and OSBORN, S. M. (1951): The haemagglutination test for tuberculosis. *J.S.A.V.M.A.* 23, 3. 121-127.

ROBINSON, E. M. (1955): Tuberculosis in sheep and goats. *J.S.A.V.M.A.*, 26, 2.

A NOTE ON THE OCCURRENCE OF ACUTE ERGOT (CLAVICEPS PURPUREA) POISONING IN STEERS

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In this note it is intended to record the occurrence of acute ergot poisoning in a group of 23 steers in the Mooi River district of Natal.

While the writer was farming at Edgehill, Mooi River, a number of young steers were purchased in the Vryburg district of the Cape Province. They had been on the farm Edgehill about six months. Rotational grazing was carried out on the farm, camps being grazed and rested for some months at a time as their condition indicated. The particular camp into which these steers were changed had been rested for several months throughout the summer — the grasses in the camp were chiefly red-seed grasses (Tristachya Hispida), red grass (Themeda Triandra) and Paspalum (Paspalum Dilatatum). Being the end of the summer the grasses had, of course, flowered and ripened. The paspalum was heavily infested with ergot (Claviceps purpurea).

Twenty-three steers, two and three years old, were placed in the camp on 28/3/54 at 10.00 a.m. They were kept under close observation. It was observed that they grazed principally the ripe paspalum heads with the seed heavily infested with ergot. This grass was so plentiful that the possibility of ergot poisoning was considered, but it developed sooner than anticipated.

On 30/3/54, during the forenoon, a steer was lying apart from the others. When approached he showed some difficulty in rising and slight muscular incoordination during movement. The other steers appeared unaffected at that time. On 31/3/54, at 9 a.m., the steers were lying, not in close company as is usual with cattle at grass at this hour, but widely separated. When approached, on horse-back, they appeared nervous and rose with difficulty. During movement there was marked muscular incoordination. One of them was so badly affected that he fell after rising and had considerable difficulty in regaining his feet.

The symptoms appeared to be confined to the nervous and muscular systems. The affected steers were hypersensitive; the ears and skin twitched. There were signs of aggressiveness towards their fellows when in close proximity. One of them scratched the temporal region with the hind hoof as if he may have been suffering from "head-ache". Their eyes were staring and anxious looking. There was marked ataxia in both the fore and hind limbs. The head was held low. The steers seemed hungry and anxious

to feed, but in those with marked incoordination grazing was difficult when the mouth was lowered to the grass: It was difficult for the steers to maintain balance with the head so low. One of them fell on his knees, and could not graze. There were apparently no other symptoms. The steers had fed in the early morning, since the paunches were full, except in those with marked symptoms. At this stage the coat did not lack lustre.

The steers were removed to a camp free from paspalum immediately, a distance of about 500 yards. Those with marked symptoms reached the new camp with some difficulty. Some of the steers were improving at 3.30 p.m. on the same day. The following morning there was marked improvement. At this time a steer that did not appear to be affected the previous day showed incoordination. All the steers had recovered within 48 hours with the exception of two that were badly affected. These lay down most of the day, but when they rose, which they did with difficulty, they began to try to graze immediately. It was approximately a week before they had completely recovered. During the week these two lost some condition. The coat became harsh and staring, but they were otherwise unaffected.

All the affected steers made a complete recovery.

Acute fatal ergot poisoning is not a common condition in steers. In fact during a long experience with grazing paspalum pasture, the writer had not seen a case of ergot poisoning until those now being described. There is little doubt that fatalities would have occurred if the steers had not been kept under close observation and removed from the source of poisoning.

An interesting point in the management of paspalum pasture is that the camp had been grazed throughout the previous spring and summer with pregnant cows and heifers without incident. There is little doubt that this was due to the close grazing, the grass not being allowed to flower and ripen. In the camp in which the poisoning occurred paspalum had not been planted, the seeds having been washed in by flood water from a neighbouring pasture. Had it been possible the paspalum heads could have been mown. However, this was not possible owing to the nature of the surface of the camp.

It appears that paspalum, an excellent grass in certain types of veld in Natal, can become dangerous for cattle if the pasture is rested and the grass allowed to seed and ripen. The danger can be obviated by mowing and removing the hay. As indicated this may not be possible in certain camps. Under such circumstances the grass must be grazed during spring and summer and not allowed to seed and ripen.

DDT RESISTANCE IN THE BLUE TICK, *BOOPHILUS DECOLORATUS*, KOCH

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AFRICAN EXPLOSIVES AND CHEMICAL INDUSTRIES, LIMITED — RESEARCH DEPARTMENT

In some areas of South Africa the cattle tick, *Boophilus decoloratus*, Koch, was shown in 1940 to have developed a marked tolerance to arsenic dipping preparations which had for many years previously exerted effective field control (du Toit et al., 1941). The serious position thus created was temporarily alleviated by the introduction of gamma benzene hexachloride which was shown to be extremely effective initially (Whitnall and Bradford, 1947). After only eighteen months of the field use of BHC dips, tolerance to BHC by the blue tick had increased to such an extent that control was no longer practicable (Whitnall et al., 1952).

It is significant that the first signs of BHC resistance occurred in the East London district where only a few years earlier the same tick had become resistant to arsenical preparations. In numerous tests carried out on many thousands of adult female ticks no instance was recorded in which the BHC-resistant tick was not also resistant to sodium arsenite (Whitnall et al., 1953) although it was later reported that *B. decoloratus* from an isolated area of the Pretoria district had developed resistance to BHC without prior resistance to arsenic (Bekker, 1953).

In areas affected by the arsenic-BHC resistant tick, DDT preparations have given effective field control for the past five years. In laboratory tests field concentrations of DDT have never been effective against the adult tick and it is suspected that the field control achieved is a result of the toxic action of DDT on the larval stage alone.

Recently a small number of adult female blue ticks of a strain suspected of being tolerant to DDT in all stages was collected from a farm in the East London district and despatched to this laboratory. These specimens were placed in an incubator and the larvae produced were subjected to tests involving immersion in a suspension of DDT wettable powder. Details of this technique will be published at a later date.

The effect of DDT on suspected DDT-resistant tick larvae was compared wth the effect on larvae bred in the laboratory from parent ticks originally obtained from a different locality in the same district. It had been established previously that ticks from the latter source were resistant to both arsenic and BHC preparations yet were effectively controlled in the field with DDT.

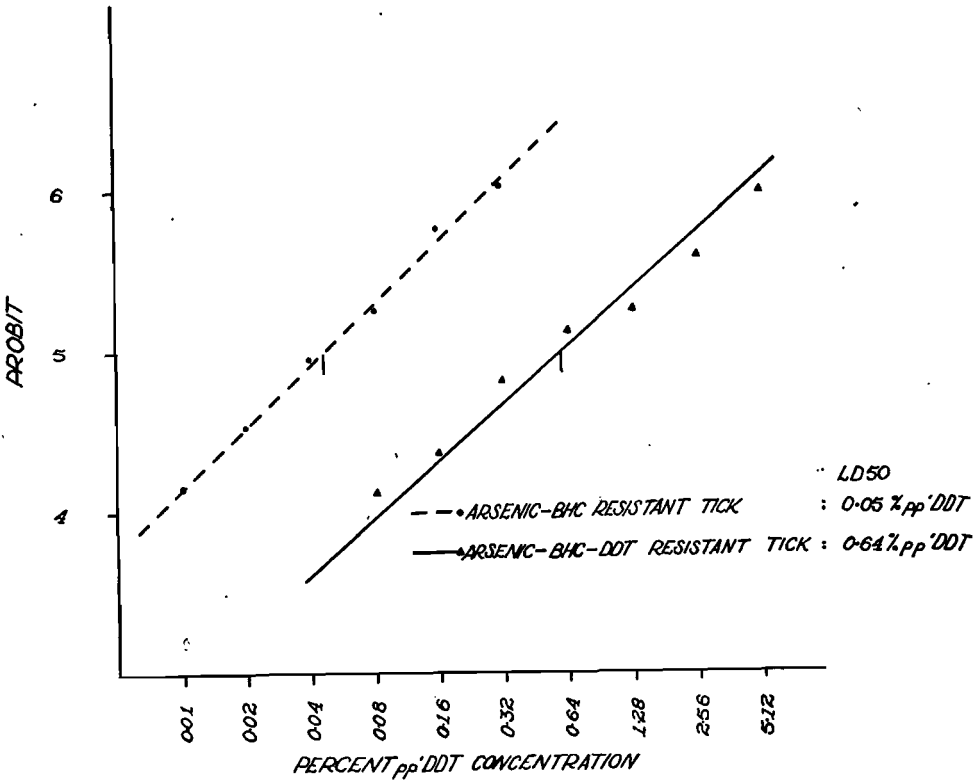

Fig. 1.

The effect of pp'DDT on different strains of blue tick larvae from the East London district.

The graphical probit regression lines obtained in these tests are presented in Fig. 1. Under the conditions of test the amount of DDT necessary to provide 50 per cent mortality was 0.05% pp'DDT for the ordinary strain of arsenic-BHC resistant tick and 0.64% pp'DDT for the suspected DDT-resistant tick. This establishes that a strain of the blue tick highly tolerant to DDT has now made its appearance in the East London district.

These findings are supported by laboratory tests carried out on adult fully engorged female ticks using a modification of a technique developed by Whitnall and Bradford (1947). The histogram (Fig. 2) indicates the difference in control exerted by various concentrations of pp'DDT on adult female ticks from different localities of the East London district.

Preliminary field trials have also given a strong indication of the development of a DDT-resistant tick in the East London district (McHardy and Baker, 1955).

Laboratory tests with adult female ticks have shown that ticks which are now resistant to DDT are also resistant to both arsenic and BHC.

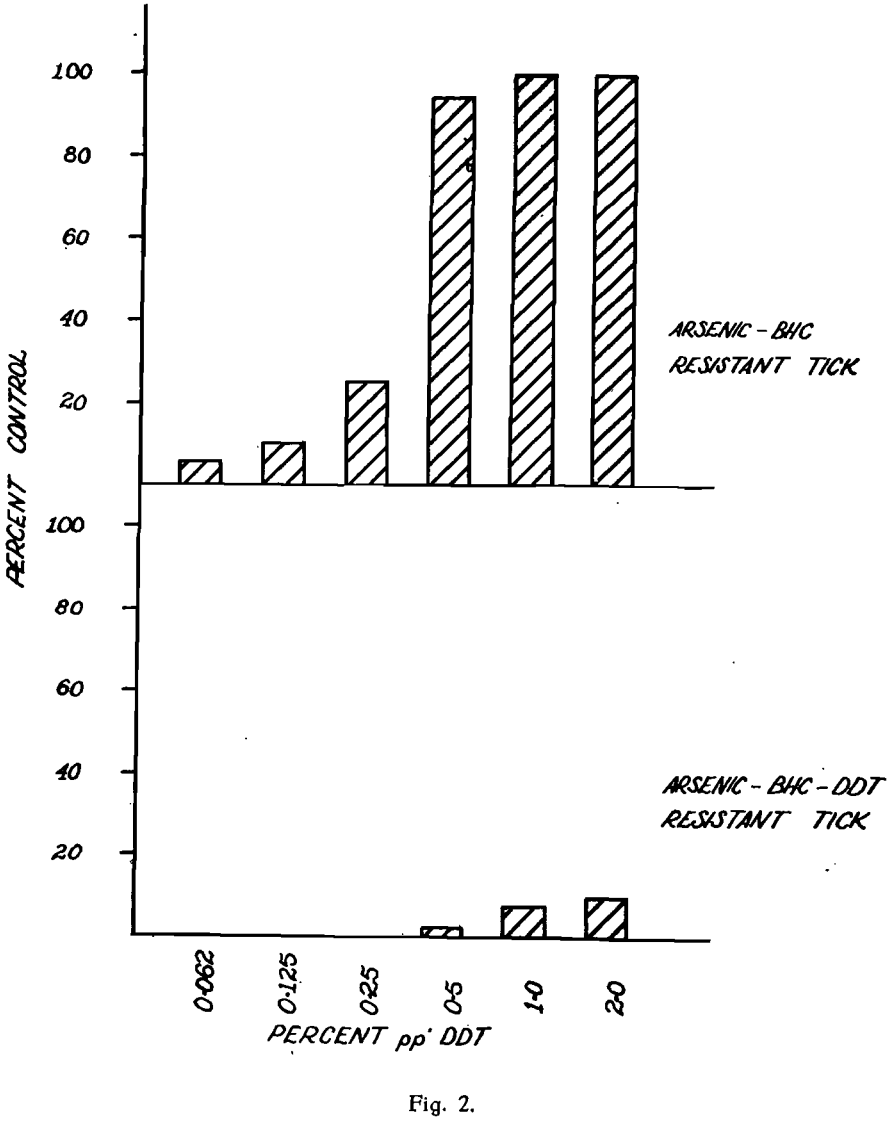

Fig. 2.

The percentage control exerted by pp'DDT on adult female blue ticks from different localities of the East London district.

Resistance to all three of these insecticides has developed independently and is a strong indication that the mechanism of resistance to the three materials is unrelated. The independent development of resistance to arsenic, BHC and DDT in the blue tick population from the same area suggests that environmental conditions play an important role in the development of insecticide resistance..

ACKNOWLEDGEMENTS

The laboratory work described in this communication was carried out in the Research Department of African Explosives and Chemical Industries, Limited, to whom thanks are due for permission to publish the results.

The writer wishes to acknowledge the assistance of Dr. L. C. Blomefield who first suspected the development of DDT resistance in the blue tick and who assisted subsequently in supplying specimens. The co-operation of Dr. W. M. McHardy and Mr. J. A. F. Baker of Cooper and Nephews South Africa (Pty.) Ltd., who were responsible for the collection and supply of adult ticks is gratefully acknowledged. Thanks are also due to Dr. R. A. Alexander, Director of Veterinary Services and his staff for advice and assistance in this work.

REFERENCES

BEKKER, P. M. (1953). A Blue Tick resistant to BHC, but not to Arsenic. Fmg. in S. Afr. 38, pp. 119-120, 136.

DU TOIT, R., GRAF, H., BEKKER, P. M. (1941). Resistance to arsenic as displayed by the single host Blue Tick *Boophilus decoloratus* (Koch) in a localised area of the Union of South Africa. — J.S. Afr. vet. med. Ass., 12, pp. 50-58.

McHARDY, W. M., and BAKER, J. A. F. (1955). Unpublished Technical Report S.A.F. 11/3/39. Cooper and Nephews S. Afr. (Pty.) Ltd.

WHITNALL, A. B. M. and BRADFORD, B. (1947). An arsenic-resistant tick and its control with gammexane dips. Bull. ent. Res., 38, pp. 353-372.

WHITNALL, A. B. M., THORBURN, J. A., McHARDY, W. M., WHITEHEAD, G. B. and MEERHOLZ, F. (1952). A BHC resistant tick. Bull. ent. Res., 43, pp. 51-65.

SWEATING SICKNESS IN MAN

No one has suggested that there is any etiological connection between sweating sickness of man and of the ox and, unless human beings in South Africa have acquired a very solid immunity to the bovine disease, it is very unlikely that there is a connection; there are many instances of veterinarians and farmers having handled ailing beasts with no ill effects to themselves.

In spite of the almost certain difference in etiology, a brief review of sweating sickness in man may, apart from its intrinsic interest, stimulate a desire to keep abreast with the latest work on the disease in cattle.

Barbara Winchester, in her "Tudor Family Portrait", records the activities of a firm of Tudor merchants, "Johnson and Company" (John, Otwell and Richard) trading between England and Calais, Flanders, France and Spain. Most of the book is devoted to the life of the times, to living conditions, trading and farming, and then, towards the end, to the "Tragedy of 1551". Five outbreaks of sweating sickness ravaged England, in 1485, 1508, 1517, 1528 and 1551. "This sickness cometh with a great sweating and stinking, with redness of the face and of all the body, and a continual thirst, with a great heat and headache because of the fumes and venoms." It was a great killer. "One moment a man would be talking to his friends; a second later he would kneel on the ground, and they would find that he was dead."

The 1517 outbreak spread like wildfire. In Oxford 400 students died. In London the King's Secretary died, the Bishop of Winchester and the Venetian Ambassador and his son were seriously ill. Rumours of the heavy death rate reached the Continent and, rather than visit Cardinal Wolsey at such a time, the Cardinal of Aragon and his retinue waited for weeks on the French side of the Channel. During this outbreak the first remedies(?) were used. The windows of the sick room were closed, a fire lit and the room kept warm. The bedclothes were tucked in and the patient's arms were crossed on his chest so that "not even the smallest breath of air should reach his armpits". No cold water was allowed — only a crust of bread soaked in ale, whole mace (spiced nutmeg) and sugar. "Above all, the patient had to be kept wide awake until the sweat had run its course, for it had been observed that those who slept sank into a fatal coma."

In the 1528 outbreak, Henry VIII was greatly perturbed. His beloved Anne Boleyn was threatened because one of her maids was sick and although Anne did, in fact, contract the disease, she recovered with, probably, as Miss Winchester suggests, far-reaching effects on England's history. "If Anne had died then, she would have been spared her tragic fate; there would have been no Royal Divorce, no break with Rome and none of the glories of Elizabeth's reign."

The disease gradually burned itself out in England only to break out on the Continent in 1529 where it was called the English Sweat. From Hamburg, it passed to Bremen and Danzig, to Lithuania, Poland and Russia, killing thousands as it went. Its southernmost limit was Vienna and slowly Europe began to recover.

In the 1551 and final outbreak, the second Johnson brother, Otwell, fell a victim and died. "On July 8th he folded and sealed his last letter to John as carefully as was his wont and at three o'clock on the morning of the 10th he died of the sweat". The disease disappeared from England in 1557.

Zinsser, in his "Rats, Lice and History" summarizes what is known of the disease. It began without warning with a chill and tremors. This was soon followed by fever and profound weakness with cardiac pain, palpitation, in some cases vomiting, severe headache and stupor but rarely delirium. A rash is mentioned by some writers. Death supervened with astonishing rapidity. A single attack did not immunize, since a number of people had two or three attacks in quick succession.

Zinsser compares the "sweat" with other diseases, and is of the opinion that it was not influenza, and suggests that it was caused by a filterable virus of a variety at present unknown.

Picardy Sweat, that resembled sweating sickness, appeared in France in the beginning of the eighteenth century and disappeared in the 1870's. According to Tidy (1945), the epidemics were explosive, reached their maximum in a few days, maintained this level for 2 or 3 weeks, then tailed off and the disease disappeared from the locality. The mortality could reach 40% but deaths were almost confined to fulminant cases, and few people died after 48 hours of illness. Many of the symptoms were the same as those of sweating sickness but according to Zinsser "most students agree that, apart from localization, the Picardy Sweat can be differentiated from the English sweating sickness largely on the basis of the eruption and of the violent mental symptoms accompanying the Picardy disease." Tidy, on the other hand, says that there is no substantial reason to doubt the identity of *Sudor anglicus* and Picardy Sweat.

The true nature of sweating sickness and of its connection, if any, with the Picardy Sweat will probably remain unknown. In view of the justifiable terror aroused by the English disease at least, it is, without question, best that man should be spared another visitation even if science suffers.

J.H.M.

References

Zinsser, Hans (1935). *Rats, Lice and History,* Reprinted 1935, 301 pp. London: George Routledge and Sons Limited.

Tidy, Henry (1945). *Sweating Sickness and Picardy Sweat,* Brit. Med. J. 2, 68.

Winchester, Barbara (1955). *Tudor Family Portrait,* 1st ed. 330 pp. London: Jonathan Cape.

THE GERMICIDAL EFFECT OF HEXACHLOROPHENE SOAPS

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Onderstepoort

Hexachlorophene is a chlorinated bisphenol also known as G-11. The use of Hexachlorophene as an agent for skin sterilization has been recognized by the United States Pharmacopoeia and only liquid soaps containing Hexachlorophene are recognized as antiseptic soaps.

Introduction

The main interest of previous workers was centred on the application of G-11 in the surgical theatre. Whilst good claims were made for the sterilization of the skin by Seastone (1947), Curtis (1951), Canzonetti and Dolley (1952) and others, it was emphasised that G-11 should be used in conjunction with iodine for sterilizing the operative site.

In the Bulletin of the American Society of Hospital Pharmacists (1949) a comprehensive survey of G-11 was reported. The phenol coefficient was determined as 125 and dilutions of 1 in 5,000,000 to 1 in 8,000,000 completely inhibited the growth of Staphylococcus aureus. A single scrub-up with Hexachlorophene-soap was not found to be sufficient. The soap must be used exclusively and regularly before any special advantages could be demonstrated. A 20% liquid potash soap containing 1% G-11 was advocated. The prolonged use of a soap containing 2% G-11 resulted in a significant decrease of carbuncles, furuncles and cellulitis and acne was reduced. The use of this soap left in contact with the skin for 1-3 minutes several times daily for at least five days a week, reduced the bacterial flora of the skin and maintained it at approximately 5% of the original count. This was ascribed to a residual effect of Hexachlorophene which attacks the deeper layers of bacterial flora of the skin. When this procedure was discontinued the bacterial flora recovered in seven days. An alcoholic rinse should not be used after G-11 as the alcohol extracts G-11 from the skin.

Florestano and Babler (1953) found G-11 to be very potent against gram-positive organisms in vitro, but it was not so effective against gram-negative organisms. The activity of this substance is markedly reduced by the presence of proteins.

Traub, Newhall and Fuller (1944) confirmed the work of Seastone (1947) and others in a trial in an asylum (where personal hygiene is of a low standard). The incidence of carbuncles, furuncles and acne was also reduced, reflecting the

germicidal effect of G-11. Patch tests were conducted and no sensitivity to G-11 could be induced.

Van Drimmelen (1956) examined the effect of Hexachlorophene on Brucella-organisms including Br. melitensis, Brucella abortus, Brucella suis and Strain 19. The growth of these organisms was uniformly inhibited for a zone of 5 m.m. radius surrounding a paper disc impregnated with Hexachlorophene.

Dichlorophene a chlorinated bisphenol known as G-4 or Fongicide was incorporated in these experiments.

In view of these reports it was decided to investigate the activity of G-11 soaps at Onderstepoort.

Methods

Test No. 1

For the execution of this test two proprietary preparations were employed viz. "Surge" containing 0.4% G-11 (2% based on 20% content of anhydrous soap) and "Gill" containing 0.5% G-11 (2.5% based on the anhydrous soap).

1. Hexachlorophene dissolved in ether. Paper discs were impregnated with this solution and the ether evaporated.
2. "Surge" diluted 1 in 10 parts distilled water and paper discs impregnated.
3. Fongicide (G-4) as in 1.
4. Phenol 1 in 10 parts distilled water and as 2.
5. "Gill" as in 2.
6. Methyl Violet tablets containing methyl violent 1 in 400 of inert base.

Cultures tested

Erysipelothrix rhusiopathiae.

Pseudomonas aeruginosa.

Corynebacterium pyogenes bovis.

Salmonella typhi type A.

Staphyloccocus albus.

The procedure followed was to flood a petri-dish containing medium with a suspension of the particular organism. The petri-dishes were left for fifteen minutes, and the excess fluid pipetted off. Paper discs were stamped out of filter paper, autoclaved and immersed in the test solution. They were left for fifteen minutes, removed and placed in dry, empty petri dishes to drain for half an hour. These discs were then placed on the surface of the test culture.

The tests were repeated to obtain consistent results and a table drawn up reflecting the zones of inhibition of growth in millimetres.

TABLE 1

Organism	*Medium used*	*Diametre of zones of inhibition in millimetres.*					
		Hexachlorophene 100%	*Surge* 1.10	*Fongicide* 100%	*Gill* 1.10	*Phenol* 1.10	*Methyl-Violet* 1.400
Erysipelothrix rhusiopathiae	Serum agar	—	3	—	—	—	—
	Peptone agar	1	10	2	11	2	—
	Tryptose agar	3	10	8	10	3	—
Pseudomonas aeruginosa	Serum agar	—	—	—	—	—	—
	Peptone agar	2	8	—	2	—	—
	Tryptose agar	2	8	—	—	—	—
Corynebacterium pypgenes bovis	Serum agar	3	3	—	2	—	—
	Peptone agar	—	5	—	5	—	—
	Tryptose agar	3	4	4	8	4	2
Salmonella typhi type A	Serum agar	3	4	—	5	1	—
	Peptone agar	6	8	3	5	3	—
Staphylococcus albus	Serum agar	1	3	1	5	—	2
	Peptone agar	2	5	2	7	2	3

TEST NO. 2

As the recommendations are that the soap should be used with as little water as is necessary to supply a good lather, the same test was run with pure soap and a 1 : 10 dilution of the soap in distilled water to observe the effect of dilution.

The paper discs were observed to draw moisture from the surface of the medium, accordingly dry blank discs were also used as controls.

The medium used was peptone agar.

TABLE II

Organism	Diameter of Zone of Inhibition in Millimetres.					
	Surge		Gill		Control	Methyl Violet
	100%	10%	100%	10%	Dry disc.	1 : 400
Staphylococcus albus	11	10	14	12	—	4
Corynebacterium pyogenes bovis	5	3	6	3	—	2
Pseudomonas aeruginosa	6	3	7	3	—	—
Salmonella typhi A	5	3	7	3	—	1
Erysipelothrix rhusiopathiae	2	1	2	1	—	—
	—	—	—	—	—	—

The medium used was peptone agar.

Table III

Organism	Diameter of Zone of Inhibition in Millimetres.						
	Surge			Gill			Methyl Violet
	1/10	1/100	1/1000	1/10	1/100	1/1000	1 : 400
B. anthracis	15	6	—	17	9	4	6
Streptococcus agalactiae	15	4	2	15	8	3	5

Test No. 3

Bacillus anthracis (virulent strain V27) and Streptococcus agalactiae were used in this trial.

Table IV

Growth of organisms on media containing G-11 soap, potassium soap and phenol.

Organism	G-11 soap.				Potassium soap.			Phenol.	
	1/10	1/100	1/1000	1/10000	1/10	1/100	1/1000	1/100	1/1000
Corynebacterium pyogenes bovis				+	+	+	+	∓	+
Psuedomonas aeruginosa		∓	+	+	+	+	+	∓	+
Proteus sp.				+	+	+	+	∓	+
Erysipelothrix rhusiopathiae						+	+	∓	∓
Streptococcus agalactiae				+		+	+		
Salmonella typhi		∓	+	+	∓	∓	+	∓	+
Staphylococcus albus				+		∓	+	∓	+
Bacillus anthracis				∓		∓	+	∓	+

+ = growth similar to control.
∓ = growth partially inhibited.

Test No. 4

It was decided to incorporate Hexachlorophene in the medium and to compare the effect of a liquid soap. This liquid soap was a potassium one. In addition to these two soaps phenol was used and media containing no addition acted as controls. The basic medium used was peptone agar.

It must be borne in mind that the concentrations of Hexachlorophene in the soap is 0.5%. Accordingly the dilutions of the G-11 soap must be multiplied by 1/200 to obtain the concentration of Hexachlorophene.

Discussion

From the work done at Onderstepoort it appears that the phenomenal decrease in skin bacterial counts is probably due to the effect of G-11 on the usually saprophytic gram positive Staphylococcus albus. The available overseas literature deals with general decrease of organisms occurring on the skin, rather than the effect of Hexachlorophene on particular organisms.

It was confirmed that the presence of serum suppresses the action of Hexachlorophene. Hexachlorophene was shown to be more effective against grampositive organisms.

From the results obtained above and the work of others it would appear that Hexachlorophene should be of great use to workers in microbiology, surgery, medicine, viz., cleaning of animals' skins, ringworm and pyogenic injections, and perhaps in the dairy industry as evinced by the effect on Streptococcus agalactiae.

Acknowledgements

The permission of the Director of Veterinary Services for the publishing of this article is gratefully acknowledged.

The Hexachlorophene soaps were supplied by the S.A. Commercial House (Pty.) Ltd., Johannesburg, as well as most of the literature.

Thanks are also due to Dr. Clark for his kind assistance in preparing this article for publication.

References

(1) Anon (1949). The Bulletin of the American Society of Hospital Pharmacists, Vol. 6, No. 2.

(2) Canzonetti, A. J., and Dolley, M. M. (1952): Bacteriological survey of scrub techniques with special emphasis on pHisoderm with 3% Hexachlorophene. Annals of Surgery 135, 228.

(3) Curtis, A. P. (1951): Clinical use of Hexachlorophene. U.S. Armed Forces Medical Jnl. 2, p. 819.

(4) Florestano, H. J., and Babbler, M. E. (1953). Antibacterial activity of a series of diphenylmethanes.

Jnl. of Am. Pharmaceutical Association, Scientific edition, 42, p. 576.

(5) Glaser, J. (1951): Prevention of minor skin irritation (miliaria) and impetigo in the new born. Am. Jnl. of Diseases of Children 81; p. 329.

(6) Seastone, C. V. (1947): Observations on the use of G-11 in the surgical scrub. Surgery, Gynaecology and Obstetrics 84, p. 355.

(7) Traub, Newhall and Fuller (1944): Studies on the value of a new compound used in soap to reduce the bacterial flora of the human skin. Surgery, Gynaecology and Obstetrics 79: 205.

(8) Van Drimmelen, G. C. (1956): Personal communication.

OBSERVATIONS ON THE TRANSMISSION OF FOOT AND MOUTH DISEASE TO GAME AND CONTROLLED TRANSMISSION OF THE DISEASE FROM GAME TO CATTLE AND VICE VERSA BY MEANS OF CONTACT

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Pretoria Kokstad
J. P. VAN DER MERWE
Pietersburg

The importance of game in the epizootology of Foot and Mouth Disease in Southern Africa has long been recognised. For various obvious reasons no experimental work had so far been undertaken except for limited transmission work from game to small animals by Rossiter and Albertyn during 1945. These workers quote also the instance of transmitting the disease from an infected kudu to cattle during 1937 by the Director of Veterinary Services, Southern Rhodesia, in that territory.

During the 1954/55 outbreak of Foot and Mouth Disease, in the Eastern Transvaal, game were once more implicated in the spread of the disease. To gain further information on this aspect the Director of Veterinary Services agreed to certain elementary experiments on the transmission of the disease from cattle to game and vice versa being carried out.

Purpose

To transmit Foot and Mouth Disease to game, observe the reaction and lesions in game, and its transmission by contact to cattle and other game animals. These observations to be controlled by infecting cattle, in a second experiment, and to observe the reaction and to attempt transmission to other cattle and game animals, by contact.

Method

A farm infected with Foot and Mouth Disease was selected as the site. No cattle had been to this part of the farm and it was well removed from all stock.

Two cages were constructed of approximately 15′ x 15′ and some thirty feet apart. The construction ensured the safe-keeping of the animals. (Fig. 1.)

Four head of young cattle, one young kudu male and three young impala were obtained. The kudu, two head of cattle and one impala were placed in cage No. 1 and the rest of the animals in cage No. 2. There was one drinking trough in each cage and the animals had to feed off the ground.

Fig. 1.
Experimental cage.

Arrangements were made to prevent mechanical transmission of the disease from one cage to the other and for the proper care of the animals.

The virus used was from a second sub-inoculation into cattle of a virus obtained from the Pilgrims Rest area. Tongue epithelium for typing was collected at the time the virus was aspirated from intact tongue blisters. The virus was typed as S.A.T.1.

The kudu in cage No. 1 and one of the cattle in cage No. 2 were infected intralingually by the injection of 0.4 c.c. of a 15% dilution of blister material.

RESULTS

The experiments were conducted by the officers responsible for the administration of the Foot and Mouth Disease campaign in this section. Continuous observations were therefore not possible.

The observations were made during the period 1.3.1955 to 31.3.1955.

The animals in Cage No. 1. Twenty-four hours after infection the kudu exhibited a tendency to lie down but no other deviations from normal. Forty-two hours after infection there was slight erosion of the epithelium of the tongue at the injection site but no blister formation. At this stage lesions were found in all four feet. Intact blisters extended the whole distance between the hoofs to the heels. The feet appeared completely normal when viewed from the front. Blister material and epithelium were collected at

this stage. (Fig. 2.) The latter was submitted for typing and the virus was again found to be S.A.T.1.

The kudu never developed mouth lesions.

There was no phenomenal rise in temperature. The first rise, 101.8° F., was observed twenty-six hours after infection and the highest, 103.4° F., was found at forty-eight hours. Thereafter the temperature returned to normal in less than two days.

There was rapid loss of condition in spite of a willingness to feed. A small necrotic area developed at the site of injection on

Fig. 2.

Collection of fluid from a vesicle in the foot.

the tongue. The foot lesions remained more or less moist up to the fifth day after infection.

The outstanding symptom was the tendency to lie down.

No observations were possible on the sixth day and the animal died on the morning of the seventh day, six and a half days after infection.

Post Mortem Lesions: The foot lesions had developed to the stage when "slippers" had started to form. There was congestion of the internal organs, particularly the lungs. The heart showed sub-epi- and endocardial petechiae with possibly reduced resistance of the myocardium. There were small haemorrhages in the connective tissue in the region of the kidneys.

The impala in cage No. 1 died from injuries inflicted by the kudu and cattle in the cage four days after commencement of the experiment. It showed no reaction of Foot and Mouth Disease.

The two head of cattle in this cage were kept under observation for a total period of thirty-one days. They never showed any lesions or other visible reaction. On the eleventh (103.6° F. and 104.0° F.), thirteenth (103.4° F. and 102° F.) and fifteenth (104° F. and 103° F.) days, temperature rises were recorded in both animals. These were probably due to high atmospheric temperatures prevailing at the time.

The animals in Cage No. 2: The infected bovine showed a well developed, intact, blister on the tongue eighteen hours after injection of the virus. The maximum temperature of 102.8° F. was recorded. The temperature returned to normal on the fifth day.

The control bovine showed a temperature of 102° F. on the twelfth day, after commencement of the experiment and a typical Foot and Mouth Disease blister on the tongue on the thirteenth day. The maximum temperature during the reaction was 102.4° F.

These cattle were also kept under observation for thirty-one days. They never developed visible foot lesions.

The first impala died on the second day of the experiment — probably from eating wilted grass. The second impala lived for seventeen days before it died from an injury. It did not show any discernible reaction.

Virus collected from the kudu was sub-inoculated intralingually into cattle on another farm. Blisters of 5 cm. and more in diameter developed after eighteen hours. Epithelium collected from these cattle was submitted for typing. The virus was once more found to be S.A.T.1.

Summary and Conclusions

Foot and Mouth Disease virus was artificially transmitted to a kudu by injection into the tongue. The animal exhibited loss of condition, a tendency to lie down and developed extensive foot lesions but no mouth lesions. It succumbed to the infection after six and a half days.

The in-contact cattle did not develop any visible lesions up to thirty-one days after commencement of the experiment. Failure to transmit infection through contact may be due to the nature of the virus itself.

In the reverse experiment infection spread to the control bovine but not to the one impala that survived captivity for seventeen days.

It was established that the kudu is very susceptible to Foot and Mouth Disease.

The virus was typed before infecting the kudu, again from material collected from the kudu itself, and finally from material obtained from cattle sub-inoculated with blister-material from the kudu. In all three instances the type was S.A.T.1.

Acknowledgements

We wish to record our thanks to the Director of Veterinary Services for permission to publish this article.

Thanks are also due to Mr. J. J. Jonker for permission to carry out the experiments on his farm Wildebeest; to Fauna and Flora and Mr. Malan for assistance to obtain the impala; to Mr. and Mrs. C. J. Lombard for presenting the kudu and to Assistant Stock Inspector Griffin for his assiduous care of the experimental animals.

Reference

Rossiter, L. W., and Albertyn, A. A. I. (1947) — Jl. S.A.V.M.A., XVIII, 1.

REINSCH'S TEST
A SIMPLE QUALITATIVE FIELD TEST FOR ARSENIC

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Most veterinarians have at some time or other wished for a simple test to indicate whether or not arsenic was present in a carcass or other material. Some years ago a somewhat elaborate and bulky outfit was issued to each Field Veterinarian but I, personally, did not find it very satisfactory. However, as I had the facilities of the College of Agriculture chemistry laboratory available and the good services of a qualified chemist, this did not worry me much. My greatest difficulty was that the chemist always insisting that I arrange for the ashing of the suspected material. This involved the use of a sandbath on a primus stove which often took several hours. Material from not-too-recently dead carcasses rendered my efforts somewhat unpopular with other staff members less interested in the test. The climax came when the whole outfit exploded because a flame was applied too soon. The danger of flying glass and sulphuric acid splashes made a deep impression on me and I decided that in the absence of a simple test I would leave the matter entirely in the hands of the chemists.

It was then that Dr. N. J. Viljoen drew my attention to, and demonstrated the application of, Reinsch's Test. This requires a minimum of equipment, is simplicity itself and can be applied in a few minutes. I have since obtained positive reactions from stomach contents, stomach-wall, liver and bone, also with soil samples and water. That such results can be obtained on the spot within half an hour will impress those who have conducted investigations involving the possibility of arsenical poisoning. A negative reaction can, of course, be just as important.

EQUIPMENT:

(a) Glass beakers of ½ to 1 litre capacity.
(b) Heating apparatus (this could at a pinch be supplied by the farmer) and asbestos gauze.
(c) Hydrochloric acid diluted 1 to 2 parts water.
(d) Arsenic-free copper-foil.
(e) Long-handled forceps (not essential but useful).
(f) Nitric acid in a drop-bottle.

Note: Copper-foil becomes dull with slight oxidation. This dullness is removed by moistening it with water, running a few drops of nitric acid over it and washing off quickly. This leaves the copper bright.

METHOD:

Put in enough material to take up $\frac{1}{4}$ to $\frac{1}{3}$ of the beaker's capacity, cover it with HCl, bring it to the boil and then put a bright strip of copper-foil into the boiling fluid. If arsenic be present the copper-foil will darken. This reaction is obtained in 15 minutes or less depending on the concentration of arsenic. If no arsenic is present the foil will remain bright.

Dr. Viljoen assured me that the only other substance that will give a similar reaction is antimony.

(Note by Mr. Brevis, Chemist, College of Agriculture, Potchefstroom: "The difference between the two can be determined by introducing the tarnished portion of the copper-foil into a flat arsenic tube. This, when heated, gives off arsenious oxide vapours which crystallize on the cooler part of the tube into tetrahedrons if arsenic is present and can easily be identified under a microscope.") Veterinarians will appreciate how remote are the chances of this element masking one's test outside Nagana areas.

I once obtained a suspicious atypical reaction which proved to be due to sulphur. This is a snag as sulphur is used in licks. The reaction, however, differs from that of arsenic by being patchy.

A useful control is to cut a thin strip of foil along the edge to nearly the full length of the piece to be placed into the boiling fluid. This strip is bent back over the rim of the beaker, thus making a useful "handle" and at the same time leaving a bright piece to compare with the immersed portion.

My personal outfit is a $8\frac{1}{2}''$ x $7\frac{3}{4}''$ x $7''$ vaccine box divided into four compartments roughly (a) $4\frac{1}{2}''$ x $4''$ for two beakers, the smaller fitting into the larger, (b) $4''$ x $2''$ for a drop-bottle with Nitric acid, (c) $3\frac{3}{4}''$ x $3\frac{1}{4}''$ for a roll of copper-foil and (d) $3\frac{3}{4}''$ x $3\frac{1}{4}''$ for 1 Winchester pint of Hydrochloric acid, plus $12''$ glass rod and a $7''$ crucible tongs.

Jl. S.A.V.M.A. 27 (2), 1956

AN OUTBREAK OF GASTRO-ENTERITIS IN THOROUGHBRED FOALS CAUSED BY SALMONELLA TYPHI-MURIUM

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Gastro-enteritis is a commonly occurring condition in thoroughbred foals in South Africa. It occurs, as a rule, as isolated cases in a stud, and since it usually responds to modern methods of antibiotic therapy, the aetiological factors would not appear to have received much research attention. Fatal attacks of infectious gastro-enteritis in foals, older than six months, have not been previously observed by us, although acute gastro-enteritis, with high mortality had been encountered in the new-born foal. Mason and Robinson (1938) investigated the cause of such an outbreak and concluded it was due to Cl Welchii type B, the lamb dysentery organism.

Salmonella typhi-murium infection in South Africa has been recorded previously by Henning and Clark (1938) as a cause of purulent arthritis in a foal. Henning (1939) has also isolated the organism from mares which had aborted. These are the only references that can be found in the literature in which Salmonella typhi-murium has been identified as pathogenic for equines in this country.

The organism has, of course, been identified with gastro-enteritis in equines in other countries (Edwards 1934). This author gives a short survey of the literature on the subject. Up to the time of the publication of his article, its aetiological role in diseases of equines had received more attention in Germany than in other countries.

Cosgrove (1955) and Collins (1955) have recently mentioned its aetiological significance in gastro-enteritis in thoroughbred foals in England and Eire. In fact, Collins says that S. typhi-murium is the chief cause. Cosgrove suggests that B. Coli is the chief cause of acute gastro-enteritis in new-born foals, but that Salmonella infection may be considered a contributory factor.

The present report is concerned only with an outbreak of infectious gastro-enteritis in thoroughbred foals experienced on the largest stud farm in the Natal Midlands. The outbreak was most interesting in many respects. The stud maintains more than fifty thoroughbred mares and three stallions. The management and supervision are very good. However, oats, during the period of the outbreak, were in short supply for race horses, thoroughbred mares, foals and yearlings. Consequently, breeders were some-

times unable to purchase high quality grain. This was the case with some of the grain purchased for the stud under consideration. The horses were fed a balanced ration which was supplemented with the necessary minerals and trace elements. Aurofac was also fed as an antibiotic supplement to try and produce greater growth. Further, all foals were fed phenothiazine continuously for 21 days on and 7 days off. The foals were dosed with carbon bisulphide, by the stomach tube, after weaning. They were run on indigenous pasture during the day and stalled at night.

Although the owner called for professional advice when the animals became indisposed, they were not under constant veterinary supervision.

Prior to the outbreak of gastro-enteritis, there was an outbreak of strangles (Streptococcus equi) in the stud. Professional advice was called for one case only. This was a yearling, not a foal. There were 28 foals living at the time of the outbreak. The foals were weaned in three groups when they reached approximately six months of age. The outbreak was confined almost entirely to the second group of nine foals. There was no environmental or nutritional explanation for this. According to the owner, all the foals were treated in the same manner. A few foals from the latest weaned group developed the infection, but in a less acute form, and recovered.

The outbreak of gastro-enteritis occurred during May, 1954, in several foals from the second weaned group that contained nine foals, approximately seven months old. None of the older group was affected, and at this stage, none of the younger group had, as yet, shown symptoms. All foals were run together during the day and stabled separately at night. There was direct contact in the paddocks.

When the outbreak of strangles had subsided, one of the affected yearlings failed to put on condition and eventually developed enteritis, which, in spite of treatment, continued intermittently for several weeks. This was the first case of enteritis observed, and it was this yearling that had to have professional attention for strangles. Although the colt had recovered from strangles, he remained poor and anaemic, and in this condition was an excellent subject for any infection. The colt was treated and improved, but he had several recurrences of diarrhoea over a period of 3 months. He eventually made a good recovery.

The outbreak in foals began in May and continued throughout June and early July, new cases developing at intervals during this period.

The first symptom observed was the passage of liquid faeces mixed with undigested roughage. The faeces soiled the hind quarters and the limbs to the hoofs and the tail was entirely wet. Diarrhoea was profuse. At first, there was no other marked symptom. The foals continued to feed and drink. However, there was rapid deterioration in the foals' condition. In some cases,

there was sub-acute colic which was continuous, the foal being very depressed and lying stretched out for most of the day. The colic sometimes continued for several days, being evident when the effects of treatment passed off. In the most acute cases, dehydration was rapid, with great loss of condition, sunken flanks, listlessness, inappetence, sunken eyeballs, relaxation of the anal sphincter, the faeces running from the anus without effort; the rectal temperature could not be taken. There was marked general weakness until the foal could not rise. Death occurred within two weeks in most cases. However, in some cases, where the disease was not so acute, the symptoms developed less rapidly and the foals lived three weeks. In these latter cases, treatment would bring about a temporary improvement for a few days, but in almost every case, there was a relapse.

In all, 11 cases were observed. Of these, eight died and three recovered. Several other foals showed loose faeces, but they recovered without treatment.

POST MORTEM:

Post mortem examination showed a markedly emaciated cadaver with the tail and hind quarters soiled with liquid excreta. The eyes were sunken. The mucous membranes were pale. The subcutaneous tissues were pale and somewhat yellowish. The muscular tissue was pale. The spleen and liver were slightly enlarged. The mucous membrane of the stomach and intestines was somewhat swollen and covered with mucus, which, on being scraped away, showed some reddening of the mucosa. The colon and caecum showed dark reddish patches. The surface of the mucosa appeared rough. There were some small nodules containing pus in the intestinal wall. Areas of slight peritonitis were present. Some petechial haemorrhages were present on the epicardium. There was no fatty tissue in the body. The picture was one of rapid wasting of all body tissue due to dehydration from gastro-enteritis and profuse diarrhoea.

BACTERIOLOGY:

Specimens in glycerine were taken from the liver, spleen, lung, intestine with pus nodules and faeces.

Cultures were made from these specimens:-

1. Directly on to McConkey's medium
2. Into Tetrathionate broth
3. On to liver agar
4. Into liver broth.

The specimens on to liver agar and into liver broth were cultured aerobically and anaerobically.

Slides were made directly from:-

1. Spleen
2. Blood
3. Pus in nodules.

When stained by Ziehl-Neelson method, the slides showed no acid-fast organisms.

When stained by the Gram method, the spleen and blood smears from the pus showed a number of Gram negative bacilli.

A smear from the pus was stained with Giemsa and showed a number of the cells were packed with small bacilli.

The next day the McConkey's media, which had been infected directly from the specimens, showed odd opaque colonies. These cultures were made from the liver, lung, diluted faeces and pus from the nodules. From each of these colonies slides were made and all showed similar Gram negative rods.

Sub-cultures made from the Tetrathionate broth on to McConkey's medium, yielded similar odd opaque colonies

These were again sub-cultured on liver media and the next day agglutination tests were carried out on slides. All gave positive reactions to S. typhi-murium sera.

Sugar tests were set up with the following results:-

Culture	*Lactose*	*Maltose*	*Glucose*	*Saccharose*
Foal lung	——	+ A & G	+ A & G	——
Pus nodules	——	+ A & G	+ A & G	——
Foal liver	——	+ A & G	+ A & G	——
Foal spleen	——	+ A & G	+ A & G	——

A tentative diagnosis of S. typhi-murium was made and sub-cultures were sent to Onderstepoort for typing and it was confirmed that the cultures were S. typhi-murium.

Blood samples from seven brood mares whose foals had died were tested with O and H antigens prepared from the cultures obtained from the foals. All tests yielded negative results, which would appear to indicate that the mares were not carriers and that the foals contracted the infection from elsewhere.

A vaccine was prepared from the cultures obtained and all foals were vaccinated twice at an interval of seven days. The vaccine was prepared by the method of Felix (1941) and to it was added Amphogel to intensify the reaction. Deaths ceased shortly afterwards but it would be difficult to claim that it was entirely due to the use of the vaccine.

The results of treatment were most disappointing. Affected foals were kept in the stables, which were disinfected at frequent intervals. They were put on to a low residue diet, consisting of breakfast oats, a little green food and teff hay. Those which did not feed, were given oatmeal gruel through a stomach tube. Very weak foals were given milk and eggs. When the foals showed improvement, they were again fed the balanced ration which, it will be seen later, was contaminated with S. typhi-murium.

The following therapeutic agents were tried, single or in combination. Intestinal astringents, Kaylene, chlorodyne, sulphamezathine, sulphaguanidine, aureomycin and chloromycetin. All drugs were administered through the stomach tube and were continued

throughout until death supervened or the foal recovered. Since the stud farm was several miles from the home of the veterinarian, aureomycin and chloromycetin could not be administered intravenously.

Towards the termination of the outbreak, a vaccine, made from S. typhi-murium, was given to all the remaining foals. It is doubtful, however, if the cessation of the outbreak was due to vaccination. The outbreak appeared to be subsiding at this time. It appears more likely that the source of contamination was withdrawn.

When the outbreak began, contaminated food was immediately suspected. Everything shown by the stud groom that was being fed to the foals, was examined. Nothing was found that could be incriminated. When S. typhi-murium was isolated from the dead foals, the stud-groom was questioned about the probability of contamination with rat faeces. He stated that there could be no such contamination. Some months after the outbreak had cleared up, the stud-groom remembered having got a consignment of grain screenings from a miller in a neighbouring town. Some of this had not yet been fed to the horses. It was examined by the stud-groom and found to be grossly contaminated with rat faeces. It was immediately removed from the store to be fed to fowls. Deaths amongst the fowls began to occur, consequently feeding was discontinued. This information did not come to us for some months after the outbreak, the stud-groom or the owner being reluctant to admit his failure to submit all food for inspection through an oversight. By this time it was too late to test the grain, which was contaminated with rat faeces, for S. typhi-murium. It had all been destroyed.

During the past two foaling seasons, 1955 and 1956, great care has been exercised in examining the grain for contamination and there has been no further trouble in the stud.

The probable explanation of the failure of therapy, is that the foals were re-infected as they improved and were being put back on a balanced ration which was made of crushed grain sweepings contaminated with S. typhi-murium. It is strange, however, that the disease was practically confined to one group of foals. For some inapparent reason, the second weaned group was more vulnerable than the senior and junior groups in the same climatical and nutritional environment. Further, the senior group was less vulnerable than the junior group. The average age difference between the three groups would not be more than one month.

References

Collins, S. M. (1955). Veterinary Record, 67, 50, pp. 966.

Cosgrove, J. S. U. (1955). Veterinary Record, 67, 50, pp. 961-965.

Edwards, P. R. (1934). Journal of Infectious Diseases, 54, 1, pp. 85-90.

Felix, A. (1941). British Medical Journal, 4184, p. 391.

Henning, M. W., and Clark, R. (1935). Journal S.A.V.M.A. 9, pp. 179-181.

Henning, M. W. (1939). Onderstepoort Journal 13, 79-189.

Mason, J. H., and Robinson, E. M. (1938). Onderstepoort J. Vet. Sc. and An. Ind., 11, 2, 333-337.

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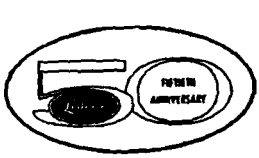

AN INSTANCE OF THE HIGH INCIDENCE OF TUBERCULOSIS IN RANCH CATTLE IN SOUTH AFRICA AND CERTAIN OBSERVATIONS ON THE SINGLE INTRADERMAL TUBERCULIN TEST

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Pretoria, Mtubatuba, Vryheid.

Until 1954 the general opinion was held that Bovine Tuberculosis in South Africa was essentially confined to dairy herds. This belief was strengthened by findings elsewhere which supported the contention that the disease progresses best under intensive farming conditions favourable to its spread. It was further contended that the South African climate with extremes of heat and continuous sunshine was a sufficient deterrent to the spread of tuberculosis under ranch conditions.

Very little tuberculin testing of ranch cattle had been conducted up to that time so that the belief in the relative freedom from tuberculosis of ranch cattle was not based on fact.

During 1953 the director of one of the Municipal Abattoirs reported that cattle infected with tuberculosis were repeatedly received from a certain region. The climate in this particular area is sub-tropical and subject to extremes of temperature during the summer months. Surface water is generally scarce, farmers having to rely almost entirely on bore-hole water for their stock. Small circular reservoirs or concrete troughs are in general use and watering points are relatively few.

The vegetation varies from fairly open grassland to thick indigenous bush. The region is one of the premier cattle raising areas in the country.

During an investigation ordered by the Director of Veterinary Services, during August 1954, 1,705 head of cattle, on five farms, were subjected to the single intradermal tuberculin test. Human strain P.P.D. tuberculin of a strength of 2 mgm per c.c. was used with a dosage rate of 0.1 c.c. Readings were taken after 72 hours.

The general findings are summarized in table 1.

Farm	Total Cattle Tested	Total Reactors Adults	Calves	% Reactors	% Reactors amongst adult cattle	No. Indefinite
1	391	70	2	18.4	33.01	—
2	359	77	3	22.28	25.21	—
3	309	58	2	19.42	27.75	—
4	224	4	—	1.78	1.78	—
5	422	12	2	3.32*	—	29
	1,705	221	9			

* Does not include indefinite reactors.

The owner of farm No. 1 decided to send all the reactors for slaughter. It was possible to inspect forty-two of these animals at the Abattoir. The post-mortem findings together with the tuberculin reactions are listed in table 2.

Animal	Normal Skin Fold in mms.	Skin Measurement after 72 hours	Reaction	Post-Mortem Findings — Organs affected
1	19	40	DOH	Mesenteric Lymph glands
2	10	22	COH	Mediastinal Lymph glands
3	11	15	CT	Small suspected lesion in liver
4	12	20	DOTH	Bronchial and Mediastinal Lymph glands
5	9	20.5	DOTH	Retrophar., Mesenteric and Prescapular Lymph glands
6	9.5	36.5	DOTH	Mesenteric and Precrural Lymph glands
7	8	19	DOTH	Bronchial and Mediastinal lymph glands
8	10	17	COTH	Measles
9	10	25.5	COTH	Retropharyngeal, Supramammary, Periportal, Bronchial and Mediastinal Lymph glands
10	9	14	C	No visible lesions
11	8	14.5	CF	Bronchial and Mediastinal Lymph glands
12	9	16	COTH	Bronchial and Mediastinal Lymph glands
13	10	19.5	COH	Mesenteric Lymph glands
14	6.5	12	SDOT	Mesenteric and periportal Lymph glands
15	9	34	DOTH	Mesenteric, Bronchial and Mediastinal Lymph glands
16	9	29	DOTH	Retropharyngeal Lymph glands
17	11	31	DOTH	Retropharyngeal Lymph glands
18	9	35.5	DOTH	Supramammary Lymph glands
19	8	21.5	DOTH	No visible lesions
20	6.5	12	CO	No visible lesions
21	8.5	16.5	COHST	No visible lesions
22	7.5	32	DOTH	Retropharyngeal Lymph glands
23	7	13.9	DOH	Mesenteric Lymph glands
24	9	18	FOH	Supramammary Lymph glands
25	10.5	17.5	COH	Retropharyngeal and Mesenteric Lymph glands
26	8.5	35	DOTH	Mediastinal and Mesenteric Lymph glands
27	8	23	DOTH	Retropharyngeal and Supramammary Lymph glands
28	10	20	DOH	Supramammary Mesenteric, Bronchial and Iliac Lymph glands
29	8	21.5	DOTH	Bronchial and Mediastinal Lymph glands
30	9	13	SDO	No visible lesions
31	8.5	13	SDOTH	No visible lesions
32	14.5	19	C	No visible lesions
33	7	18.5	DOHST	Bronchial Lymph glands
34	6	12.5	FO	Bronchial, Mediastinal and Mesenteric Lymph glands
35	8.5	16.5	DOH	Bronchial, Mediastinal and Mesenteric Lymph glands
36	9.5	18	DOH	Bronchial and Mediastinal Lymph glands

37	7	13.5	COH	Retropharyngeal Lymph glands
38	6.5	11.5	DOH	Mediastinal Lymph glands
39	9	16	SDO	Retropharyngeal, Supramammary, and Bronchial Lymph glands
40	4.5	9.5	DOH	Advanced generalized T.B.
41	9	13	SDO	No visible lesions
42	7	14.5	CO	Bronchial and Mediastinal Lymph glands

Abbreviations:

D = diffuse; O = oedema; T = tender; H = Heat;
S = slight; F = flat; C = circumscribed.

The position in regard to increases in skin measurements in relation to macroscopical positive findings, at post-mortem, and not taking the nature of the reactions into consideration, is as follows:

Increases in skin measurements	4	5	6	7	8	9	10	Over 10	Total
Number of positive cases	1	2	1	8	2	2	2	15	33
Number of no-visible-lesion cases	2	3	1	1	1			1	9

There is evidence of probable per os infection in twenty-one of the thirty-three cases in which macroscopical lesions were found.

Discussion

During a conversation with the owner of farm No. 1 it was learned that the previous owner of the farm had introduced a number of dairy cattle about eighteen years previously. These animals apparently did not do too well in this area and were gradually eliminated and replaced with Nguni and Africander type cattle bred for beef production. It is possible that infection was introduced by these dairy animals.

It was notable that practically only adult cattle were infected with evidence that infection per os played the preponderant role. It can be assumed that under the ruling climatic conditions infection via the grazing played a minor if any role. Licks are not fed in the region. It is, therefore, concluded that the watering points served as the sources of infection. The relatively small volume of water in a trough must be subject to considerable contamination.

It appears that calves, while suckling from their mothers, do not drink much water, hence their comparative freedom from infection. Game animals are present in considerable numbers on some of these farms and it is possible that they too may become infected and serve as reservoirs of infection after the removal of infected cattle. Up to the present, however, it was not possible to establish infection in game on these farms.

The reactions to tuberculin were generally good and of the classical type. If the presence of macroscopical lesions is taken as a criterion it appears, in this instance, that increases in skin measurements of 7 mms. and more, were the most reliable to identify "positive" cases by. The location of the lesions did not

appear to influence the size of the reaction. In practically all instances the reactions extended to the subcutaneous tissues.

It may be significant that while animal No. 8 showed a fairly good reaction no tubercular lesions were found at post mortem but the carcase was heavily infested with measles.

Summary

Following on certain abattoir findings 1,705 head of ranch cattle were subjected to the single intradermal tuberculin test. A high incidence of infection was disclosed, especially amongst adult cattle. It is concluded that the watering points, consisting of relatively few small concrete reservoirs and troughs served as the sources of infection. This contention is supported by an apparent preponderance of infection per os as disclosed by the distribution of lesions found at post mortem in forty-two reactors from one of these farms.

Tuberculin reactions were good and generally involved the subcutaneous tissues. Increases in skin measurements of 7 mms. and more appeared to be the most reliable criterion in deciding on "positive" cases.

The high incidence of tuberculosis in ranch cattle is considered unusual under South African conditions.

Acknowledgement

We wish to thank the Director of Veterinary Services for permission to utilize and publish the data obtained through the organisation of the Division of Veterinary Services.

CASE REPORT

NEPHROPEXY IN THE DOG — TO TREAT COLIC RESULTING FROM NEPHROPTOSIS

J. F. BROWNLIE

Cape Town

Dr. Hofmeyr's excellent clinical article on Nephropexy in our December, 1955, copy of the Journal of the S.A.V.M.A. prompts me to record a similar case seen in 1952.

The subject was a six-year-old Ridgeback dog. He had a history of intermittent colic with accompanying restlessness and straining to pass stool.

My provisional diagnosis was enlarged prostate with faecal impaction anteriorly.

Rectally an enlarged prostate was palpable but the stool was normal in size and consistency. The latter was removed by enema. Penicillin-Streptomycin injections were given daily for four days to obviate prostate infection and a course of Stilboestrol was prescribed to cover benign hypertrophy.

No improvement took place and after two weeks with mild laxatives and sedatives in addition to his other treatment, an examination was made under Intraval anaesthesia since his large fatty abdomen made palpation difficult.

A firm mass about the size of an average tomato became palpable in the lower abdomen. Exploratory laparotomy was advised and carried out by routine midline incision, when the "mass" proved to be the left kidney freely movable in the abdominal cavity.

With suitable packing off this was anchored to the sublumbar area using the capsule of the kidney and a continuous suture was made along the greater curvature. This was loosely tied and then "hoisted" up and fixed. No. 1 chrome catgut was used. The incision was closed in routine fashion with two tension sutures.

He was returned home anaesthetised. No haematuria was reported — recovery was rapid and he is still alive and there has been no recurrence of colic.

My diagnosis at the time was kinked ureter resulting from a malpositioned floating kidney causing colic unrelated to the bowel at all. But from Dr. Hofmeyr's description it seems that the bowel may have been neurogenically involved.

LETTER TO THE EDITOR

Dear Sir,

UNPROFESSIONAL CONDUCT

The attention of the Veterinary Board has been directed to the practice of Veterinarians accepting employment in the State Service, or in Municipal Service or with corporate bodies and thereafter resigning the position to set up practice in the region or area covered wholly or in part by the appointment. A warning is sounded that such action may constitute unprofessional conduct and anyone contemplating such action in future would be well advised to approach the Veterinary Board, giving full particulars, before such action is taken.

Yours faithfully,

R. ALEXANDER,
Chairman, Veterinary Board.

24.1.56.

VETERINARY SPECIALISTS

The Animal Health Trust Canine
Research Station,
Kennett, Nr. Newmarket,
Suffolk,
31st January, 1956.

The Secretary,
South African Veterinary Medical Association,
P.O. Onderstepoort, Pretoria,
Union of South Africa.

Dear Sir,

At a meeting of the Permanent Committee of the International Veterinary Congress held in May, 1955, approval was given to an amendment to the statutes which provided for the affiliation to this Committee of International Associations of Veterinary Specialists.

It has been suggested that an International Association of Small Animal Specialists be formed and Mr. S. F. J. Hodgman (England), has been nominated as Provisional President whilst I have been asked to act as provisional Secretary.

The main purpose of the specialist associations is to encourage closer contact and collaboration with colleagues working in the same field. They will also be required to take the initiative for organising the scientific programme of their sections at the International Veterinary Congress in consultation with the Organising Committee, which in turn may submit to the Specialists Association subjects received from other quarters for consideration.

It is hoped that when the groups of small animal specialists are organised in each country or group of countries, they will organise their own meetings which may of course coincide with their National Veterinary Congresses. Also joint meetings with neighbouring countries may form an excellent preliminary for meetings of the Association at the International Veterinary Congresses.

The following are the main principles which will govern the affiliation of International Associations of Veterinary Specialists:-

1) Each International Association will be represented on the Permanent Committee of the International Veterinary Congress by one delegate (Membre titulaire). The nomination of a second delegate (Membre adjoint) may be considered. Each International Specialists' Association will have one vote.

2) The International Specialists' Associations will form an integral part of the International Veterinary Congresses and will hold a meeting at the same place and time as the International Veterinary Congress.
3) The International Specialists' groups will be self-supporting and autonomous.
4) The facilities during a Congress with regard to meeting rooms, interpreters, etc., will be arranged through the Organising Committee of the Congress.
5) The question as to whether a small subscription should be levied on the Specialists' Associations for affiliation to the Permanent Committee is under consideration.

It is realised that in some countries groups of small animal specialists already exist and where this is the case, I should be grateful if secretaries of these groups will contact me with a view to the formation of an International Association.

If no such groups exist, I would be grateful if you could arrange for the publication of this letter in appropriate Veterinary Journals so that individual colleagues can apply to me for membership, and in so doing form the nucleus of a specialist group in their own country.

Yours faithfully,

(sgd.) W. BRIAN SINGLETON,
M.R.C.V.S.

ESTABLISHMENT OF AN INTERNATIONAL ASSOCIATION OF POULTRY PATHOLOGISTS

The Houghton Poultry Research Station,
Houghton Grange, Houghton,
Huntingdon, England.

Dear Sir,

The amendment to the statutes of the International Veterinary Congress approved by the Permanent Committee in May, 1955, provided for the affiliation to the Permanent Committee of the International Veterinary Congresses of International Associations of Veterinary Specialists.

A number of such international associations already exist or are being established.

Although the main purpose of such specialist associations is to encourage closer contact and collaboration between veterinarians working in the same field, there are numerous instances in which they could be of considerable value, e.g. agreed nomenclature for certain diseases. In addition, it is the intention that such associations should assume, in consultation with the Organising Committee of each Congress, the initiative in arranging the scientific programme in their section of each International Veterinary Congress. It is also envisaged that the Organising Committee in their turn, would submit subjects received from other quarters to the specialists' associations for considerations.

Although the International Specialists' Associations may possibly only meet during the course of an International Veterinary Congress, the specialised group within a country or group of countries, e.g. Europe or U.S.A. and Canada, could meet more frequently, or when the opportunity arose, at National Congresses or Conferences. In the case of the proposed International Association of Poultry Pathologists, a meeting could also be held during the course of the World's Poultry Science Congress. The following are the main principles which will govern the affiliation of International Associations of Veterinary Specialists :-

(1) Each International Association will be represented on the Permanent Committee of the International Veterinary Congress by one delegate (Membre titulaire). The nomination of a second delegate (membre adjoint) may be considered. Each International Specialists' Association will have one vote.

(2) The International Specialists' Association will form an integral part of the International Veterinary Congresses and will hold a meeting at the same place and time as the International Veterinary Congress.
(3) The International Specialists' groups will be self-supporting and autonomous.
(4) The facilities during a Congress with regard to meeting rooms, interpreters, etc., will be arranged through the Organising Committee for the Congress.
(5) The question as to whether a small subscription should be levied on the Specialists' Association for affiliation to the Permanent Committee is under consideration.

It has been proposed that an International Association of Poultry Pathologists should be established. Dr. L. de Blieck (Holland) has been nominated as provisional President and myself as provisional Secretary. If an Association of Poultry Pathologists already exists in your country I would be pleased if you would ask them to contact me direct with regard to the formation of such an international association. In any case I would be grateful if you would arrange for the publication of this letter in your Association's journal in order that individual colleagues can apply to me for membership.

Yours sincerely,

(Sgd.) R. F. GORDON.

THE HARRY STEEL-BODGER MEMORIAL PRIZE

In the initial years of establishing this Memorial, the Committee seeks the help of divisions and veterinary schools in bringing it to notice among members of the profession and final-year students and in stimulating and encouraging individuals to apply, whom they believe would benefit by such an award. Your Division may, in fact, like to nominate a member or members whom it thinks eligible, and the Memorial Committee would be very pleased to receive any suggestions.

Applications must be received by 30th July and nominations should be accompanied by a brief supporting statement.

The Steele-Bodger Memorial Fund was established in September, 1953, to honour the memory of Henry W. Steel-Bodger, President of the Association from 1939 to 1941 and Chairman of the Survey Committee from 1939 to 1946, in recognition of his great services to the veterinary profession and agriculture, more particularly during the war years of 1939 to 1945.

The Fund was sponsored by the British Veterinary Association and contributed to by organised bodies within the profession, including the student bodies of the University Veterinary Schools, by agricultural organisations and societies interested in farm stock, horses and dogs, by veterinary surgeons individually in this and other countries throughout the world, and by many friends and associates of the late Harry Steele-Bodger.

The object of the Memorial is to further the aims and aspirations of the late Harry Steele-Bodger and, to this end, a travelling scholarship or contribution to a tour of study abroad, will be awarded at least once in every four years.

Particulars of the award are as follows:-

1. Members of the Royal College of Veterinary Surgeons are eligible; also final year students of any of the University Veterinary Schools in the United Kingdom and Eire.
2. The award will normally be the grant of income of the Fund for one year, or any part thereof, or failing suitable applicants or in special circumstances, may be the accumulated income of a period not exceeding four years.

3. Application should be made in writing to the General Secretary, B.V.A., 7, Mansfield Street, London, W.1, *not later than* 30th July each year.
4. The name and qualifications of the successful applicant, if an award is made, will be announced in September each year, and he or she will be expected to claim the award by 1st January of the following year, and to have completed the work by 31st December of that year. If the award is not taken up within 12 months of its announcement it shall be forfeited.
5. Applicants must inform the Association of their proposed course and place(s) of study and the successful applicant shall provide a report in a form suitable for publication within six months of the completion of the tour of study. The Association reserves the right to publish the report in "THE VETERINARY RECORD" if it so wishes. If such a report is not so provided, the Association may require that the grant be returned.
6. The Association shall have the right to withdraw an award after it has been made if it so decides.

Extract Letter from British Veterinary Association, London, d.d. 10th January, 1956.

BILL

to amend the Laws relating to Cruelty to Animals

(Introduced by Dr. V. L. Shearer, M.P.)

Be it enacted by the Queen's Most Excellent Majesty the Senate, and the House of Assembly of the Union of South Africa, as follows :—

1. The following new section is hereby inserted in the Prevention of Cruelty to Animals Act, 1914, after section thirteen

Regulations — 13 bis. (1) The Minister of Social Welfare may make regulations in regard to the following matters :

(a) the sale for the purpose of slaughter of bovine or equine females within three months of calving or foaling; or of the females of sheep, goats or pigs, within a month of having young;

(b) the transport of animals without making adequate provision for safety against accident or in overcrowded vehicles; or without adequate provision for food or water; or in any manner likely to cause suffering or unnecessary discomfort.

(c) the keeping of animals without making adequate provision for food, water and shelter, or the confining of animals in such a manner as to cause the suffering from lack of reasonable freedom; and

(d) the humane slaughtering of stock.

2. Any regulations made under sub-section (1) may provide penalties for the contravention of any provision therein contained not exceeding the penalties specified in section three (3), save that the Court may in a proper case prohibit the person convicted from possessing or being in control of any kind of animal specified for a period to be specified and may provide a further penalty for every day during which such prohibition is disregarded.
3. No such regulation shall be invalid because it is in conflict or inconsistent with any other law (not being an Act of Parliament) which directly or indirectly relates to or affects any matter dealt with by such regulation and any such other law shall, to the extent of such conflict or inconsistency, be suspended while the regulation in question is in force.

This Act shall be called the Prevention of Cruelty to Animals Amendment Act, 1956.

ARTIFICIAL INSEMINATION

Registration as a veterinarian ipso facto registers as an artificial inseminator in terms of Act 23 (1954). The register of the Artificial Insemination Board reserves the right to remove the name of a veterinarian from the list of approved artificial inseminators should it be found necessary.

Veterinarians would not be requested to pay the £1 registration fee as laid down in the Artificial Insemination Regulations. The attention of veterinarians is drawn to the above Act and the regulations framed thereunder (Government Notice 434, Government Gazette 5648 of 16-3-56).

BOOK REVIEW

DISEASES OF THE PIG — David J. Anthony, Bailliere, Tindall & Cox, London; 4th Edition, 25/-.

This book covers a wide field in having sections dealing with breeds, housing, management, feeding and diseases of pigs. There is a considerable amount of information, but in attempting to deal with so many aspects of pig husbandry and diseases the various sections have of necessity had to be curtailed.

A number of diseases found in South Africa are not described and others which do not occur here are included.

G. D. Sutton.

SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION

COUNCIL MATTERS

A meeting of Council was held on Thursday, February 2nd, 1956, in the Committee Room of the Meat Board Building, Pretoria.

Present: Drs. P. S. Snyman (Vice-President), R. A. Alexander (Hon. Life Vice-President), A. C. Kirkpatrick (Hon. Life Vice-President), G. D. Sutton (Treasurer), R. Clark, M. de Lange, M. C. Robinson, S. W. J. van Rensburg, C. F. B. Hofmeyr, L. van den Heever and S. van Heerden.

Apologies: Drs. Diesel and E. M. Robinson.

The following matters were discussed.

(1) *Professional Insurance Scheme.*

Dr. Clark reported that the General Purposes Committee had gone into the various documents and that they could report favourably on the scheme. Council agreed to Dr. Clark's suggestion that the Hon. Secretary write to the Management of the Scheme and enquire whether applications from veterinarians would be accepted. If veterinarians were acceptable a notification would be published in the Journal for information of members. — Agreed.

(2) *Veterinary Health Certificates.*

Dr. Clark reported that the General Purposes Committee had obtained quotes to have the certificates printed. Specimens handed round for inspection. After a full discussion it was agreed that the Finance Committee would establish the price per pad to members. (Suggested that 5/- and 6/- per pad respectively be the price to members.) Agreed to circularise branch secretaries to obtain firm orders, for pads of certificates from members before an order is placed with the printers.

Amendment to Veterinary Act to allow Veterinary Board to sit in on examinations.

It was reported that Dr. Diesel had spoken to the Registrar of Veterinarians, who advised that the matter was in hand.

MEMORANDUM — ATROPHIC RHINITIS OF PIGS.

The position of this disease as it affects South Africa outlined by Drs. Snyman and Alexander. Dr. Alexander pointed out that this memo. is intended for information of members of the profession.

Agreed at request of Dr. de Lange to have this memo. or abstract published in Journal.

MEMORANDUM — T.B. ERADICATION — COMMITTEE OF INQUIRY.

Dr. Alexander felt that every member of Council should have a copy to study and to prepare a memo. Notes that General Purposes Committee had prepared a memo. for submission to the Committee of Inquiry.

After some discussion it was agreed that all Council members and secretaries of branches be sent copies of the memo. prepared by the General Purposes Committee, together with questionnaire and that the matter be placed on the agenda of the next Council meeting.

GENERAL.

Date of Annual General Meeting.

It was suggested that the programme committee arrange the dates in consultation with Dr. Alexander who is chairman of I.B.E.D. Congress which is to be held in Pretoria during first week in August. The second week in August was suggested. — Agreed.

Award of prize by firm for post-graduate overseas study. Dr. Alexander reported establishment of this prize to Council and asked that Council nominate a member to sit on Selection Committee who award this prize.

Award of Gold Medal by I.B.E.D. for services to Veterinary profession, provided that work was done on African Continent.

Reported by Dr. Alexander. Agreed to let this stand over until next Council meeting.

Sheep Industry Committee —

The Secretary reported that Dr. Diesel had enquired into this matter and that the President was satisfied to leave matters as they are.

Dispensing by Veterinarians.

Dr. Hofmeyr reported that he had seen in the lay press that the Pharmaceutical Society had objected to medical dispensing medicines, drugs, etc., and he enquired what the position of the veterinarian was. — Agreed to await developments.

W.H.O. Public Health Fellowship.

Dr. van der Heever reported that Secretary for Public Health made recommendations to the W.H.O. and that he, Dr. van der Heever, had a mandate from the V.P.H. Group to request Council to make representations to the W.H.O. to include veterinary public health aspects, so that veterinarians could also be considered for award of these Fellowships. Agreed that Dr. Alexander discuss this matter with Secretary for Public Health.

SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION

COUNCIL MATTERS

A meeting of Council was held on Thursday, April 26th, 1956, in the Committee Room of the Meat Board Building, Pretoria.

Present: Drs. A. M. Diesel (President), P. S. Snyman (Vice-President), A. S. Kirkpatrick (Hon. Life Vice-President), R. A. Alexander (Hon. Life Vice-President), G. D. Sutton (Hon. Treasurer), M. de Lange, E. M. Robinson (Editor), R. M. du Toit, S. W. J. van Rensburg, R. Clark, C. F. B. Hofmeyr, L. van den Heever and S. van Heerden (Hon. Secretary).

No apologies received.

MATTERS ARISING FROM MINUTES.

Report by Convenor of Committee of Inquiry into Co-operative Employment of Veterinarians.

Dr. Diesel gave an outline of the work that had been done by the Committee. All the evidence and information had been obtained and it only remained to write the report.

Ante and Post-Mortem Inspection of Meat in South Africa. Dr. van der Heever handed out copies of the report he had drawn up, to members of Council. He tendered an apology for not having had this report sent out with the agenda. Dr. van den Heever then gave a resumé of the report.

It was agreed, at the suggestion of Dr. Kirkpatrick, that the report be considered and discussed at the next Council meeting.

Dr. Alexander, as Director of Veterinary Services, pointed out that the Veterinary Division used every opportune and appropriate occasion to stress the desirability of veterinary control in abattoirs and meat inspection practice.

Dr. van den Heever indicated that he and representatives of the Veterinary Public Health Group would appreciate the opportunity to meet and discuss with the Director of Veterinary Services, the various aspects mentioned in the report.

In view of the fact that executives of the various branches would attend the next Council meeting it was proposed that this report be sent to branch secretaries. Dr. Hofmeyr disagreed with this procedure as he felt that it should be circularised to all members. On being put to the vote Dr. Hofmeyr's amendment was defeated.

I.B.E.D. GOLD MEDAL AWARD.

Dr. Alexander briefly outlined the conditions governing this award, and asked Council to suggest persons to whom the award should be made. Dr. Alexander, as a member of I.B.E.D., would then make a nomination for I.B.E.D. to consider.

It was agreed on Dr. Snyman's proposal, seconded by Dr. Clark, that the matter be left in Dr. Alexander's hands.

In conclusion Dr. Alexander said that he would welcome suggestions from Council members should they choose to make them privately.

DATE OF ANNUAL GENERAL MEETING, 1956.

Dr. Robinson pointed out that as I.B.E.D. Congress was now to be held during the first week of July, the time of our Congress could conveniently be postponed somewhat. It was agreed to have the Congress from the 11th to the 13th September inclusive. Dr. Hofmeyr felt that the question of guest speakers should receive attention as early as possible.

VETERINARY HEALTH CERTIFICATES.

Dr. Clark reported that a few firm orders had been received from members in response to the circular to branches.

Dr. Clark suggested that an order be placed with the printers for 100 pads of each type and that the printers be requested to hold the type. This was agreed to.

Dr. Sutton felt that the sale of these pads of certificates should be administered through the Book Fund. This was agreed to.

It was also agreed to have copies of the pads available for sale at the registration desk during the Annual Congress. The pads would sell at 5/- and 6/- respectively.

TUBERCULOSIS ERADICATION — COMMITTEE OF INQUIRY.

Dr. Clark reported that because the above committee required to hear evidence before this Council meeting the decision taken by Council at its last meeting could not be implemented.

Dr. Clark and members of the General Purposes Committee completed and submitted a memo. and also gave oral evidence to the above committee on the 13th of April. Copies of the memo. were also circulated to branch secretaries for information and branch secretaries were asked to compile and submit memos.

on behalf of their branches, to the Inquiry Committee, and to give oral evidence, at the respective times and places indicated in the itinerary of the Committee.

DISCOUNT ON VACCINES SUPPLIED TO MEMBERS BY ONDERSTEPOORT.

Dr. Hofmeyr outlined the present system of discounts allowed and asked Council to investigate the possibility of obtaining for members, a discount on vaccines, irrespective of the amount purchased by any one practitioner.

Dr. Alexander informed Council that this matter is being considered by the Department, prior to representations being made to the Treasury. Treasury, however, was not favourably disposed granting such discounts and Dr. Alexander said that a letter from the Association in this regard would strengthen his hand. Dr. Hofmeyr proposed that such a letter be written to the D.V.S., and this was agreed to.

Dr. Hofmeyr felt, however, that only veterinarians should distribute vaccines and not Co-ops., stores, etc. Dr. Alexander pointed out that this would be in conflict with the accepted policy of the Government.

Use of both Official Languages on the Cover of the Journal of the S.A.V.M.A.

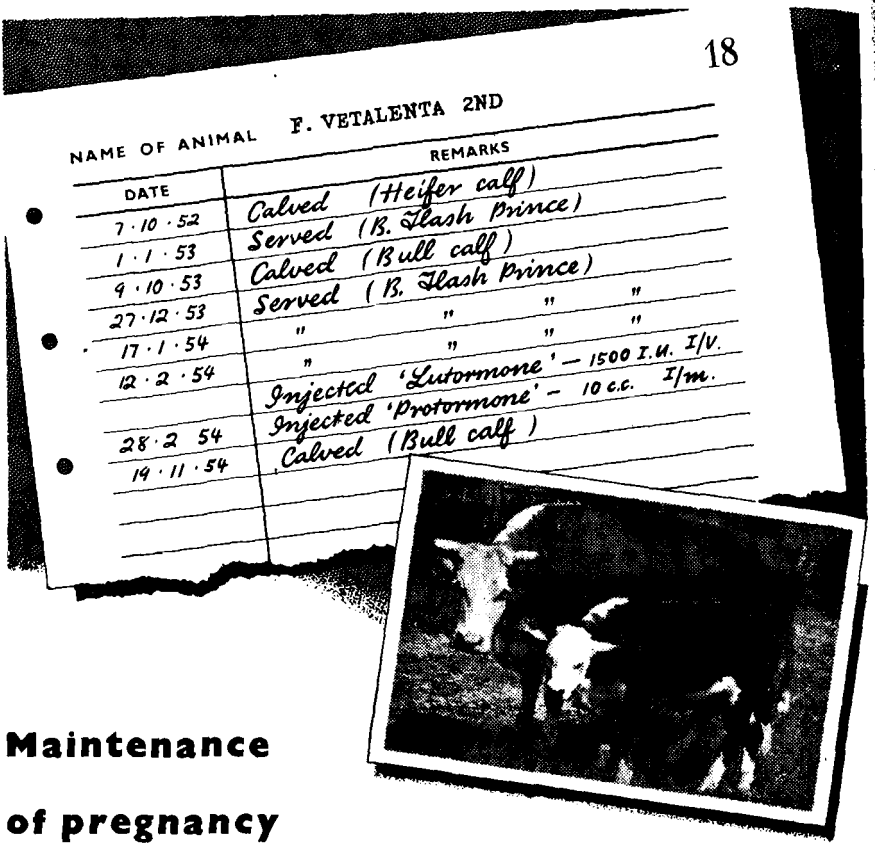
It was unanimously agreed to request the Editorial Committee to have the position rectified.

Visit of Sir T. Dalling to South Africa.

Dr. Diesel reported that he had received intimation that Sir T. Dalling would be visiting South Africa in 1957, and that he had written to Sir Thomas to say how pleased we (members of the Association) would be to meet, see and hear him. The visit was planned for January or February, 1957. It was agreed that the Secretary obtain more details of Sir Dalling's visit and also enquire what commitments we could arrange for him.

ERRATUM

In the article "The influence of running a stallion with non-pregnant thoroughbred mares" by C. W. A. Belonje, in the March issue, the words "Eight mares conceived, 4 mares settled in September, and 4 in October. Mare number 3 remained barren for the season" should have been included in paragraph 2 after "following results."



Maintenance of pregnancy

Mild luteal deficiency in the cow results in abortion or resorption of the fœtus. Until recently the common method of correcting this condition was to inject 'Lutormone' brand Luteinising Hormone at the time of service and then to give further doses until the cow was at least 12 weeks in calf.

Workers at The Wellcome Veterinary Research Station, Frant, have now demonstrated a more reliable method. This is the administration of 'Lutormone' at the time of service followed 14-16 days later by one injection of progesterone ('Protormone').

'Protormone' is also of value in marked luteal deficiency, for example persistent ovarian cysts. In cases where two doses of 'Lutormone' have failed to correct the condition a response may often be elicited with 'Protormone'. 'Protormone' is issued in 20 c.c. rubber-capped multi-dose containers, containing 10 mgm. progesterone per c.c.

'PROTORMONE' BRAND

INJECTION OF PROGESTERONE (VETERINARY)

BURROUGHS WELLCOME & CO. (The Wellcome Foundation Ltd.) **LONDON**

Depot for South Africa:

BURROUGHS WELLCOME & CO. (SOUTH AFRICA) LTD., 5, LOOP STREET, CAPE TOWN

Jl. S.A.V.M.A. 27 (3), 1956

PRESIDENTIAL ADDRESS

51st ANNUAL GENERAL MEETING : S.A.V.M.A. SEPTEMBER 11th, 1956

A. M. DIESEL,
Pretoria

While glancing through the files of the Association recently I came across the following interesting reference to presidential addresses made by our esteemed colleague, Dr. P. J. du Toit, when conducting the 1927 Annual General Meeting. This is what he said:—

> "I was looking through the booklet of rules last night to make sure that I should commit no error today in conducting the Conference, and then I saw for the first time that a President is expected to deliver an address at the first meeting after his election. It was thus very late in the day that I saw this rule; in the past we have always taken it for granted that is was not necessary. I'm sure you will regard it as a waste of time listening to addresses when you can listen to scientific papers".

It is true that prior to 1927, very little attention was given to presidential addresses, even though provision had been made for them in the constitution. The objects of the Conferences were to advance veterinary knowledge, and while the constitution was essential it was not allowed to overshadow the real purpose for which the Association was founded. We, the present generation of veterinarians, of course hold the same views.

Between the years 1924-1936, two general meetings were held per annum — viz. a business meeting at Johannesburg, at the time of the Witwatersrand Agricultural Show and a scientific meeting held at Onderstepoort during March-April.

I personally view the presidential address as a very essential part of the agenda. It gives an opportunity to the President to review the highlights of the Association's activities and interests, and allows him, if he is so inclined, to show his ability as a philosopher, a master critic and even a clairvoyant.

If you page through the minutes of previous general meetings you will come across some very fine presidential addresses and there is no doubt about it, some of our past presidents were very accomplished soothsayers. Personally, I prefer to review the past rather than to attempt to foretell the future.

There have been quite a number of highlights of interest to the Association during the past year. I won't attempt to refer to them in order of merit, but rather to consider them from the scientific and constitutional or legal and administrative aspects respectively.

Quite a number of advances in veterinary research have been made known during the year. These are largely still unpublished and one cannot therefore quote chapter and verse. I refer particularly to the work done on virus and protozoal diseases, on improved methods of diagnosis and on vaccine production technique. Veterinary research is therefore still as active as ever.

It seems that at long last a serious attempt will be made to control bovine tuberculosis. The Departmental Committee appointed by the Minister, will submit its report by October of this year. It will no doubt be awaited with much interest by the profession.

The field veterinarian in the State Service has continued to prove his worth to his country. His duties seldom reflect the spectacular — more often the critical — side of his activities.

In the sphere of the Municipal Veterinarian much paddling through troubled waters is still being experienced. The Veterinary Public Health Branch has done some useful work in the short time that it has been in existence. These members of our profession have still many lone furrows to plough and we should stand behind them in their endeavours to advance this very specialised branch of veterinary science. While engaged on the Committee of Enquiry into bovine tuberculosis, it was indeed encouraging to appreciate the regard in which the Municipal Veterinarian is held by his public health colleague, the Municipal Medical Officer of Health.

The private practitioner too has continued to play his part in the preservation of animal health, but if one listens to the critics, life for him is tending to become a little more difficult. He is accused on the one hand of being in the "big money" while on the other, that his one time prosperity is about to be concluded.

I think that a well established private practitioner is most essential in an advancing country like South Africa. I don't think any have made fortunes, but if some should have done well this could only have been due to the attention which they gave to the job in hand. Many other people engaged in private enterprise have improved their positions during the years of prosperity and surely no one should grudge a veterinarian a little prosperity during such times. If altered circumstances affect his income it doesn't mean that he will necessarily be forced to seek a more stable type of existence.

I would now like to draw your attention to a few features on the constitutional, legal and administrative side of our professional responsibility. Looking at your Agenda you will see that quite a bit of space is taken up by proposed alterations to the constitution. Your council has considered these contemplated changes and they are commended to you for your attention when the business side is discussed on Thursday. These proposals visualise an improved administration in the affairs of the Association through an executive committee which can attend to them day by day. It is proposed to increase the members of Council from 8 to 11 and to have two

ordinary Council meetings per annum instead of four. The membership of your Association now stands at well over 300 and greater representation in Council is therefore called for. The idea of regional representation on Council was voiced a year or two ago.

I see a further advantage in adopting these suggested changes, viz. the possibility of the Executive Committee attending the Annual General Meetings of the various Branches of the Association, once every three or four years, thereby to some extent accommodating the much favoured idea at one time of holding the annual meetings at various provincial centres. At least such an arrangement will bring the Branches into greater contact with the affairs of the parent body.

Over and above these changes which you are now being asked to consider, I feel that the time has arrived to review the constitution of the Association as a whole.

As you know, the South African Veterinary Medical Association was formed by the amalgamation of the Transvaal Veterinary Medical Association, The Natal Veterinary Medical Association and the Cape of Good Hope Veterinary Medical Society. The inaugural meeting was held in the Board Room of the Witwatersrand Agricultural Society in Johannesburg on April 1st, 1920.

The three provincial associations had previously discussed the matter of their amalgamation into the one central association. The records of the council meeting of the Transvaal Veterinary Medical Association, held in Johannesburg on October 11th, 1919, show that at this meeting rules for the new Association were passed for confirmation at the inaugural meeting which had been set down for April 1st, 1920.

These rules were very largely based on those of the Transvaal Veterinary Medical Association, which had, together with its constitution, been registered in 1903, under authority of the Transvaal Ordinance No. 56 of 1903. This ordinance provided for the incorporation of Societies and their registration at a fee of twenty-five shillings. Ordinance No. 56 of 1903 was revoked by The Companies Act No. 31 of 1909 of the Transvaal and this in turn was superseded by the Union Companies Act No. 46 of 1926, as amended.

The Constitution of the S.A.V.M.A., agreed to at its inaugural meeting in 1920 and correctly registered in terms of the provisions of Act No. 31 of 1909, was printed and issued to members in 1922. By Section 21 of Act No. 46 of 1926, continuity of registration of the Association as a non-profit making society was effected and the registration of its constitution accordingly maintained.

At the Annual General Meeting of the Association held on March 28th, 1929, a committee was appointed to draft a new set of rules. These were considered by council on March 29th, 1930, and approved at the General Meeting on 17th April, 1930. This new set of rules was then also registered in terms of the provisions of Section 21 of the Companies Act.

By 1940 it had become necessary to reprint the constitution and to incorporate the amendments made since 1930.

More than a dozen amendments to the constitution have been made since 1940.

It seems indicated therefore that the constitution of the Association should be reviewed and reprinted in a manner which will allow for easy annotation of future amendments.

You have very recently been supplied with a copy of the amended Ethical Code as drawn up by the Veterinary Board.

It is up to each one of us to study this code very carefully and to appreciate its significance.

You may be wondering what has happened to the suggested amendment to the Veterinary Act. A rough draft of a new Bill has been prepared but this has as yet not been seen by the Veterinary Board or by the Department of Agriculture. There are a few reasons why no further action has been taken at this stage. Firstly the Parliamentary Programme appears each year to contain more urgent and pressing legislation and I doubt very much whether a new Veterinary Act will be favourably considered by the Minister at this stage. Secondly the rough draft of the contemplated new Bill contains two or three contentious aspects viz. the influence which the Board should have on Veterinary Education, the application of any new Act to South West Africa and the future constitution of the Board itself. Personally I feel that the Veterinary Board should consider this rough draft and perhaps agree to approach the Department for authority to circulate it for criticism so that in a year or two when the Minister may be able to give his attention to it, it could have some chance of being favourably considered.

The present Act is working fairly well and can continue to meet our needs until it can be replaced by a new one without too much trouble. While on the subject of legislation I must draw your attention to two new legal provisions which affect our interests as veterinarians.

The first is the amendment to the Sixth Schedule of the Medical Dental & Pharmacy Act No. 13 of 1928 as amended by Act No. 29 of 1954. The amended Sixth Schedule is set out in Proclamation No. 20 of 1956, appearing in the Government Gazette No. 5625 of 10 February, 1956. It will save lots of people lots of trouble if veterinarians will study this new Sixth Schedule, particularly in its relation to the registration of Stock Remedies under the Fertilizers, Farm Feeds, Seeds and Remedies Act No. 36 of 1947 and its supporting Regulations. It is disquieting to stock owners and pharmacists when veterinarians advise farmers living away from chemists to obtain certain drugs only to find that the substances are only procurable under cover of a veterinary prescription.

The second piece of legislation to which I wish to draw attention is the regulations under the Artificial Insemination of Animals

Act No. 23 of 1954. These are published in Government Notice No. 434 of 16 March, 1956.

Before coming to the valedictory part of this address I would like to mention three further items of interest. Firstly I understand from the Director of Veterinary Services that a prize for post graduate overseas study is contemplated by a well-known firm in South Africa. Secondly, I understand that a Gold Medal is to be given by the Inter-African Bureau of Epizootic Diseases for services given to the veterinary profession in Africa. Our thanks go to the Director for the part he played in these privileges.

Lastly I would draw your attention to the report of the sub-committee which investigated the subject of the employment of veterinarians by Co-operative Societies and similar non-professional veterinary organizations. This document is now available to you. I urge you to study it carefully in order that it may be fully discussed during the present meeting.

In conclusion I wish to thank office bearers and members alike for the assistance given to me during the four years of office as President of the Association. In this connection I would like particularly to thank the Secretaries, Dr. de Lange, Dr. Weiss and Dr. van Heerden and the Treasurer Dr. Sutton for the hard work which they undertook, especially last year during the Jubilee Congress. To the ladies too, I wish to express our sincere thanks for their meticulous attention to the social side of our activities. Without their assistance our Congresses would be very ordinary affairs.

I would also like to thank the various branches of our Association for their kind attention to me when appearing at some of their Annual General Meetings.

Our special thanks goes also to the staff of Messrs. Glover and Dyer, our Secretaries, for the services they have so willingly given to our Association.

Jl. S.A.V.M.A. 27 (3), 1956

RABIES IN THE NORTHERN TRANSVAAL (1950 OUTBREAK)

P. R. MANSVELT,
Louis Trichardt

Prior to 1950 it was thought that in the Union of South Africa, Rabies remained confined to the mungoose (meercat) inhabited areas of the central plateau, where occasionally other types of wild carnivora such as the spotted genet, suricate, blackfooted cat, wildcat, skunk and others became involved as carriers. They accounted for sporadic cases of rabies in domestic animals and human beings, but the disease in that area had never assumed epidemic proportions in dogs. Up to the year mentioned the disease had never been diagnosed in the Northern Transvaal.

In the adjoining territories, rabies had not been diagnosed in Mocambique; in Bechuanaland Protectorate a case in a native child was reported by Hobday in 1936. It was known to exist in jackals and dogs in South West Africa. According to Edmonds (1922) rabies was known in the area North of the Zambesi River in the 19th century. The same author also mentions that it was known to the Matabele tribe in Southern Rhodesia before he diagnosed it near Bulawayo, in August, 1902. From this centre the disease was discovered to have spread radially in all directions in the colony. It would appear that it affected dogs principally, although every species of domestic animal became infected. No cases were proved in wild animals, but according to Edmonds there was every reason to believe that wild carnivora were infected to a considerable extent. Reports were received of several animals having been bitten by rabid jackals and there was a noticeable decrease in the number of wild dogs in the territory.

Some 60,000 dogs were destroyed by the police for non-compliance with muzzling regulations. The incidence of the disease decreased with the drop in the dog population, but sporadic cases continued to occur for a period of eleven years afterwards. No cases were discovered after 1914 and Southern Rhodesia was considered free from rabies.

Dogs were destroyed as a precautionary measure in a fifty-mile wide area along the border of Transvaal, and this was apparently effective in preventing its introduction into the Union.

History of the Outbreak which Started in 1950

In June, 1950 rabies suddenly made its appearance in the Northern Transvaal, a hitherto unsuspected area. Two cases occurred almost simultaneously, one at Messina, close to the Rhodesian border and another further South in the Limpopo River valley, on the Bechuanaland border. Although these were the

first discoveries there were indications that the disease had actually entered the Union some months previously.

The dog involved at Messina belonged to a Hospital Sister, who was able to give a fairly accurate account of the history of the case. The symptoms as described by her give a fairly accurate picture of the disease as manifested in dogs during this outbreak. A wound, which appeared to be a bite, was first noticed on the dog's hindleg on the 10th of June, and on the 27th the leg appeared swollen, and the dog continually licked it. That evening when taken for a walk the animal was excited and howled in a queer manner. During the following days he would disappear from home for long periods and eventually return either very excited or exhausted. He fought other dogs. On the 30th, the night before his destruction, he moaned and cried continuously; his mouth was dry and full of soil and he scratched and bit at the walls. Examination of the brain at Onderstepoort confirmed the clinical diagnosis of rabies.

Careful investigations led to the discovery of more cases in the border area, and it was then decided to conduct a partial zoological survey in an endeavour to establish whether as in the Free State and Western Transvaal, wild carnivora could be incriminated as reservoirs of infection. This brought to light the comparative absence of the mungoose (meercat) and confirmation of the supposition that, contrary to previous experience, dogs and jackals were the main carriers in the Northern Transvaal. It also became apparent that with dogs and jackals as the principal disseminators of infection, we had to contend with a rabies virus differing somewhat from the mungoose carried strain and simulating more closely the much feared European street virus.

Within the first year numerous reports were investigated and 18 cases in dogs, three in jackals, two in donkeys, one in a cow and one in a native child were confirmed. The distribution of the cases shewed that the disease had made it appearance along the whole Limpopo River border with shallow penetration into the drier, less densely populated North-Western parts of the district. In the centre it was apparently spreading along the Njelele River, penetrating deeply into the more densely populated native areas in the East. Isolated cases, through probable movements of infected dogs, occurred in other directions, but the main wave seemed to follow the water courses, and therefore, populated areas.

In the first half of the ensuing year (1951) the epidemic raged in the Sibasa native area in the East, when 29 cases in dogs and one in a mungoose (*Paracynictis selousi*) were confirmed by laboratory examination. This was followed by a marked drop in the next six months when only nine cases in dogs and one in a native woman were discovered. It appeared that the epizootic had passed its peak, which was borne out by there being only two cases in dogs and one in a cat in the third year. Eleven months passed without further cases being reported or discovered, although it was

known that the main wave had passed further South, into the Letaba and Potgietersrust districts.

Undoubtedly, and as could be expected, local centres of infection in wild animals were left behind and probably also in dogs in the remote inaccessible native areas. Early in 1954 three cases appeared in dogs in the Sibasa district adjoining the Kruger National Park, and one case in cattle in the dry North-Western part of the Zoutpansberg district. The latter was in all probability transmitted by a jackal. Later in the same year two more cases were discovered, one in a genet cat (*Genetta rubiginosa*) in the North-Western area and the other in a dog, near the Sibasa district boundary.

During 1955 the disease remained fairly quiet. Two cases were confirmed in wild animals, one in a jackal (*Thos Mesomelas*) and the other in a long-eared fox (*Otocyon Megalotis*) in the dry areas. The remaining two cases were in dogs in the Eastern native area.

In spite of only three cases being confirmed this year (1956) there appears to be a general spread in and around two centres, i.e. in dogs in the Eastern native area and in wild animals in the North-Western dry area. The three confirmed cases were one in a long-eared fox, one in a bovine and one in a dog.

It may be of some interest to note that in the first stages of the epidemic the majority of the cases were of the "furious" type, whereas towards the end "dumb" cases predominated. More "furious" cases appeared again in the latter years.

Control Measures

(a) General:

As rabies had not previously made its appearance in this area, the public in general was completely ignorant of the implications of this disease. To protect them and to obtain their co-operation, to locate all foci of infection so as to limit its spread, pamphlets were distributed to schools, police posts and veterinary inspectorate staff. Native Commissioners were requested to warn the native population, and farmers meetings were addressed on the subject. This programme of propaganda was greatly assisted by radio talks and news items released for broadcasting and to the press.

(b) Dogs:

(i) *General Control Measures.*

In consultation with the Southern Rhodesian Veterinary authorities it was mutually decided to prohibit the import and export of dogs. Southern Rhodesia imposed quarantine restrictions in six Southern native districts. The infected areas were similarly dealt with on the Union side of the border, but it was later found necessary to extend this quarantine to include the four Northern districts.

It was also decided to decrease the dog population by eliminating all stray and unlicensed dogs in the infected and threatened

areas. With the aid of the Provincial Licensing Officials dog hunts were organised on a house-to-house, hut-to-hut basis. Before the campaign commenced, the co-operation of the Natives was sought at meetings arranged with their chiefs and headmen. Their response was immediate — they had seen and heard enough of this frightful disease to agree to the voluntary destruction of their dogs. Some chiefs went as far as destroying all dogs in their areas before the official combing out. Maximum co-operation was also experienced on the part of the European population and a total of 11,959 dogs was destroyed, an estimated 60% of the dog population of the district.

There can be no doubt that this measure turned the tide in this district. The remaining isolated foci of infection could then be dealt with by vaccination with egg adapted Flury virus.

In June, 1952 vaccination of all dogs over 5 months old commenced. No trouble was encountered from the European owners, who produced their dogs, but the charge of 7/6d. per dose appeared to be excessive for the majority of Native owners, particularly as their dogs have relatively short lives because of biliary fever and distemper epidemics. To overcome this difficulty, authority was obtained in July 1953, to issue the vaccine free of charge. Up to this time 4,121 dogs had been inoculated. Lederle produced vaccine was used until June 1954, and thereafter Onderstepoort vaccine. The total number of dogs vaccinated to date is 15,532. It is estimated that over 70% of the dogs in the district have been inoculated with Flury virus.

Vaccination was at first concentrated in the urban and more densely populated areas, with the ultimate object of eventually covering the whole district. Since then annual inoculations to immunise dogs born and brought into the district since last vaccinations have become routine. When new outbreaks occur, all dogs in the area are re-vaccinated.

Co-operation from all sections of the community is always at its best when there has been an outbreak in the vicinity. Good timing in such operations seems to give the best results.

(ii) *Local Control Measures.*

Quarantine and tying up of dogs were imposed on the infected towns and surrounding areas. With the assistance of the Municipalities concerned, house-to-house notices were served. Stock Inspectors checked at irregular intervals and prosecuted negligent owners. In spite of this, control proved most difficult as a certain percentage of owners did not seem to realise the danger, and unleashed their dogs at night. Local Authorities found it difficult to deal with stray dogs because of cumbersome bye-laws and lack of catching and impounding facilities. In this way the restrictions were unnecessarily prolonged and owners became impatient, complaining about the cruelty of having to keep their dogs permanently chained.

It was a relief when immunisation methods could be applied. Advertising in local cinemas and house-to-house notices produced a remarkable response. Very few dogs missed the first round of vaccination.

The chaining of the dogs could not be rigidly enforced in the farming areas. Owners were advised to destroy all unwanted dogs and keep the remaining dogs under close control. The co-operation was good.

The same difficulty was encountered in Native areas, the only practical method being the destruction of all unlicensed and stray dogs plus mass immunisation.

Wild Carnivora

Quite early in our dealings with this outbreak, it became evident that the control measures hitherto employed in combating rabies elsewhere in the Union would not work here.

Conditions were entirely different, so much so that even the disease itself as has been pointed out, seemed to behave differently in that it spread more actively and rapidly all round.

If one compares the Northern Transvaal (North of Pretoria) to the Southern Transvaal and Orange Free State (Highveld), as regards latitude, altitude, climate, vegetation and predominant fauna one does indeed find very striking differences. The former, mainly tropical in climate, varying from arid to moist, embraces most of what we know as "bushveld" and "lowveld". The vegetation is typically bush, from sparsely wooded parkland to thicker Mopani and other associations, to rain belt forests. As the ideal and continuous "cover" for all sorts of wild life, this type of vegetation can scarcely be improved upon.

By contrast the Central Highveld with its higher altitude, colder climate, undulating windswept grassland, offers little or no cover. Little wonder that some of the fauna which survives there has been driven underground to seek shelter in innumerable burrows. It was this very feature in fact, which enabled the standard practice of gassing and trapping to be developed and applied with success in that area.

For the different kinds of wild "carriers" encountered in the North with their different life habits and favoured with such extensive and difficult bush cover, it was obvious that a fresh start had to be made. Some old ideas had to be abandoned and new methods had to be evolved.

How effective these measures have proved so far is detailed below.

Habits

After the discovery of rabies in jackals it was decided to extend the survey of wild carnivora to include and establish the number and distribution of other known rabies carriers. As already mentioned this confirmed the opinion that the main disseminators were dogs and jackals as there were not many meercats (*Cynictis Peni-*

cillata) and civet cats (*Civettictis Civetta*), and although badgers (*Mellivora Capensis*) and spotted genet cats did occur in some numbers they were localised to particular areas. Except for one case each, in a mungooose and a genet cat, no trace could be found of the disease affecting the species mentioned above, during the present outbreak.

This left the jackals to be dealt with, and we were at an immediate disadvantage as very little appeared to be known of this animal's habits. Groundwork had to be done and careful notes were kept during experiments to evolve a method to eliminate some of them in the infected areas. A few relevant facts may be of interest here.

It soon became apparent that in bushveld areas, jackals do not live in burrows as a rule. Only lactating bitches and pups apparently make use of burrows during the breeding season, which extends from August to October in these parts. A litter may comprise two to five pups according apparently, to the availability of food. Normally they hide in stony hills or thickets during the day and hunt in the more open parts late in the afternoons and early evenings, sometimes towards morning. Greater numbers are found where there is small game or small stock. Judging from stomach contents examined, they live on birds, ostrich eggs, small rodents, berries and even green mealies or watermelon when available. It is possible that they live on afterbirths of stock and game to some extent. The type of terrain and availability of water also influences the population numbers, e.g. fewer are found in sandveld, very dense bush and shrub, or where there is long grass. There are also fewer jackals in the mist belt or high rainfall areas of the district.

It appears that families or groups have their own hunting areas. They often hunt in pairs and follow roads and footpaths except in short grass or bare veld. They seem to avoid long grass until a scent is picked up and followed.

Civet cats, badgers and genet cats also follow bait drags. Civet cats appeared to live in dense shrub or stony koppies near water, and hunt later at night than jackals. Badgers are more often found in stony country near rivers. They have roughly the same hunting times as civet and genet cats. Very few other species followed our bait drags. The long-eared foxes appeared to have no interest in drags as they live mainly on insects. They apparently also make more frequent use of burrows as permanent homes than jackals. Leopards (*Panthera Pardus*) and hyenas (*Crocuta Crocuta*) do follow bait drags but appear to have no interest in poisoned bait.

Destruction Methods

The wholesale distribution of poisoned bait, as used in some countries to control rabies, appeared too dangerous for local application. A safer and more efficient method had to be evolved and the following is a brief summary of the work started here in 1950.

(i) *Trapping at burrows.*

No bait was used and 364 traps were set at burrows over a period of 21 days on 9 different farms. The results were not promising, the catches being three immature jackals, 17 long-eared foxes and eight mungoose (*Myonax*). As long-eared foxes were not known "carriers" at the time it was obvious that this method had to be abandoned.

(ii) *Trapping with bait.*

This method appeared to hold more promise when it was discovered that jackals did not live in burrows.

Game carcases, e.g. impala, bushbuck, blue wildebeest, kudu and zebra were used. The attractive properties of entrails and meat, from fresh to 72 hours old carrion (in summer) were noted. There was no noticeable difference. Jackals were apparently equally attracted by drags of the above materials, whereas the long-eared fox took little or no interest in them. There was also no noticeable difference in the attraction to the jackals whether the drags were made from behind a motor vehicle or on foot.

All traps set on or near the drags were buried and carefully covered with soil, particular care being taken to disturb the surface appearance as little as possible. Some were set while wearing washed rubber boots and gloves, other were scorched and some smeared with blood and ingesta.

In seven experiments the bait was left on the ground and the traps set around. In 12 trials the bait was suspended from trees, and traps set underneath.

Over a period of 18 days a total of 966 traps were set and only two jackals and one genet cat caught.

According to tracks the jackals readily followed the bait drags to the hidden traps, but here they would turn away. Even setting the traps a few days before baiting made no difference.

(iii) *Trapping with artificial bait.*

"Forster Geheimnis Milde Sorte Fuchswitterung", a patent German preparation used for attracting foxes, containing Indol and Skatol, was then tried in five trials on two different farms. These experiments lasted for three days each but no jackal or other animal was attracted. After the third day the drag and poison bait method was used on the same sites. On the first farm 10 out of 14 pieces were taken by four jackals and on the second eight out of 22 taken by one jackal and three civet cats.

This work was later repeated with "Forster Geheimnis Starke Sorte Fuchwitterung" on a different farm. Eleven traps were set for 10 days and three jackals and a badger were caught. This seemed to indicate that the stronger bait was more effective. There were, however, indications that they avoided the trapping area after the first seven days. It also seemed to offer too many practical difficulties as a means for large-scale destruction of jackals.

Figs. 1 and 2. Jackals destroyed by poison bait.

(iv) *Poison-bait method.*

This was found to be the most effective means of destroying jackals.

Variations of this method have been used by farmers for some years, and because of the failure of traps we were forced to resort to poison. It remained to work out a scheme which was safe, rapid and efficient. The ultimate object when developed, was to recommend this method to farmers for use on their farms and for use departmentally to control outbreaks of rabies in jackals.

Essentially the method is the placing of strychnine poisoned bait on drags made of meat, entrails and other carcase material. Game as described under trapping, and later donkeys were used

for bait and drags. As already mentioned jackals appeared equally attracted by any of these materials.

For poison bait raw meat was cut up into pieces approximately one cubic inch in size, and roughly ½ grain of strychnine put into the centre through a deep cut. These baits were prepared just before distribution late in the afternoon. The object being to have the baits small enough for the jackals to gulp down without having to bite and perhaps taste the strychnine. In freshly prepared baits the strychnine presumably has less time to pervade the piece of meat and for the same reason hard dry surfaces which would delay absorption when once swallowed, cannot form.

At first the baits were made and distributed without touching by hand, but experiments proved that this was an unnecessary precaution.

Different methods of distribution were tried and ultimately it was found more practical and efficient to make drags behind a motor vehicle placing two pieces of poison-bait on the drag mark at approximately 350 yards or 0.2 mile intervals. Experience showed that jackals preferred to follow drags on roads and footpaths, while drags through the veld were less successful. During the trials it was found that they would pick up bait and as a rule continue to follow the trail for some 200 yards. At this point they would generally turn off, apparently losing interest through the effects of the strychnine.

A routine mark was made with a spade on the ground some ten feet away from the placed poison-bait, to enable it to be located the next morning. Records were kept of the numbers and distribution of the poisoned baits. Early next morning the drags were examined for tracks. These and the number of pieces taken were recorded. Notes were also made of the number of dead jackals found, together with observations on their stomach contents, ages and states of lactation.

Incidentally a method was evolved by which the density of jackal population in different localities could be compared. The number appearing at poison-bait prints, according to tracks, is divided by the total length of the drag. The results are expressed in jackals per mile.

The country where the work was done is bushy and did not lend itself to the easy finding of dead jackals. The position of the strychnine in the bait sometimes led to slow absorptions. In such cases the animals would go relatively long distances before dying. On the average two pieces of bait were found in the stomachs of dead jackals. On this basis the total number killed could be calculated within reasonable limits.

To test the efficacy of the method, repeat trials were carried out. The results showed that jackals, although appreciably decreased in numbers, were not completely eradicated in the tested areas. When retests were carried out in the exact localities, the decrease was more marked, bearing out the supposition that jackals

lived in groups with defined hunting areas. By extending the interval between baitings an increase in number was found, which seemed to indicate that there was a gradual infiltration from the surrounding areas.

From a rabies control point of view however, the method was efficient in that it destroyed sufficient numbers, breaking down the close contact chain. In general it reduced the jackal population from an average of three to six, to less than one jackal per mile.

The work was carried out by one European official and four native labourers, using a ¾-ton light delivery motor vehicle. On an average two zebra or donkey carcases per week were used during the hot summer months. In winter however, it was possible to use one donkey carcase for a week, thus keeping the cost down to £1 or £1.10.0d. per week for bait.

The method has been in use since January, 1951 to control rabies in jackals and also to decrease their numbers over a wider area. The following figures give an indication of the extent of the work and its efficacy over a period of approximately 2 years.

Number of farms worked on	305	
Total drag distance	2,067	miles
Number of poisoned baits placed	21,020	
Number of baits picked up by jackals	7,917	
Number of baits eaten by other animals	978	
Number of dead jackals found	515	
Estimated number of jackals possibly destroyed	3,900	

All baits not taken by animals during the night were picked up and destroyed by burning or burial.

The method could be considerably speeded up in the morning by using a suitably low-built vehicle where one man could place and pick up baits without having to get off the vehicle. Naturally during our trials time was spent on observations and the area covered per night had to be limited. This would be unnecessary in large scale operations after a preliminary study of the topography of the terrain.

Other poisons e.g. H.C.N. capsules should be tried as they may have the advantage of killing more rapidly, carcases would be easier to find, thus enabling clearer evaluation of results obtained.

Discussion

The W.H.O. Expert Committee on Rabies, in their second report, considers that "the three basic principles of an operational program are elimination of stray dogs, canine vaccination and control of wildlife vector populations". For the sake of convenience I wish to discuss the local measures under these headings.

(a) *Elimination of stray dogs.*

The original large-scale reduction of the dog population in this district undoubtedly had a notable effect on the incidence of the

disease. The marked drop in the number of outbreaks must be attributed to this measure.

Licensing of dogs is controlled by the Provincial Administration. Due to the topography of the country, lack of roads and a large uneducated native population, officials were unable to reach all areas. At the time of the outbreak, therefore, a large number of dogs were unlicensed. The population had by this time seen or heard enough about rabies to agree to elimination instead of licensing. Working in conjunction with Provincial Officials, who were the only officials legally empowered to destroy unlicensed dogs, we were able to destroy the number mentioned earlier in this report.

As can be expected this measure led to an increase in the number of licensed dogs in later years. Also during the vaccination propaganda campaign, owners had to be assured that immunised dogs would not be destroyed. As there are no local pounds or facilities for the collection of strays it has become more difficult to apply this measure on the same basis, since it entails the grave risk of losing the confidence of dog-owners on whose co-operation much of the success of an eradication campaign depends.

(b) *Canine Vaccination.*

Vaccination of dogs has supplemented the previous measure. Unfortunately it has not been possible to reach the ideal state when all dogs are immune against the disease, with the result that there are a few foci where rabies appears to be smouldering. The "dumb" form is the most dangerous as it may often pass unnoticed.

Although vaccination is compulsory there is a very real difficulty in proving ownership of an unvaccinated dog in a native area, as it is immediately disowned by everybody. Without special powers it cannot be destroyed, more so if it should prove to be a licensed dog. Co-operation of all dog owners is therefore of the utmost importance for the success of a vaccination campaign.

In sparsely populated areas it has been possible to keep records of all dogs and very few escape vaccination. It is also in such areas where rabies has been quiet for a number of years, except in instances where it has recurred in wildlife, that it may have been smouledring or reintroduced.

Three breakdowns have occurred in this district, one 5 months, one $6\frac{1}{2}$ months and the third 17 months after vaccination. Two were done with imported vaccine and the third with vaccine produced at Onderstepoort. These dogs were vaccinated when over six months of age.

Although such cases may shake the confidence of some dog owners, they actually form a small percentage of the total number of dogs vaccinated. Under field conditions it is often most difficult to keep the vaccine cool. Some doses may deteriorate after too long exposure to high temperatures and when used give insufficient immunity. In other instances, the vaccine may not have been

properly applied, either through carelessness on the part of the official or intractability of the particular dog.

(c) *Control of wild life.*

According to the Expert Committee on Rabies (W H.O. Report on first Session) "it is recognised that rabies exists in two epizootiological forms:- (1) a widely disseminated disease propagated principally in dogs, predominantly in urban areas; and (2) a more localised disease of wild animals, ... "

In this district the disease apparently started in the first form and there are now a few foci of the latter form which are being dealt with as already described. There is still lots of experience to be gained but results have shown very clearly that this aspect of control should not be neglected. Experience in other countries seems to be in full agreement, e.g. the Chief of the U.S. Bureau of Animal Industry reports in 1951 that "community-wide vaccination programs doubtless are helping because rabies in other species except man, which parallels the dog, is not decreasing. Cattle with 948 cases, and wild animals showed marked decreases.

Acknowledgements

In conclusion I wish to thank the Sub-Director of Veterinary Services (Transvaal), Dr. J. G. Williams, under whose instructions and guidance this work was carried out. I would also like to thank Dr. A. D. Thomas of the Veterinary Investigation Centre, Louis Trichardt, for his assistance in the preparation of this paper, and the Zoutpansberg Veterinary staff for all their hard work.

References

EDMONDS, C. R. (1922): Diseases of Animals in South Africa. Bailliere, Tindal & Cox. Pp. 195-212.

EXPERT COMMITTEE ON RABIES (1950): W.H.O. Technical report series No. 28. Palais des Nations, Geneva, November 1950. Pp. 1-26.

EXCERPTS FROM THE 1951 REPORT OF THE CHIEF OF THE U.S. BUREAU OF ANIMAL INDUSTRY. Jnl. of the A.V.M.A., Vol. CXX, No. 901. Pp. 179.

KAPLAN, MARTIN M. (1955): The present status of rabies control in Animals. Reprint from REFUAH VETERINARITH (Veterinary Medicine), Vol. 12, No. 2, June 1955. Pp. 148.

WILLIAMS, J. G. (1953): Rabies — Its control in South Africa. Radio Talk, S.A.B.C., 7th January, 1953.

EXPERT COMMITTEE ON RABIES (1954): W.H.O. Technical report series No. 82. Palais des Nations, Geneva, April, 1954. Pp. 1-27.

Jl. S.A.V.M.A. 27 (3), 1956

EXPERIMENTS IN THE TREATMENT OF LUMPY WOOL

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INTRODUCTION

Lumpy wool is a condition found in Merino sheep, first brought to the notice of the Union Veterinary Department in 1925 — a very wet year — when severe outbreaks were reported all over the Union. The disease was first investigated by Bekker (1928) but it was Bull (1929), an Australian worker, who first described this skin disease and established the causal organism to be the streptothrix, *Actinomyces dermatonomus*. He successfully transmitted the disease by means of pure cultures of this organism and by scrapings from the lesions applied to the skin of healthy sheep. Since then Steyn (1931) has investigated the cause, transmission and treatment of this condition in South Africa. He found the Australian and South African Lumpy wool infections to be identical and to occur under the same climatic conditions, with heat and humidity being predisposing factors, but he failed to isolate the organisms. This was done, however, by Mason and Bekker (1934) who found the cultural and morphological characteristics to be identical with those of the organism described by Bull. Recently Snyders and Jansen (1955) have indicated that morphologically and biologically there is very little difference between the causative organisms of Lumpy wool and Senkobo Skin Disease. Schulz (1955) and Mornet and Thiery (1955) refer to the widespread incidence in Africa of mycotic dermatitis.

Lumpy wool occurs in the Union, more particularly along the Eastern escarpment with its high summer rainfall and its greater humidity, i.e. the grassveld region, but it has been reported from a number of different areas, always associated, however, with periods of high atmospheric humidity.

It is most often encountered in young sheep, i.e. lambs and 2-toothed, but cases in older sheep are not uncommon. The lesions are generally seen on the back and sides, more rarely elsewhere. Infection commences at skin level with a pustule which ruptures, giving rise to a copious yellow exudate which tends to coagulate rapidly and mat the wool fibres together. As the wool grows, the matted portions increase in length with the growing wool, the bases being added to from the continuous exudate until horn-like rods of hardened exudate enclosing firmly cemented wool fibres rise from the skin to staple length. These masses vary from a quarter to one inch in diameter and frequently show a tendency to coalesce so that areas several inches in diameter result. As a rule they are firmly adherent to the skin with somewhat concave bases

and forcible removal leaves a raw granulating surface with removal of the superficial dermis.

The exudate has been shown to consist of serum, fibrin, leucocytes especially neutrophiles and superficial epithelial cells.

In advanced cases the animal is usually hardly able to move, grazing is interfered with and there is a rapid loss of condition. The lesions also predispose to blow-fly attack.

It is also seen on and around the mouth and ears of young lambs even when no infection exists in the more adult members of the flock, due, no doubt, to the fact that the mouth and adjoining parts are often wet from suckling and the ears from dew, lending weight to Bull's theory that the organism is a normal saprophyte invading the skin after injury and/or prolonged and continuous wetting. The disease is commonly first seen during February/March, i.e. one to three months after shearing, and a month or two after the normal routine dipping. Thorold (1950) has shown that the condition is not associated with any particular kind of dip used. It is becoming of great economic significance today with the high price of wool.

Steyn (1931) reported that a mixture of equal parts of raw linseed oil and tincture of iodine had a strikingly curative effect but nevertheless he suggested the slaughtering of badly infected cases. Mason and Bekker (1934) found that this method of treatment did not yield the desired results in bad cases and stated that in their opinion no fungicidal preparation would have sufficient penetrative powers to effect a cure. They suggested that bad cases should be treated surgically and the exposed skin treated with a mixture of copper sulphate.

Recently Zlotnik (1955) in Nyasaland has shown that the disease known as Cutaneous Streptothricosis or Senkobo Skin-Disease can be successfully treated with the proprietary product ANABAC, a liquid dairy sanitiser containing Quaternary ammonium compounds known to possess good fungicidal properties. He found that it could be applied safely both locally or totally. These results showed that the product had considerable promise for the treatment of fungus-type diseases. This product, therefore, suggested itself as a likely mycoticide in the case of Lumpy wool. Thus when an infected flock was encountered, the opportunity was taken to try it out against 0.2% Copper sulphate and a high concentration of B.H.C. The last two formulations had previously shown some fungicidal effect.

Experimental Procedure

The condition was diagnosed in February, 1954, in 88 two-toothed Merino sheep out of a flock of 350 similar aged sheep in the Ermelo district. The owner had dipped his sheep in a B.H.C. wettable powder in January after shearing them during the previous month. Soon after dipping it rained incessantly and the sheep

were thoroughly soaked and remained wet for some time, thus producing the conditions so favourable for the growth of this saprophyte.

These 88 sheep were divided into four groups, so that in each group there were sheep with every degree of infection, varying from light to medium. Each group consisting of 22 sheep, was dipped in one of the following washes:—

(a) 1/400 Anabac, i.e. 0.04% active ingredient.
(b) 1/200 Anabac, i.e. 0.08% active ingredient.
(c) 1/500 Copper Sulphate or 0.2% $CuSO_45H_2O$.
(d) 10-lbs. Dubble Benhex (a proprietary dispersable or wettable powder containing 40% technical B.H.C. with a total content of 6% of the gamma isomer) in 100 gals. water i.e. 0.06% gamma B.H.C.

The various washes were prepared in a galvanised iron bath of 25 gallons capacity. Each sheep was placed on its back in the bath containing the wash under test and thoroughly soaked whilst the lesions were hand-soaked. This took from 2 to 3 minutes for each sheep. After initial drying, each group was distinctively marked.

Results of Treatment and Comments

These sheep, which had been allowed to mix with the clinically non-infected flock, were re-examined a fortnight later. There was not much difference between the two Anabac groups as in both the dermatitis was completely arrested and the wool, previously matted into lumps and "horns", was already beginning to grow out normally, whilst in most cases and especially in the more concentrated Anabac group, the smaller lumps and "horns" had almost completely disintegrated.

In those sheep dipped in 1/500 Copper Sulphate in water, it also appeared as if the dermatitis had been completely arrested but the lumps and "horns" had not disintegrated to the same extent as in the two Anabac groups. Storey (1952) warns against the indiscriminate use of Copper Sulphate as a treatment for Lumpy Wool because the resultant copper content of the wool is likely to be well above the maximum that can be tolerated when the wool is dyed with copper-sensitive dyes, leading to obscure and annoying dyeing faults and dingy whites.

In the group dipped in the B.H.C. wash, the dermatitis was arrested except in two cases in which it was doubtful if such was the case. The skin had cleared up, the wool, was growing out normally but, here again the lumps and "horns" had not disintegrated to the same extent as in the two Anabac groups or even in the Copper Sulphate group.

All the sheep in groups (c) and (d) were re-dipped in a 1/200 Anabac solution about 3 weeks after the first dipping and at a subsequent inspection of all sheep it was found that with the exception of the odd medium-infected sheep, the majority of the

lumps or "horns" had completely disintegrated and disappeared, leaving only a "tip" here and there.

The wool was classed at shearing time some 9 months later by a sheep and wool expert who stated that the dippings carried out had had no apparent deleterious effect on the wool.

Recently three old but valuable rams with 10 months growth of wool were found to be so heavily infected that they were hardly able to move and the owner was seriously considering slaughtering them. They were dipped in a 1/200 Anabac solution, and thoroughly soaked whilst the lesions were hand-soaked; a fortnight later they were partially shorn where previously this would have been impossible. A second dipping in 1/200 Anabac solution was given immediately afterwards and it was possible to complete the shearing after they had dried out.

These results would seem to indicate that light to medium infections of Lumpy Wool can be effectively treated by one dipping in a 1/200 Anabac solution with hand-soaking of lesions but that in the case of heavy infection individual and selective treatment is necessary and that it might be necessary to dip two or more times at intervals of 3 weeks.

Summary

The skin infection of sheep caused by the streptothrix, *Actinomyces dermatonomus,* in the Union of South Africa is discussed with special reference to its prevalence in the grassveld of the Eastern Transvaal. The results of treatment carried out under field conditions with Anabac, a proprietary quaternary Ammonium compound, are compared with B.H.C. and Copper Sulphate applications.

Acknowledgments

I wish to express my appreciation to the Director of Veterinary Services for permission to publish this article; and my thanks to Messrs. Cooper & Nephews for making available the Anabac used in these trials.

Editors Note

The Director of Veterinary Services wishes to make it clear that although permission to publish these observations is granted, the Division of Veterinary Services may not agree with the conclusions reached nor does it necessarily subscribe to the view, at this stage, that Anabac has any value in the treatment of Lumpy Wool.

References

Bekker, J. G. (1928): *Jl. S.A.V.M.A., 1*:51.
Bull, L. B. (1929): *Aust. J.Exp. Biol.med.Sci., 6*:301.
Mason, J. H. and Bekker, J. G. (1934): *Onderstepoort J. Vet. Sci. and Anim. Indust., 3*:211.
Mornet, P. and Thiery, G. (1955): *Bull. of Epi. Dis. of Africa., 3*:241.
Schulz, K. C. A. (1955): *Bull. Epi. Dis. of Africa, 3*:244.
Snyders, A. S. and Jansen, B. C. (1955): *Bull. Epi. Dis. of Africa, 3*:242.
Steyn, D. G. (1931): *Rep. Vet. Res. S.Afr., 17* (part 1), 205.
Storey, L. F. (1952): *N.Z. J. Agric., 85*:6, Dec.
Thorold, P. W. (1950): *Jl. S.A.V.M.A., 21*:20.
Zlotnik, I. (1955): *Vet. Rec. 67*, 613-614.

DIE SUID-AFRIKAANSE VEENYWERHEID OP DIE KRUISPAAIE

M. W. HENNING,
Onderstepoort

In die Unie vind daar tans 'n fenomenale uitbreiding op die gebied van die nywerheid en die mynwese plaas. Dit gaan gepaard met 'n steeds groter aanvraag vir kos om die vinnig groeiende bevolking behoorlik te voed. Maar Suid-Afrika is ongelukkig minder rykelik op die gebied van die landbou as op die terrein van sy minerale bronne bedeel. Daarbenewens word die Suid-Afrikaanse landbou deur al die plae van al die eeue en nog wat geteister. Dit alles verg veel meer inspanning en baie meer navorsing van die Suid-Afrikaanse burger ten einde die verskeidenheid van vraagstukke die hoof te bied.

Weliswaar het 'n vèrsiende regering aangespoor deur die dryfkrag van 'n Arnold Theiler fondse beskikbaar gestel vir die daarstelling van 'n Onderstepoort wat vir baie jare alreeds 'n leidende rol gespeel het in verband met die ontplooiing van probleme wat betrekking het op die gesondheid van die huisdier. Deur gebrek aan genoeg opgeleide personeel en fasiliteite kan die dienste wat gelewer word egter nie in alle opsigte meer tred hou met die vereistes van 'n vinnig ontwikkellende en uitgestrekte land soos Suid-Afrika.

Middels kon gevind word ter bestryding van die dringende vernietigende episootiese siektes soos runderpes, ooskuskoors, rooiwater, miltsiekte, sponssiekte, bloedpens, bloednier, perdesiekte, bloutong ens., ens.; maar die kroniese en kruipende plae, soos tuberkulose, geslagsiektes en kalwersiektes, het nie voldoende aandag geniet nie, met die gevolg dat onvrugbaarheid van teeldiere en vrektes onder kalwers 'n stremmende invloed op die veestapel het. Derhalwe is die kalweroeste wat gelewer word heeltemal ontoerykend (Sien Tabelle I en II).

Daar word jaarliks slegs 1,200,000 beeste, of 10 persent van 'n totaal van 12 miljoen, in Suid-Afrika geslag en naastenby 800,000 vrek van siektes, verwaarlosing en ondervoeding. Met ander woorde 'n vermindering van nagenoeg 2 miljoen beeste elke jaar. Die kalweroes van omtrent 2,100,000 is dus nouliks genoeg om die getalsterkte te handhaaf. Volgens hierdie syfers word nie meer as 36 kalwers vir elke 100 teelbeeste grootgemaak, in vergelyking met minstens 63 in Brittanje, 67 in Nederland en 67 in Denemarke.

Met die verloop van 'n studie het dr. M. C. Lambrechts vasgestel dat die kalwervrekte in die Vryheid distrik nie minder as 22 persent per jaar is nie. In 'n voorlopige opname in die Zout-

pansberg het dr. A. D. Thomas 'n vrekte van meer as 40 persent waargeneem.

Dat die jaarlikse slagting van 1,200,000 beeste (10 persent) nie vir die gebrek aan toename aanspreeklik gehou kan word nie word bewys deur syfers verkry van ander lande. In Groot Brittanje word 29 persent en in Nederland 40 persent van die totale getal beeste jaarliks geslag, nogtans kan daar 'n vermeerdering van 21 en 11 persent onderskeidelik in die afgelope jare getoon word.

Ofskoon die getal skape in Brittanje (23 miljoen) nie meer as 62 persent van die totaal in Suid-Afrika (37 miljoen) uitmaak nie kan Brittanje dit bekostig om 9,144,000 skape per jaar te slag sonder om die normale toename merkbaar in te kort, terwyl Suid-Afrika met die slagting van slegs 3,900,000 nouliks sy getal sterkte kan handhaaf. Dit moet egter erken word dat Suid-Afrika jaarliks ongeveer 3 miljoen skape moet opoffer as die gevolge van siekte, verwaarlosing en ondervoeding.

Die feit dat ongeveer 40 persent van die groot getal beeste en 12 persent van die skape in die besit van naturelle-eienaars is kan nie veel verskil in die saak maak nie. Trouens word daar 'n groot persentasie van hierdie diere vir slagdoeleindes aan blankes verkoop en moet dus by die berekening ingesluit word. Nogtans, selfs wanneer die opbrengs wat verstrek word slegs op diere van blanke eienaars (sewe miljoen beeste en 33 miljoen skape) van toepassing is kan die toedrag van sake nie as bevredigend beskou word nie.

Die toestand van die Suiwel-nywerheid is nie minder onrusbarend nie (Tabel I). In Suid-Afrika is die gemiddelde jaarlikse opbrengs melk per koei slegs 233 gallon in vergelyking met 700 gallon in Brittanje, 827 in Nederland en 810 in Denemarke. Dit moet egter erken word dat die produksie vanaf 1939 met 175 miljoen gallon per jaar vermeerder het; maar in dieselfde tyd het dit in Brittanje met 617 miljoen gallon gestyg — 'n toename byna gelykstaande aan twee maal die totale produksie van die Unie. Die agterstand van Suid-Afrika van 467 gallon teenoor Brittanje en 594 teenoor Nederland is 'n prestasie wat nie tot self-tevredenheid kan lei nie.

Hierdie ongesonde toedrag van sake moet vernaamlik aan die volgende oorsake toegeskryf word:—

(1) Die klein kalweroeste wat die gevolg is van die lae vrugbaarheid van ons teeldiere, die hoë kalwerverliese, en die slagting van nugter kalwers en grootuier-koeie en verse.
(2) Die hoë vrekte van volwasse en half-volwasse beeste as gevolg van siektes, verwaarlosing en ondervoeding.
(3) Die ontoerykende deskundige dienste wat tot die beskikking van die veenywerhede is (sien Tabel IV).
(4) Gebrekkige organisasies van die vee-nywerhede, in besonder van die Suiwel-boerdery.

In Groot Brittanje, met 'n veestapel kleiner in getalle as die van Suid-Afrika, word daar nie minder as 487 veeartse in diens van 84 navorsings- en akademiese inrigtings gehou. Hiervan werk

332 in 62 inrigtings wat nie onder Staats-beheer val nie. Laasgenoemde sluit 6 akademiese institute in, waar altesame 186 voltydse veeartse en 51 ander deskundiges werksaam is. Van die 15 inrigtings in Nederland met 'n totale personeel van 113 veeartse val slegs twee onder Staats-beheer. Die getal voltydse veeartse in akademiese poste is 49 — die aantal ander wetenskaplikes is nie bekend nie. In Denemarke is die getal inrigtings vyf en die aantal veeartsenykundige werkers 74. Sewe-en-veertig hiervan beklee voltydse akademiese poste — die aantal ander deskundiges is ook nie bekend nie. Aan die ander kant is daar in Suid-Afrika slegs twee inrigtings met 'n totale Veterinêre personeel van 39. Hierdie werkers is verantwoordelik vir al die navorsing, al die akademiese werk, die bereiding van al die entstowwe (53 miljoen dosisse in 1955), en vir die ondersoek van patologiese monsters afkomstig van alle dele van die land en S.W.-Afrika. Twee-en-twintig van die 39 veeartse word as deeltydse dosente vir die opleiding van studente aangehou; hulle word bygestaan deur drie nie-veterinêre dosente, ook op 'n deeltydse basis. Terwyl een veearts beskikbaar is vir elke 1,700 beeste in Denemarke, 2,500 in Nederland en 2,900 in Brittanje moet een veearts vir die gesondheid van 35,000 beeste in Suid-Afrika sorg.

Vanaf 1922 het die getal navorsings en akademiese inrigtings in Groot Brittanje van vyf na 84 gestyg, in Nederland van twee na 15, in Denemarke van twee na vyf. In Suid-Afrika, in teendeel, het dit van vier na twee gedaal.

Terwyl die getal veeartse in Suid-Afrikaanse navorsingsinrigtings vanaf 1939 byna staties gebly het, het hul verpligtings aansienlik toegeneem. Die produksie van entstowwe het gestyg van elf miljoen dosisse in 1939 tot 53 miljoen in 1955. Ook het die akademiese werksaamhede baie uitgebrei en die getal studente het van 45 in 1939 tot 94 in 1956 toegeneem. Dit is verstaanbaar dat die lewensbelangrike navorsings-werksaamhede deur hierdie toedrag van sake noodwendig minder aandag kan geniet.

Sover die velddienste betref is daar in Brittanje nie minder as 583 voltydse en 1,900 deeltydse veeartse in die diens van die Staat; in Nederland en Denemarke is die getal voltydse Staats-veeartse onderskeidelik 89 en 44 — daarbenewens word 'n groot getal algemene praktisyns op 'n deeltydse basis in diens gehou. In Suid-Afrika het die getal Staatsveeartse van 73 in 1940 tot 44 in 1956 gedaal. Geen privaat veearts word op 'n deeltydse basis in diens gehou nie.

Daar is tans nie minder as nege goedgekeurde poste in die navorsingsdienste en twintig in die velddienste wat vakant is en wat nie gevul kan word nie. Omdat geen beskikbare kandidate verkrygbaar was nie is 'n aantal verdere poste afgeskaf.

Ten einde doeltreffende dienste aan die veenywerheid te besorg is die veearts genoodsaak om hom te bemoei, nie net met die bestryding van siektes en die behandeling van siek diere nie, maar hy is verantwoordelik vir alle aspekte van die huisdier, vir sy voeding,

sy versorging en sy voortplanting. Deur 'n tekort aan deskundiges kan hierdie dienste, tot nadeel van die veenywerheid, nie gelewer word nie.

Onder hierdie omstandighede moet dit duidelik wees waarom die veenywerheid van Suid-Afrika in so 'n ongunstige toestand in vergelyking met ander westerse lande verkeer.

Daar is nogtans geen rede vir swaarmoedigheid nie. Suid-Afrika kan veel baat by die ervaring van ander lande en behoort informasie wat elders ingewen is onder lokale toestande te beproef en waar moontlik toe te pas. Plaaslike vraagstukke moet hier met beslistheid op die aangewese metode aangepak word. Sodoende sal die Suid-Afrikaanse boer in die geleentheid gestel word om die beskikbare natuurbronne met meer doeltreffendheid te benuttig en om die opbrengs van voedingstowwe aansienlik op te skuif. Om hierdie doel te bereik verg die volgende voorstelle die ernstige oorweging van alle belanghebbendes:—

(1) Die verskaffing van beter deskundige dienste. Dit verg die opleiding van meer deskundiges en die oordraging van alle akademiese inrigtings wat tans deur die Staat beheer word aan die betrokke Universiteite.

(2) Die instelling van 'n navorsings-liggaam van die aard van die Agricultural Research Council in Brittanje van wie alle landbou-navorsings-institute en -ondernemings ondersteuning ontvang. Hierdie raad word, soos die W.N.N.R., nie deur 'n Staats-departement maar deur 'n groep wetenskaplikes beheer. Fondse vir die totstandhouding van hierdie Raad word grotendeels deur die Staat verskaf, maar kan ook gedeeltelik uit privaat bronne aangevul word. Nie minder as 43 navorsings-inrigtings in Brittanje staan tans onder hierdie Raad; vyftien van hulle was nog tot onlangs deur die Departement van Landbou beheer.

Dit mag toevallig wees maar dit is nogtans veelseggend dat landbou produksie die minste gevorder het in sekere Westerse lande waar landbou navorsings en onderwys uitsluitlik onder Staats-beheer val.

Hoe meer onafhanklike navorsings-institute daar is, wat nie onder Staats-beheer staan nie, hoe wyer die werkkring en hoe groter die doeltreffendheid van die werk, wat gelewer word, sal wees. Tans staan alles onder een baas, 'n toestand wat 'n baie ongesonde uitwerking op die navorsing het.

(3) Die instelling van 'n Suiwel-Beheerraad, soortgelyk aan die Milk Marketing Board in Brittanje, wat volle beheer oor alle aspekte van die Suiwelnywerheid moet uitoefen. So 'n Raad kan, soos in Brittanje, Nederland en Denemarke oneindig veel daartoe bydra om die aard, die gesondheid en die produktiwiteit van die Suid-Afrikaanse Suiwel-kuddes te verbeter.

(4) Die oprigting van behoorlike toegeruste streeks-laboratoria, met die nodige opgeleide personeel, in verskillende dele van die land, ten einde gesondheidsdienste meer eweredig deur die land te versprei en meer aandag aan plaaslike vraagstukke te wy. Terselfdertyd kan daar sodoende veel meer geleentheid aan jong werkers gebied word om eie inisiatief te ontwikkel en selfstandig op te tree. Meer opgeleide veeartse sal hulle vir navorsingsposte aanbied, besonder as die inrigtings nie onder Staats-beheer val nie. 'n Gesonde gees van mededinging sal onvermydelik onder werkers in die verskillende inrigtings ontstaan.

'n Aantal streeks-laboratoria is in die afgelope jare tot groot voordeel van die Veenywerheid in Brittanje en Nederland opgerig. Frankryk oorweeg dit tans sterk om soortgelyke dienste in te stel.

(5) Dringende voorsiening moet gemaak word om die nodige fasiliteite te skep vir 'n deurtastende studie van probleme i.v.m. geslagsiektes, onvrugbaarheid, kunsmatige inseminasie en kalwervrektes. Die slagting van kalwers en grootuierkoeie en verse moet noukeurig beheer word.

(6) Fondse wat deur publieke inrigtings en die beheerrade ten bate van landbou-beurse en landbounavorsing beskikbaar gestel is moet deur die universiteite of ander nie-Staatsbeheerde inrigtings geadministreer word.

(7) Die behoorlike beskerming en benuttings van die veld en veld gewasse, die aanplanting van permanente weiding, die produksie van steeds meer hooi en kuilvoer sal alles meehelp om die gesondheid en produktiwiteit van ons veestapel te verbeter.

(8) Die verskaffing van aanloklike diensvoorwaardes ten einde belowende graduandi na navorsings-inrigtings te trek. Dan moet daar die nodige fasiliteite geskep word om navorsers van tyd tot tyd in die geleentheid te stel om buitelandse inrigtings te besoek ten einde op hoogte te bly van vorderings wat daar op die gebied van die wetenskap elders gemaak word. In teenstelling met navorsers in Europa en Amerika is die Suid-Afrikaanse werker vir 'n afstand van minstens 6,000 myl van wetenskaplike institute elders afgesonder met die gevolg dat hy nie die nodige kontakte kan handhaaf en gedagtes met ander wetenskaplikes behoorlik kan wissel nie. Dit het 'n stremmende invloed op sy werk en bemoeilik sy taak.

(9) Ten einde die verlangde deskundige dienste so gou as moontlik te verskaf moet daar sonder versuim voorsiening gemaak word vir die uitbreiding en verbetering van opleidingsfasiliteite. Dit mag selfs wenslik wees om die leer-

planne wat daar in veeteelt en in veerartsenykunde deur die Universiteite aangebied word aansienlik te wysig. Aangesien die leerplanne in veerartsenykunde alreeds voorsiening maak vir 'n omvattende opleiding van deskundiges wat vir alle aspekte van die huisdier, in gesondheid en siekte, kan sorg, ontstaan die vraag onwillekeurig of 'n afsonderlike opleiding vir veetelers nie heeltemal oorbodig is nie.

Indien leerplanne van veeartsenykunde en veeteelt saamgesmelt kan word sal dit moontlik wees om veel meer deskundiges op te lei wat ten volle toegerus is om die veelvoudige vraagstukke van die veenywerheid aan te pak.

Hierdie voorstelle verg almal die dringende aandag van die owerheid, sowel as van die professie en die Universiteite.

TABEL I. — VEESTAPEL

	Groot Brittanje	*Neder-land*	*Dene-marke*	*Suid-Afrika*
Beeste 1939	8,900,000			11,853,000
1950		2,723,000	3,178,000	
1954	10,718,000	3,025,000		11,604,000
Toename	1,818,000	302,000		— 248,000
Persentasie toename	21	11		0
Teeldiere: 2 jaar en ouer	5,350,000	2,000,000	2,030,000	5,800,000
Kalwers onder 12 maande oud	3,400,000	1,350,000	1,360,000	2,100,000
Persentasie kalwers	63	67	67	36
Beeste geslag 1950	3,046,000[1] (1,300,000)[2]			1,180,000
Beeste geslag 1954	3,100,000[1] (1,000,000)[2]	1,200,000 (700,000)[2]	1,137,000 (630,000)[2]	1,200,000 (100,000)[2]
Persentasie van veestapel geslag	29	40	36	10
Aantal beeste wat jaarliks vrek				800,000
Melkkoeie 1954	3,107,000	1,540,000	1,500,000	1,500,000
Melkproduksie in gallon:				
1940	1,560,000,000			185,000,000
1954	2,177,000,000	1,281,000,000	1,200,000,000	350,000,100
Gemiddelde Produksie per koei in gallon	700	827	810	233
Aantal beeste in T.B. geattesteerde kuddes	5,300,000	3,025,000	3,178,000	25,591
Persentasie	50	100	100	0.22

1. Slagbeeste wat van Eire ingevoer is word nie ingesluit nie.

2. Aantal kalwers wat geslag is.

TABEL II. — SKAPE

	Groot Brittanje	*Suid-Afrika*
Getal 1924	22,000,000	
,, 1939	26,000,000	38,289,000
,, 1948	18,164,000	32,612,308
,, 1950	20,430,000	31,360,000
,, 1952	21,655,000	35,480,000
,, 1954	23,000,000	37,140,000
Aantal Geslag 1939		3,622,000
1950	6,684,000	2,302,000
1952	7,140,000	3,587,000
1954	9,144,000	3,885,000
Persentasie Geslag	39	10
Vrekte per jaar		2,750,000

TABEL III.

	Groot Brittanje (Engeland en Wallis)	*Neder-land*	*Dene-marke*	*Suid-Afrika*
Aantal Koeie wat kunsmatig geinsemineer is	1,286,289	856,000	1,500,000	23,000
Persentasie teelkoeie en verse	46	43	75	0.4
Persentasie bevrugtings:-				
(a) Met een dekking	66.5	60		60
(b) Met een of meer dekkings		90	92.5	
Aantal Veeartse in diens by K.I. sentra	24	80		3
Aantal Veearts in diens by K.I. sentra	36	aantal deeltyds	68 (227 deeltyds)	2

TABEL IV.

	Groot Brittanje	*Neder-land*	*Dene-marke*	*Suid-Afrika*
Aantal Veeartse	3,876	1,200	1,860	330
Praktiserende Veeartse	2,811		1,030	189
Inrigtings waar veeartse in diens is:-				
(a) Staats navorsing	22(155)[1]	2(21)[1]	4(27)[1]	2(39)[2]
(b) Akedemiese en navorsings	6(186)[1]	1(49)[1]	1(47)[1]	
(c) Ander navorsings inrigtings	56(146)[1]	12(43)[1]		
(d) Totaal navorsings- en akademise inrigtings	84(22)[7]	15(2)[7]	5(4)[7]	2(2)[7]
Aantal veeartse in Navorsings- en Akademiese inrigtings	487	113	74	39
Staatsveeartse	583 (1,900)[3]	89 (31-58)[4]	44	44
Munisipale Veeartse	31	120	97	11
Veeartse by K.I. Sentra	36	D[5]	68(277)[2]	2
Veeartse in ander poste	116	D[6]	347	30
Veeartseny Studente:				
1939	—	—	—	45
1955	1,128	384	414	95
Graduandi per jaar (1955)	210	75	52	13
Aantal beeste per veearts	2,900	2,500	1,700	35,000

1. Aantal veeartse in die inrigtings.
2. Die getal sluit in navorsers wat verantwoordelik is vir al die akademiese werk op 'n deeltydse basis, vir die bereiding van entstowwe, en vir die ondersoek van patologiese monsters.
3. Privaat praktisyns wat deeltyds in diens is.
4. 31 vir bestryding van siektes en 58 vir vleiskeuring, ens.
5. Alle poste is van 'n deeltydse aard.
6. Geen syfers beskikbaar nie.
7. Aantal wat Staats-inrigtings is.

Bronne van Inligting

BRITTANJE:

Agriculture in Britain, Central Office of Information, London.
Agricultural Statistics 1953, U.K., Part I, H.M. Stationery Office.
Annual Review and Determination of Guarantee, 1955, H.M. Stationery Office.
Milk Marketing Board, Rep. of Production Division No. 5, 1954.
Register of Veterinary Surgeons, 1955, R.C.V.S., 10 Red Lion Square, W.C.1.
Mr. W. G. R. Oates, Registrar, R.C.V.S., 10 Red Lion Square, W.C.1.
Dr. A. W. Stableforth, Veterinary Laboratory, Weybridge.
Monthly Digest of Statistics, 119, 1955.

NEDERLAND:

Diergeneeskundig Boekje 1956, Maatskappy v. Diergeneeskunde.
K.I. in Nederland, Fonds Nederlandse Veefokkery 'S-Gravenshage, 1954.
Mnr. J. P. Engels, Handelsraad, Ambassade der Nederlanden.

DENEMARKE:

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Dr. F. Woldike Nielsen.

SUID-AFRIKA:

Raad van Beheer oor die Vee- en Vleisnywerhede.
Raad van Toesig op die Suiwelnywerheid.
Buro van Sensus en Statistiek.
Departement van Landbou.
Die Sekretaris, Veterinêre Fakulteit.
Die Universiteit van Pretoria.
Die Sekretaris, S.A. Vereniging van Veeartse.
Dr. Louis Smith, Landbou Attache, Ambassade van die V.S.A.

English Summary

1. In the past veterinary research was confined mostly to the study of the urgent, acute epizootics of animals with the result that the chronic, insidious diseases like tuberculosis, reproductive disorders and calfhood diseases have not received sufficient attention.
2. Approximately 800,000 cattle and 3,000,000 sheep die every year from disease, neglect and malnutrition, and about 10 per cent. of the entire animal population, including the calves, is slaughtered. The annual calf-crop of not more than 36 calves per 100 breeding animals can barely maintain the numbers. No wonder, therefore, that no increase in numbers takes place.

   This state of affairs compares extremely unfavourably with that in Great Britain, Holland and Denmark where from 29 to 40 per cent of the total number of animals are slaughtered without materially affecting the increase desired. The number of calves raised per 100 cows varies from 60 to 67.

   In the field of dairy farming the position is not less unsatisfactory. Whereas the average animal milk production per cow varies from 700 gallons in Britain to 827 gallons in Holland. the figure for South Africa is barely 233 gallons.

3. This unhealthy state in which the animal industry finds itself should be ascribed chiefly to the low fertility rate of our breeding stock, the high calfhood losses, and not least to the ineffective and insufficient expert services rendered. Moreover, the disturbing number of pregnant females and bobby calves that are slaughtered also play a part.

Whereas no less than 487 trained veterinarians are employed in 84 research and academic institutions in Britain, and 113 in 15 institutions in Holland, only 39 veterinarians are available for all the academic, research and diagnostic services and for the preparation of all the vaccines in South Africa. They are employed in two institutions both of which are state controlled, so that the the scope of the field of employment of the veterinary research worker in South Africa is limited to the state service. This is not advisable.

The total number of veterinarians employed by the state has decreased from approximately 108 in 1940 to 75 in 1956, and there are about 30 vacant posts for which hardly any applicants can be obtained.

In Denmark one veterinarian is employed for every 1,700 head of cattle, in Holland one for every 2,500 cattle and in Britain one for every 2,900 bovines. In South Africa, on the contrary, one veterinarian is obliged to safeguard the health of 35,000 head of cattle, the care of the 38 million sheep not being taken into account.

4. The following measures are advised for remedying this unhealthy state of affairs:-

(a) Immediate provision should be made for the training of many more scientific workers and thus far the transfer of all academic institutions controlled by the state to the different universities. The curricula of all courses in animal husbandry and veterinary science should be closely co-ordinated and where possible combined.

(b) The institution of research services that are not state-controlled. For this purpose a Research Council should be appointed on the basis of the Agricultural Research Council of Britain. It should be controlled by a Board of Governors of Scientists that are not responsible to a government department.

(c) The erection of Regional Laboratories to serve the different parts of the country.

(d) The institution of a comprehensive study of all aspects of infertility of breeding stock, artificial insemination, calfhood losses and nutritional disturbances.

(e) The proper co-ordination of all the services rendered to the animal industry.

(f) The provision of conditions of service which are sufficiently attractive not only to attract promising workers to research institutions, but also to retain their services.

Jl. S.A.V.M.A. 27 (3), 1956

ISOLATION OF VIBRIO FOETUS FROM BULL SEMEN IN SOUTH AFRICA

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Onderstepoort

Abstract

Vibrio foetus was isolated from bull semen in South Africa by intraperitoneal injection of semen into pregnant guinea-pigs and culturing the foetal stomach contents after a few days.

Vibrio foetus infection as a venereal disease of cattle grows in importance with the improvement of husbandry and breeding economy. The infection is permanent in the bull, is transmitted during service and results in breeding troubles with loss of productive capacity. Successful artificial insemination requires a high standard of breeding efficiency and freedom from infections of this nature.

Snyman reported the first case of Vibriosis in South Africa in 1931. The organism was isolated from the fluid of condensation on a 10% horse-serum-agar slant inoculated with material from the foetal stomach.

Canham (1948) recorded a number of outbreaks of Vibrionic abortion investigated in Natal. The abomasum of the foetuses contained the infection.

The purpose of the present report is to record the direct proof of the presence of *Vibrio foetus* in the semen of some bulls in South Africa as shown by means of a biological test in guinea-pigs.

In other countries the infection in bulls has been diagnosed by tests on virgin heifers after controlled mating and by culturing the organisms from the semen. Plastridge, Williams, Easterbrook, Walker and Beccia (1951) and Lawson and McKinnon (1952) have reviewed this work. Adler (1953) isolated *Vibrio foetus* from the uteri of guinea-pigs after vaginal insemination of infected semen into the vagina during induced oestrus.

Price, Poelma and Faber (1953) have pointed out that three of ten strains isolated in America from the semen, uterus and vagina of cattle showed no serological evidence of relation to any of 20 foetal strains. These three strains were considered saprophytic species. Similarly Bryner and Frank (1955) showed that 27 strains isolated from aborted foetuses were all catalase positive and H_2S negative whereas 33 strains out of a total of 57 strains isolated from bulls were catalase negative and H_2S positive. All strains isolated from virgin bulls and heifers also were catalase negative and H_2S positive. Consequently this kind of *Vibrio* infection is not considered pathogenic.

Ristic and Morse (1953) and Ristic, Wipf, Morse and McNutt (1954) showed that pregnant guinea-pigs could be infected with pathogenic strains of *Vibrio foetus* which could then be recovered from the foetal stomachs and from other organs. Later Morse and Ristic (1954) pointed out that the strains of *Vibrio foetus* isolated from bovine foetuses were significantly more pathogenic for pregnant guinea-pigs than the strains originally isolated from bull semen. Some of the latter failed to cause abortion in guinea-pigs.

Materials and Methods

Pregnant guinea-pigs in the last third of the gestation period were inoculated into the peritoneal cavity with graded doses of:—

(a) pure *Vibrio* cultures;
(b) contaminated *Vibrio* cultures;
(c) good normal bull semen;
(d) undiluted suspected bull semen.

The dosage of semen injected intraperitonedly was 0.1 ml. This was found to be sufficient to detect Vibrio foetus if present in the semen, and larger doses are liable to kill the guinea-pigs or cause abortions.

After 5 to 7 days the animals were killed and the contents of the foetal stomachs were cultured in 2-3 ml. Bacto Thiol (Difco) medium incubated at 37°C in a 15% CO_2 atmosphere.

The cultures were examined on the 4th, 5th or 6th day by means of:—

(i) Hanging drop preparations with phase contrast examination.
(ii) Gram stained films.
(iii) Carbol Thionin stained films.
(iv) Carbol Fuchsin stained films.
(v) Hansen stained films.
(vi) Surface subcultures on 20% bovine blood agar.

Results

It was found that stock cultures of *Vibrio foetus* strains imported from Holland and Denmark and maintained on horse-serum-agar, sheeps-blood-agar and Tryptose-bovine-serum-agar tended to lose the spirillar morphology and changed to the coccoid form. Only on frequent subculture in Bacto Thiol medium could the strains be propagated indefinitely.

Three imported strains failed to cause abortion in pregnant cows inoculated intravenously with a small dose of 5 day cultures of each.

Two groups of stilboestrol treated female guinea-pigs failed to show any *Vibrio foetus* in cultures when pieces of their uteri were cultured in serum broth and Bacto Thiol medium 5 days after being inseminated with living culture during the induced oestrus.

Intraperitoneal inoculation of two of the imported *Vibrio* strains into pregnant guinea-pigs resulted in the recovery of fully spirillar

cultures from the foetal stomach contents of the foetuses of some of the guinea-pigs aborting on the 4th day or slaughtered after 5 days. The aborted foetuses found within three days of inoculation only gave negative and contaminated cultures.

This result suggested the intraperitoneal inoculation of suspected semen into pregnant guinea-pigs as a method of discovering infection. A number of pregnant guinea-pigs were inoculated intraperitoneally with varying doses of suspected semen. Control inoculations with normal semen mixed with artificial culture were included. One of the cultures produced from suspected semen supplied the first strain isolated, and this strain ("B") was freeze-dried, stored at minus 40°C and also maintained in regular subculture for the production of antigen to be used in the vaginal mucus agglutination test in this country.

Subcultures of this strain have up to the present failed to produce abortion in three pregnant cows repeatedly inoculated intravenously with small doses of live cultures.

Two out of four heifers inseminated with small doses of live culture have developed a vaginal mucus titre. Experiments with larger doses and a larger number of animals are in progress. Cross agglutination tests have shown identical titres in hyper-immunized rabbit serum for this South African strain and the "American" strain imported from Denmark.

Two other strains of *Vibrio* have been isolated by this method from the semen of bulls. In the case of one bull kept at the laboratory this has succeeded repeatedly. These strains have been studied serologically and are all antigenically related to known pathogenic strains.

Discussion

The success of this biological method is important in that the semen originating from animals with a typical epidemiological history of Vibriosis proved infected. It is also remarkable that some infected samples of semen had been transported in ice by rail over a distance of 1,000 miles (2 days).

The usefulness of the method cannot be evaluated until a large number of suspected and possibly infected semen samples have been examined.

Acknowledgements

The Director of Veterinary Services, Dr. R. A. Alexander, is thanked for permission to publish this report. Technical assistance of Mr. W. de Vos and Mr. G. du Plessis is appreciated.

References

Adler, H. C. (1954): Method for diagnosing *Vibrio foetus* infection in the bull. F.A.O. Meeting, Copenhagen.

Bryner, J. H. and Frank, A. H. (1955): A preliminary report on the identification of *Vibrio foetus*. *Am. J. Vet. Res.* 16: 76-78.

Canham, A. S. (1948): *Vibrio foetus* infection in cattle. *J.S.A.V.M.A.* 9: 103-104.

Lawson, J. R. and McKinnon, D. J. (1952): *Vibrio* infection in cattle. *Vet. Rec.* 64: 763.

Plastridge, W. N., Williams, L. F., Easterbrooks, H. L., Walker, E. C. and Beccia, R. N. (1951): Vibriosis in cattle. *Storrs Agr. Exp. Sta. Bull.* 281, pp. 1-54.

Price, K. E., Poelma, C. J. and Faber, J. E. (1953): Preliminary report on Serological Relationships between strains of *Vibrio foetus*. *Vet. Med.*, 48: 353-358.

Ristic, M. and Morse, E. V. (1953): Exptl. *Vibrio foetus* infection in Guinea-pigs I Bacteriological Aspects. *Am. J. Vet. Res.* 14: 399-404.

Ristic, M., Wipf, L., Morse, E. V. and McNutt, S. H. (1954): Transmission of Experiment *Vibrio foetus* infection among Guinea-pigs and Hamsters. *Am. J. Vet. Res.*, 15: 307-313.

Morse, E. V. and Ristic, M. (1954): Exptl. *Vibrio foetus* infection in Guinea-pigs III. Pathogenicity studies and the effect of G.P. passage upon agglutinins. *Am. J. Vet. Res.*, 15: 599-603.

Snyman, P. S. (1931): *Vibrio foetus* as a cause of bovine abortion in South Africa. *17th Rept. D.V.S. and Am. Ind.*, 1: 197.

Jl. S.A.V.M.A. 27 (3), 1956

THE COMPARISON OF IMPORTANT EXOTIC DISEASES WITH COMMON INDIGENOUS DISEASES OF THE U.S.A.

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It was my great fortune and privilege to be invited to participate in a series of six meetings in the U.S.A. on the above subjects in March and April, 1956. These meetings were held at widely separated localities which were the centres for the six districts into which the U.S.A. was divided for this purpose. Each meeting was a three day affair devoted to a discussion of these exotic diseases, the ways they could be introduced, disseminated and differentiated from local diseases, and the regulations in practice which are designed to prevent their introduction or spread in the U.S.A., which has the greatest livestock industry in the world, but most susceptible. The meetings were attended mainly by Federal and State regulatory officials, university personnel, and some interested private practitioners. The speakers were people who had first hand experience of the diseases they discussed.

This was a most exciting and interesting trip for me in many ways. Phoenix, Arizona, at the southern end of the Rockies, was at its most glorious best with its delightful climate at this time of the year (March) and with the town in holiday and carnival mood. Stillwater, Oklahoma, location of the veterinary school, welcomed use most warmly and Bozeman, Montana, just north of the Yellowstone Park and nestling amongst high mountain peaks, dazzling white with snow, turned on a spell of radiant warm sunshine for us (it was a shame to spend the three days indoors in that spectacular mountain scenery). Our fourth meeting — the largest of the six — was held at Ames, Iowa, home of the veterinary school and the centre of much animal and agricultural production. We were enthusiastically received there and made welcome in a manner for which the Midwest is famous. The next trip to Atlanta, Georgia was a pleasant contrast — spring was well on its way then, but the Southern customs and traditions were particularly interesting. The last meeting was at Storrs, Connecticut, entirely a college town and located in the beautiful New England countryside, offering a marked contrast to the other meetings. The series terminated here in this lovely environment.

The hospitality, lovely scenery and weather were wonderful, but my greatest pleasure was gained from the information collected. My interests differed from those of most in the audiences in that I wanted to know more about the indigenous diseases of the U.S.A. of which I knew less than of the exotic diseases. I felt that my

colleagues in South Africa would be interested in some of the salient features of these diseases, hence my object in writing this article. It would take too much space to give full details so I have included the most important references for those who are interested in consulting the literature in greater detail.

Viral Alimentary Tract Infections of Cattle.

In this group of diseases rinderpest was compared with two domestic viral diarrhoeas, namely Indiana V.D., New York V.D., and Mucosal disease which, although not conclusively proved to be caused by a virus, will be classed as a viral diarrhoea for the purposes of this paper. Mention was also made of similar diseases reported from Canada,[1] Sweden[2] and South Africa.[3-6]

Broadly speaking these diseases are very similar to one another, there being much more likeness than dissimilarity, but they differ immunologically in their morbidity rate and in their virulence. Some severe cases of Indiana V.D., New York V.D., or Mucosal disease are hardly distinguishable from a case of rinderpest on the basis of individual clinical or postmortem symptoms, but they would differ on a herd basis. In fact the similarity is so great that anxiety existed in the U.S.A. that the domestic viral diarrhoeas might in actual fact be mild forms of rinderpest. Cross-immunity experiments have now been conducted which show quite definitely that the three domestic diseases are immunologically distinct from one another. Recovered animals from the above three domestic diseases were also challenged with rinderpest virus but were found to be fully susceptible. On the basis of cross-immunity tests it is quite evident therefore that these are distinct diseases yet clinically they are similar, but differ from rinderpest chiefly in having a lower mortality and morbidity rate. In rinderpest it may be as high as 90-100%, although in Mucosal disease mortality may be as high as 90% but the morbidity rate is much lower (2-50%) and the spread slower. The mortality rates of the other two diseases are lower yet, namely in Indiana V.D. it is 0-50% (morbidity 80-100%) and in New York V.D. it is 4-50% (morbidity 33-88%). These domestic viral diarrhoeas are important enough but it is clear that rinderpest is a considerably more dangerous disease and for this reason it is important to differentiate between these diseases and to recognize rinderpest if it should appear.

The appearance of these diseases in the U.S.A. within a comparatively recent period has posed the question as to whether they are actually new ones or not. The concensus of opinion of the authorities is that they are probably new ones, although some authorities believe they have been here for many years. They are such definite disease entities that it is unlikely however that they were overlooked heretofore, and if they occurred they were no real problem then as they are now. It is a relatively easy matter to transmit these diseases artificially since the infective agents apparently produce septicaemias in much the same manner as rinderpest does. Two causal agents of the domestic diarrhoeas have been

grown in laboratory animals, namely N.Y. V.D. and Ind. V.D. in rabbits. No vaccines have as yet been developed but fortunately there are effective vaccines against rinderpest. The immunity in all these diseases seems to be of long duration except in Iniana V.D. where it lasts for only a few months ($\pm$ 4 months).

The distribution of the three American diseases is approximately as follows: Mucosal disease is the most widespread and has been found in about 24 states, mostly western and mid-western and is particularly important in the corn belt. Indiana V.D. has thus far been recognized in the state after which it is named, while New York V.D. has been found in at least six states, including California.

Apart from the general gastro-enteritis characteristic of these four diseases, an ulcerative or erosive stomatitis is also consistently present. Slight variations in the stomatitis are described in the four diseases but taken as a whole it is very similar in all of them. None of them develops the erosions by way of blisters as is so characteristic of the vesicular diseases. I also wish to remind South African readers of the infectious cattle diseases described in their literature which have a similarity to these American diseases in that they are all characterized by an ulcerative or erosive stomatitis, though gastro-enteritis was not a noteworthy symptom in any of them. These infectious diseases are "erosive stomatitis" and "scaly tongue",[3] the so-called bluetongue of cattle[4] which seems more likely to be erosive stomatitis,[5] and the syndrome described by Belonje.[6]

For those who wish to consult the literature further, I wish to recommend the following references : Mucosal diseases,[7] New York Viral Diarrhoea[8] and Indiana Viral Diarrhoea.[9]

The Respiratory Tract Infections of Cattle.

These diseases do not present the same difficulties in diagnosis as the previous group does. They are quite distinct clinically.

The two domestic respiratory diseases, namely rhinotracheitis and malignant cattarrh, were compared with the exotic disease bovine pleuropneumonia.

Malignant catarrh has a world-wide distribution but appears in more or less sporadic outbreaks or cases and often such outbreaks follow contact with sheep or wild game. Rhinotracheitis is confined to about twelve mid-western and western states in feeder cattle and is most prevalent in Colorado, while bovine pleuropneumonia occurs in Africa, Asia and Australia and is a major problem there.

Malignant catarrh, which in South Africa is known as "snotsiekte", and possibly "blouwildebeesoog" could also be a variant, is characterized by being a systemic disease in which the symptoms are: (1) nervous derangement as exemplified by marked aggressiveness, and the appearance of cytoplasmic inclusions in the nerve cells of the brain, first described by Stenius of Finland, (2) an involvement of the lymphatic system which shows up as a swelling of the glands, (3) ophthalmia which often progresses to a pan-

ophthalmia and ulceration of the cornea, (4) severe inflammation of the upper respiratory tract is the most characteristic lesion, and (5) in certain forms involvement of the alimentary tract.

These generalized symptoms of malignant catarrh differ from those of rhinotracheitis in that in this latter disease the lesions are of a localized nature. The causative agent is a virus and is easily transmissible, but secondary infections probably play a role. The disease reminds one of infectious laryngotracheitis of chickens in certain respects — in its localization and the production of asphyxia. Clinically the disease is characterized by marked apparent and audible respiratory disturbances due to diphtheritic, inflammatory or oedematous lesions of the nasal passage or of the mucosa and submucosa of the larynx and trachea. These lesions may cause the lumen of the trachea to be reduced to a third of its normal size so that one can visualize that laboured respiration is characteristic of the disease. Pneumonia does not ordinarily occur but it may be secondary to the infection due to inhalation of the discharges and usually appears as a bronchopneumonia.

It is interesting to note that since this condition has been recognized as a distinct disease entity, calf diphtheria has been diagnosed far less often. On the other hand this disease is recognized more frequently suggesting that what is sometimes diagnosed as "calf diphtheria" may indeed, sometimes at least, be a form of rhinotracheitis.

The morbidity rate may be high yet the mortality rate may be low. It is suggested that in mild outbreaks there may be many inapparent cases and in severe outbreaks secondary invaders play a role. Marked and rapid loss of weight is quite characteristic of the disease.

While pneumonia is not very typical of either of the above two diseases, pleuropneumonia of a very typical type is characteristic of bovine pleuropneumonia. These three diseases can therefore be readily differentiated clinically and otherwise from one another on the basis of several criteria. Important references are as follows: rhinotracheitis,[10] and malignant catarrh.[11]

Vesicular diseases:

This subject was dealt with in detail by several well-known authorities and in each case it was stressed that no one can differentiate between vesicular exanthema (VE), vesicular stomatitis (VS) and foot and mouth disease (F & M) on the basis of a clinical examination alone. When Dr. Jacob Traum discussed these diseases he emphasized that the typical lesion was a vesicular one and he effectively pressed this point by repeatedly employing the terms "vesicle" and "blister" in his presentation, stressing the importance of this type of lesion in this group of diseases. He pointed out that if anything is characteristic of this complex it is the vesicle and the blister. He pointed out that the ulcers and erosions in other diseases develop without vesicle formation, while in the

vesicular diseases the erosions are the result of the rupture of vesicles.

However, the blister of one vesicular disease is apparently indistinguishable from that of any other. Although the severity of the disease or the distribution of the lesions may differ it is necessary to examine the host spectrum, particularly the horse, pig and bovine, but there are a number of other animals that may be used in addition. It seems quite clear that F & M disease is basically a disease of cattle, that VS is basically a disease of horses and VE a disease of pigs. There is, however, much overlapping of the host range, yet on the basis of pathogenicity one can differentiate the three diseases.

The susceptibility of man to Foot and Mouth has been known for a long time but he rarely becomes infected. However, he appears to be much more susceptible to VS and in fact the number of human cases, sometimes of a very serious nature, are almost alarming.

The types and subtypes of these diseases are determined by serological and cross-immunity tests. To date six (possibly a seventh from Asia) types of F & M, three of them South African, two of VS, and possibly six of VE have been recognized. There are, therefore, in effect 13, possibly 15, separate diseases in this complex.

Pig Diseases:

The two exotic diseases, African Swine fever (AFS) and Teschen disease, were compared with the two local diseases, Hog Cholera (HC) and acute erysipelas.

Teschen disease, which is still partically confined to Europe, manifests itself almost entirely as a disease of the nervous system. Nervous symptoms are the most characteristic. Autopsy findings are negative as a rule but histologically fairly characteristic lesions are seen in the nervous system and diagnosis depends largely on these findings.

Of these four diseases, one is struck by the great similarity between African Swine fever and Hog Cholera but the other two are notably different. One may encounter fits and other nervous symptoms characteristics of Teschen disease in Hog Cholera and in erysipelas sudden death following a febrile disease may cause confusion, but on the whole they are easy to differentiate.

The similarity between African Swine fever and Hog Cholera is so great that one gets the impression that they are variants of the same disease. It has been suggested that if one is called Hog Cholera then the other should be called African Hog Cholera. They are, however, immunologically distinct.

There are several clinical differences between Hog Cholera and African Swine fever. ASF is the more virulent of the two diseases. In Hog Cholera symptoms of mental depression and general malaise develop shortly after the temperature rises and the pig appears sick and is off its feed several days before it dies. Dr. R. Aitken,

who quoted another observant veterinarian, described the mental depression in hog cholera thus — "the pig thinks and a pig has no business thinking!" In the other three diseases under discussion, the pigs remain bright and retain the appetite until a day or two before death. In ASF the body temperature may be high for several days before the animal actually shows symptoms.

At autopsy ASF and HC are rather similar but there are relative differences. Petechial and ecchymotic hemorrhages are typical of both diseases, being found in the skin and many of the viscera. In HC the numerous pinpoint hemorrhages of the lungs and kidneys ("turkey egg kidney") are characteristic but similar ones occur in ASF, except that in ASF hemorrhages in the kidneys may be entirely absent in as many as 30%. In those cases in which they occur they are very extensive and more prominent than in HC, sometimes being attended by diffuse haemorrhages of the pelvis of the kidney. My impression is that there is a definite difference in the appearance of the spleen. In HC the spleen is usually normal in size but is characterized by hemorrhagic infarctions which usually are present along the border but in some cases the whole organ is affected. Such lesions may occur in ASF too, but in the South African literature great stress is placed on the tumor splenis that consistently occurs in this disease. However, a group of Americans working in East Africa with a Kenya strain of ASF observed splenic enlargement in only about 10% of their experimental cases which were usually killed when moribund. It is possible that there are strain differences or that cases that die nautrally may be different from those sacrificed in extremis. Oedema of the gallbladder has often been seen in ASF but not in HC. The appearance of the lymph glands offers a clue to differentition also — in both diseases there is marked hyperaemia and extensive hemorrhage in these organs but in ASF it is more intense than in HC. The mesenteric lymph glands are the most severely affected. In ASF the most typical is the lesion in which the hemorrhage is so extensive that the cut surface has the coal-black or red-black appearance of a blood clot or haemo-lymph gland, but in HC the haemorrhages are usually peripheral and even though the nodes may appear quite dark superficially, on cross-section they are invariably mottled with light areas. "Boutons" in the alimentary tract may be found in both diseases but they are found only in those cases that have lingered on for a few days and are much more likely to occur in HC and are relatively rare in ASF.

Acute erysipelas is rather easy to differentiate. Its course is erratic but differs from the two diseases discussed above and Teschen disease in several respects. Firstly, it responds dramatically to penicillin or antiserum therapy — therefore the use of these in clinical cases is a valuable diagnostic weapon, often helping one to differentiate within 24 hours. The incoordination of movement in the four diseases differs too. In HC, and to lesser extent in ASF, the weakness of the hindquarters is rather typical but is probably

mainly due to a muscular weakness, whereas in Teschen disease it is an ataxia as well as an incoordination. It usually affects the four legs, being a central nervous disturbance. In acute erysipelas, however, it is due to intense pain and swelling of the skin and the joints. The animal is reluctant to move but if it does it minces its steps and walks with a very stiff gait and arched back in what is described as a "creeping motion". Urticarial swellings of the skin along the back are almost pathognomonic but the following frequently occur. ie. edematous swelling of the snout and nasal passages resulting in obstructive dyspnoea, and of the ears, joints (in acute cases bog spavin type — in chronic cases bone spavin type) and marked reddening of large areas of the skin. The "diamond" skin lesions and chronic endocarditis so often associated with this disease are only characteristic of the chronic form. In a fair percentage of cases the kidneys show what seems to be a characteristic lesion — a mottling with blotches of dark and lighter areas.

The habitus of the animals in the four diseases differs. As already pointed out in the case of HC, marked depression "thinking" and anorexia set in early but in ASF this is delayed until the disease is far advanced. In erysipelas the animals do not lose their appetite (gastro-intestinal disturbances are rare) and remain bright but are very inclined to hide away in dark corners or under the straw. In Teschen disease there are signs of acute encephalitis early, but later the pig may be quite bright with a good appetite though paralysis may become evident.

Fowl Plague and Newcastle Disease.

Fowl plague was compared with the Asiatic form of Newcastle disease. The presentations given faithfully repeated comparisons that have been made in laboratories in the U.S.A., but it is my opinion that in the light of our present knowledge they were not broad enough. I think that we have to recognize that there are many different strains of Newcastle disease and that, although these are immunologically identical, clinically they may differ vastly. The mild American forms which are largely airborne produce marked respiratory symptoms while the virulent Asiatic forms, which are very occasionally airborne, produce marked lesions of the alimentary tract. It may sound odd but I believe that of the two the American form is by far the more difficult to control because of its airborne nature, and by virtue of its mildness makes detection difficult. The Asiatic type, which is detected immediately because of its high mortality rate, spreads poorly from flock to flock requiring more direct contact than the other form. Since Newcastle disease vaccination is widely practised in this country, the Asiatic type is never likely to be a great national danger but its similarity to fowl plague caused the emphasis on the disease at these meetings.

While differentiations were made of fowl plague and Newcastle disease on the basis of clinical and autopsy findings, I wish again to remind readers that we should be very careful in fixing our minds on these differences based merely on the reactions of a few

strains. This criticism could probably also apply to other diseases too. One will remember how Doyle's description of his original cases at Newcastle-on-Tyne differed from the fowl plague of the Continent. His disease presented almost a negative postmortem picture, but the type of Newcastle disease that was later encountered in South Africa in 1945 and 1949 very closely resembled fowl plague. If one remembers that between these forms and the mild airborne American forms there are many other types, one can realize how dangerous it is to depend on the description of the disease based on a few strains. In the same way the description of fowl plague in this country is usually based on the two outbreaks in 1924 and 1929 and on the studies made in Boston during the last world war. While these descriptions resemble those given by most of the European workers, it appears that in Egypt mild forms are now being encountered which are characterized by respiratory symptoms and low mortality resembling clinically the mild American forms of Newcastle disease and are therefore very different from classical fowl plague. This serves to prove that the complete identification of these diseases by laboratory means is the only certain way of differentiating them.

Rift Valley Fever and Epivaginitis.

The likelihood of Rift Valley fever spreading to the U.S.A. was discussed. It was considered that if the virus appeared in the summer or fall it is possible that vectors would be present to transmit the disease and cause an epizootic.

Epivaginitis (infectious infertility of cattle) was also discussed, mainly to inform the audience of the general nature of the disease. In view of the lack of knowledge and the absence of tests to detect inapparent or incipient cases, this disease should be regarded as a potential danger since it could be introduced unwittingly into the U.S.A.

ACKNOWLEDGEMENTS

My sincere thanks are due to the following:— Dr. Frank A. Todd, Assistant to the Administrator of the Agricultural Research Service, who arranged for me to be invited to take part in this programme, and I would also like to mention here that he was in charge of it and was chiefly responsible for its successful organisation; Drs. W. M. Martin, Dean and Director of the Experimental Station and F. R. Beaudette, Chairman of the Department of Animal Pathology, Rutgers University, for their very generous attitude in making it possible for me to take part in these meetings; Lt. Colonel Fred Maurer of the Armed Forces Institute of Pathology who did the lion's share at the meetings, for his constructive criticism of this article; Dr. W. A. Aitken, Editor of the Jnl. A.V.M.A., the most colourful contributor at the meetings who gave me a copy of his manuscript reporting these meetings in his journal and upon which this report is based; Dr. W. R. Pritchard of Purdue University, another valuable contributor at the meetings, who supplied me with most of the selected references, and the many other contributors from whom I gained information.

References

1. Childs, T. (1946): X-Disease of cattle in Saskatchewan (Canada). J. Com. Med. & Vet. Sci., 10, 316.
2. Hedstrom, H. and Isakson, A. (1951): Epizootic enteritis in cattle in Sweden. Cornell Vet., 41, 251-253.
3. Mason, J. H. and Neitz, W. O. (1940): Erosive Stomatitis of cattle. Ond. J. Vet. Sci. and An. Ind., 15, 159-173.
4. Bekker, J. G., de Kock, G. and Quinlan, J. B. (1934): The occurrence and identification of bluetongue in cattle, etc. Ond. J. Vet. Sc. and An. Ind., 2, 2, 393-507.
5. Mason, J. M. and Neitz, W. O. (1940): The susceptibility of cattle to the virus of bluetongue. Ond. J. of Vet. Sci. and An. Ind., 15, 1-2. 149-157.
6. Belonje, C. W. A. (1952): A disease of cattle associated with stomatitis and stiffness. J. S.Afr. Vet. Med. Assoc., 23, 141-147.
7. Mucosal Disease:
   a. Ramsey, F. K. and W. H. Chivers (1953): Mucosal Disease of cattle. North Amer. Vet., 34, 629.
   b. Ramsey, F. K. (1954): The Pathology of a mucosal disease of cattle. Proc. 91st Annual Meeting, A.V.M.A., 162-166.
   c. Pritchard, W. R. (1955): The Mucosal Diseases of Cattle, Epizootiology Symptomatology and Experimental Studies. Proc. 92nd Annual Meeting, A.V.M.A., 37-42.
   d. Pritchard, W. R., H. E. Moses, R. G. Carlson and D. B. Taylor (1955): Virus Diarrhoea and Mucosal Disease. Proc. 59th Annual Meeting, U.S. Livestock Sanitary Association (1955).
   e. Siebold, H. R. (1956): The Pathology of Mucosal Disease in Alabama, J.A.V.M.A., 128, 21-26.
   f. Schipper, I. A., D. F. Eveleth, R. F. Shumard and S. H. Richards (1955): Mucosal Disease of Cattle, Vet. Med. 50, 431-434.
8. Virus diarrhoea — New York:
   a. Olafson, P., A. D. MacCallum and F. H. Fox (1946): An Apparently New Transmissible Disease of Cattle. Cornell Vet., 36, 205-213.
   b. Olafson, P. and C. G. Rickard (1947): Further Observations on the Virus Diarrhoea (New Transmissible Disease) of Cattle. Cornell Vet., 37, 104-106.
   c. Walker, R. V. L. and P. Olafson (1947): Failure of Virus Diarrhoea of Cattle to Immunize Against Rinderpest. Cornell Vet., 37, 107-111.
   d. Wheat, J. D., D. G. McKercher and C. J. York (1954): Virus Diarrhoea in California. California Vet., 7, 26-27.
   e. Baker, J. A., C. J. York, J. H. Gillespie and G. B. Mitchell (1954): Virus Diarrhoea in Cattle. Ames J. Vet. Res., 15, 525-531.
9. Virus Diarrhoea — Indiana:
   a. Pritchard, W. R., D. B. Taylor, H. E. Moses and L. P. Doyle (1954): Virus Diarrhoea of Cattle in Indiana. Annual Report Indiana Agric. Expt. Station.
   b. Pritchard, W. R. (1955): A Transmissible Erosive Gastro-Enteritiis of Cattle (Virus Diarrhea). Iowa State Col. Vet. 6, June (1955).
   c. Pritchard, W. R., D. B. Taylor, H. E. Moses and L. P. Doyle (1956): A Transmissible Disease Affecting the Mucosae of Cattle. J.A.V.M.A. 128, 1-4.
   d. Pritchard, W. R., H. E. Moses, R. G. Carlson and D. B. Taylor (1955): Virus Diarrhoea and Mucosal Disease. Proc. 59th Annual Meeting, U.S. Livestock Sanitary Assoc.
10. Infectious Bovine Rhinotracheitis:
   a. Schroeder, R. J. and M. D. Moys (1954): An Acute Upper Respiratory Infection of Dairy Cattle. J.A.V.M.A. 125, 471-474.
   b. McIntyre, R. W. (1954): Experimental Studies of Acute Upper Respiratory Infection in Calves. J.A.V.M.A. 125, 473-474.
   c. McKercher, D. G., J. E. Moulton and D. E. Jasper (1954): Virus and Virus-like Diseases of Cattle New to California. Proc. 38th Annual Meeting, U.S. Livestock Sanitary Assoc., 260-269.
   d. Jensen, R., L. A. Griner and T. L. Chow (1955): Infectious Rhinotracheitis in Feedlot Cattle, I. The Pathology and Symptoms. Proc. 59th Annual Meeting, U.S. Livestock Sanitary Assoc. (1955).
   e. Chow, T. L., A. W. Deem and R. Jensen (1955): Infectious Rhino-

tracheitis in Feedlot Cattle, II. The Experimental Reproduction. Proc. 59th Annual Meeting, U.S. Livestock Sanitary Assoc. (1955).

f. McKercher, D. G., J. E. Moulton, J. W. Kendrick and J. Saito (1955): Recent Developments on Upper Respiratory Diseases of Cattle. Proc. 59th Annual Meeting, U.S. Livestock Sanitary Assoc. (1955).

g. Chow, T. L., J. L. Paloty and A. W. Deem (1956): Infectious Rhinotracheitis in Feedlot Cattle, III. An Epizootiological Study in a Feedlot. J.A.V.M.A., 128, 348-351.

h. Miller N. J. (1955): Infectious Necrotic Rhinotracheitis of Cattle. J.A.V.M.A., 126, 463-467.

11. Bovine Malignant Catarrh:

a. Plowright, W. (1953): The Pathology of Infectious Bovine Malignant Catarrh in Cattle and Rabbits. Proc. 11th International Veterinary Congress I, (1953), 323-328.

b. Stenius, P. I. (1953): Bovine Malignant Catarrh (A Statistical, Histopathological, and Experimental Study). Proc. 15th International Vet. Congress I, (1953), 320-323.

c. Stenius, P. I. (1952): Bovine Malignant Catarrh. Monograph, Inst. of Pathology, Veterinary College, Helsinki. State Vet. Med. Inst., Stockholm.

d. Piercy, S. E. (1953): Investigations into Infectious Bovine Malignant Catarrh. Proc. 15th International Vet. Congress I, (1953), 328-332.

e. Gross, J. W., Cole, C. R. and Kissling, R. E. (1947): Pathology of Malignant Catarrhal Fever. Journal of Pathology, 837-841.

f. Textbooks:
M. W. Henning (1949): Animal Diseases in South Africa, 2nd Edition.
W. A. Hagan and D. W. Bruner (1951): Infectious Diseases of Domestic Animals.
Hutyra and Marek (1949): Special Pathology and Therapeutics of the Diseases of Domestic Animals.

CHLOROMYCETIN TINCTURE 10% (VETERINARY) — A NEW AND EFFECTIVE REMEDY FOR CONTAGIOUS FOOT ROT

Parke, Davis Laboratories (Pty.) Ltd., announce the introduction of Chloromycetin Tincture 10% (Veterinary). This product is an alcoholic solution of Chloromycetin 10% with 0.5 gentian violet, which was developed following original work in Australia through the Parke-Davis laboratories there. It has proved to be an extremely effective agent for the treatment of the serious and widespread condition of contagious foot rot in sheep.

The first report of the treatment of contagious foot rot in sheep with Chloromycetin was given by Dr. D. F. Stewart,[1] of the C.S.I.R.O.'s McMaster Animal Health Laboratory, in August, 1953, and the full report was published in the Australian Veterinary Journal in July, 1954.

Dr. Stewart compared the efficiency of various agents, including formalin in various strengths, penicillin, streptomycin and chlortetracycline, against experimentally induced foot rot, with Chloromycetin. The 10% Chloromycetin solution displayed the most promise, since treated cases dried up the same night and healed satisfactorily. While some of the other agents affected an improvement, the infection reappeared after a week or a fortnight.

In subsequent field trials a 10% Chloromycetin solution was found to be remarkably effective, 87% of 107 affected feet being apparently cured by one treatment.

Sambrook,[2] writing in the Veterinary Record, reports on the treatment of thirty rams with Chloromycetin Tincture 10% where early treatment with copper sulphate and Stockholm tar had proved ineffective and, despite the advanced state of the condition, and the persistence of granulation tissue, all animals became sound and remained sound. H. Thornberry,[3] writing on "The Control of Foot Rot in Sheep" in the Irish Veterinary Journal, October, 1955, states: "An examination carried out in May indicates that 10% Chloromycetin Tincture is the most effective of the agents so far employed, for even after one application a marked improvement was noticeable in some of the chronic cases which had defied the other common treatments" and, "An examination of all the sheep under trial was carried out three weeks later, when the opinion was formed that 10% Chloromycetin Tincture is a more effective agent against foot rot than either 30% copper sulphate or 50% formalin solution. It has the further advantage that it can be more easily and thoroughly applied, is time-saving and much safer and pleasant to work with than strong solutions of either copper sulphate or formalin, the latter constituting a very real danger to the eyes and exposed mucous membranes of the operator."

References: (1) Stewart, D. F. (1954), Austr. Vet. J., 30:209.
(2) Sambrook, P. M. E. (1955), Vet. Rec., 67:74.
(3) Thornberry, H., Irish Veterinary Journal, October, 1955.

ADMINISTRATION:

Before applying Chloromycetin Tincture it is essential that all diseased and underrun horn should be thoroughly pared away. The importance of this is emphasised by Stewart,[1] who points out that in those cases where a second treatment was required an unexposed pocket of infection was found.

After paring, the hoof should be washed clean and the Tincture applied vigorously by means of the stiff brush provided. Treated sheep should be allowed to remain on dry, hard ground for at least one hour before being returned to pasture.

In order to obtain the best results, affected pasture should be isolated from seven to fourteen days to allow the organisms in the soil to die before sheep are returned for grazing.

Two fluid ounces of the Tincture are usually sufficient to treat 25 to 30 affected feet and, in order to assure the greatest economy, it is suggested that the Tincture be poured into a small receptacle as required, and placed out of direct wind or sunlight.

Package Information:

Chloromycetin Tincture is supplied in:
Bottles of 2 fl. oz. with brush;
Bottles of 16 fl. oz. with brush.

Distributors:

Union of South Africa: Lennon Limited — All branches.
Rhodesia: Ian Wilson (Pvt.) Limited.

INTER-AFRICAN ADVISORY COMMITTEE FOR EPIZOOTIC DISEASES

THIRD ANNUAL MEETING

The above C.C.T.A. meeting under the Chairmanship of Mr. R. S. Marshall, C.B.E. Veterinary Adviser to the U.K. Colonial Office, was held in Pretoria from July 2-4th, 1956, Veterinary Representatives from each of the Six Member Countries of the Commission namely Belgium, France, Federation of Rhodesia and Nyasaland, Portugal, Union of South Africa and the U.K. were present.

Technical reports were received on the following subjects:—

1. Murine adapted strains of Asterococcus mycoides in the immunisation of cattle against bovine pleuropneumonia, by Dr. Gerlach — Angola.
2. A quantitative Complement fixation test for contagious bovine pleuropneumonia, by Mr. R. C. Newing — Kenya.
3. Recent advances in Rinderpest vaccine Research, by Dr. S. E. Piercy — Kenya.
4. A review of the bovine Theilerioses, by Dr. W. O. Neitz — Union of South Africa.
5. Prophylaxis against Rabies in Southern Africa, by D. A. Lawrence — Federation of Rhodesia and Nyasaland.

Further consideration was given to interterritorial projects including rinderpest, survey of wildlife, a statistical survey of clinical and laboratory data in rabies, regulations for the exchange of virulent material and the establishment of regional committees on epizootic diseases.

It was resolved that an international convention for the control of rinderpest be drafted and a specialist meeting of experts on laboratory techniques in contagious bovine pleuropneumonia be convened.

The technical reports for the 1957 meeting will fall under the title of Important Virus Diseases of Animals transmitted by Arthropoda.

An invitation to hold the Fourth Annual Meeting at Dakar was received from the French Government and Dr. D. A. Lawrence, Director of Veterinary Services, Southern Rhodesia, was elected Chairman for 1956/57.

REF.: 90B/36

Dear Sir,

Above brief note on the proceedings of a recent meeting of the Inter-Africa Advisory Committee on Epizootic Diseases for favour of printing in your scientific Journal.

Your faithfully,

W. E. SEATORS,

Direct, Inter-African Bureau of Epizootic Diseases.

P.O. Kikuyu, Kenya.

Editor, Journal South African Veterinary Medical Association,
P.O./P.K. Onderstepoort,
Transvaal,
Union of South Africa.

19th July, 1956.
WGB/HMDW.

MULE BREEDING AT THE CAPE

The following letter has been received from Dr. H. H. Curson, dated 9/7/56:—

Date when Mules were first Bred at the Cape.

"A military friend in London has asked me the above question. He adds that there is no mention of them before 1845 that can be found so that before that date it must be taken that all transport would have been horse or ox. Donkeys would probably have the same date as mules. The R.A.S.C. is very keen to obtain some information."

Can any of our members throw any light on the subject?

Editor.

THE CONSTITUTION AND ARTICLES OF ASSOCIATION OF THE SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION

A. M. DIESEL

Pretoria

It is not proposed, in this short article, to do more than draw attention to the need to review, recast, and reprint, the Constitution and Articles of Association of our Society.

The South African Veterinary Medical Association was formed in 1920 by the amalgamation of The Transvaal Veterinary Medical Association, The Natal Veterinary Medical Association and The Cape of Good Hope Veterinary Medical Society. At the inaugural meeting, held in Johannesburg on April 1, 1920, a constitution and rules for the newly formed Association were adopted, and in 1922 printed and issued to members.

In 1929 a special committee was appointed to revise and redraft the constitution. At the General Meeting held on April 17, 1930, the recommendations of this committee were considered. The revised constitution came into effect on June 1, 1930, was printed and issued to members. Since then no organized revision has taken place.

In 1940, it became necessary to reprint the Constitution and Articles of Assoication showing the amendments brought about during the previous ten years. This annotated version was again issued to members.

Since 1940 other amendments have been adopted and the reprinting of an up-to-date copy of the constitution is once more indicated.

It would be wise, therefore, to reprint a reformed Constitution and Articles of Association setting it out in keeping with modern conceptions and thereby incorporating certain safeguards.

The present constitution was originally based on that of the old Transvaal Veterinary Medical Association and still shows signs of a now decadent form.

All amendments have of course been brought to the notice of the Registrar of Companies.

It is not the intention in this article to indicate in detail how the Constitution and Articles of Association could be improved. This should be left to a committee acting in consultation with a specialist in constitutional law. Such a specialist is available in Pretoria and his services can be obtained at a very moderate fee.

It is necessary, in justification, to draw attention to only a few of the needs for revision of the constitution. During the last Annual General Meeting, a proposal designed to improve the

representation on Council through regional delineation failed, because the constitution made no provision for the affiliation of its branches.

Furthermore it would seem that if branches are affiliated to the parent body, local rules necessary for their activities, should be laid down in the Articles of Association of the parent body. The branches should not be permitted to draw up local constitutions, each different and possibly committing the parent body.

The Association may on certain occasions wish to contribute to causes and charities of a non-professional nature. Under the present constitution this cannot be done.

The existing constitution has no liquidation clause.

As it stands at present there are four proclaimed standing committees and provision is not made for any other standing committees.

Rule No. 16, calls for the presentation to the secretary of a copy of the paper to be delivered at an annual meeting — this could be left out of the constitution as it is covered by the objects of the Association.

And so one could go on making suggestions, but as indicated previously this should be the task of a special committee, acting in consultation with a legal specialist.

We can no longer operate on a constitutional pattern which suited our purpose thirty years ago.

Times have changed.

We live in a difficult world. We should protect our interests in the best way possible.

We have a Journal and we accept advertisements for insertion into it. We have a Benevolent Fund. Our assets are considerable.

Is our present constitution in keeping with our responsibilities and possible commitments and does it protect us against average eventualities? The expert on constitutional law will be able to advise and assist us to improve our constitution and design it to modern standards.

The Registrar of Companies will doubtless welcome such action as his records must by now be as confused as our own.

Finally, it is suggested that after each Annual Meeting a list of members enjoying the full privileges of the Association should be printed and issued to all members.

Jl. S.A.V.M.A. 27 (4), 1956

SOME THOUGHTS ON MODERN VIRUS TECHNIQUE

R. A. ALEXANDER

Pretoria

Research into viruses and virus disease has reached a tempo equalled or possibly surpassed only by the phenomenal industrial and agricultural development seen in South Africa today. In fact, in this field we have reached a stage of progress which is comparable with the progress that was made in the field of bacteriology shortly after the turn of the century. Even the full time research worker finds it almost impossible to keep abreast of the mass of literature which weighs down the shelves of any well-stocked library. I fully appreciate, therefore, that it is quite impossible for the busy practising veterinarian to obtain even a nodding acquaintance with modern developments, particularly since I was amazed to note that even at Onderstepoort there are workers who are not acquainted with the activities in the virus section at this Institute. That is my excuse for giving a sketchy review in very general terms of the various techniques employed by the research worker in virus disease in a well equipped laboratory **today.**

Sound technique is the basis of all research. Once a technique has been developed and proved, results flow in and progress can be reported. Conversely if one has a knowledge and appreciation of technique then one is in a position to follow and understand what the research worker is doing and what he is aiming at.

To start off with let us consider a workable definition of a virus. It may be defined as an infectious agent below the limits of visibility, capable of passing a filter, and capable of multiplication only in the presence of living cells.

Let us consider these three points very briefly.

(1) *Visibility*

It is not possible to increase the power of resolution of the modern microscope because essentially this is dependent upon the refractive index of the material used for manufacture of the lenses. Appreciating the limitations of the sensitivity of the human eye, more sensitive photographic plates have been used to obtain clear images of objects which could not be seen. Thereafter came the development of the electron microscope, so that today we are able to obtain clear pictures of objects far below the limits of visibility under the best possible microscope. Therefore, the first point in our definition now falls away.

(2) *Passage through a filter*

This property is primarily a function of size though such factors as electrical charge, etc., do have a role. The development of graded collodion filters of known and uniform porosity has made it possible to develop filters capable of preventing the passage of particles far smaller than the vast majority of virus particles. Even

the virus of Foot and Mouth disease, which is only slightly larger than the haemoglobin molecule can be kept back. Therefore, the second point in our definition falls away.

(3) *Multiplication only in the presence of living cells*

This point of differentiation between the viruses and bacteria is still valid today. Without entering the controversial field of the exact position of the Rickettsias one may still state dogmatically that viruses are capable of multiplication only in, or in the presence of living cells. It is in that field of research which deals directly or indirectly with the propagation of viruses outside the animal body that the greatest progress has been made in recent years. I purposely use the word indirectly because not only is it important to "grow" the virus but it is equally important to determine accurately what degree of multiplication has taken place. Here there has been a refinement of technique which can be described only as ingenious.

Up to only some 30 years ago the research worker was dependent upon the actual animal which suffered from the particular disease for a supply of the virus which he wished to study or of which he required an adequate supply. There are present in this room some who will remember Sir Arnold infecting horses with horsesickness virus to obtain supplies of virus for the production of hyperimmune serum from previously immunized animals. Two susceptible horses were required for the hyperimmunization of about five horses and these two donors always died. More recently many will remember the injection of a particular strain of bluetongue virus into susceptible sheep and the tapping of their blood at the height of the subsequent febrile reaction for the production of some three million doses of bluetongue vaccine per annum. Even today we use the premune bovine from which to obtain supplies of blood infected with protozoa for the production of redwater and gallsickness vaccine, though in this instance I have wandered from the field of virology. Remember, however, that Swine Fever virus which is the basis of the serum virus method of immunization against Swine Fever is still obtained from reacting pigs which are sacrificed.

It was natural that attention should be directed to a search for susceptible small laboratory animals available in large numbers in which the virus could be propagated as desired. In 1920 Waldmann and Pape showed that the virus of Foot and Mouth disease could be propagated by suitable injection into the plantar pad of the guinea-pig foot. Virus could be harvested in large quantities from the vesicles that developed at the site of injection. Then Laidlaw and Dunkin, during the course of their classical research into dog distemper that was sponsored by the sporting paper "The Field" showed that the ferret is susceptible to dog distemper. That experimental animal was used to supply the virus which led to the development of the first method for artificial immunization of dogs against distemper, and was replaced only by the present method developed at Onderstepoort in which the virus is propagated in the developing hens egg.

Then in 1930, along came Max Theiler, the son of our Sir Arnold, with his report that the white mouse is susceptible to the virus of Yellow Fever of man, provided it was injected by the intracerebral route. If the virus from man is injected into the brain of a mouse not only does it multiply but, during the course of serial passage from mouse brain to mouse brain it becomes so modified that it loses its virulence for man but produces an immunity. This discovery led to the development of the present vaccine which has controlled Yellow Fever in the world today.

This technique opened up a huge new field for research. The method was applied to research into a host of other viruses such as horsesickness, louping ill, herpes and the whole series of insect-borne Encephalitides. It is outside the scope of this communication even to outline the results which have been achieved but the nett result was that by 1932 the accepted approach to an investigation of a virus disease of man or domestic animals was to collect material as early as possible in the febrile reaction of the disease and to inject as wide a series of laboratory animals as possible for instance rabbits, guinea-pigs, mice, ferret, hamsters, gerbilles, cotton rats and even particular strains of these experimental laboratory animals by every conceivable route of injection, for example, subcutaneous, intraperitoneal, intravenous, intracerebral, intradermal, intratesticular, intraocular and intrathecal. Great progress was made but this shotgun method has its limitations. The first is that the virus under investigation may be contaminated with and actually outgrown by a virus which is peculiar to the laboratory animal under investigation. Secondly, such as in the case of bluetongue, virus may multiply but show no visible evidence of that multiplication.

Finally in 1948 Dalldorf and Sickels made the completely unexpected discovery that suitably prepared material from the stools of two children suffering from mild poliomyelitis in Coxsackie, a small town in the State of New York, America, was lethal for the suckling mouse but not for older mice. The route of injection was through the interscapular pad of fat into the base of the brain and the virus multiplies in the brain and the muscles generally. This led to the discovery of the Coxsackie group of viruses of which there are no less than 26 antigenically different strains which fall into two groups causing signs of disease in man varying from a mild fever or summer diarrhoea to a condition almost indistinguishable clinically from poliomyelitis. Again the development of this technique opened up a new field. We ourselves use it for the study of bluetongue of sheep to which the suckling mouse but not the adult mouse is susceptible and reacts with definite clinical symptoms terminating in death. We also use the method to differentiate between Rift Valley Fever virus and Wesselsbron virus since the adult mouse injected intraperitoneally is susceptible to Rift Valley fever but not to Wesselsbron, whereas the day-old mouse is susceptible to both. Today the day-old mouse is the laboratory animal of choice for investigation of a wide range of virus diseases.

Again bearing in mind that the living cell is essential for the multiplication of viruses, Woodruff and Goodpasture in 1931 reported their finding that the chorioallantoic membrane of the developing hen's egg may be used for propagation of the virus of vaccinia and that as a result of multiplication on the membrane there was developed well-marked specific pocks. Strangely enough this discovery did not attract the attention that it merited. Use of the fertile egg has many advantages. Eggs are comparatively cheap and are obtainable in large numbers. Bacterial contamination can be detected immediately. Hereditary diseases, particularly virus diseases of fowls are not usually transmissible to domestic animals and man. The source of living cells is presented to the worker complete in its own container and can be easily handled in large numbers. It was only some ten years later when Burnet was carrying out his classical research into influenza of man that full attention was focussed upon the value of the fertile hen's egg and it was shown that not only the chorio-allantoic membrane was of importance as a source of living cells that real progress was made. Fertile eggs were infected by injection into the chorio-allantoic cavity, directly into the yolk-sac, or by injection into the brain or body of the embryo itself. Finally the intravenous route by injection straight into one of the larger veins of the chorio-allantoic membrane was used. Time does not permit me to describe in detail exactly how these various techniques are carried out. Great ingenuity has been displayed and the various methods are within the compass of any reasonably experienced technician. The developing hen's egg is now used as a routine method for work on a very wide range of viruses. We use the method for bluetongue, distemper, rabies, Newcastle disease, Rift Valley fever, Wesselsbron virus, fowlpox, and Swine fever. It may surprise you to know that in this work we at Onderstepoort regularly use 75 dozen fertile eggs per day. Without the fertile hens egg it would have been quite impossible to meet the demand for 20 million doses of bluetongue vaccine for sheep which was made on us last year.

An interesting side line is that Hirst noticed that while he was collecting virus in the form of the allantoic fluid of infected eggs that if that fluid came into contact with blood from the chick embryo the red cells were agglutinated. He followed up his observation and there was developed the haemagglutination test for viruses. This test is now extensively used not only for the specific identification of viruses but for a quantitative estimation of virus content and has been used as a basis for the classification of various groups of viruses.

While all this was going on progress was of course being made in other fields of biological research. In the early 1920's attention was focussed upon the work of Alexis Carrel on the propagation of chick embryo fibroblasts in tissue cultures. Here we had a method of not only keeping cells alive but of growing them outside the body. It was believed at the time that the knowledge that would be gained of the growth requirements of

cells would ultimately lead to the discovery of why and under what conditions normal cells became malignant, in fact that we were on the threshold of the solution of the cancer problem. Valuable contributions to the study were made by a number of workers but it is common knowledge that up to the present tissue culture has not solved the cancer problem. To my mind tissue culture is a technique of maintaining and propagating cells but it must be regarded only as a technique though characterized by extreme refinement. To master this technique is the best training ground I know for the budding bacteriologist or virologist. Divested of all its details tissue culture is really based upon obtaining living cells and adding them to a liquid or solid medium such as a blood plasma clot, all under complete asepsis, and thereafter to allow the cells to multiply. Actually in 1928 Maitland and Maitland used a simple modification of the technique for propagation of viruses. All they did was to add virus to small pieces of kidney material placed in nutrient fluid. The kidney cells remained alive even if they did not multiply but in the presence of the living cell the virus multiplied. This method was adapted to the propagation of a number of viruses but fell into disrepute chiefly for two reasons.

(1) Although the virus did multiply the titre invariably was so low that the harvest was of little value.

(2) Bacterial contamination was the bugbear to the production of large quantities of infective fluid. This stumbling block has been overcome by the advent of the antibiotics and I propose to show how history has again repeated itself. In 1943 Huang working with Western equine encephalomyelitis virus and using the original Carrel technique with hanging drops of chick embryo fibroblasts to each of which was added a drop of fluid from falling dilutions of virus emulsion, showed that he was able to titrate quantitatively from the necrotic lesions produced in the fibroblasts the exact titre of his original virus emulsion. In other words as a result of multiplication of the virus the tissue was destroyed. Eight years later along came Robbins and his co-workers to show that poliomyelitis virus produced exactly the same cytopathogenic effect on cultures of various human cells. Then came Dulbecco and Vogt, Melnick, Selers and Enders with their cultures of cells in monolayers in roller tubes. Not only has the development of this technique been the basis for the development of the present Salk vaccine for poliomyelitis but it has been as great a stimulus to virus research as the discovery of the antibiotics and the sulphonamides has been in the treatment of frank disease in animals and man. As a source of living cells practically any living tissue, embryonic or otherwise, may be used. For poliomyelitis is used monkey testicular or kidney tissue. We use for bluetongue, Lumpy skin disease, Swine fever, Rift Valley fever, etc., kidney tissue of sheep, cattle and pigs. For fluid there is used balanced buffered isotonic salt solutions. Just as in the early days of the development

of bacteriology almost every bacteriologist developed a particular type of bacterial medium with peculiar advantages which invariably was named after him. So today we have a wide variety of fluids named after the particular worker who used or developed them. Sterilization is effected either by autoclaving or when that is not possible, by filtration, bacterial contamination is obviated by the judicious use of antibiotics. For nourishment of either the cells or the virus or both there is used either the good old chick embryo extract or serum or synthetic lactalbumin hydrolysate or all together. Again time does not permit me to detail the exact technique but it is based upon preliminary digestion of unwanted material by the action of trypsin. The trypsinized material is spun so that eventually the individual cells are disbursed and can thereafter be transferred in particular concentration to a series of tubes. By appropriate incubation these disbursed cells settle onto the glass upon which they grow out as a sheet which becomes confluent. Virus added to these living multiplying cells itself multiplies and produces certain effects which are easily detectable.

I have no hesitation in saying that the development of this technique has proved as great a stimulus to further research into virus diseases as any previous discovery. A huge field has been opened of which we have only touched the very fringe. History is again repeating itself. Maitland as I have told you suspended small pieces of tissues in his culture medium. Today we are suspending individual cells in nutrient fluid and by maintaining them alive if not multiplying in the fluid by agitation, there is provided a nutrient medium upon which viruses will multiply just exactly as on any bacteriological medium. There has even been developed a solid medium whereby the disbursed individual cells are contained in agar on plates.

Shorn of all the elaborate details what I have written indicates that what was merely a dream a few years ago has now eventuated. There has been developed for the virologist a culture medium in tubes for the in vitro propagation of his viruses which is the exact counterpart of any ordinary bacteriological medium and in addition there are further advantages in that the growth of the virus can be followed by the visual effect upon the cells. In effect in virology we have reached an era comparable to the discovery of the possibility of propagating bacteria in inert sterile medium in a tube. It is confidently anticipated that there will be made within the next few years as notable an advance in our knowledge of viruses, virus diseases, and their control as was accomplished in the field of bacteriology at the turn of the century.

I conclude by repeating that history has again repeated itself.

ASPECTS OF TUBERCULIN TESTING IN CATTLE

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Tuberculin testing in cattle and the associated problems form so vast a subject that it is not possible to do more than touch very briefly on most aspects.

Bang (1892) made the following statement: "It is found that the tuberculin-test is no more perfect than any other things in this world. Sometimes it fails. Animals with a very real degree of tuberculosis will sometimes fail to react and the same applies to animals with a very slight degree of the disease. Further, a positive reaction has been observed several times in animals in which no tuberculous changes were found on examination of the organs when the animals were slaughtered . . . but it would be the greatest folly to reject this method because it is not able to give everything we desire."

These words are still true and for this reason it is necessary that the test, the phenomenon of allergy and the pathogenesis of tuberculosis be properly understood. Only with meticulous and correct execution of the test and a realization of the factors that may influence it does it become possible to interpret results in a responsible manner.

The intradermal tuberculin test in some form or other has now been generally accepted in the world as the official test. So far the Single Intradermal Tuberculin Test has been adopted as the official test in South Africa.

The main concern in the interpretation of the Intradermal Tuberculin test is to decide when a reaction is specific. To be able to decide this question various factors must be taken into consideration.

1. *Tuberculin*

Great strides have been made in tuberculin production since Koch's Old Tuberculin was first prepared. With this tuberculin it was found that protein bodies other than tuberculo-protein, and derived from the culture medium also caused swelling and interfered with the interpretation of reactions. It was also difficult to maintain a standard strength from batch to batch.

Synthetic medium tuberculins in which the nitrogen was supplied by the addition of asparagin, were introduced to overcome this difficulty. Other problems remained. It was found that high molecular weight tuberculo-protein was antigenic and could sensitize subjects in subsequent tests. Unheated tuberculo-proteins elicited the same property. These difficulties were overcome by using trichloracetic acid to precipitate the tuberculo-protein and by the use of a certain amount of heat in the tuberculin preparation.

Some difference of opinion still exists as to the relative merits of P.P.D. and Heat Concentrated Synthetic Medium Tuberculins. South Africa has followed the lead of a number of eminent authorities in that P.P.D. tuberculin offers the best product. It has the merit that its production is standardized, it can be physically purified and chemically standardized. It is therefore a standard product and test results can be compared over a long period.

Van Waveren (1953) found that Tri-chloracetic Acid is damaging to the proteins and has reduced contact to six hours. He further established that Mono-potassisum-phosphate, used for washing tuberculo-protein, was wasteful and replaced it with 5% Sodium Chloride.

Dalling (1948) pointed out that the yield of tuberculo-protein was essentially dependent on an optimum pH during the growth and disintegration of the bacilli.

For a long time human strains of Mycobacterium tuberculosis were used practically exclusively in the production of tuberculin. This was the case because it was believed that human and bovine strains were practically identical antigenically and because of the easier growth of human strains and resultant bigger yields of tuberculin.

Van Waveren (1953) found that by using the Weybridge glycerine-tolerant bovine strain AN5, on B.A.I. medium, nearly as much tuberculo-protein was obtained as with the human strains C, PN and DT.

This has also been the experience at the Onderstepoort laboratory.

2. *Tuberculin Sensitivity (Allergy)*

The tuberculin test is based on the fact that a specific reaction is sought to a specific antigen (tuberculin). One of the biggest problems with the test is to be found in this fact: The family Mycobacteriaceae embraces many members and group- and cross-reactions are common. This is to be expected as proteins which are functionally, and therefore probably structurally, related, are likely to give such reactions.

This subject could possibly be briefly discussed under the following headings:

(a) *Non-Specific Sensitization to Tuberculin*

The term "non-specific reaction," in cattle, is used to imply the response in healthy cattle to tuberculin.

The causes of non-specific sensitization can be classified as follows:—

(i) Pathogenic acid-fasts, viz., M. tuberculosis var. hominis, M. tuberculosis bovis, M. tuberculosis var. avium, M. para-tuberculosis and possibly certain strains of acid fasts found in so-called skin lesion infection.

Hedström (1949) after exhaustive investigations concludes that acid-fasts, responsible for so-called skin lesions, fall within a group of pathogenic Mycobacteria.

Wessels (1948) also concludes that ". . . positive skin lesion reactors have not been sensitized by ordinary saprophytic acid fasts."

(ii) Non-pathogenic acid fasts.

(iii) Temporary hetero-allergy. In this group a great variety of infective agents and other conditions have been blamed. Brucella abortus infection, fungi (Actinomycosis, Actinobacillosis), C. ovis (Prèisz-Nocard), C. pyogenes, pregnancy "heat", liver pathology, e.g., cirrhosis and fascioliasis, insect stings, the season, etc.

Buxton and Glover (1939) conducted experiments surveying a number of infections. These findings were briefly:—

No Reactions: C. pyogenes, C. Preisz-Nocard, Actinomycosis, Actinobacillosis, M. phlei.

Reactions Obtained: Br. abortus — from no reaction to a slight and definite one. Reactions were obtained with the various recognized pathogenic strains of M. tuberculosis.

(b) *Serological Relationship of Mycobacteria*

For some considerable time it has been accepted that tuberculin sensitivity fell into two main groups, viz., Mammalian and Avian. (Wilson, Furth, Aronsen and Lewis, cit. Wessels 1948). It was also generally agreed that reactivity to human and bovine tuberculins in bovine infection did not differ materially.

Fromm and Wiesmann (1953) found that in human sensitization at least 50% of animals gave bigger reactions to human tuberculin. In the same investigation bovine tuberculin gave bigger reactions in 36.36% and equal reactions in 13.64% of animals tested.

Plum stated that 15-20% cattle sensitized with the bovine strain react as well to human as bovine tuberculin and stronger in 10% of cases.

Hedström experienced generally stronger reactions with human tuberculin in bovine infection and decided that human tuberculin had a greater allergen content and that for this reason higher human values are also obtained in human-bovine tests in skin lesion infection. A comparative investigation of this nature has therefore no significance in the differential diagnosis of tuberculosis and so-called skin tuberculosis.

Hedström also conducted comparative investigations with bovine and avian tuberculosis in three groups of 102, 232 and 841 animals infected with bovine, avian and so-called skin tuberculosis, respectively. He proves statistically that bovine tuberculin gives stronger reactions in bovine infection, and avian tuberculin gives stronger reactions in both avian and so-called skin-lesion infection. He therefore concludes that the comparative avian-mammalian test

has merit in excluding bovine tuberculosis in herds which show reactors. It would, however, be necessary to exclude avian infection. He states that Plum also found greater reactions to avian tuberculin.

Wessels (1948) investigated the serological relationship of various acid fast bacteria. He used human, bovine, and avian strains as well as nine strains obtained from skin lesions, two saprophytes, M. phlei and butyricum, and two strains of so-called Leprosy bacilli. His findings are revealing: Using purified proteins of the organisms concerned he found —

(i) a distinct difference between human, bovine and avian strains and that they are three different serological types;

(ii) the bovine strain is serologically unrelated to the skin lesion acid-fasts — there is only a group reaction;

(iii) there is a closer relationship between skin-lesion acid-fasts and the human strain;

(iv) the relationship between skin-lesion acid fasts and the avian tubercle bacillus is very close and they cannot be differentiated serologically;

(v) skin-lesion acid-fasts are related to both saprophytic acid fasts and so-called leprosy bacilli.

Dalling (1948) is also of the opinion that bovine P.P.D. is likely to be helpful in differential diagnosis when used in comparison with avian tuberculin. He cites a bovine tuberculin only one-third as active as human tuberculin in avian sensitized guinea pigs yet having the same potency as the human preparation in bovine sensitized guinea pigs. He also quotes Green's (1946) chart of specificity factors. Six "tuberculins" produced from different acid fasts were used. "Specificity factor" is defined as the number of weight units of heterologous P.P.D. required to elicit the same reaction as one unit of the homologous product.

Type of Sensitization	*Human*	*Bovine*	*Avian*	*Johne*	*Phlei*	*BCG*
Phlei	150	150	100	50	1	150
Human	1	½	20	30	150	2
Bovine	1	1	40	30	150	2
Avian	20	40	1	3	100	40
Johne	10	10	3	1	50	10
BCG	1	½	20	30	150	1

The work was done on guinea pigs and the table is important in deciding relative sensitivities.

Van Waveren (1953) used human and bovine tuberculins (strength 1.5 mg. per ccm.) in comparative investigations. He quotes the following findings:—

	Average increases in skin measurement with		
	Human PPD	Bovine PPD	Avian Tuberculin
Healthy Cattle	3.3	1.8	1.4
Infected Cattle	9	8.9	2.5
Problem Cattle:			
(a) 17 infected at slaughter	4.2	5.3	1.6
(b) 10 "Skin Lesion" cases	3.9	2.5	2.2
(c) 19 T.B. free at slaughter	3.3	2.2	1.7

The author concludes that bovine tuberculin is at least as good as "human" and more specific — positive reactions being more oedematous.

In South Africa some comparative investigations have been carried out with human and bovine tuberculins (strength 2 mg. per ccm.):—

(i) 28 Animals, including twenty-four naturally infected with bovine tuberculosis were tested with the following results— "Bovine reactions" exceed "human reactions" twenty times. "Human reactions" exceed "bovine reactions" four times— in the twenty-four infected animals. Equal reactions were obtained in the four negative animals.
Aver. inc. in skin measurement to "Bov."=8.54 mms.
Aver. inc. in skin measurement to "Human"=6.54 mms.
Reactions to the bovine tuberculin were generally more oedematous.

(ii) 162 Head of cattle free from tuberculosis yielded the following results:—
"Bovine" bigger than "human" — 60 times — average increase in skin measurement 0.51 mms.
"Human" bigger than "bovine" — 44 times — average increase in skin measurement 0.475 mms.

(iii) In a herd slightly infected with so-called skin-lesions, there were two clinical cases, 237 head were tested with the following results:—
"Human" exceeds "bovine" 98 times — average increase in skin measurement 0.93 mms.
"Bovine" exceeds "human" 52 times — average increase in skin measurement 0.64 mms.
The actual readings for the two clinical cases of so-called skin-lesions were H 5.5 and 15.
B 3 6

(iv) 225 Head of cattle contained in a well isolated tuberculosis-free herd, but infected with so-called skin-lesions were

subjected to a comparative test with human and bovine tuberculins (2 mg./C.cm.).

91 Animals gave reactions of 2 mms. or more to one or other of the tuberculins used. "Human" exceeded "Bovine" 81 times and "Bovine" exceeded "Human" 5 times and equal reactions were obtained in three instances. Reactions in the latter two categories were at a relatively low level.

The total increase in skin measurements to "human" in these 91 animals was 408.5 mms. and to "bovine" 167.5 mms. Average increase to "human" was 4.49 mms. and average increase to "bovine" was 1.84 mms. This phenomenon had been noticed on a smaller scale in other herds.

These findings are in accordance with those of Wessels (1948) who established that skin-lesion acid-fasts were serologically unrelated to bovine bacilli but more closely related to the human type.

Hedström (1949) ascribed greater reactions to human tuberculin to a greater allergen content. In view of Wessels' findings this contention cannot be supported. This latter herd was also subjected to the "Human-Avian" single intradermal comparative test, three months previously. The smallest increase in skin measurement noted for purposes of compiling these findings was 1.5 mms. to any one of the two tuberculins.

86 of the 225 animals reacted.

"Human" exceeded "Avian" 61 times.

"Avian" exceeded "Human" 19 times.

"Human" equal to "Avian" 6 times.

Average increase in skin measurement in these 86 animals were:—

To Human tuberculin — 4.222 mms.

To Avian tuberculin — 2.535 mms.

The biggest increase to Avian tuberculin was 6 mms. with the corresponding human increase 4 mms.

The comparative figures for human tuberculin were 9.5 and 6.5 mms., respectively.

The "human" exceeded the "avian" increase by 6 mms. in one animal only.

In the face of these results the serological picture becomes somewhat involved as avian tuberculosis was found to be very closely related, serologically, to skin-lesion infection. (Wessels 1948.)

Hedström (1949) again found considerable variation in the pathogenicity of acid-fasts of the skin lesion type and it is likely that the antigenic picture varies likewise. He was able to transmit the disease and establish allergy with three of four "strains" but had a negative response with a large number of other strains. He also considers it unlikely, after comparison, that his acid-fasts are

identical with those of Daines & Austin in America. It is therefore possible that further differences exist between the acid-fasts isolated in Sweden and America and those causing infection in South Africa.

The Blood Picture

Dalling (1948) mentions the possible importance of examinations of blood before, during and after the tuberculin test. Reference is made to the work by Johnstone (1942), Bredich (1929) and Arthur (1946) in this connection. These workers found that about 12 hours after the injection of tuberculin in reacting cattle an absolute leucocytosis developed characterized by a neutrophilia and a lymphopenia. Insignificant changes were registered in non-reacting cattle. It was also not possible to differentiate non-specific infection by this means. Lamont participating in discussions on Prof. Dalling's paper mentioned that similar blood changes were found after parturition and after the injection of Sphyngomyelin and A.C.T.H. Almost the same blood changes followed the intramuscular injection of antigen into the sensitized subject or in intra-uterine instillation. This cell reaction was very exaggerated with the Stormont test. The interesting fact was that in all these procedures tuberculin reactivity was either completely suppressed or markedly reduced. He considered that the lymphopenia was significant.

Rolle & Mayr (1953) suggested the use of the neutrophile reaction following the injection of tuberculin in guinea pigs for test purposes: White cell counts are to be made 8-10 hours after injection. If the neutrophile count is doubled or shows an increase of at least 50% a positive reaction can be decided on. This method has no value if the pre-injection neutrophile value is 40%.

Schwartzmann and Scheierson (1953) concluded that skin reactivity is suppressed by A.C.T.H. by virtue of the fact that the tissues are protected against "toxins" to which they are sensitive without desensitization of the animal. Salicylates have a similar action of depressing the reactivity phenomenon through adrenal stimulation. Calcium Pantothenate is utilized by the adrenal cortex in the synthesis of steroids and if given with salicylates completely suppresses skin reactivity.

Stoerck (1953) states that Cortisone suppresses delayed reactivity, as in tuberculin, but not the immediate reaction (Arthus phenomenon, Anaphylaxis). Allergy is suppressed but not destroyed. He decides that this action is due to the adverse action of cortisone on lymphoid tissue and the resultant development of resistance.

Lurie et al (1953) similarly state that reactivity is suppressed by virtue of the prevention of inflammation and finally as a result of retardation of development of antibodies following the adverse action on lymphoid tissue.

These findings throw some light on the nature of tuberculin-allergy and further work along these lines may lead to alternative methods of testing for tuberculosis.

3. *Sensitivity of the Individual*

The ability of the individual to react to tuberculin varies considerably and this fact has an important bearing on the interpretation of test findings.

It is generally agreed that the extent of reactivity may vary with the age of the animal, the mode and extent of infection, the age of infection and whether the tuberculous processes in the body are active or static. There may also be individual or breed differences in sensitivity. The texture of the skin and the locality where the injection is made may considerably influence the nature of the reaction. The maximum reaction may occur at varying intervals after the injection of tuberculin in different individuals. Because of this and other reasons it was decided in Britain not to rely entirely on the nature of the reaction when tests are interpreted, Dalling (1948).

Reactions appear to decrease considerably as the disease progresses. This may be due to generalization or to encapsulation, and in still other instances no clear explanation exists.

Too frequent tests may cause desensitization which is also found in cows immediately following parturition (Kerr, Lamont and McGirr, 1949). Lamont pointed out that reactions are still found with the Stormont test, in cows so desensitized.

In addition reactivity may be influenced by febrile conditions and also through non-specific infection of diverse origin.

Rolle and Mayr (1953) investigated the virulence of T.B. bacilli from old cows. Material was obtained from 40 cows aged 8-12 years: Their findings were: Bacilli in —

20% remained virulent,
45% showed reduced virulence, and
35% showed more or less total loss of virulence.

Guinea pigs were used in these investigations.

The importance of these findings relative to reactivity remains to be decided.

Similarly, Arthur (Dalling, 1945) speculated on the relationship between reactivity and the activity of the tuberculous processes in the body. He found that in skin-lesion infection reactivity was directly related to whether lesions were active or static. He believes that allergy wanes with regression of the tuberculous processes in the body and quoted the following example of nine calves which were fed on tuberculous milk:—

	Increases in skin measurements in mms.		
Calf	Initial Test	After 6 months	After 10 months
1	33	17	15
2	33	14	11
3	47	21	14
4	40	19	14
5	32	17	11
6	24	30	14
7	31	22	14
8	34	14	8
9	35	25	25

Workers in Northern Ireland (Kerr, Lamont and McGirr, 1946) succeeded in desensitizing animals for various periods by administering excessive doses of tuberculin. These workers also indicated that specific reactions were still obtained by injecting heat killed bacilli in suspension in desensitized subjects — "specific bacillary reaction".

Multiple injections of tuberculin will cause desensitization and in comparative tests the stronger antigen will suppress the weaker. Also, the state of allergy of the subject will determine the extent of reaction to heterologous antigens.

The more concentrated the tuberculin, the more false positives will be found. Dalling (1948) and others feel that a smaller dose of tuberculin may give more specific reactions.

Messerli also concludes that tuberculin strengths are important.

Animals in the pre-allergic stage will not react or may react weakly.

Buxton and Glover (1939) established that a local area of skin ± 6 inches in diameter is desensitized by an injection of tuberculin some three weeks later. Hence the importance of choosing a test site at least this distance removed from the previous injection site.

The difficulty of individual sensitivity will never be completely solved. Experience in testing, correlating test and slaughter results and a knowledge of the history of animals and herds are most important in interpreting test results.

4. *The Intradermal Tuberculin Test*

The intradermal test was first introduced by Moussu and Mantou (1908). Since then a great deal of work has been done to perfect the test which has the merit of easier application and more expeditious execution as compared with the old subcutaneous test. The latter, especially the short thermal test, as evolved by Gregory, is at present still used as a differentiating test. The ophthalmic and various serological tests have been found to be too variable for general application.

In Britain the double intradermal comparative test was used until it was shown that equally good results were obtained by the single intradermal comparative test when the latter was adopted as the routine test. Great importance is attached to skin measurements in that country and an exact method of execution and interpretation had been evolved. (Ritchie 1953).

It is generally conceded that the intradermal test is more prone to give non-specific reactions than other tests. It is for instance believed that the subcutaneous test will rarely show reactions in either human sensitization or so-called skin-lesion infection. Francis (1947), Hedström (1949), Gotink and van Ulsen (1953).

Götshe and Plum, however, believe that a proportion of skin-lesion cases will react to the subcutaneous test.

In spite of unfavourable aspects of the intradermal tuberculin test it is generally acclaimed as the best test for use in an eradication

campaign. With experience and an understanding of the test great accuracy can be achieved.

It is important that the test in whatever form it is used, be carried out in a meticulously uniform manner.

Tuberculin must be of standard strength. Equipment must be suitable and preferably of uniform design. It is best for one operator to perform the test in all its phases and a standard modus operandi is essential. The injection site must vary as little as possible, the middle third of the neck, at least four inches below the crest, and injections must be made into the deeper layers of the skin. Disinfectants are best avoided. Clipping and thorough wiping of the test site is all that is necessary. Various methods of interpretation of the single intradermal and single intradermal comparative tests have been adopted in different countries. Interpretation standards will necessarily vary with the strength of tuberculin used.

Briefly, the following are a few variations in the Single Intradermal Test.

Britain

Increase in mms of 1 Circumscribed=Negative.
Increase in mms of 2 Circumscribed=Negative.
Increase in mms of 3 Circumscribed=Suspicious.
Increase in mms of 4 Circumscribed or more=Positive.
Increase in mms of 2 Slight Oedema=Positive.
Increase in mms of 3 Slight Oedema=Positive.
Tuberculin Strength 1.5 mg. per c.cm., etc.

Glover (1954) quoted somewhat extended standards at the meeting of the A.V.A., New South Wales Division, viz.:

Increase in mms of 2–3=negative.
Increase in mms of 3–5=suspicious.
Increase in mms of more than 5=positive.
Readings to be done at 72 hours.

Germany (Meyn, 1949 and 1953)

Goetze's standards.

Increase in mms up to 1.5=negative.
Increase in mms up to 3 =suspicious.
Increase inover mms 3 =positive but that interpretation must be more lenient in "clean" herds.

The importance of the nature of the swelling is stressed. Goetze considers that it should be possible that 96-98% of animals could be classed negative or positive and the remainder suspicious. Readings to be taken after not less than 72 hours or more than 96 hours. Tuberculin strength 100,000 T.U. per cc., synthetic medium albumen free tuberculin.

Netherlands (Van Waveren, 1951)

Increase in mms up to 2=negative.
Increase in mms of 4 and more=positive.
Any oedematous swelling=positive.
Tuberculin strength 1.5 mg. per cc.

Denmark (Nielson, 1949)

Different standards are used for "clean" and infected herds. *T.B. free herds.* Up to 2.5 mms is considered negative. With greater reactions the avian-mammalian test is performed and if still doubtful a further comparative test is done two months later. If the avian reaction exceeds the mammalian the test is considered negative.

The single intradermal comparative test is used in a number of countries. The British guide to the interpretation of this test can be summarized as follows:—

Reaction	If non-specific infection established	If non-specific infection not established
A+M—	Retain	—
AOM—	Retain	Retain
A+M+ A greater than M	Retain	Retest
A+M+ A+MO AO+MO AOM+ M not more than 4 mm greater than A	Retain	Retest
A—MO	Retest	Retest
A—M+ M not more than 6 mm greater than A	Retest	Remove
A+M+ AOM+ M 5 or 6 mm greater than A	Retest	Remove
A+M+ AOM+ A—M+ M more than 6 mm greater than A	Remove	Remove

Abbreviations: M=Mammalian. A=Avian. +=positive. —=negative. O=suspicious.

It is stressed that further variations are possible, e.g., if the presence of bovine infection is established the test must be interpreted as if non-specific infection is absent in spite of evidence to the contrary. Again, with marked reactions to both tuberculins, retesting is indicated in spite of the presence of non-specific infection in the herd.

The presence of one or more animals giving an A+M—, or clinical evidence of Johne's disease or "skin tuberculosis", in a herd, should be regarded as establishing the presence of non-specific infection.

Both Dalling and Lamont (1948) pointed out that the comparative test is only useful in herds with a known test history. Glover (1954) stressed that this test should not be used until near freedom from tuberculosis has been attained. Van Waveren (1951) states that the comparative test had been adopted for use in "clean herds".

Meyn (1953) mentioned that avian tuberculin had been found useful in indicating the presence of non-specific infection and that Lauterbach had compiled a formula that would largely eliminate mistakes in areas where tuberculosis had been more or less eradicated. The latter worker considers the comparative test positive in —

> Animals reacting positively to bovine tuberculin only and in animals where the reaction to bovine tuberculin exceeds the reaction to avian tuberculin by at least 3 mms. He states that slaughter tests had proved the value of this test.

Kerr, Lamont and McGirr (1946) compared the single intradermal, single intradermal comparative and Stormont tests in 590 animals. Their findings were:—

(a) *Single intradermal test.*
4.4% of positive animals missed.
6.1% false positives.
4.8% animals doubtful of which 28 were positive at slaughter.

(b) *Single intradermal Comparative Test.*
5.9% positives missed.
4.1% false positives.
Doubtfuls as for the single intradermal test.

(c) *Stormont Test.*
2% infected animals missed.
1.4% false positives.
No doubtfuls.

Human sensitization in cattle is somewhat more difficult to differentiate. Reactions are usually small and on retest may be decreased in size or may have waned completely. The comparative test in such cases is not indicative of avian sensitization.

Frömm and Wiesmann (1953) summarized their findings in investigations in this connection as follows:

(a) A large number of doubtful reactions are encountered.
(b) The reaction to human tuberculin exceeds that to bovine in 50% of cases.
(c) The subcutaneous and ophthalmic tests give a larger number of negative and doubtful reactions.
(d) A high percentage of negative post mortems is found.
(e) Lesions found show a strong tendency to calcification.

A knowledge of the history of the herd is important.

Also other workers determined that "human" infected cattle rarely react to the subcutaneous test. (Stenius, 1938; Nielson and Plum, 1940. Cit. Francis.)

Human sensitization is of considerable potential importance in South Africa. Up to the present comparatively little work has been done in this connection. It can be stated, however, that reactions to human tuberculin are generally greater than those to avian tuberculin. In at least one instance "human" reactions exceeded "bovine" reactions in 39 out of 40 reacting animals. Further investigations will be carried out on this herd.

It has been the aim in South Africa to follow the British standards of interpretation of the single intradermal test. Many difficulties have been experienced in practice as these standards appear to be too severe under our conditions. The extended standards as quoted by Glover (1954) in Australia appear more acceptable. Only with experience in an extended testing campaign and with correlation of test and slaughter results will it become possible to decide on standards most practicable under our conditions.

5. *So-called Skin Tuberculosis*

The condition was first described by Perard & Ramon (1913) and in America by Traum (1916). (Francis). Since then it has enjoyed very considerable attention from workers in all countries where bovine tuberculosis was combated by means of the intradermal test. Wessels (1948) reviews the literature on this subject — essentially of the work done in the United States of America.

In South Africa reference was first made to this condition by Fourie (1942) but it was only during the last two or three years that it was encountered as a possible problem in tuberculin testing.

From these preliminary observations it appears that so-called skin-lesions may be one of the major potential complicating factors in test interpretations in South Africa. Infection of herds is widespread with the greater incidence, so far observed, in the Cape, Transvaal and Natal.

Hedström (1949) remarks on the apparent position that "skin tuberculosis" is more prevalent where the incidence of tuberculosis is low or where it has been eradicated. The author suggests that the two conditions may be immunologically connected and that reciprocal immunity may be responsible for this apparent epizootology.

Arthur (Dalling, 1948) also believes that dual infection is possibly rare.

Provisional, and admittedly fractional, survey testing for tuberculosis in South Africa, revealed a comparatively low general incidence of tuberculosis and it can now be speculated whether the relatively high incidence of skin-lesion infection can be correlated with this apparent position.

Many authorities, however, believe that the two conditions can occur in the same herd and animal at the same time. It is felt that this aspect has not been clarified in any detail.

Usually skin-lesions become prominent when progress has been made in the eradication of tuberculosis. This has been the case in the United States of America, England, Holland, Sweden, Denmark, etc. Reactions to tuberculin in "clean" herds usually focus attention on conditions such as skin tuberculosis.

Etiology. Some divergence of opinion exists in this field. Acid fast bacteria in varying numbers and differing in morphology have been constantly found in smear preparations from skin lesion material. Cultural and biological tests have been negative in a number of countries. Culture efforts have, however, been successful in America by Daines and Austin and other workers, in Germany by Haemmert-Halswick and Pescatore in a few instances, and in Sweden by Hedström. Elsewhere cultural efforts have been successful only in rare instances. Hedström conducted extensive investigations with a large amount of material and succeeded in reproducing the disease with a few specimens and to establish allergy to bovine and avian tuberculin.

He concludes that the acid-fasts isolated by him fall into two groups which are identical with or closely related to M. graminis and M. butyricum. It is therefore ". . . a question of two species within the group of mycobacteria which are usually looked upon as saprophytic," and that these . . . "represent a pathogenous type of mycobacterium".

Robertson and Hole and Daines and Austin (cit. Wessels, 1948) also concluded that skin-lesions are probably caused by a separate infective agent.

It has also been possible to isolate on culture a few strains of acid-fast bacteria from skin-lesions in South Africa.

Other organisms, e.g., non-pathogenic Staphylococci, Staphylococcus aureus, Corynebact. pyogenes, Corynebact. ovis, Listeria monocytogenes and yeast-like fungi have been isolated from these lesions (Hedström). None of them could, however, be proved to have any connection with the condition. Hedström produced granulomata of a non-tubercular nature with the yeast-like fungus and demonstrated allergy to bovine and avian tuberculin. He concludes, however, that the fungus is not the cause of "skin tuberculosis".

Götink and van Ulson (1953) stated that acid-fast organisms are probably the cause. Frieling (1953) concludes that the etiological agent is of an infectious nature. Schaaf (1953) holds similar views.

Wessels (1948) worked on the serological relationship of skin-lesion acid fasts and other mycobacteria. His findings are referred to earlier in this paper.

Mode of Infection. No certainty exists about this aspect. It is generally thought that entry takes place through injuries — hence the prevalence of lesions on the legs of animals. In South Africa there may be a connection with muddy conditions. Hedström produced skin-lesion type lesions with Wells' vole bacillus and also

demonstrated allergy to avian and mammalian tuberculin. He speculates on the possible role of one or more small animals in the transmission of the disease. He further draws attention to the similarity between skin-lesions and the human disease described by Gellerstedt (1944). Schaaf (1953) quotes an instance where skin lesions occurred in three generations from mother to daughter.

It is generally agreed, however, that although the mode of infection is not yet understood it is unlikely that direct transmission takes place.

The Lesions. These are cutaneous or subcutaneous nodules rarely involving the musculature and occurring essentially on the front legs of cattle along the "lymphatic line". They also occur on the hind legs below the hock and sometimes extending above it. Other situations are the side of the neck, the chest wall and the udder. They vary in size from being clinically not detectable to the size of the palm of the hand and two inches thick. They are painless and may be hard or more or less fluctuating. The overlying skin may be covered by hair, be hairless or covered by a scab. Sometimes they rupture and there is a discharge. Lesions vary in number from one to several. The pearl-string-like arrangement is diagnostic. (N.A.V.M.A. Publications 1948, Hedström 1949, Götink and van Ulsen 1955, Schaaf 1953.) Hole and Hulse classified lesions into three types. This classification was also adopted by Götink and van Ulsen (1953) and Hedström 1949. Frieling (1953) distinguishes superficial and deep lesions.

The three types can be briefly described as follows:—

Type I: Specific granulomata, mainly situated in the cutis with a tendency to tubercle formation but generally without regressive changes.

Type II: Subcutaneous specific granulomata with formation of solitary or multiple tubercle-like structures with a tendency to caseation and calcification.

Type III: Like type II but with collequative necrosis and abscess formation. They usually contain a greenish-yellow to orange creamy pus containing particles.

This classification is based on age as is witnessed by the progressive regressive changes. The number of acid fasts present in lesions is also related to the age of the lesion.

On a few occasions "lesions" consisting of small pinkish granulomata, with no regressive changes and lying in the subcutis and independent of the cutis and underlying musculature have been noticed in this country.

Histo-pathology

Hedström states that in type one there is thickening of the corium due to the formation of specific granulomatous tissue consisting of lymphocytes, epithelioids and varying numbers of giant-cells. There is a tendency to tubercle-formation but this is not

strong. Lesions tend to heal with the formation of non-specific connective tissue.

The changes in types two and three are characterized by one or more "tubercles" demarcated by connective tissue, and showing central caseation and calcification. The specific granulomatous tissue consists of lymphocytes, groups of epithelioids and varying numbers of giant-cells. The tendency to heal and the formation of non-specific scar tissue are also evident in these instances. Schaaf mentions perivascular cell-infiltration of lymphocytes, epithelioids and eosinophiles with occasional penetration of the vessel leading to haematogenic or lymphogenic spread. He mentions microscopical lesions in regional lymph glands showing nests of epithelioids and some giant-cells. Wessels (1948) also refers to one macroscopical lesion and a number of microscopical lesions encountered in a lymph gland.

It can be mentioned that the pathological changes in skin-lesion infection represent the response of tissues which is common to infection with all members of the acid-fast group.

Cattle Affected

All breeds and sexes are probably equally susceptible. The condition had never been found in animals under one year old. The optimum age is given as 2-5 years in Holland (Götink and van van Ulsen 1953), 1-4 years in Sweden (Hedström, 1949).

The size of the herd does not appear to have any influence on the incidence of the disease.

In South Africa infection occurs under both ranching and more or less intensive conditions of farming.

Season: In Europe some authors consider that skin-lesions appear to be more prevalent in summer and autumn.

Allergy: The only importance of skin-lesion infection is to be found in the allergy to tuberculin which is caused by it or associated with it.

Reactions are generally weaker than those found in bovine infection, 3-4 mms, although reactions in excess of 6 mms are quite common. Arthur (Dalling, 1948) states that animals so infected react at first to Avian tuberculin only and gradually also to Mammalian. Later equal reactions are obtained and still later the response to mammalian tuberculin becomes stronger than the avian — the latter response may disappear with mammalian sensitivity remaining. He further associated the extent of reactivity with the relative activity of the "lesions" and found that injection of tuberculin serves to activate skin-lesions. Hedström registered stronger reactions with avian tuberculin. Schaaf found variable results, with reactions to avian tuberculin sometimes stronger than those to mammalian tuberculin and vice versa. Francis also states that there is little differentiation with avian and bovine tuberculins.

Goting and van Ulsen (1953) found that the avian reaction persists longer than the mammalian reaction. Wessels 1948 also

cites the opposite experience, viz.: that the mammalian reaction is more durable and that animals may still show mammalian sensitivity after "lesions" have healed out (Hole and Hulse, 1939) Sjollema holds the opinion that skin-lesions can occur with tuberculosis and will tend to shift the reaction to the non-specific.

Hole and Hulse (1939), Hedström (1949) and Schaaf (1953) each found bovine type infection in two of the skin lesion specimens investigated by them. Real tuberculosis of the skin in bovines remains, however, rare.

Götshe and Plum state that some 50% of cattle so infected react to the test and that some without visible skin lesions also react. They also experienced generally bigger reactions to mammalian tuberculin.

Hedström found a mean reaction of 2.78 mms. in skin-lesion infection compared with 7.54 in bovine infection. There was no great difference in the character of the reactions.

Practically all workers found that skin-lesion infected animals rarely react to the subcutaneous test although Götshe and Plum experienced such reactions in a proportion of cattle. It has also been stated that reactions are not obtained with the ophthalmic test.

After the injection of tuberculin the leucocyte reaction does not differ from that found in tuberculosis (Dalling, 1948).

In South Africa consistently higher reactions were recorded to human tuberculin as compared with avian tuberculin and, in provisional observations, also as compared with bovine tuberculin.

The following table reflects the extent of sensitivity recorded in skin-lesion infected herds:

Province	No. of Herds	Total Cases	Range of increases in skin measurement
Transvaal	5	12	1 to 11 mms
Natal	11	27	1 to 15 mms
Cape West	11	43	1 to 15 mms
Cape East	1	2	2.5 & 7 mms

The following few examples will serve to indicate possible test results with skin-lesion infection:

(a) Six animals in a herd infected with skin tuberculosis gave the following reactions:

6–25 Heat, oedema and pain.
8–15 Heat, oedema and pain.
4–12 Heat, oedema and pain.
6–12 Heat, oedema and pain.
5–14 Heat, oedema and pain.
6–20 Heat, oedema and pain.

They were despatched to the abattoir and in spite of careful post-mortem examination no lesions of tuberculosis could be found.

(b) During a first test of a herd — also skin-lesion infected, the six animals eliciting the reactions listed below were slaughtered with negative results:

5–20 Heat, oedema, pain.
5–21 Heat, oedema, pain.
6–17 Heat, oedema, pain.
7–28 Heat, oedema, pain.
5–18 Oedema.
5–16 Heat, oedema, pain.

(c) One animal in yet another herd had a large skin-lesion on the near foreleg. The first reaction was 8-19 and the comparative test A6—11.5. She was slaughtered and M10—17
except for the skin lesion no disease processes could be found. A non-pathogenic acid-fast was isolated from the lesion on culture.

(d) One cow, infected with skin-lesions, in a T.B. free herd, was tested six times in 27 months at intervals of three months and more. Increases in skin measurements were: 7.5, 5.5, 6.5, 9, 5 and 6. She was also positive to the Stormont test but negative to the haemagglutination test.

The duration of allergy has been found to be in the region of 1-2 years. Hedström found this period to vary from 1-5 years with the persistent reactivity in a relatively small percentage of animals. Schaaf determined that sensitivity may endure for as short a period as 3 months. This aspect has not been worked out in South Africa.

It is therefore clear that, with the apparent prevalence of skin-lesion infection in South Africa, due care should be exercised in the interpretation of test findings. This is especially important in initial tests of herds.

Summary and Discussion

An effort has been made to indicate the importance of the correct interpretation of the intradermal tuberculin test in cattle. Errors in interpretation are often blamed on the test.

The importance of the tuberculin used, the phenomenon of tuberculin sensitivity, non-specific sensitization, antigenic relationship of mycobacteria and the sensitivity of the individual are briefly discussed.

Reference is made to changes in the leucocytes of sensitized subjects following the injection of tuberculin and the phenomenon of partial or total desensitization generally associated with it.

The intradermal tuberculin test, its application and interpretation, with comparative standards of interpretation in a few other countries, are also discussed.

So-called skin lesion infection appears to be of particular importance in South Africa. The subject is dealt with in some

detail and examples quoted of possible errors in interpretation in initial tests of herds.

Findings in a relatively small number of tests comparing human and bovine tuberculins, indicate that better results may be obtained by using a Bovine P.P.D. instead of a Human P.P.D. as the standard tuberculin. These observations are supported by the findings of workers elsewhere. The question of standards of interpretation in South Africa also needs further study. Accepted standards elsewhere appear to be too severe under South African conditions. The problem can possibly be best solved, by correlation of test and slaughter results in a large number of subjects.

Apart from a knowledge of the test, and the factors that may serve to complicate its interpretation, it is also important that testing officers have a knowledge of the history of cattle and that they follow as many reactors to the abattoir as possible and thereby build a foundation on which to base their judgments.

REFERENCES

Francis, John (1947), Bovine tuberculosis.
Buxton, J. B. and Glover, R. E. (1939), A.R.C.
Van Waveren, G. M. (1953), XVth Rep. Intern. Vet. Congr. Proc. 1, 1.
Dalling, T. (1948), Vet. Rec. 44, 60.
Wessels, C. C. (1948), J., S.A.V.M.A. 19, 1.
Wessels, C. C. (1948), J., S.A.V.M.A. 19, 2.
Frömm, G. and Wiesmann, E. (1953), Schweiz. Arch. für Tierh. 95.
Hedström, Harry (1949), Studier over S.K. Hudtuberculos, Hos Nötkreatur.
Kerr, W. R., Lamont, H. G. and McGirr, J. L. (1946), Vet. Rec. 58, 42.
Schwartzmann, G. and Scheierson, S. S. (1953), Ann. N.Y. Acad. Sc., Vol. 56A, Art. 4.
Stoerck, H. C. (1953), Ann. N.Y. Acad. Sc. 56, Art. 4.
Lurie, M. B. et al (1953), Ann. N.Y. Acad. Sc. 56, Art. 4.
Veenstra, M. J. (1948), Tydschr. v. Dierg. 73, 15 and 16.
Rolle, M. and Mayre, H. (1953), Monath. für Tierh. B. 5.
Ritchie, J. N. (1953), F.A.O. Agric. Studies No. 25, 1953.
Gotink, W. M. and van Ulsen, F. W. (1953), Tijdschr. v. Dierg. 78, 3.
Götshe, N. O. and Plum, N., Danish State Vet. Serum Lab. Series, 169.
Glover, R. E. (1954), Minutes of Meeting of the N.S.W. Branch of the Austr. Vet. Assoc.
Nielson, W. (1950), XIVth Report Intern. Vet. Congr. Vol. 2.
Meyn, A. (1953), Monath. für Tierh. 5.
Lauterbach, D. (1953), Monath für Tierh. 5.
N.V.M.A. Publications, 1948.
Frieling, D. (1953), Tydsch. voor Dierg. 78, 3.
Schaaf, J. (1953), Monath. für Tierh. B. 5.
Messerli, W., Schweiz. Archiv. für Tierh.
Terpstra, J. I. (1948), Tydschr. v. Dierg. 73.
Fourie, P. J. J. (1939), Personal communication.

AN OUTBREAK OF HORSESICKNESS, COMPLICATED BY DISTEMPER, IN A PACK OF FOXHOUNDS

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Theiler (1906, 1910) showed that dogs are susceptible to infection with horsesickness virus. The question was raised as to whether or not dogs might become infected naturally. Bevan (1911) and Piercy (1951) found that dogs fed infected horse-meat were readily infected with horsesickness.

In view of the present beef shortage, horse meat is being fed extensively to dogs. For this reason it is believed that cases of horsesickness among dogs will become more common. It is with the object of bringing this disease of dogs to the notice of veterinarians that this account of an outbreak of horsesickness in a pack of foxhounds is given. The outbreak was of further interest in that an exaltation of latent infection with distemper virus was observed.

History of Outbreak

Situated near Johannesburg is a Hunt Club which maintains a pack of about 50 foxhounds. The animals are kept under rather poor conditions. The runs have earthen floors and the feeding is rather stinted. Generally the animals are fed a ration of fish-meal, maize-meal and vegetables. Shortly before the outbreak of the disease, however, three horses and a cow were destroyed, and the meat fed to the hounds, and it was stored in a refrigerator. In none of these animals was horsesickness suspected. Usually it was well cooked before it was fed to the hounds but raw meat was offered after exercise.

Since 1949 all the hounds in the pack have been vaccinated against distemper.

In April, 1955 (at the height of the horsesickness season) a disease broke out among the hounds. Distemper was suspected at first, but it soon became apparent that horsesickness was the cause of the trouble.

The onset of the disease was gradual. At first only a single case was observed. Within the next week there were six cases. The peak was reached in about 14 days when approximately 30 dogs were sick. At this time the owners did not seem to know which animals were healthy and which were affected. However, it was apparent that the disease was confined to the working dogs. Two bitches which had whelped recently and three five month old pups remained normal. None of these latter received raw meat.

The symptoms shown varied considerably in severity. In general they resembled those described by Theiler, Bevan and Piercy. One example of the peracute form was seen. This animal was apparently normal when taken out of its kennel but died an hour later.

Four dogs died of the acute form. They were sick for about a week and showed hyperthermia, pharyngitis, coughing and diarrhoea. Two had fits shortly before they died.

The other affected dogs showed similar symptoms in a milder form, and all but three recovered. These three dogs became gradually weaker. Later they developed marked central nervous symptoms and either died or were destroyed.

Post-mortem examination of the dogs that died of the peracute and acute forms revealed marked pulmonary oedema, hydrothorax, tumor splenis, extensive extravasation of blood and enteritis. Those that died after a protracted illness showed little else than emaciation. All were infested with hookworms. The number of worms present was considerably greater in those that died after prolonged sickness.

Laboratory Findings

Isolation of a Strain of Horsesickness Virus

A suspension of pooled liver, spleen and kidney and another of brain were prepared from the dog that died of the peracute form of the disease. This was inoculated into a variety of animals. The results of these inoculations are shown in Table I.

Table 1: *Inoculation of material collected from a peracute case of horsesickness in a dog.*

Material Injected	Animal Injected	Route	Result
Pooled liver spleen and kidney	Infant white mice	intracerebral	Died or killed from 6th to 8th day
	Horse	intravenous	Febrile reaction from 5th day. Supra-orbital swellings. Killed.
	Ferret	intraperitoneal	Febrile reaction from 4th to 6th day. Recovered.
	Dog I	intravenous and intraocular	Mild febrile reaction on 4th and 5th days. Highest temperature—104.4 deg. F.
	Dog II	do.	Mild febrile reaction on 3rd and 4th day; highest temperature—103.6 deg. F.
	Two Guineapigs	intraperitoneal	No apparent reaction
Brain	Ferret	intraperitoneal	No apparent reaction
	Infant mice	intracerebral	No apparent reaction

From the results shown in Table 1 it was apparent that a strain of horsesickness virus had been isolated. It was named the "Inanda" strain.

Similar attempts to isolate a virus from two dogs that died of the acute form of the disease were unsuccessful.

Neutralization tests in which rabbit antisera were mixed with third mouse brain passage virus gave inconclusive results but indicated that this virus could be assigned to type I according to the classification of McIntosh (1955).

To confirm this finding serum samples were obtained from the dogs and ferret that reacted to inoculation with infective material (see Table 1). Serum neutralization tests were made in which five-fold dilutions of these sera were tested against a known type I strain of horsesickness virus after the method of McIntosh (1955). The results of this test are shown in Table 2.

TABLE 2: *Neutralization tests. Inanda immune serum against known type I horsesickness virus.*

Serum	Time after infection	Titre of Serum
Ferret	25th day	625*
Dog I	12th day	42
	25th day	55
Dog II	12th day	72
	25th day	625

* End-point expressed as the reciproccal of the serum dilution.

From the results shown in Table 2 it was apparent that these serum samples contained antibodies of type I horsesickness virus.

Since horsesickness virus was isolated from only one dog, a test was made to determine what percentage of the dogs had horsesickness antibodies. For this purpose 24 hounds were bled at random, approximately two months after the outbreak of disease in the kennel. Nineteen proved positive when tested against a known type I strain of horsesickness virus. These dogs were known to have been affected. Of the five which proved negative four had for various reasons been away from the kennels at the time of the outbreak of the disease. The remaining dog, however, was known to have been sick.

Isolation of distemper virus

From the brain of one of the three dogs that had a prolonged illness and showed marked central nervous symptoms, a pathogenic agent was isolated by intraperitoneal inoculation into a ferret. Sub-inoculations from the other two dogs were negative.

The ferret had a temperature of 104 deg. F. on the 13th day after injection. The temperature returned to normal but rose again on the 17th day when the animal was obviously sick and showed spasms of all the muscles. On the following day it had screaming fits. No skin or eye lesions were seen. It was then killed and a suspension of pooled brain, liver and spleen was inoculated intraperitoneally into two more ferrets. Both

showed symptoms similar to those of the first ferret after an incubation period of 16-17 days. Four serial passages were made in ferrets and all showed similar symptoms.

Specimens from most of these ferrets were examined histologically, by Dr. le Roux of this Institution. In a ferret in the third passage distemper-like inclusion bodies were demonstrated in the bladder epithelium.

Three ferrets that had been immunized previously with Onderstepoort avianized distemper virus (Haig 1948) together with two untreated controls were inoculated with second passage material. The two controls died after showing nervous symptoms whereas the three vaccinated ferrets had shown no symptoms by the time they were killed 30 days after the injection.

It was concluded that an atypical strain of distemper which showed some similarity to that described by Mansi (1951) had been isolated.

Summary and Discussion

An outbreak of horsesickness among a pack of foxhounds in the Union of South Africa is described.

Bevan and Piercy have shown that dogs are susceptible to infection by the oral route. On the other hand McIntosh (1955) has indicated that insect-borne infection of horsesickness in dogs is uncommon. Since the hounds involved in this outbreak were fed horsemeat at the height of the horsesickness season it is assumed they became infected in this way.

In this outbreak isolation of horsesickness virus was successful in only one of seven attempts. It would, therefore, appear that it is for a short time only during the course of the disease that virus can be demonstrated. The contention that horsesickness was indeed widespread among the pack was confirmed by positive serum neutralization tests on 19 of 20 hounds that were exposed to the infection.

While the disease ran an acute course in the majority of cases, in three it was protracted and terminated with central nervous system involvement. From the brain of one of these cases an atypical strain of distemper virus was isolated.

Vaccination against distemper of all hounds has been practised since 1951. Since that time only two mild cases of distemper have been diagnosed. It is believed that in these three cases, latent infection with distemper virus were exalted by protracted illness following an infection with horsesickness aggravated by severe hookworm infestation.

REFERENCES

Bevan, L. E. W. (1911). The transmission of African horsesickness to the dog by feeding. *Vet. J.* Vol. 67, pp. 402-408.

Haig, D. A. (1955). Canine distemper-immunization with avianized virus. In press.

Piercy, S. E. (1951). Some observations on African horsesickness including an account of an outbreak amongst dogs. *E. African Agric. J.* Vol. 17, 2, pp. 1-3.

McIntosh, B. M. (1955. Studies on horsesickness. To be published.

McIntosh, B. M. (1955a). Horsesickness antibodies in the sera of dogs in enzootic areas. *J.S.A.V.M.A.* Vol. 26, pp. 269-272.

Mansi, W. (951). Isolation of a neurotropic virus from a dog suffering from so-called nervous distemper. *Br. Vet. J.* Vol. 107, pp. 214-229.

Theiler, A. (1906). Transmission of horsesickness into dogs. Rep. Govt. Vet. Bact. 1905-1906, pp. 160-162.

Theiler, A. (1910). The susceptibility of the dog to African horsesickness. *J. Comp. Path. and Ther.* Vol. 23, pp. 315-325.

Jl. S.A.V.M.A. 27 (4), 1956

THE IMPACT OF INTENSIVE CATTLE FARMING ON GAME AND GAME PRESERVATION IN THE VICINITY OF THE KRUGER NATIONAL PARK

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In a previous article Nel, Meeser and van der Schyff (1955) discussed game fences and game barriers as adjuncts to game protection and game preservation. In this article the effect of intensive cattle farming upon game population will be discussed.

The National Parks Act of 1926, when defining the boundaries of the Kruger National Park and especially that part of the western boundary between the Sabie and Olifants rivers, failed to take cognisance of the natural requirements of game in that particular area. These requirements are water and grazing and those other factors having an influence on the normal range of game. In due course this resulted in the authorities of the Kruger National Park having to contend with —

(1) intensive hunting by Europeans and Natives. Statistics for 1949 show that on the 56 farms in the immediate vicinity of this portion of the Kruger National Park licences were issued to 256 persons for 1,347 head of game, including 263 head of the fast diminishing sable antelope;
(2) the establishment of "shooting boxes" in that area. Many "shooting box" owners by applying conservation methods, e.g., building of dams, have attempted to entice game from the Kruger National Park to their farms;
(3) the pioneering of cattle farming in this game predominant area.

The repeated outbreaks of foot and mouth disease in cattle, the destruction of cattle grazing grounds by large herds of game and the competition between game and cattle at water holes has resulted in an agitation for the fencing of the western boundary of the Kruger National Park. This "fence idea" has received the support of Provincial Authorities, Farmers Associations, Veterinarians and Biologists. Also, at the request of the Curators of the National Parks Board, Nel, Meeser and van der Schyff (1954), drew up a report where, in their conclusion, they stated that a barbed wire fence should be used as a basic type of barrier.

In continuance of some of the studies mentioned in the report of Nel, Meeser and van der Schyff (1955) the results of observations

made by one of us (M.J.N.M.) have been tabulated. These observations have been made on two farms. Farm A is one where intensive cattle farming is practised. Farm B, which adjoins farm A, is a game farm. Farm A is fenced. The fence, on three boundaries of the farm consists of four smooth wires, poles ten yards apart with eight droppers between each pair of poles. The remaining boundary, which is also common to Farm B which is otherwise not fenced, is the Veterinary protective fence or "red line". This "red line" is a veterinary protective fence erected to the west of the western boundary of the Kruger National Park between the Sabie and Olifants rivers. This veterinary fence serves the following functions —

(1) to create a barrier between cattle coming into contact with game and cattle not doing so;

(2) to prevent the westward movement of game. It can be emphatically stated that the veterinary protective fence has been signally successful in achieving its purpose.

Initially farm A was not fenced. Farming equipment consisted of a cattle kraal, dipping tank, dam, dwelling and outbuildings. In due course the owners found that cattle could not be run with game such as gnu, zebra and impala. Large scale destruction of game was then undertaken. However infiltration from outside areas, especially Farm B, continued. Despite the intensive hunting there was no diminuition in game numbers. As intensive hunting failed to alleviate the position the open boundaries of the farm were then fenced. At the same time vigorous hunting was commenced and most of the game shot out. Regular patrolling of the fence was instituted and is still being carried out. On these patrols all breaks are immediately repaired. This led to such an improvement in the grazing conditions for cattle that farming activities were intensified. The farm was divided into 13 camps, three new boreholes and seven extra dams were erected to supply the needs of the cattle. Vigorous game control was maintained until the adverse influence of the competitive game types, i.e., the gnu, zebra and impala, was reduced to a minimum. The browsers such as the giraffe were considered non-competitive and left undisturbed.

Farm B, the game farm, is unfenced except for the common "red line" on its western boundary. Farm B is contiguous with a large number of other game farms and the western boundary of the Kruger National Park. Here game abounds and game limiting or game disturbing factors such as shooting and poaching are vigorously controlled. A large provincial road runs through the farm.

Observations were made over the period 26.4.52 to 29.5.54, i.e., a period of 25 months. Over this period it was possible to make a series of 68 observations. Whenever possible these observations were made at weekly intervals. Inclement weather, impassable roads, staff vacancies and staff on leave tended to

disrupt the sequence of weekly observations. These disruptions, however, are of no import in the overall consideration of the value of the observations made. All these observations were made from a single main road through each farm. No digressions into the surrounding bush were made. Observations for a single journey only were taken into consideration. As motor transport only was used there was no disturbance of game. All this tended to keep the norm of the observations constant.

Table No. 1 shows the total number of animals seen on farms A and B during the period of observation.

TABLE NO. 1

Farm	Game Animals						
	Tsessebe	Kudu	Giraffe	Impala	Zebra	Gnu	Total
A	—	6	46	21	10	246	329
B	1	61	98	1,180	427	1,688	3,455

Thus, on Farm B the game farm, ten times the amount of game was seen as on the cattle farm, Farm A, during the period of observation. A more detailed analysis shows that Farm B showed six times the number of gnu, forty-two times that of zebra, fifty-six times that of impala, and ten times that of kudu. Giraffe which are not considered as competitive grazers showed the least variation.

As a result of the intensive fencing on Farm A, the constant patrolling of and the repair of the breaks in the boundary fences and the initial large scale destruction of game on this farm, observations showed that no infiltration whatsoever from the surrounding game farms took place onto Farm A. Regular independent observations over a four monthly period by two staff members under one of us (M.J.N.M.) revealed a constant count on Farm A. The result of these observations is shown in Table 2.

TABLE 2

Official No. 1

Date	Game Animals			
	Kudu	Impala	Gnu	Zebra
4. 9.54	—	7	80	10
2.10.54	—	20	—	—
15.10.54	1	15	—	—
30.10.54	—	—	—	—
27.11.54	—	—	—	—
4.12.54	3	4	—	—

Date	Game Animals			
	Kudu	Impala	Gnu	Zebra
28. 7.54	—	20	—	—
14. 8.54	—	—	—	—
19. 8.54	—	1	—	—
28. 8.54	—	—	—	—
9.10.54	—	—	—	—
15.10.54	—	30	—	—
28.10.54	—	—	—	—
6.11.54	—	—	—	—
20.11.54	—	—	—	—

Conclusions

These observations show:—

(1) That cattle farming is not economical on a farm where game is abundant and uncontrolled. This was shown on Farm A prior to fencing and the initiation of game control.

(2) That cattle farming in a predominantly game area can be successfully practised provided efficient game control is instituted; that correct fencing is erected and that such fencing is regularly patrolled and maintained in a constant state of repair.

(3) That infiltration of game from surrounding game areas onto such a cattle farm can be eliminated or reduced to a negligible minimum.

(4) That an alteration in the hunting laws to enable an owner to adopt vigorous hunting measures to maintain and care for the health and well being of his cattle is most advisable.

(5) That from a veterinary disease preventive viewpoint constant patrolling and maintenance of fencing can prevent contact between cattle and game. This is of utmost importance in a country where diseases of game animals can be transmitted to domestic cattle. In Africa this particularly refers, amongst others, to Rinderpest, Foot and Mouth Disease and Malignant Catarrh.

(6) That, in our opinion, the opinion expressed by Nel, Meeser and van der Schyff (1955) that barbed wire fencing could be the basis of all game protective barriers is substantiated.

REFERENCES

Nel, Meeser and van der Schyff (1955). Game fences: A General Survey. *Journal S.A.V.M.A.* Vol. XXVI, No. 4, pp. 281-287.

Nel, T. G., 1949. Extract from Report to Executive of the Transvaal Province.

SUBCUTANEOUS CARBONTETRACHLORIDE IN HELMINTHIASIS OF RUMINANTS AND PIGS

L. R. HURTER

Dundee

The following results only reflect findings in the field on the efficacy, or otherwise of carbontetrachloride-liquid paraffin mixture after subcutaneous administration, and cannot be regarded as a critical experiment at all. Where possible, P.M. examinations were conducted at varying periods following administration. Faeces samples were examined by Dr. Ortlepp of Onderstepoort.

History

In I.B.E.D. Information leaflet 2/55 of January, 1955, the efficacy and dosage of CC14 "in an oil" is described when injected subcutaneously, in verminosis control in sheep and cattle. The mixture consists of 1 part CC14 and 3 parts liquid paraffin.

The dosage advocated is 5 cc for lambs and kids, 10 cc for adults of 30 kg. and 15 cc for those of 50 kg. weight.

In cattle the dose is 10 cc for calves and 15-20 cc for adults, according to weight.

In sheep and cattle the method is claimed to be effective in the control of verminous pneumonia, distomatosis, and intestinal strongylosis.

In I.B.E.D. Information leaflet 3/56 of January, 1956, the treatment of pigs in the same fashion is described.

In pigs the drug is claimed to be polyvalent against helminthiasis.

Field Experiments

On 18.5.55 20 sheep on Mrs. S's farm were injected with the mixture. They were bastard sheep of approximately 15-30 kg. weight. The dose varied from 8-15 cc, which is more than the amount advocated. Marked symptoms of ataxia, paresis and paralysis were seen immediately after injection, the site being the hairless area behind the elbow on the lateral chest wall. Apparently a severe irritation at the site of injection is experienced, as shown by the lifting of the leg, pointing, turning, jumping and falling down. They remained in the recumbent position for up to 20 minutes. The condition of the sheep was very poor.

On the 27th two P.M. examinations on two of Mrs. S's sheep were done and a severe wireworm and nodular worm infection was found.

On the 20th May, 1955, 12 merino sheep on Mr. HN's farm were injected, weight being from 30-50 kg. and from 10-20 cc being

injected. The sheep were in good condition, reactions were slight and none died. Results were inconclusive.

On 23.3.56 270 cattle and 657 sheep on Mr. S's farm were injected. Weights of sheep varied from 15-45 kg. and from 5-15 cc were injected. Reactions in lambs were very evident. The injection was given along the side of the neck, at the poll, and on the lateral chest wall posterior to the elbow. Reactions were equal in severity, and the site of injection apparently does not make much difference. Cattle showed no reactions.

On 24.3.56 an ox on Mr. S's farm that was slaughtered by natives, showed perfectly normal liver flukes. That was after 30 hours from the time of the first injection.

On 24.3.56 a sheep belonging to Mr. S was slaughtered and a massive, live infestation of wireworm and nodular worm was found. Mr. S subsequently reported that sheep slaughtered continued showing a severe parasitic infestation.

At the beginning of March, 1956, 170 pigs and 272 cattle on Mr. K's farm were injected. Pigs were injected with from 5-10 cc behind the ear, and a reddening there was evident within seconds of injection. The discoloured area had a diameter of about 5-7 cm. Ascaris was still found in the sites till such time as NaF was used. Pigs that died at varying times after the injection were infested with ascaris.

At this stage it was decided to submit faeces samples of selected sheep at the time of treatment and some time thereafter, for examination when the next injections were given.

On 1.6.56 20 sheep on Mr. VR's farm were injected, each with from 5-15 cc. The animals were cross-bred, poor and weight varied from 15-25 kg. Faeces from one sheep were taken and showed a severe infestation of wire- and nodular wors.

On 7.6.56 one of the sheep referred to above was slaughtered and a P.M. examination showed a slight infestation only. At the time of the first visit to the farm on 1.6.56, an untreated sheep was slaughtered and, although very thin, it did not show a more severe infestation than was demonstrated at the P.M. examination on 7.6.56. I do not think that Mr. VR's flock was severely worm infested, although the faeces examination did reflect a severe infestation.

On 7.6.56 15 sheep on Mr. H's farm were injected, doses varying from 8-16 cc and weights being from 15-30 kg. Reactions were severe. One ewe had a severe bottle-jaw, which disappeared after two days, but after a further two days, reappeared. Two faeces samples were examined by Dr. Ortlepp and a severe round-worm infestation was found.

On 18.6.56 further faeces samples from the same two sheep on Mr. H's farm were submitted to Onderstepoort, and a severe roundworm infestation was again found.

On 13.6.56 20 sheep on Mr. N's farm were injected with from 7-15 cc of the mixture, weights being from 12-25 kg. The dose

was thus very high and reactions were severe. Faeces were very watery and Dr. Ortlepp reported a severe nematode, especially nodular worm, infestation.

On 20.6.56 the one sheep referred to on Mr. N's farm was slaughtered and a P.M. examination showed an extremely severe nodular worm infestation. Dr. Ortlepp reported that the faeces sample showed an even higher concentration of eggs than that taken on the 13th, 7 days previously. The faeces were just as watery.

Discussion

In my opinion, subcutaneous injection of CC14 liquid paraffin appears to be of doubtful value in the treatment of helminthiasis of ruminants and pigs. In all cases where P.M. examinations were carried out on sheep coming from infected flocks, severe infestations were always found.

Until such time as critical experiments have been carried out and the worth of CC14 by subcutaneous injection proved beyond any doubt, I feel that dosing has a claim as the method of choice in treating domestic animals for intestinal parasites.

I do know of cases where colleagues reported improvements in condition after injection. It is, however, feasible that the oil itself could perhaps exert a tonic-like action on the system. This is stated because in a pig, suffering from an eczema-like condition, the improvement was almost miraculous after the injection. The same reaction is seen when Vitamine A&D-oil mixtures are given to ruminants. In these cases the resulting improvement is not due to the Vitamine A or D but solely apparently to the oil itself.

Reference in the literature by Russian workers to intramuscular CC14 as effective against Fascioliasis in cattle has been noted, but I have not tried the method myself.

ACKNOWLEDGEMENTS

Dr. R. A. Alexander, Director of Veterinary Services, for permission to publish this report.

Dr. R. J. Ortlepp, who examined faecies samples submitted to him and encouraged the experiments.

DESKUNKING A SKUNK

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Bethlehem

When the request of deodorising a skunk (Kaapse Stink Muishond) (Ictonyx striatus striatus) was first put to me, I put off the operation for a while in the hope of finding some literature dealing with this animal's anatomy and/or the operation. I believe some American literature can be obtained dealing with the subject but I could not lay my hands on any.

Not being able to get any information on the subject, I decided to tackle the job and proceed with caution. Now, after having done a few, I can give a description which might help other practitioners in the same predicament.

Anatomy: The so-called stink glands of the polecat or skunk seem to be the equivalent of the anal sacs of the dog as described by Sisson. They are situated lateral to the anus between the sphincter ani externus and internus with the opening of the sac just interior to the opening of the anus. The glands can be palpated in the animal as two swellings, one on either side of the anus. In the male the testicles can be felt but these swellings are more posterior.

Anaesthesia: Anaesthesia was given in every case with ether the same way as for a cat. The skunk was placed under a bell jar and a wad of cotton wool saturated with ether was put in with it. As soon as the animal went down it was taken from the jar and placed on the table, more ether being given whenever necessary. Recovery from this anaesthesia was uneventful in every case.

Operation: After clipping the area around the anus carefully the normal antiseptic precautions for any operation are taken. Then taking the swelling between the thumb and forefinger a longitudinal cut is made through the skin and sphincter ani externus but great care must be taken not to cut through the wall of the sac or it will be regretted. Exposing the wall of the sac — with a pair of forceps and blunt dissection, the whole of it may be taken out.

In none of the cases has the wound been sewn up and complete recovery has taken place within seven days.

It may be mentioned here that the writer has seen a few animals tamed, deskunked and trained as pets in the house and they really make lovely ones.

TWO HUNDRED AND EIGHTY-FOUR AUTOPSIES AT THE NATIONAL ZOOLOGICAL GARDENS, PRETORIA

C. F. B. HOFMEYR

Pretoria

Summary

(1) An outline is presented of disease preventive measures at the National Zoological Gardens, and the duties and problems attached to the part-time veterinary appointment. The necessity for adequate laboratory facilities and the importance of research into morbid conditions of wild animals is emphasized.

(2) An extensive review is presented of South African veterinary literature pertaining to diseases of game.

(3) Two hundred and eighty-four post mortem examinations are individually listed and some are discussed.

(4) An analysis of these autopsies is attempted in four tables.

Introduction

The main purpose of this report is to place on record, in brief form, the experience gained during the performance of routine autopsies at the National Zoological Gardens. As such a large number of species are concerned, it is clear that, with the comparatively small number of post mortems, few, if any, definite conclusions can be drawn from the findings. It is hoped that the material presented here will form a nucleus to be added to from time to time.

General Procedure

The usual procedure is to conduct a post mortem examination on every animal that dies. Very occasionally this is omitted through force of circumstances (advanced decomposition, etc.). Some reptiles are also examined, as are small birds in case of heavy mortality and sometimes individuals of the larger species. Routine necropsies are not performed on birds, because of lack of proper facilities for laboratory investigation and because very little is to be gained from the naked eye examination of the bodies of small birds.

Whenever examinations are carried out, the findings are immediately recorded in a post mortem book made available by the Director of Veterinary Services and of the type used at the Onderstepoort Veterinary Research Institute.

Although the National Zoological Gardens ranks very high in the world amongst institutions of its kind, proper veterinary facilities are non-existent. Even though the great need for a hospital and well equipped laboratory have been felt for many years, sufficient funds for their establishment have not been available. The prospects are brighter at the moment, however.

The unfortunate result has been that valuable scientific material could not be utilized properly. In exceptional cases the author has had the benefit of co-operation with colleagues from Onderstepoort. In view of the great shortage of research personnel and the mounting burdens shouldered by the depleted research staff there, regular demands could not be made on it.

Blood or organ smears could not be examined as a routine procedure. Where there were definite indications for this examination, the work was carried out at the author's hospital, a few miles from the zoo. The same applied to other laboratory procedures, X-ray examination and major operations.

Although autopsies are the main concern of this article, reference to other veterinary measures cannot be considered to be outside its scope.

Handling of a wild animal entails, to the animal itself with few exceptions, great exertion, fear, and grave risk of injury. Proper restraint often presents a problem. Clinical examination is not only made difficult, but the animal is often in such a state of tension as to make it almost impossible to obtain intelligible results clinically. Laboratory procedures would therefore be of more relative value than in the case of most sick domestic animals. From the comparative view point, it is remarkable how soon after showing signs of illness the majority of wild animals die, more particularly the hoofed animals and other herbivora, less so the carnivora and some other orders. Often they appear normal in the afternoon and are found dead the following morning. It is also quite usual to conduct a necropsy and find the organs so moderately altered macroscopically as to leave some uncertainty as to the actual cause of death. In these cases further histopathological, biochemical or bacteriological investigation might be of great assistance. The long drawn out type of illness is not usual. There is some small grain of truth in the statement that they are either healthy or dead.

The following explanation for this is suggested: The animal in the natural state is dependent on good health to obtain food and water with ease and to avoid falling prey to another animal. One condition of survival is, therefore, *to remain healthy*. Once sick, the illness can seldom run its course as the sick animal becomes an easy victim of its enemies. Natural selection thus takes place at the level of absolute resistance to disease, *not* on powers of recovery.

While the author acted on behalf of a colleague now deceased, he found tuberculosis in a buffalo (Syncerus caffer), a nyala (Nyala angasi) and amongst the springbok (Antidorcas marsupialis). He decided to do the tuberculin test on all the herbivora except the pachyderms and the animals in two large camps known as the Lowveld camps. The former were not tested, because of handling difficulties and finding skin suitable for the test, and the latter, because the camps are so big that catching would have resulted in some antelopes being injured or killed. Whenever individuals from these camps are trapped to be moved elsewhere,

they must now first pass a clean test before release. The primates, carnivora, etc., have not been tested, as tuberculosis has never been found amongst them. They have not been in contact with any of the infected animals and effective handling would have been most difficult.

An interesting finding was the remarkable uniformity in thickness of the skin fold amongst the females of the same species. A delicate technique is required to make an effective intradermal injection when the fold is two millimetres thick, sometimes less. As a result of the handling, injuries, even deaths, occurred. Each animal was, therefore, only tested once, unless a positive case was detected in the same or an adjoining enclosure. The tests were repeated at suitable intervals until all the contacts passed a simultaneous negative test. Tuberculous cases were donated by the Director of the Zoological Gardens to Onderstepoort for further study. A tuberculous doe, the only one of a rare species, could not be destroyed, and she and the stag were isolated.

In order to obtain some idea as to the incidence of helminthiasis amongst the mammals, a composite sample from each enclosure or cage was examined, using the Willis flotation technique. There were very few positive samples and each of these indicated a light infestation. It is the usual experience not to find much helminth infestation when animals have been captive for long, but rather when they have been recently caught. Notwithstanding, haemonchosis occurs amongst the thar (Hemitragus jemlahicus), barbary sheep (Ammotragus lervia), mouflon (Ovis musimon) and a mixture of various Lowveld antelopes occupying spacious camps in the newer part of the zoo. Phenothiazine in correct amounts for each camp is mixed with a day's ration of concentrates and fed at intervals throughout the day. Concentrates are withheld the day preceding treatment to ensure the rapid eating of the medicated feed. This treatment is repeated at suitable intervals. Results have been satisfactory.

Vaccines are employed whenever possible. Horsesickness vaccine is used on the draught animals (horses and mules), none of the wild equines in the zoo being susceptible to this disease. The Onderstepoort distemper vaccine ensures immunity to all wild members of the Canidae if injected once only. All Felidae are protected against feline infectious panleukopenia with Burroughs Wellcome vaccine — two injections being given spaced by at least six weeks.

Briefly, the purpose of the part-time veterinary appointment can be described as the institution of preventive measures, the treatment of the sick and the performance of autopsies in order to determine, in the first place, whether death was from a cause which constituted a threat to the health and lives of other animals.

Given suitable conditions and facilities, it is not only feasible, but imperative to make an intensive study of morbid conditions of game. The self-evident advantage is that the knowledge so gained

would be applied to the benefit of the animals in the zoo. Further, it would help to advance knowledge of pathological processes in domestic animals and in man, as the larger the number of species in which a particular disease is studied, the better the disease will be understood. Finally, what is termed civilization is continually encroaching more and more onto areas inhabited solely or mainly by game. The closer association between domestic animals and game favours the transmission of diseases from the latter to the former. It is therefore of cardinal importance to study these problems. Only constant scientific investigation will make it possible for game and domestic animals to co-exist harmoniously. Those, who are indifferent to our natural heritage and who are prepared to sacrifice everything for material gain, will, in time to come, clamour more and more for destruction of game. Those demands may eventually be difficult to resist, unless science has an answer for many of these problems, notably that of communicable disease. It is hoped that, with adequate facilities at their disposal, zoo veterinarians of the future will recognize and accept their responsibilities with regard to disease problems of game in the wild state and will have suitable facilities at their disposal for their study.

South African References to Disease in Wild Animals

Although international literature on wild animal pathology is voluminous, it is still scanty compared to the wideness of the subject. In South Africa the investigations concerned mainly internal and external parasites and infectious diseases. A wide field still lies fallow.

Very little has been published about morbid conditions of individual game animals. Martinaglia (1930) reported tuberculosis in a giraffe (Giraffa camelopardalis) from the Johannesburg Zoo. Curson (1931a) described polydactyly in a pig and a springbok, and (1931b) a foreign body (wire) wound round the os coxae of a jackal (Thos mesomelas). Curson and Quinlan (1931) mention a steenbok (Raphicerus campestris), which, when shot in the veld, was found to have ankylosis of the hock joint.

Martinaglia and Robertson (1933) reported an umbilical herniotomy on a lion cub (Leo leo). Hofmeyr (1952a) recorded placenta praevia in a hanuman monkey (Pithecus entellus) and (1952b) tetanus in a Cape Chacma baboon (Papio ursinus ursinus).

Of external parasites ticks are, generally speaking, not host specific and are to be found on game and domestic stock alike. Those specially interested are referred to the work of Dr. G. Theiler in connection with the tick survey in the Union and published in various Onderstepoort Journals.

The investigations of Bedford into the lice of wild fauna have been too extensive to be referred to in detail here, but will be found under the following references: (1918a, 1918b, 1926-1927, 1928, 1929, 1930, 1931, 1934, 1939a, 1939b).

Numerous articles have been published about helminth parasites. A great deal of the work concerns the description of new species.

Experiments have been made in order to determine the significance of various infestations in game to domestic animals. There is little to indicate the effect on game hosts. Theiler and Robertson (1915) worked on the life-cycle of the wireworm of the ostrich and Baer (1926-27) identified some helminths from various hosts. Mönnig (1926-27, 1929a, 1929b, 1929c, 1931b, 1931c, 1931d, 1932b, 1932c, 1933a), le Roux (1929a, 1929b, 1929c, 1930a, 1930b, 1930c, 1930d), Ortlepp (1932a, 1932b, 1933a, 1933b, 1934, 1935, 1937a, 1937b, 1937c, 1938a, 1938b, 1938c, 1938d, 1939a, 1940), van der Westhuysen (1938), Malan (1939) and Meeser (1952) described many helminth parasites, the first three authors identifying numerous new species. Mönnig (1931a, 1932a, 1933b) investigated the rôle of antelopes as carriers of parasites of domestic ruminants, and Ortlepp (1939) found that hares and rabbits can act as hosts of the trichostrongylids of sheep, but discounts the possibility of this being important economically. Martinaglia and Brandt (1947) refer to cysticercosis of impala (Aepyceros melampus) and wildebeest (Gorgon taurinus taurinus) carcases during meat inspection. They were confronted with the problem as to what to do with lightly infested carcases as it was not known, whether freezing as for beef measles would be sufficient. Lesions produced by Oesophagostomum columbianum in the blesbok (Damalisccus albifrons) were investigated by Fourie (1951).

Very interesting facts have been brought to light by those who worked on microbial infections of game. Walker (1912) noted a Leucocytozoon infection in an ostrich. Neitz (1931) examined blood and gland smears of a large series of animals shot in Zululand. Trypanosoma congolense was found in a zebra (Equus burchellii), a kudu (Strepsiceros strepsiceros) and a bushbuck (Tragelaphus sylvaticus), T. vivax in a bushbuck, and small piroplasms in zebra, bushbuck, duiker (Sylvicapra grimmia), waterbuck (Kobus ellipsiprymnus), kudu, blue wildebeest, reedbuck (Redunca arundinum), mountain reedbuck (Redunca fulvorufula), steenbok, and ant bear (Orycteropus afer) — recording them for the first time in the last six species. Kluge (1945) and R. du Toit (1954) wrote reports on nagana in game in this area, the latter also about the eradication of tsetse flies by chemical means. Neitz (1935a) also showed that Spirochaeta theileri can be transmitted to the blesbok and (1935b) Anaplasma marginale to the black wildebeest (Connochaetes gnu). The cases remained clinically unaffected. These findings are significant with regard to livestock.

Other protozoa found in game were as follows: Neitz (1937a) discovered Piroplasma pitheci in the blood of a vervet monkey (Cereopithecus aethiops cloeti) (1938b), Nuttallia cynicti M. Mayer 1912 in the albino and wild rat after splenectomy and Martinaglia (1930) a babesia in a sable antelope (Ozanna grandicornis).

The following new protozoa were described: Neitz (1938a) Grahamella conchi in the multimammate mouse (Mastomys concha),

Neitz and Thomas (1948) Cytauxzoon sylvicapra from the duiker, P. J. du Toit (1937) Sauroplasma thomasi from a lizard (Zonurus giganteus) and Jansen (1952) Babesia thomasi from the Cape dassie (Procavia capensis).

Neitz and Steyn (1947) transmitted Babesia canis and Rickettsia canis to the black backed jackal (Thos mesomelas mesomelas). A fatal form of theileriosis amongst cattle and named "corridor disease", together with other diseases transmissible by game were mentioned by Bigalke and Neitz (1954). Neitz, Canham and Kluge (1955), who investigated corridor disease, regard buffaloes and perhaps other species of game as reservoirs of infection.

Aspergillosis is a problem in most zoos amongst the birds. In Pretoria, e.g., it usually accounts for the penguins eventually. Walker (1915) referred to this infection in ostrich chicks.

Few bacterial diseases in game have been reported in the Union. Paine and Martinaglia (1928) found tuberculosis in kudu and duiker. Thorburn and Thomas (1940) diagnosed this infection as occurring naturally in the Cape kudu, and Robinson (1944) found the tuberculosis to be of bovine type.

De Villiers (1943) was of the opinion that anthrax, causing mortality in kudus, was transmitted by biting flies.

Neitz (1933) found the blesbok susceptible to both heartwater (Rickettsia ruminantium infection) and bluetongue. He (1937b) later confirmed the findings with regard to heartwater in this species; the animals remained clinically healthy. The same author (1944) transmitted heartwater to springbok. In the intima smears of two which died he found numerous colonies of Rickettsiae.

Neitz and Marais (1932) gave a history of rabies as it occurred from the earliest times in S.A. as well as a survey of wild vectors. Anon (1931) drew up a list of the transmitters of rabies amongst the small carnivora and also referred to the warthog (Phacochoerus aethiopicus) as a carrier of African swine fever. Neitz and Thomas (1934) drew up a summary of cases of rabies and its distribution in S.A. during 1933. Snyman (1937) made a comprehensive survey of the rabies problem in this country, and indicated the wild species in which the disease has been diagnosed. He (1940) wrote a thesis on the study and control of the vectors. Von Maltitz (1950) gave information about rabies in northern S.W. Africa.

P. J. du Toit (1932) described the foot and mouth disease position in S. Rhodesia. Rossiter and Albertyn (1947) discussed, inter alia, the game factor in the spread of this disease.

Mettam (1934), referring to "snotsiekte" in cattle, indicated the rôle played by the black wildebeest in transmitting the sickness, although it remains free from symptoms.

Stevenson-Hamilton (1939) gave a picture of the population fluctuations of some veld species and suggested possible causes of death. He urged the importance of scientific investigation of disease amongst game. Thomas and Neitz (1933) and de Kock (1938) stressed the importance of the spread of disease from game to domestic animals.

Thomas and Kolbe (1942) defined the distribution of wild pigs in S.A. and discussed their rôle in the dissemination of disease, especially African swine fever.

Fourie and Snyman (1942) reported a condition in cattle called "blouwildebeesoog", which occurred in domestic ruminants as an ophthalmic affection of great severity. Circumstances pointed to the blue wildebeest as a subclinical carrier of infection.

Mettam (1936) recorded his experiences with rinderpest, while Thomas and Reid (1944) described their experience of an outbreak of this disease amongst cattle and game in Central Africa and showed what control measures were instituted.

P. J. du Toit (1947), at an international congress, summarized the available knowledge about game in relation to animal diseases in Africa.

POST MORTEM EXAMINATIONS

The following is a list of post mortems performed at the National Zoological Gardens over a period of six years between 1950 and 1956.

Animal		Cause of Death	Refer to comments following table
Chimpanzee	Pan satyrus (Linn.)	Enteritis and fatty degeneration of liver	1
Orang Utan	Pongo pygmaeus (Hoppius)	Obesity and senility	
Hanuman monkey	Pithecus entellus (Dufresne)	Placenta praevia	2
do.		Torsion of colon	
Bengal monkey	Macaca mulatta (Zimmerman)	Trauma	
do.		do.	
Puttynosed monkey	Cercopithecus nictitans (Linn)	Enteritis and fatty degeneration of liver	
Bonnet monkey	Macaca radiata (E. Geoffroy)	Early pneumonia, circulatory collapse	
Yellow baboon	Papiocynocephalus (Linn)	Pulmonary carcinoma	
Ringtailed lemur	Lemur catta (Linn)	Trauma	
Sumatran tiger	Felix tigris (Linn)	Rupture of uterus	3
Puma	Felix concolor (Linn)	Trauma	
do.	do.	do.	
Leopard	Panthera pardus melanotica (Gunther)	Feline infectious panleucopenia	7
Cheetah	Acinonyx jubatus	One died of encephalitis and four from feline infectious panleucopenia	
Cape Hunting Dog	Lycaon pictus	Two died of distember, one distemper with toxoplasmosis and one from trauma	
Australian dingo	Canis familiaris	Babesia canis infection	5
Black backed jackal	Thos melomelas	Pneumonia one, trauma one	
Silver jackal	Cynalopex chama (A. Smith)	Distemper	4
Long eared fox	Otocyon megalotus (Desmarest)	Distemper	4

Animal		Cause of Death	Refer to comments following table
Honey badger	Mellivora capensis (Schreber)	Too decomposed for post mortem	
Cape polecat	Ictonyx striatus (Perry)	Haemorrhagic gastro-enteritis	
Clawless otter	Aonyx capensis (Schinz)	Pneumonia (one) Circulatory collapse (one) Lesions like those of babesiasis (one) Too decomposed (one)	
Black rhinoceros	Diceros bicornis (Linn)	Generalized tuberculosis	6
Brazilian tapir	Tapirus terrestris (Linn)	Sand in coecum, auto-intoxication	
Transvaal zebra	Equus burchellii transvaalensis (Ewart)	Enteritis (one) Trauma (one) Strongylus inf. Treated (one) Pneumonia (one)	
Rock rabbit (Dassie)	Procavia capensis (Pallas)	Babesiasis	8
Hippopotamus	Hippopotamus amphibius (Linn)	Acute gastritis (new born) (one) Trauma (new born) (one) Pneumonia (new born) (one)	
Javan swine	Sus vittatus (Muller and Schlegel)	Pneumonia	
Warthog	Phacochoerus aethiopicus (Pallas)	Heat stroke (effects of journey)	
Wild boar	Sus scrofa (Linn)	Chronic nephritis	
Camel	Camelus dromedarius (Linn)	Fibrosis of myocardium	
Giraffe	Giraffa camelopardalus	Volvulus of colon (one) General parenchymatosis atrophy (one) Cirrhosis of liver (one) Trichuris infestation (one)	
Friesland calf	Bos taurus (Linn)	Snotsiekte	10
Buffalo	Syncerus caffer (Sparrman)	Emaciation and dystokia	
Water buffalo	Bubalus bubalus	Kidney and liver cirrhosis	
Anoa. Dwarf buffalo	Anoa depressicornis (H. Smith)	Encephalitis (one) Uraemia (atrophy of kidney) (one) Stillborn (one) Pneumonia peritonitis and pleuritis (one)	
Gnu Black wildebees	Connochaetes gnu (Zimmermann)	Inanition (new born) (one) Trauma (two) Extensive abscessatiton of neck (one)	
Blue wildebees	Gorgon taurinus taurinus (Burchell)	Starvation (new born) (one) Trauma (new born) (one) Traumatic pericarditis (one)	
Redhartebeest	Alcephalus caama (Cuvier)	Enteritis (two)	
Bontebok	Damaliscus pygargus (Pallas)	Trauma (two) Enteritis (one) Exposure (young) (one) Foreign bodies in rumen (one)	

Animal		Cause of Death	Refer to comments following table
Blesbok	Damaliscus albifrons (Burchell)	Trauma (one) Encephalitis (one) Deep cellulitis of cheek (one) Abomasitis (one) Pediculosis (exposure) (one) Septic polyarthritis (one)	
Tsessebe	Damaliscus lunatus (Burchell)	Trauma (one) Encephalitis (decomposed) (one)	
Waterbuck	Kobus ellipsi prymnus (Ogilby)	Acute heart failure (one) Heart failure (aged) (one) Purulent sinusitis (one) Thoracic abscess (one) Worn teeth (one)	
Lechwe	Onotragus leche (Gray)	Trauma (two) Weakness at birth (one) Senility (one)	
Reedbuck	Redunca arundinum (Boddaert)	Pediculosis (cachexia) (one) Trauma (one) Cellulitis of face (one) Heart failure (one) Enteritis (one)	
Mountain reed buck	Redunca fulvorufula (Afzelius)	Enteritis (one) Pediculosis (cachexia) (one) Pneumonia (one) Undiagnosed (one) Pneumonia (one) Abomasitis (one) Trauma (one)	
Grey rhebuck	Peleaca preolus (Bechstein)	Two pneumonia cases Three enteritis cases One heart failure (young) Three trauma cases	
Grey duiker	Sylvicapra grimmia (Linn)	Three pneumonia cases Six enteritis cases One abscess in throat (starvation) case One too decomposed One protein poisoning case	
Klipspringer	Oreotragus oreotragus (Zimmermann)	Enteritis	
Steenbok	Raphicerus campestris (Thunberg)	Six enteritis cases. Six pneumonia cases. One pneumonia & purulent arthritis. One encephalitis. Five trauma. One cachexia with taeniasis. One doubtful heartwater case. Two too decomposed for diagnosis. One senility	
Springbok	Antidorcas marsupialis (Zimmermann)	Two pneumonia cases. One shot (bad teeth). One enteritis case. One tuberculosis case	

Animal		Cause of Death	Refer to comments following table
Impala	Aepyceros melampus melampus (Lichtenstein)	Trauma (fifteen). Worm infection (six). Enteritis (twelve), four with congestion of lungs and three with pneumonia. Pneumonia (eight). One bad teeth (shot). Feeding etc. (five). Too decomposed (two) dental defects (one). Inanition (young). Fatty liver (one) pregnant. Exposure (young) (one). Multiple abscesses (one) cachexia (one)	
Blue duiker	Guerei caerula (H. Smith)	Trauma (two) Enteritis (three) Pneumonia (two) Enteritis and pneumonia (one) Fatty degeneration of liver (one) Exposure (young) one Multiple abscesses (one) Cachexia (one)	
Gemsbok (Cape Oryx)	Oryx gazella (Linn)	Traumatic pericarditis (one) Trauma (two) Pneumonia (one) Enteritis and pneumonia (one) Hydrocephalus (one) Encephalitis (two) Senility (one) Exposure (new born) (one) Starvation (new born) one	
Sable Antelope	Ozanna grandicarnis (Herman)	Impaction of forestomachs (one) Blindness and general collapse (one)	
Roan antelope	Ozanna equina (Desmarest)	Pneumonia and senility (one)	
Eland	Taurotragus oryx (Pallas)	Trauma (two) Nephrolithiasis (one) Congestion of lungs (one) Pneumonia (one) One no diagnosis Torsion of uterus (one) Heart failure (one) (age) Irregular teeth (one) Cachexia and parenchymatons atrophy (one)	
Kudu	Strepsiceros strepsiceros (Pallas)	Trauma (two) Pneumonia, cirrhosis liver and kidneys (one)	
Nyala	Nyala angasii (Grey)	Enteritis (one) Encephalitis (two)	

Animal		Cause of Death	Refer to comments following table
Bushbuck	Tragelaphus scriptus sylvaticus (Sparrman)	Trauma (two) Senility (one) Abomasitis (two) Pneumonia (two) Undiagnosed (one)	
Thar	Hemitragus jemlahicus (H. Smith)	Trauma (three) Exposure (new born) four Cachexia (one)	
Blackbuck	Antilope cervicapra (Linn)	Trauma (three) Heartwater (one) Enteritis (one)	
Nilgau	Boselaphus tragocamelus (Pallas)	Exposure (new born) one	
Barking deer	Muntracus muntjak (Zimmermann)	Pneumonia (one) Enteritis (one) Exposure (new born) one	
Hog deer	Cervus porcinus (Zimmermann)	Trauma (three) Stillborn (one) Enteritis (one) Pneumonia (one)	
Fallow deer	Dama dama (Linn)	Pneumonia (one)	
Pere David's deer	Elaphurus davidianus (A. Milne Edwards)	Peritonitis (one)	
Spotted paca paka	Cuniculus paca (Linn)	Undiagnosed (one)	
Patagonian cavy	Dolichotis patacochonica (Shaw)	Encephalitis (one)	
Large spotted tailed native cat	Dasyuris maculatus (Kerr)	?	
Tasmanian devil	Sarcophilus harrisii (Boitard)	Pneumonia (one)	
Naked nosed wombat	Phascolomis mitchelli (Owen)	Pneumonia (one)	
Great red kangaroo	Macropus rufus (Desmarest)	Liver degeneration and necrosis Fracture of metatarsus (one) Pneumonia (one)	
Red necked wallaby	Macropus ruficollis (Desmarest)	Pneumonia (one) and paraplegia	
Black faced kangaroo	Macropus melanops (Gould)	Pneumonia (one)	

Here now follow some brief comments on the post mortems as indicated by numbers in the last column above:—

(1) The chimpanzee died as a result of one member of the public giving him 14 icecreams in succession. The animal developed severe enteritis. Treatment was impossible as no way could be found to disguise the medicine successfully and he was too powerful to be dosed by force. When he weakened sufficiently to permit handling, he could no longer swallow. Intravenous glucose saline drip for hours on end with a keeper holding his arm in position, as well as other parenteral therapy proved unavailing.

(2) This case of placenta praevia [described by Hofmeyr (1952a)] unfortunately occurred in the night house during the night. If the condition had been detected in time a caesarean hysterotomy should have been successful.

(3) The Sumatran tigress as well as the lion, which shared her cage, had been reared on dogs. The lion developed into a magnificent specimen, but the tigress remained on the small side. She became in whelp by him and, at full term, developed dystokia, the pelvis being rather small and the "liger" cubs very big. Caesarean section was decided upon, while she was still fairly strong, but she unexpectedly collapsed and died. Autopsy showed rupture of the uterus well forward and a cub with placenta lying free in the abdominal cavity. The sudden demise was apparently due to shock.

(4) The cases of distemper among the Cape hunting dogs and the other members of the Canidae were due to the fact that there was a temporary shortage of vaccine. The Toxoplasma infection was diagnosed by Dr. D. A. Haig of Onderstepoort.

(5) The Babesia canis infection manifested itself in the same way as in the common domestic dog. Other cases recovered after appropriate treatment.

(6) The rhinoceros had not been in contact with any of the diagnosed tuberculosis cases in the zoo. The diagnosis was made ante mortem from sputum by Dr. E. M. Robinson of Onderstepoort, and later confirmed by a biological test. The only animal in contact with the rhinoceros was the elephant, which had a habit of putting its trunk across the space between their enclosures, until measures were taken to prevent it. To date the elephant appears to be in normal health.

(7) Feline infectious panleukopenia runs a rapid and highly fatal course amongst some of the wild Felidae. Particularly amongst the cheetahs a haemorrhagic gastro-enteritis is a constant and ominous symptom. Besides the deaths listed, some pumas were affected, but recovered after treatment.

(8) The whole colony of dassies died out as a result of babesiasis. Unfortunately the keeper, through an oversight, did not submit any cases for autopsy until the last two died. From one of these Jansen (1952) described the new organism Babesia thomasi.

(9) This giraffe had been caught in the veld, but was never robust and was subject to bouts of diarrhoea. Repeated faeces examination showed a few worm ova. Treatment with phenothiazine on two occasions produced no improvement. During the last weeks before death the diarrhoea was uncontrollable.

(10) The Friesland calf developed typical "snotsiekte" soon after a young black wildebest calf was brought in to share its quarters. The latter was not born in captivity and never showed signs of sickness.

(11) The occurrence of pediculosis is interesting. An animal may show depilation and loss of weight. It may be found to have anaemia and lice infestation, the latter usually not as severe as commonly encountered in domestic stock. After delousing, improvement is usually rapid. This seems to indicate that antelopes are much more sensitive to pediculosis than domestic animals.

(12) As the author was on a distant call, Dr. M. M. Greathead was asked to see the sick eland cow. He diagnosed torsion of the uterus and had her prepared for caesarean section, but she died before the operation could be performed.

(13) The three deaths indicated here were representative of the picture as seen in 35 young impala of about 6 months old. All were not recorded as they were identical. Most of these animals were destined for another place. They appeared to do exceedingly well for a week or more. They were confined to a night house. The cases all showed initial diarrhoea, progressive weakness and death, and all succumbed. It was suspected that they, being mainly browsers, could not overcome the period of adaptation of their ruminal flora and fauna. Their hay was then contaminated with ruminal contents of sheep and leaves were brought in to supplement the hay. Intestinal sulphonamides were used as well as the usual anti-diarrhoeals. As Haemonchus and Cooperia hepatica infestation were found, all were treated with phenothiazine even though the infestation was light. All efforts proved unavailing. It has been suggested that salmonellosis played a rôle. Although possible, it appears unlikely. The impala bred in the camp in whose night house the others were kept never showed a similar mass mortality. If the aetiology was infectious, it is difficult to see how spread to the "residents" could have been avoided. In subsequent years it has been found that young impala caught in the veld are very liable to the same disease pattern.

(14) The barbary sheep and the mouflon occupy separate camps high on the hill of what is known as the Extension. It is conceivable that an odd tick infected with heartwater may get into these camps. Although the post mortem picture was typical of this disease, no microscope confirmation could be made.

(15) It had been decided to sell a few redundant males among the fallow deer, black buck and mouflon. As one of each was due to go to a heartwater area, immunization against this disease was attempted. In cattle the procedure is the intravenous injection of blood infected with a known strain of heartwater and then the taking of temperatures twice daily until fever appears, when treatment is carried out. Because of the wildness of the game, no temperatures could be taken, but it was hoped to treat them as soon as they appeared ill. The fallow deer and the mouflon were found dead and unfortunately not submitted for autopsy. The black buck was only seen in extremis and treatment was unsuccessful. Post mortem examination showed typical heartwater.

Table 1

1950

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
		3(5)	4(5)	1(2) 11(5)		2(5)		2(5)	2(5)		4(5)

1951

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1(7) 1(5)	2(5)	1(2) 5(5)	4(5)	5(5)	1(3) 2(5)		3(5)	3(5)	1(7) 6(2) 3(5)	2(2) 1(1) 10(5)	3(5)

1952

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
2(7) 1(4)		1(7) 4(5)		1(7) 1(3) 2(5)	3(5)	2(5)	3(5)	5(5)	1(2) 1(1) 4(5)	1(2) 1(1) 2(5)	5(5)

1953

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
7(5)	6(5)	1(6) 1(2) 3(5)	7(5)	1(2) 3(5)	7(5)	8(5)	3(5)	1(5)	4(5)	1(5)	

1954

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
		1(3) 1(2) 4(5)	5(3)	2(1) 2(5)	8(5)	2(1) 9(5)	1(3) 2(5)	1(3) 4(5)	1(6)		1(1) 4(5)

1955

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
4(5)	1(2) 4(5)	1(3) 1(2) 7(5)	1(2) 4(5)	3(5)	8(5)	2(5)	1(2) 2(5)	3(5)	1(6) 1(5)	3(5)	3(5)

1956

Jan.	Feb.	Mar.
1(1)	3(2) 4(5)	3(5)

This table shows the number of post-mortem examinations done per month during the period under consideration. These figures indicate, as set out below, the zoölogical order to which the various cases belonged.

1. Primates, i.e., apes, monkeys and lemurs.
2. Carnivora, i.e., dog and cat family, mongooses, etc.
3. Perissodaytyla, i.e., rhinoceroses and equines.
4. Hyracoidea, i.e., dassies.
5. Artiodactyla, i.e., hippopotami, pigs, bovine, ovine, caprine, antelope and deer family.
6. Rodentia, i.e., rodents.
7. Marsupialia, i.e., all the marsupials.

TABLE 2

Deaths classified according to the system primarily affected

Order	System						
	Digestive	Respiratory	Circulatory	Nervous	Urinary	Genital	Trauma
Primates	3	2	1			1	3
Carnivora	1	2	1	1		1	4
Perissodactyla	4	3	1		1		1
Artiodactyla	45	32	9	8	5	1	62
Rodentia				1			
Marsupialia		4		1			

The above list only indicates sporadic and not infectious diseases.

TABLE 3

Years 1951-1955

Deaths amongst the Artiodactyla

Each month shows the total number of deaths during that month over the years indicated above. Only the systems which were the seat of the lesions in a significant number of cases are listed.

Respiratory System

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
3	1	3	4	4	1	3	2	3	1		1

Digestive System

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
3		5	7		8	4	2	5	2	2	1

TABLE 4

Years 1951-1955

Mortality amongst all species (first column) and Artiodactyla (second column).

Jan. to Mar.		Apr. to Jun.		July to Sept.		Oct. to Dec.	
60	48	78	69	51	48	57	39

Deaths grouped into three monthly records.

Discussions and Conclusions

Table 1 gives the autopsies performed every month over the period under review. No clear pattern emerges, except that the first half of the year generally shows higher mortality than the second half. The orders other than the Artiodactyla are too poorly represented to permit discussion.

The latter statement is confirmed in Table 2. For obvious reasons infectious diseases would have been out of place in this table. It is further patent that the digestive and respiratory systems are, by a long way, the most frequently affected macroscopically. This appears to be true of all orders having had a significant number of deaths. A puzzling feature is the fact that, though pneumonia and enteritis are often diagnosed, severe and advanced lesions are seldom seen. In the domestic animal under similar circumstances one expects, as a rule, to encounter pathological processes much further advanced before the animal succumbs.

For the sake of comparison all deaths due directly or indirectly to trauma have been listed. Injuries are sustained during journeys, fights — the male sometimes attacks the females — but, most often, at night when all animals are instinctively on the alert and stampede easily. Broken necks are then quite common. It is seldom possible to find out what caused a fright, although it has happened during past years that dogs managed to find their way into the zoo at night.

In Table 3 the time of the year is correlated with deaths amongst the Artiodactyla and associated with the main lesions in a particular system. The number of deaths in other orders have been too small to be significant. The pictures with regard to the respiratory and digestive systems are similar, i.e., autumn to spring is the worst time from the point of view of affection of these systems.

Table 4 shows the time of the year when an animal in this zoo is the most likely to meet its death irrespective of species or cause of death. In all species the mortality rate is fairly constant throughout the year, but there is a peak during April to June. This applies to the Artiodactyla by themselves, except that the peak during April to June is more evident. The other orders taken together, are represented by too small a number to give significant results. The apparent higher mortality rate during these months is entirely due to the Artiodactyla.

It is hoped that, by the presentation of additional data from time to time over a period of years, a much clearer picture will emerge.

Acknowledgements

The author has pleasure in recording his appreciation of assistancce rendered by various colleagues, who are and have been associated in practice with him: Dr. A. B. la Grange for doing

13 of the necropsies, Dr. M. M. Greathead 13, Dr. P. G. Howell two, Dr. D. J. le Roux five and Dr. C. L. Craig four necropsies. In addition, Dr. Greathead did the lion's share of the faeces examinations made during the helminthological survey at the zoo.

BIBLIOGRAPHY

Anon. (1931): News Letter to Government Veterinarians. Jnl. S.A.V.M.A. 2 (2), p. 154.

Baer, J. G. (1926-1927): Contributions to the Helminth Fauna of South Africa. 11th & 12th Rep. Dir. Vet. Ed. & Res., p. 61.

Bedford, G. A. H. (1918a): Anoplura from South African Hosts. 5th & 6th Rep. Dir. Vet. Res., p. 709.

Ibid. (1918b): Ibid. (Part II) 7th & 8th Rep. Dir. Vet. Res.

Ibid. (1926-1927): A Check List & Host List of the External Parasites Found on South African Mammalia, Aves and Reptilia. 11th & 12th Rep. Dir. Vet. Ed. & Res., p. 221.

Ibid. (1928): New Species of Trichodectidae from South African Mammals. 13th & 14th Rep. Dir. Vet. Ed. & Res.

Ibid. (1929): Anoplura (Siphunculata & Mallophaga) from South African Hosts. 15th Rep. Dir. Vet. Serv., p. 501.

Ibid. (1930): New Genera and Species of Mallophaga from South African Hosts. 16th Rep. Dir. Vet. Serv., p. 153.

Ibid. (1931): Ibid. (Part II). 17th Rep. Dir. Vet. Serv. & An. Ind., p. 283.

Ibid. (1934): Descriptions of New Species of Anoplura parasitic on Antelope and a Hare. O'P Jnl. 3 (2), p. 34.

Ibid. (1939a): Further Notes on Species of Trichodectidae with the Description of New Species. O'P Jnl. 12 (1), p. 103.

Ibid. (1939b): Notes on Menoponidae (Mallophaga) with Descriptions of New Genera and Species. O'P Jnl. 12 (1), p. 121.

Bigalke, R. and Neitz, W. O. (1954): Indigenous Ungulates as a Source of New Domesticated Animals. Jnl. S.A.V.M.A. 25 (4), p. 45

Curson, H. H. (1931a): Anatomical Studies No. 19: Polydactyly in a Springbok and a Pig. 17th Rep. Dir. Vet. Serv. & Indust., p. 853.

Ibid. (1931b): An Unusual Foreign Body from a Jackal. 17th Rep. Dir. Vet. Serv. & An. Ind., p. 875.

Curson, H. H. & Quinlan, J. (1931): Anchylosis of Hock Joint in a Steenbok. 17th Rep. Dir. Vet. Serv. & An. Ind., p. 877.

De Kock, G. (1938): Wild Animals as Carriers of Infection. S.A. Med. Jnl. Oct. 1-15.

De Villiers, S. W. (1943): An Outbreak of Anthrax Amongst Koedoes. Jnl. S.A.V.M.A. 14 (1), p. 17.

Du Toit, P. J. (1932): Foot and Mouth Disease in Southern Rhodesia. J.S.A.V.M.A. 3 (1), p. 26.

Ibid. (1937): A New Piroplasma (Sauroplasma thomasi n.g., n.sp.) of a Lizard (Zonurus giganteus Smith). O'P Jnl. 9 (1), p. 289.

Ibid. (1947): Game in Relation to Animal Diseases. Jnl. S.A.V.M.A. 18 (2), p. 59.

Du Toit, R. (1954): Trypanosomiasis in Zululand and the Control of Tsetse Flies by Chemical Means. O'P Jnl. 26 (3).

Fourie,, P. J. J. (1951): Letsels van Oesophagostomum columbianum (Knoppies-wurm) in die Blesbok [Damaliscus albifrons (Burch)]. Jnl. S.A.V.M.A. 22 (2), p. 63.

Fourie, J. M. & Snyman, P. S. (1942): Blouwildebeesoog. Jnl. S.A.V.M.A. 13 (2), p. 43.

Hofmeyr, C. F. B. (1952a): Placenta Praevia in a Hanuman Monkey [Pithecus entellus (Duf.)]. Jnl. S.A.V.M.A. 23 (3), p. 179.

Ibid. (1952b): Tetanus in a Cape Chacma Baboon [Papio ursinus ursinus Kerr)]. Jnl. S.A.V.M.A. 23 (4), p. 22.

Jansen, B. C. (1952): Babesia thomasi sp. nov. an Intra-erythrocytic Parasite of the Cape Dassie [Procavia capensis (Pallas)]. O'P Jnl. 25 (3).
Kluge, E. B. (1945): Nagana in Zululand: Preliminary Report on the Incidence of Trypanosomiasis in Game. S.A. Jnl. Si. 61:311-316.
Le Roux, P. L. (1929a): Three New Members of the Genus Haemonchus, Cobb 1898 from Antelopes in South Africa. 15th Rep. Dir. Vet. Serv., p. 451.
Ibid. (1929b): On an Oesophagostome (Oesophagus susannae sp. nov.) from the Spring Hare (Pedetes caffra) Together with Remarks on Closely Species. 15th Rep. Dir. Vet. Serv., p. 465.
Ibid. (1929c): On a Hookworm (Agriostomum gorgonis sp. nov.) from the Blue Wildebeest (Gorgon taurinus) in the Transvaal. 15th Rep. Dir. Vet. Serv., p. 481.
Ibid. (1930a): A Spirurid (Streptopharagus geosciuri sp. nov.) from the Stomach of the Cape Ground Squirrel (Geosciuris capensis). 16th Rep. Dir. Vet. Serv., p. 201.
Le Roux, P. L. (1930b): An Acuaria (Acuaria martinaglia sp. nov.) from a South African Weaver (Hyphanlomis sp.). 16th Rep. Dir. Vet. Serv., p. 211.
Ibid. (1930c): A New Nematode (Rictularia aethechini sp. nov.), a Physaloptera and an Acanthocephala from the Hedgehog (Aethechinus frontalis). 16th Rep. Dir. Vet. Serv., p. 217.
Ibid. (1930d): On Two New Helminths from the Abomasum of the Bushbuck in Zululand, Natal. 16th Rep. Dir. Vet. Serv., p. 233.
Malan, J. R. (1939): Some Helminths of South Afrcian Lizards. O'P Jnl. 12 (1), p. 21.
Martinaglia, G. (1930): A Strain of Mycobacterium tuberculosis from the Giraffe and further Observations of M. tubercculosis from the Koedoe and the Duiker. 16th Rep. Dir. Vet. Serv. & An. Ind., p. 143.
Ibid. (1930): Babesiasis in a Sable Antelope. Jnl. S.A.V.M.A. 1 (4), p. 41.
Martinaglia, G. & Brandt, F. A. (1947): Cysticercosis of the Impala or Rooibok (Aepyceros melampus) with Reference to Meat Hygiene Jnl. S.A.V.M.A. 18 (2), p. 59.
Martinaglia, G. & Robertson, M. C. (1933): Operation on a Lion Cub for Umbilical Hernia. Jnl. S.A.V.M.A. 4 (1).
Meeser, M. J. N. (1952): Endo- and Ectoparasites of the Impala — Aepyceros melampus. A Preliminary Survey. Jnl. S.A.V.M.A. 23 (4), p. 221.
Mettam, R. W. M. (1924): Snotsiekte in Cattle. 9th & 10th Rep. Dir. Vet. Ed. & Res.
Ibid. (1936): Wild Game and Rinderpest Experiences in Uganda. Conf. on Coörd. Vet. Res., E.Af., 113-114.
Mönnig, H. O. (1926-1927): Helminthological Notes. 11th & 12th Rep. Dir. Vet. Ed. & Res., p. 221.
Ibid. (1929a): Hypodontus macropi n. gen. n. sp. a Hookworm from the Kangaroo (Macropus rufus). 15th Rep. Dir. Vet. Serv., pp. 303.
Ibid. (1929b): Filarinema flagrifer n. gen. n. sp. A Trichostrongylid parasite of the Kangaroo. 15th Rep. Dir. Vet. Serv., p. 307.
Ibid. (1929c): Agriostomum equidentatum n. sp. A Hookworm of the Springbuck. 15th Rep. Dir. Vet. Serv., pp. 311.
Ibid. (1931a): Wild Antelopes as Carriers of Nematode Parasites of Domestic Ruminants. Part I. 17th Rep. Dir. Vet. Serv. & An. Ind., p. 233.
Ibid. (1931b): A Second Species of the Nematode Genus Acanthoxyuris. 17th Rep. Dir. Vet. Serv. & An. Ind., p. 269.
Ibid. (1931c): Two New Species of the Nematode Genus Hartertia. 17th Rep. Dir. Vet. Serv. & An. Ind., p. 273.
Ibid. (1931d): Two New Nematodes from the Suricat (Viverridae). 17th Rep. Dir. Vet. Serv. & An. Ind., p. 277.
Ibid. (1932a): Wild Antelope as Carriers of Nematode Parasites of Domestic Ruminants, Part II. 18th Rep. Dir. Vet. Serv. & An. Ind., p. 153.
Ibid. (1932b): Syngamus indicus. A New Nematode from an Indian Elephant. 18th Rep. Dir. Vet. Serv. & An. Ind., p. 173.
Ibid. (1932c): New Strongylid Nematodes of Antelope (Preliminary Notes). Jnl. S.A.V.M.A. 3 (4), p. 171.

Ibid. (1933a): A New Species of Setaria from Antelopes. Jnl. S.A.V.M.A. 4 (1), p. 21.
Ibid. (1933b): Wild Antelopes as Carriers of Nematode Parasites of Domestic Ruminants, Part III. O'P Jnl. 1 (1), p. 77.
Neitz, W. O. (1931): Blood Parasites of Game in Zululand. 17th Rep. Dir. Vet. Serv. & An. Ind., p. 45.
Ibid. (1933): The Blesbuck (Damaliscus albifrons) as a Carrier of Heartwater and Blue Tongue. Jnl. S.A.V.M.A. 4 (1), p. 24.
Ibid. (1935a): The Transmission of Spirochaeta theileri to a Blesbuck (Damaliscus albifrons). O'P Jnl. 5 (1), p. 7.
Ibid. (1935b): Bovine Anaplasmosis — The Transmission of Anaplasma marginale to a Black Wildebeest (Connochaetes gnu). O'P Jnl. 5 (1), p. 9.
Ibid. (1937a): The Occurrence of Piroplasma pitheci in a Vervet Monkey (Cercopithecus aethiops cloetei Roberts) in South Africa. O'P Jnl. 9 (1), p. 31.
Ibid. (1937b): The Transmission of Heartwater to and from Blesbuck (Damaliscus albifrons) by means of the Bont Tick (Amblyomma hebraeum). O'P Jnl. 9 (1), p. 37.
Neitz, W. O. (1938a): The Occurrence of Grahamella conchi sp.n. in the Multimammate Mouse (Mastomys concha) in South Africa. O'P Jnl. 10 (1), p. 29.
Ibid. (1938b): The Occurrence of Nuttallia cynictis Mayer 1912 in the Albino and Wild Rat after Splenectomy. O'P Jnl. 10 (1), p. 37.
Ibid. (1944): The Susceptibility of the Springbuck (Antidorcas marsupialis) to Heartwater. O'P Jnl. 20 (1), p. 25.
Neitz, W. O., Canham, A. S. & Kluge, E. B. (1955): Corridor Disease. A Fatal Form of Bovine Theileriosis encountered in Zululand. Jnl. S.A.V.M.A. 23 (4), p. 221.
Neitz, W. O. & du Toit, P. J. (1932): Bovine Anaplasmosis. A Method of Obtaining Pure Strains of Anaplasma marginale and A. centrale by Transmission through Antelopes. 18th Rep. Dir. Vet. Serv. & An. Ind., p.3.
Neitz, W. O. & Marais, I. P. (1932): Rabies as it occurs in the Union of South Africa. 18th Rep. Dir. Vet. Serv. & An. Ind., p. 71.
Neitz, W. O. & Steyn, H. P. (1947): The Transmission of Babesia canis (Piana & Galli-Valero 1895) to the Black Backed Jackal [Thos mesomelas mesomelas (Schreiber)] with a Discussion on the Classification of the Piroplasms of the Canidae. Jnl. S.A.V.M.A. 18 (1), p. 1.
Neitz, W. O. & Thomas, A. D. (1934): Rabies in South Africa. Occurrence and Distribution of Cases in 1933. O'P Jnl. 2 (1), p. 335.
Ibid. (1948): Cytauxzoon sylvicapra gen. nov. sp. nov. — a Protozoon responsible for a Hitherto Undescribed Disease in the Duiker [Sylvicapra grimmia (Linn.)]. O'P Jnl. 23 (1 & 2), p. 263.
Ortlepp, R. J. (1932a): On a New Species of Tetrameres (Tetrameres paradisea sp. nov.) from Stanley Cranes. 18th Rep. Dir. Vet. Serv. & An. Ind., p. 177.
Ibid. (1932b): Some Helminths from South African Chiroptera. 18th Rep. Dir. Vet. Ser. & An. Ind., p. 183.
Ibid. (1933a): Ozolaimus megatyphlon (Reid 1819) a little known Helminth from Iguana tuberculatus. 18th Rep. Dir. Vet. Serv. & An. Ind., p. 83.
Ibid. (1933b): On Some South African Reptilian Oxyurids. 18th Rep. Dir. Vet. Serv. & An. Ind., p. 99.
Ibid. (1934): On Habronema murrayi (sp.n.) from the Barn Owl (Tyto alba). O'P Jnl. 2 (1), p. 347.
Ibid. (1935): On Some Helminths of the Nylghiae — Boselaphus tragocamelus (Pall) with Observations on the Parasitic Larval Stages of the Stomach Worm (Ashworthius martinaglia sp. n.). O'P Jnl. 5 (1).
Ibid. (1937a): Some Undescribed Species of the Nematode Genus Physaloptera Reid together with a Key to the Sufficiently Known Forms. O'P Jnl. 9 (1), p. 71.

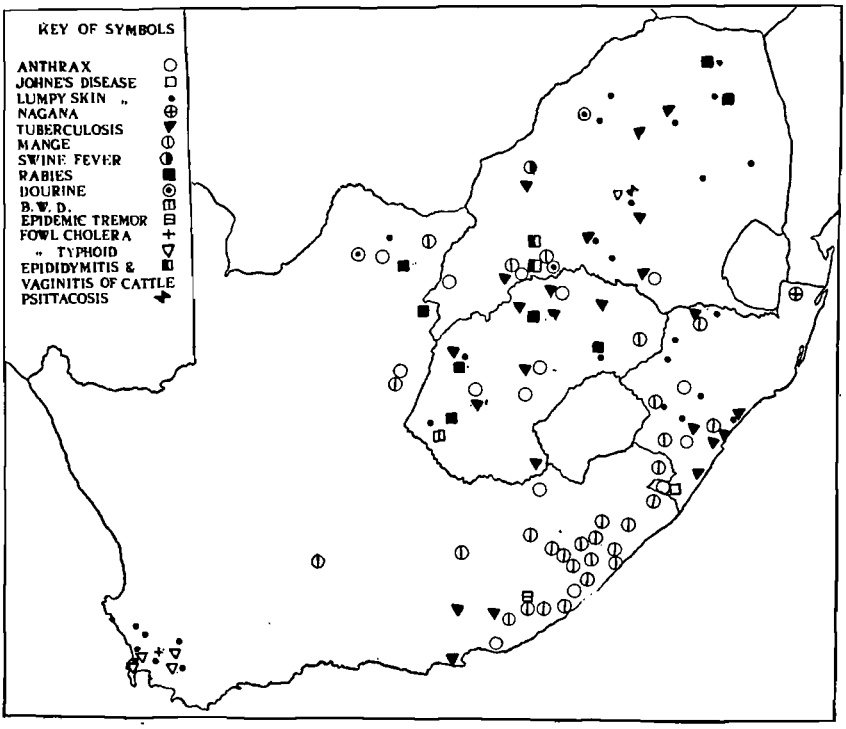
Ibid. (1937b): Whipworms from South African Ruminants. O'P Jnl 9 (1), p. 91.
Ibid. (1937c): South African Helminths — Part I, 9 (2), p. 311.
Ibid. (1938a): Ibid. — Part II. Some Taenias from Wild Carnivores. O'P Jnl. 10 (2), p. 253.
Ibid. (1938b): South African Helminths — Part III. Some Mammalian and Avian Cestodes. O'P Jnl. 11 (1), p. 23.
Ibid. (1938c): South African Helminths — Part IV. Cestodes from Columbiformes. O'P Jnl. 11 (1), p. 51.
Ibid. (1938d): South African Helminths — Part V. Some Avian and Mammalian Helminths. O'P Jnl. 11 (1), p. 63.
Ibid. (1939a): South African Helminths — Part VI. Some Helminths Chiefly from Rodents. O'P Jnl. 12 (1), p. 75.
Ibid. (1939b): Can Hares and Rabbits Act as Hosts of Sheep and Goat Bankrupt Worms (Trichostrongylus sp.) in S.A.? Jnl. S.A.V.M.A. 10 (4), p. 166.
Ibid. (1940): South African Helminths — Part VII. Miscellaneous Helminths, Chiefly Cestodes. O'P Jnl. 14 (1 & 2), p. 97.
Paine, R. & Martinaglia, G. (1928): Tuberculosis in a Kudu and Duiker. Jnl. S.A.V.M.A. 1 (2), p. 87.
Robinson, E. M. (1944): A Note on Starins of Tuberculosis from the Cape Kudu. O'P Jnl. 19 (1 & 2), p. 23.
Rossiter, L. W. and Albertyn, A. A. L. (1947): Foot and Mouth Infection in Game. Jnl. S.A.V.M.A. 8 (1), p. 16.
Snyman, P. S. (1937): Rabies in South Africa. Jnl. S.A.V.M.A. 8 (3), p. 126.
Ibid. (1940): The Study and Control of the Vectors of Rabies in South Africa. O'P Jnl. 15 (1 & 2), p. 9.
Stevenson-Hamilton, Lt.-Col. J. (1939): The Health of Wild Animals. Jnl. S.A.V.M.A. 10 (2), p. 56.
Theiler, Sir A., and Robertson, Wm. (1915): Investigations into the Life History of the Wireworm of the Ostrich. 3rd & 4th Rep. Dir. Vet. Res., p. 291.
Thomas, A. D. and Kolbe, F. F. (1942): The Wild Pigs of South Africa: Their Distribution and Habits and Their Significance as Agricultural Pests and Carriers of Diseases. Jnl. S.A.V.M.A. 13 (1), p. 1.
Thomas, A. D. and Neitz, W. O. (1933): The Importance of Diseases in Wild Animals S.A. Jnl. Sc. 30, p. 419.
Thomas, A. D. and Reid, N. R. (1944): Rinderpest in Game. A Description of an Outbreak in Game and an Attempt at Limiting its Spread by Means of a Bush Fence. O'P Jnl. 20 (1), p. 7.
Thorburn, J. A. and Thomas, A. D. (1940): Tuberculosis in the Cape Kudu. Jnl. S.A.V.M.A. 11 (3), p. 3.
Van der Westhuysen, O P. (1938): A Monograph on the Helminth Parasites of the Elephant. O'P Jnl. 10 (1).
Von Maltitz, L. (1950): Rabies in the Northern Districts of South West Africa. Jnl. S.A.V.M.A. 21 (1), p. 4.
Walker, J. (1912): A Short Note on the Occurrence of a Leucocytozoon Infection. Host the Ostrich. 2nd Rep. Dir. Vet. Res., p. 384.
Ibid. (1915): Aspergillosis in Ostrich Chicks. 3rd and 4th Rep. Dir. Vet. Res., p. 533.

OUTBREAKS OF SCHEDULED DISEASES IN THE UNION OF SOUTH AFRICA FOR THE PERIOD 1/9/56—1/12/56

	Province and District (Number of outbreaks in parentheses)			
	Cape	Natal	O.F.S.	Transvaal
Anthrax	Alexandria (1) Kimberley (3) Komgha (1) Lady Grey (1) Vryburg (2)	Alfred (1) Richmond (1) Weenen (1)	Bloemfontein (1) Thaba 'Nchu (1) Ventersburg (2) Vredefort (3)	Klerksdorp (1) Schweizer Reneke (1) Standerton (1)
Johne's Disease		Alfred (1)		
Lumpy Skin Disease	Bellville (12) Cape Town (3) Malmesbury (1) Somerset West (3) Stellenbosch (3) Vryburg (1) Wellington (1) Worcester (1)	Estcourt (30) Klip River (2) Lions River (1) Lower Tugela (4) Newcastle (1) Paulpietersburg (1) Umvoti (2)	Bethlehem (1) Boshof (1) Fauresmith (1)	Germiston (1) Heidelberg (1) Letaba (18) Lydenburg (1) Pietersburg (2) Pilgrimsrest (2) Potgietersrust (10) Pretoria (1) Waterberg (3) Zoutpansberg (6)
Nagana (T. congolense) Nagana (T. vivax)		Ingwavuma (1) Ingwavuma (1)		
Tuberculosis	Albany (1) Somerset East (1) Port Elizabeth (1)	Inanda (1) Lower Tugela (1) Pietermaritzburg (1) Pinetown (1) Umzinto (1) Utrecht (1)	Bloemfontein (2) Boshof (1) Bothaville (1) Frankfort (1) Kroonstad (2) Vredefort (1) Winburg (1) Zastron (1)	Johannesburg (2) Klerksdorp (3) Pietersburg (1) Potgietersrust (3) Rustenburg (1) Standerton (1) Witbank (2)
Mange	Albany (1) Beaufort West (1) Cradock (1) East London (1) Elliotdale (1) Engcobo (1) Flagstaff (1) Glen Gray (3) Idutywa (2) Kentani (6) Kimberley (1) Kingwilliamstown (7) Libode (1) Mafeking (2) Middeldrift (6) Mqanduli (3) Nqamakwe (1) Tsolo (1) Tsomo (3) St. Marks (4) Umtata (17)	Estcourt (4) Ndwedwe (1) Polela (2) Umzimkulu (5) Utrecht (1)	Harrismith (3)	Klerksdorp (1) Potchefstroom (2)

	Province and District (Number of outbreaks in parentheses)			
	Cape	Natal	O.F.S.	Transvaal
Rabies	Taungs (1) Vryburg (2)		Bethlehem (1) Boshof (1) Fauresmith (1) Kroonstad (2)	Letaba (7) Zoutpansberg (6)
Dourine	Vryburg (2)			Potchefstroom (2) Waterberg (1)
B.W.D.			Fauresmith (1)	
Epidemic Tremor	Middeldrift (1)			
Fowl Cholera	Paarl (1)			
Fowl Typhoid	Bellville (1) Cape Town (1) Somerset West (1) Worcester (1)			Pretoria (2)
Epididymitis and vaginitis of cattle				Potchefstroom (1) Ventersdorp (1)
Swine Fever				Rustenburg (1)
Psittacosis				Pretoria (1)

The symbols on the map indicate the area where the disease occurred and may represent one or more outbreaks.



TRADE EXHIBITS AT THE CONGRESS

This year again the Trade Exhibition was held in the new faculty building and full advantage was taken of it by drug and instrument firms. As in previous years the exhibition was opened by the president of the Association and a tour of inspection of the exhibits followed. Much more time was available this year for members of the Association attending the Congress to visit the exhibition which was greatly appreciated.

The descriptions of the exhibits have been placed in alphabetical order.

THE CONNELL INSTRUMENT CO. (PTY.) LTD., JOHANNESBURG

Precision optical, drawing and scientific instruments, projection apparatus, binoculars, and meteorological instruments were displayed and demonstrated. A selection of photomicrographs in colour were projected on the stand, as were colour photographs of Messrs. Wild Heerbrugg's instrument factory in Switzerland. The 16 mm. film "Trichomonas Foetus" was shown during the Congress.

The instruments exhibited included:—

Wild-Heerbrugg Microscopes

Model MII Binocular Microscope, with special light weight steel hood and dustproof packing giving extreme portability.

Model MII Monocular Microscope.

*New Wild Research Microscope Model M*20. Latest design research stand with modern type ball-bearing controls and high power built-in illuminations. This model was shown in various forms, having Achromatic objectives, "Fluotar" semi-apochromatic objectives, Phase Contrast and Wild Varicolour variable phase contrast equipment.

Accessories for Wild Microscopes, including Photomicrographic Outfit incorporating "H Tube" and focussing through the Binocular eyepiece tube.

Electro Magnetic Fine Focussing attachment.

Universal Condenser giving bright field phase contrast and dark ground illumination.

Drawing Mirror.

American Optical Company

Spencer 820 Precision Rotary Microtome. Spencer "Brightline" Haematological Equipment.

Educational still projection apparatus including: A.O. Model MC Slide/Film Strip Projector. A.O. Opaque 1000 Episcope with 10 x 10 ins. aperture and optical pointer.

Uno Pen Stencils: For ink lettering suitable for filing, specimen labelling, museum cards, etc.

Illuminated Magnifiers, reading glasses, hand lenses.

Binoculars by Messrs. Beck (Germany) and Messrs. Habicht (Austria).

THE CROOKES LABORATORIES LIMITED

The range of veterinary products displayed by the Crookes Laboratories Limited, is increasing each year. Once again, vitamin injections were well to the fore and in addition to Vitamin A, new injections of Vitamin D3 and Vitamins A and D3 were shown. These high potency vitamin injections, for massive dose therapy, are specially prepared for veterinary use.

One old favourite appeared under a new name, that useful tonic Collotone (Veterinary) has been renamed Collovet, which should obviate any confusion with the medical tonic.

Other products featured, which are now becoming well known to South African Veterinarians, were Haemostem, a blood coagulant for administration by intravenous or intramuscular injection, Ferrovet, the only intramuscular iron injection prepared specially for veterinary use and the Crookes Injection of Stilboestrol Dipropionate, an injection of very low viscosity at all temperatures.

GLAXO LABORATORIES (S.A.) (PTY.) LTD.

Glaxo Laboratories (S.A.) (Pty.) Ltd. exhibited their range of penicillin and streptomycin products, including Mylipen, Benapen and their well known intra-mammary preparations Streptopen and Procaine Penicillin Veterinary Cerate.

A new product under the name Triplopen was also on their stand. Each vial contains:

Crystalline Penicillin G.	500,000 units.
Procaine Penicillin G.	250,000 units.
Benethamine Penicillin G.	500,000 units.

The crystalline penicillin gives an immediate high blood level which supplements the lower, but more prolonged effect of procaine penicillin and the persistent therapeutic level is further maintained by the benethamine penicillin. In all, the therapeutic effect of Triplopen persists for three to four days. In suitable doses, this product is well suited to both small and large animal practice.

Another new Glaxo product was Cytexin Forte — a vitamin B_{12}/B complex preparation for injection.

A number of the Glaxo vitamin products were also available, including:

Cytamen (vitamin B_{12}).

Calci-Ostelin (colloidal calcium and Vitamin D for injection).

Ostelin Forte (1 cc ampoules containing 600,000 units vitamin D).

Adexolin (a stable oily solution of vitamins A and D containing 6000 units of A and 1000 units of D per gram).

Caldeferrum (a tablet containing calcium, iron and Vitamin D).

HORNE & PLATOW (PTY.) LTD.

As in previous years, being the sole Southern African Representative for the Internationally famous Veterinary supply firm of Hauptner, we exhibited a range of instruments.

In 1955 we introduced the acme in high grade, low priced monocular microscopes "The New Fuji" which created quite a sensation. This year we have been proud to add to the monocular unit, the "Fujiphot" Binocular microscope and the "N.B.K." binocular unit, both of which have superlative optical systems, and first rate mechanical operation.

The policy of this Company has always been to give the veterinarian and student the best possible value at a figure which is within reasonable limits, and we feel assured that by introducing the "Fuji" and N.B.K. lines of binocular microscopes, we had done just that.

We would like to extend to the veterinarian and student alike our sincerest wishes of good luck and prosperity in the future and assure them of our closest co-operation and assistance with any of their problems which fall within our scope.

MILBORROW & COMPANY (PTY.) LIMITED

The exhibit was attended by Mr. G. E. Milborrow and Mr. R. J. van Rensburg, and a full range of their Veterinary appliances and instruments, in addition to their locally manufactured range of Veterinary Pharmaceuticals, was displayed. There was again considerable interest shown in the automatic injection and dosing equipment, particularly the "Phen-Master" which, it is expected, will shortly be modified for the effective dosing of Tetrachlorethylene and other drenches, in addition to Phenothiazine. Samples of their new Mikrozine — Liquid Phenothiazine and Hexazene — Liquid Hexachlorethan/Phenothiazine mixtures aroused great interest as did their soluble Pen-Strept-Amide Intramammary and Intra-uterine preparations. There was a big demand for Calving Chains and Handles.

PARKE, DAVIS & CO.

Parke, Davis Laboratories (Pty.) Ltd., the Johannesburg subsidiary of Parke, Davis & Co., had the pleasure of introducing for the first time to Veterinary Surgeons in Southern Africa Chloromycetin Tincture 10% Veterinary for the treatment of foot rot. Following original research carried out in Australia further work both in that country and in Britain has established Chloromycetin Tincture as the most effective treatment for contagious foot rot in sheep and cattle. Over 80% successful results have been obtained following only one application.

Other products featured by Parke, Davis on their stand included Chloromycetin Intramuscular for a wide variety of infections in large and small animals; Benadryl Parenteral for bloat and serum sickness; Abidec Drops for vitamin deficiencies in small animals and Epanutin for hysteria and convulsions.

PFIZER

The exhibit by Pfizer Laboratories South Africa (Pty.) Ltd. featured the Terramycin range of veterinary dosage forms. The effectiveness and versatility of the truly broad spectrum antibiotic Terramycin in veterinary practice is reflected by the provision of convenient dosage forms to meet all requirements of administration and dispensing.

Particular interest was shown by veterinarians in Terramycin animal formula for Mastitis which combines the broad spectrum of Terramycin with the specific effectiveness of Polymyxin against Pseudomonas in easily dispersable aqueous suspension.

Terramycin Eye Pellets containing Terramycin, polymyxin and tetracaine also created a great deal of attention, being uniquely convenient for treating ophthalmias in large animals.

Terramycin Soluble Tables for the preparation of intravenous Terramycin injections and Terramycin Intramuscular for the treatment of many diseases, particularly Heartwater and Gallsickness were old friends of many veterinarians.

Terramycin Tablets conveniently packed in foil, 4 x 500 mg scored tablets to the box, evinced considerable comment for their convenience for oral and intrauterine work.

Other items on display were Terramycin Animal Formula Soluble Powder for medication in the drinking water and/or feed, Terramycin with polymyxin topical ointment, Terramycin Suspension in Oil for subcutaneous injection of poultry and intrasinus injection of turkeys, and Terra-Cortril Ophthalmic Suspension which combines the antibacterial action of Terramycin with the dramatic decongestive action of hydrocortisone.

PHILIPS' DISPLAY AT ONDERSTEPOORT CONGRESS

Amongst the articles displayed by S.A. Philips, in the first place we would like to mention the Philips "Practix" X-Ray unit on mobile stand. This unit is designed for surgical X-Ray plates in human beings and can cope with X-Ray work for the small animals as well.

A further article was the "Infraphil", an Infrared Medical Healing Lamp. It incorporates a 150 watt globe which provides a very concentrated beam of Infrared radiation in the therapeutical octave. It is extensively used in the treatment of all ailments amongst humans which call for heat application. Obviously it can be used equally well on household pets and other animals.

The Philips' HPW.125W Black Light Mercury Lamp has attracted attention. This lamp is employed for fluorescent effects where they occur and also finds application in the veterinary field. An example is the detection of ring worm.

The Philips "TUV" 30W Germicidal Lamp is finding increased application for the sterilisation of air. In hospitals, laboratories, etc., it is installed in such a way that the actual lamp is screened from general view, so that the atmosphere will be freed of its germs.

In food and industries, of course, the radiation often is desired to strike certain objects to prevent development of mould, etc., in which case people entering such rooms must either wear protective glasses, or arrangements must be made that the lamps are extinguished when people enter the rooms.

Last but not least, Philips displayed their 250 watt Infra-red Brooder Lamp. This finds extensive application in South Africa amongst poultry breeders. These lamps have proved more economical and easier to use than other methods of hovers. Application has now been extended to the breeding of pigs and other animals.

A. S. RUFFEL (PTY.) LTD., OF JOHANNESBURG

A. S. Ruffel (Pty.) Ltd., of Johannesburg, had on display a full range of veterinary pharmaceuticals, veterinary instruments and nutritional products.

Preparations which attracted interest were:—

Rufus 333 which is a newly formulated scour remedy based on Terramycin Hydrochloride, Vitamin A and Streptomyces fermentation.

Rufus Pig Booster is a special Terramycin and Vitamin preparation for incorporation into Pig Growth Meal. It is used at 1 lb. per 2,000 feed for optimum weight increase and at a concentration of 5 pounds per 2,000 lb. of feed to control scour in a swine herd.

Rufus R x 1 *and R* x 2 are specially compounded stabilised Vitamin Fortifications blended for the farmer mixing farm rations. The correct use of these formula fortifies the Vitamins A, D, and B2 in feeds.

Rufus Calf Scour Remedy is the normal sulphaguanidine, streptomyces and Koalin composition which has been found very effective in cleaning Calf Scour.

Aquacillin — This is an aqueous suspension of 300,000 units of Procaine Pencillin G per cc. packed in 10 c.c. Vials and is specifically registered for the treatment of Foot-Rot and calf Diphtheria.

Vetcillin — A veterinary cerate mastitis preparation containing 100,000 Units Procaine Penicillin G in mineral oil with aluminium stearate.

Vetomycin — This is a blended Dehydrostreptomycin and penicillin G veterinary cerate compounded especially for cases of Penicillin resistent mastitis.

SCHERING CORPORATION

This has been the first time that Schering Corporation has exhibited at a Veterinary Congress since Schering's new Veterinary Division was established at the beginning of this year. Three products of original research were featured, each in its way a valuable addition to the veterinarian's armamentarium.

Meticorten, the most potent corticosteroid at present available, is very useful in the treatment of many inflammatory and allergic conditions. Specifically Meticorten is used for "summer eczema", ketosis, shock, and in acute inflammation of tendon, bursa and joint. In chronic arthritis, continued administration may be necessary and cost becomes a feature.

It should be borne in mind that concomitant antibiotic or bactericidal treatment should be given when infection is present.

A new acetylcholine blocking agent is presented in two forms: Variton Cream for moist eczemas, and Variton Compound (combined with an enteric sulphonamide) for diarrhoea. It is believed that acetylcholine is the "trigger" mechanism for setting off manifestations such as itching and oedema. The resulting trauma from scratching furthers secretion of acetylcholine which in turn produces more itching and oedema. This vicious cycle can be broken by the anticholinergic action of Variton Cream. In Variton Compound the acetylcholine (parasympathetic) blocking agent reduces motility and secretion, while phthalylsulphacetamide effectively combats the organisms commonly responsible for bacillary diarrhoea. Variton Compound will usually control diarrhoea in dogs and calves within 24 hours.

CHAS. F. THACKRAY (S.A.) (PTY.) LTD.

Messrs Chas. F. Thackray (S.A.) (Pty.) Ltd., Orion House, Bree Street, Johannesburg, again had pleasure in exhibiting surgical supplies at the 51st Annual Veterinary Congress and met many old acquaintances which made this Congress most enjoyable.

The following were exhibited: Surgical Instruments; Davis & Geck Sutures; Stainless Steel Ware; Anglipoise Lamps; Denbar Plastic Aprons and Sheets; Stainless Steel Sterilizing Drums; Instrument Sterilizers; Portable Autoclaves; Sterling Surgeons Gloves; Sterling Post Mortem Gloves.

COUNCIL MATTERS

A meeting of the Council of the South African Veterinary Medical Association was held on Monday, September 10th, 1956, at tne Meat Board Building, Pretoria.

Present: Drs. A. M. Diesel (President), P. S. Snyman, A. C. Kirkpatrick, R. A. Alexander, E. M. Robinson, G. D. Sutton, C. F. B. Hofmeyr, R. M. du Toit, R. Clark, L. W. van der Heever, M. de Lange, S. W. J. van Rensburg, S. van Heerden (Hon. Secretary).

Present by Invitation: Drs. J. S. Watt (S.W.A. Branch), C. H. Flight and B. M. Horwitz (Cape Western Branch), L. C. Blomefield (Cape Eastern Branch), A. J. Louw and J. L. Dickson (O.F.S. Branch), C. C. Wessels and J. L. Dorè (Natal Branch), U. von Backstrom and M. M. Greathead (Witwatersrand Branch), W. J. Wheeler (Vet. Public Health Group).

Minutes of Council Meeting held on the 26th of April, 1956, Adoption moved. Agreed.

Matters arising from Minutes:—

(a) Report by Convenor of Sub-committee of Inquiry into Co-operative Employment of Veterinarians.

Dr. Diesel spoke on the report, copies of which had previously been sent to members of Council and branch secretaries, and asked for comments.

Dr. Snyman pointed out that para. 4 on page 28 of the report restricted the activities of veterinarians, and said that we should not agree to this in principle. In support Dr. Hofmeyr asked that this clause be deleted. Dr. Diesel said that parts of the report could not be deleted since, after having considered evidence, the committee felt it necessary to include this paragraph. Should the Association find itself unable to agree with or accept parts of the report, the Association's representatives who would meet representatives of the Co-op.'s Board, should say so at this meeting.

Dr. Blomefield said that his branch committee had discussed the report fully and that they appreciated it very much. As far as charges are concerned, however, his branch committee felt that veterinarians in employment of Co-op. Societies should render accounts in accordance with a schedule of fees adopted by practitioners in the area.

Dr. Dorè reported that the R.C.V.S. did not permit veterinarians to accept employment with Co-operative Societies.

Dr. Alexander explained that as the Veterinary Board was autonomous, it did not have to consult, or even be influenced by the policy of the R.C.V.S.

It was then agreed to pass the report to the general meeting of members on Thursday, September 13th.

(b) Ante and Post-mortem Inspection of Meat in South Africa: Dr. van der Heever reported that the memo embodies the views of the Veterinary Public Health Group, and that he was anxious to have comments thereon.

Dr. Alexander said that the Veterinary Division accepted the principles of the report, but regretted that it had no machinery to implement the suggestions.

Dr. Horwitz felt that the views of our Association should be put to other bodies and the meeting should discuss ways and means of bringing this about. Dr. Louw asked whether it would not be possible for the Director of Veterinary Services to implement parts of the report, e.g., in regard to the export of meat products, to insist that a veterinarian should be in charge of the abattoir of origin.

Dr. Alexander informed the meeting that the S.A. Bureau of Standards had now been brought under the control of C.S.I.R. and that requirements to be met for different brands for export were, at the present time, being reviewed.

Dr. van den Heever pointed out that under the Public Health Act, the appointment of a veterinarian at an abattoir was permissive and not obligatory. In practice the recommendations of the Medical Officer of Health to the local authority, determined whether or not, a veterinarian was appointed to take charge of the activities at the abattoir. Whereas the Public Health Act makes it

obligatory for a local authority to appoint a M.O.H. if the number of souls in that authority exceed a certain number, he (Dr. van den Heever) felt that a similar position should obtain in regard to the appointment of veterinarians to abattoirs when the number of animals slaughtered exceeds a certain number. Dr. van den Heever felt that personal support and active participation by the Director of Veterinary Services would be a vital factor in obtaining these further rights.

The President then read a personal letter from Dr. M. C. Robinson in which disagreement is voiced with the timing of pressure.

Dr. van der Heever conceded that Dr. M. C. Robinson's views had been seriously considered and had affected the substance of the report. The Association should proceed however, step by step, to implement the report.

Council then unanimously adopted the report in principle.

Dr. Alexander said that as the regional abattoirs of the Meat Board would have to conform to the S.A.B.S. standards the Director of Veterinary Services would insist on veterinary ante and postmortem inspections.

Council agreed to appoint the following sub-committee to consider ways and means of implementing the report, and to report back at the next Council meeting.

Members of sub-committee: Dr. P. S. Snyman (Convenor), Drs. M. C. Robinson, R. A. Alexander, L. W. van den Heever and W. J. Wheeler.

(f) Veterinary Health Certificates: It was agreed that an amendment to previous minutes be made, regarding the prices of the pads of certificates.

Resolved that the prices be 5/- for pads of small certificates and 7/6 for pads of large certificates.

It was noted that these certificates had been given a "splash" in the journal "Organized Agriculture."

(h) Purchase of Vaccines from Onderstepoort: The Secretary explained why this matter had been brought up again.

Agreed that Dr. Hofmeyr supply the Secretary with information and date, to form the basis of a letter to the Director of Veterinary Services.

(i) Scale of Directive Fees: Dr. Dorè said that the Natal Branch would prefer "minimum" rather than "directive" fees. Dr. Hofmeyr proposed that the sub-committee to be appointed report to the Annual General Meeting on 13th September, 1956. — Agreed.

It was agreed that the sub-committee consist of members nominated and representative of branches; the V.P.H. Group would not have a representative on this sub-committee. Dr. J. Dorè was appointed convenor.

III. Notification of Election of Council: The result of the ballot for members of Council for the years 1956 and 1957 was announced by the Secretary.

The elected members are: Drs. R. Clark, M. C. Lambrechts, L. W. van der Heever and S. W. J. van Rensburg.

The President — Dr. P. S. Snyman, Vice-President — Dr. H. P. Steyn, Hon. Secretary — Dr. S. van Heerden, Hon. Treasurer — Dr. G. D. Sutton, had been elected, since no other nominations were received for their respective offices.

A total of 155 voting papers had been received.

IV. Standing Committees for the years 1956/57. The following were elected to serve on the respective standing committees:—

Finance: Drs. S. W. J. van Rensburg (Convenor), C. F. B. Hofmeyr, M. de Lange, R. A. Alexander, R. Clark, E M. Robinson

Editorial: Drs. E. M. Robinson (Convenor), R. Clark, W. D. Malherbe, L. W. van den Heever, W. J. Wheeler, H. P. A. de Boom.

Library: Drs. T. F. Adelaar (Convenor), R. du Toit, W. D. Malherbe, Cadet member (nominated by students).

General Purposes: Drs. R. Clark (Convenor), W. D. Malherbe, M. de Lange.

Book Fund: Drs. G. D. Sutton, M. de Lange, A. D. Thomas.

Resolutions: Drs. W. D. Malherbe and E. M. Robinson.

V. Membership.

(a) New Members — On proposal of Dr. Clark, seconded by Dr. de Lange, it was agreed to recommend to the Annual General Meeting, that the following be elected members:—

H. C. Theron, P. M. S. Masters, J. T. R. Robinson, T. Robson, D. W. Verwoerd, J. D. Poole, A. H. Pettigrew, J. van Niekerk, M. Bachmann, P. B. Botha, D. S. Wege.

It was also agreed to recommend to the Annual General Meeting the name of L. de Bruyn for membership.

(b) Honorary Associate Members.

Prof. M. van den Ende and Mr. J. Morris had been proposed and seconded for Honorary Associate Membership.

It was unanimously agreed to recommend their election to the Annual General Meeting.

(d) Hon. Life Vice-Presidents.

Dr. Diesel proposed and Dr. S. van Heerden seconded thhat the following persons be elected Hon. Life Vice-Presidents of the Assocation.

Drs. P. R. Viljoen, H. H. Curson, E. M. Robinson and G. de Kock.

It was unanimously agreed to recommend their election to the Annual General Meeting.

Dr. Robinson thanked Council for the honour, and said that he appreciated it very much.

VIII. Notice of Motion to Amend Constitution to allow for regional representation on Council.

Dr. Clark read his proposal and asked Council to agree to the principle put forward. After further discussion it was agreed that the proposal should be discussed by the Annual General Meeting, and that it be suggested at the meeting that this matter should be referred to a sub-committee to iron out all the snags and details.

IX. (b) Letter from Secretary of O.F.S. branch, re resolution taken at branch meeting, read.

"Hierdie vergadering bring dit onder die aandag van die S.A.V.M.V., dat daar wel nog onreelmatighede voorkom insoverre die verskaffing van sekere medisynes aangaan, wat deur wetgewing gedek is, aan die publiek. Die S.A.V.M.V. word gevra om hierdie praktyk met die hoof te bied, met die beste middele tot sy beskikking."

Dr. Dickson reported that it was agreed at this meeting to report specific cases to the Association for report to the correct authorities concerned.

(c) Brief van Dr. Grosskopf gelees, insake "Registrasie van Sulfonamiede en Antibiotika as veegeneesmiddels aan die publiek."

Dr. Clark felt that the Director of Veterinary Services should not advise registration of penicillin, which had been registered.

Dr. Alexander said he would look into the matter and recommend the deletion of penicillin.

(h) Remuneration of locums and assistants.

The present final year students had asked the Secretary to bring this matter to Council. They desired standardisation of emoluments. Council did not express its views on this matter, although Dr. van den Heever reported that the Witwatersrand branch had a scheme which could meet the case.

(c) Dr. Dorè enquired whether it would be possible for the S.A.V.M.A. library to institute machinery to lend publications to members in the far off corners of our country.

Agreed to ask the Library Committee to consider and report to Council.

Appendix "A".

THE PROFESSIONAL PROVIDENT SOCIETY OF S.A.

1004, Cavendish Chambers,
Jeppe Street,
Johannesburg.
26th September, 1956.

The Honorary Secretary,
S.A. Veterinary Medical Association,
P.O. Onderstepoort, Tvl.

Dear Sir,

Furrther to my letter of the 30th ultimo, I am now in a position to advise you that on the recommendation of the Society's Actuary, my Management Committee has agreed to a loading or additional charge in respect of the subscriptions to be paid by veterinary surgeons, on the following basis.

Age next birthday at date of purchase of shares	Normal Subscription Rate per Share		Additional subscriptions per share for Veterinary Surgeons	
	Monthly	Yearly	Monthly	Yearly
30 or under	2/9	£1 13 0	2d.	2/–
31 to 35	2/10	1 14 0	2d.	2/–
36 to 40	3/–	1 16 0	2d.	2/–
41 to 45	3/3	1 19 0	2d.	2/–
46 to 50	3/6	2 2 0	3d.	3/–
51 to 55	3/9	2 5 0	3d.	3/–

For your information I should like to mention that our Actuary has submitted the following points in support of his recommendation:

(1) An examination of the practice of Insurance Companies reveals that in respect of temporary partial disablement arising from accidents it is customary to impose a loading of the order of 33⅓% on Veterinary Surgeons.

(2) On the assumption that the risk of sickness due to accident is greater and that the risk of sickness due to other causes is no greater in the case of Veterinary Surgeons, than in the case of other professional men, a loading of 10% should be adequate.

(3) This loading however, is not to be imposed on the whole subscription as only part of the normal subscription is required for the sickness element of the Society — the rest is for the provident fund element. The loading is only in respect of the sickness risk.

The figures for the loading quoted above have been assessed on this basis and rounded off to the nearest penny in the monthly subscription.

Whilst it is felt that this loading will be adequate, only experience over a period of years will reveal whether it is adequate or excessive, and any adjustment necessary could then be made.

My Management Committee would appreciate your acceptance or otherwise of membership on the basis of the loading proposed, as soon as possible, as it would be necessary before admitting any of your members, to amend the rules of the Society, to provide for the imposition of the loading.

Yours faithfully,

(Sgd.) W. H. C. KOHLER,
Secretary.

BOOK REVIEW

Veterinary Ophthalmology. R. H. Smythe, M.R.C.V.S. Bailliere, Tindall & Cox, London, 1956. Price 35/- net.

This book is devoted entirely to veterinary ophthalmology. Part I, which deals mainly with the anatomy and physiology of the eye, also has interesting chapters on the function of various types of eyes, how they differ in construction, and how this affects the vision of the different animals. Veterinarians will appreciate this information especially as it must be admitted that our ideas about the visual limits of animals are generally based more on conjecture than on a basic understanding of the subject.

Eye conditions and diseases of the eye are fully discussed in Part II, the clerical section. Modern surgical procedure is demonstrated. Modern antibiotic and hormone therapy is discussed and a complete list of pharmacological preparations is included.

The book is written in a fluent, easy style which makes reading it a pleasure. It is confidently recommended to practising veterinarians, and as a textbook teachers will find it of the greatest assistance.

N.C.S.

S.A. VETERINARY MEDICAL ASSOCIATION
S.A. VETERINÊR-MEDIESE VERENIGING

Minutes of the 51st General Meeting of Members, held at Onderstepoort, on September 11th, 12th and 13th, 1956.

The following members registered at the meeting: —

L. Abrams, D. B. V. Barrow, C. H. Basson, P. A. Basson, C. W. A. Belonje, L. C. Blomfield, J. G. Boswell, H. N. Botha, P. B. Botha, P. H. Brown, L. P. Colly, C. L. Craig, L. Daly, E. F. de Abreu, J. A. de Kock, P. de la Harpe, O. T. de Villiers, G. J. de Wet, J. L. Dickson, A. M. Diesel, J. L. Doré, R. de Bruyn, L. T. Edwards, J. M. Erasmus, C. H. Flight, J. R. Frean, P. J. Goosen, M. M. Greathead, J. Grobler, H. F. T. Hellberg, W. B. Hobbs, C. F. B. Hofmeyr, B. M. Horwitz, C. J. Howell, L. R. Hurter, J. H. Huyser, J. Jackson, C. v. N. Jonker, Z. P. Kempster, A. C. Kirkpatrick, E. B. Kluge, G. Kronsbein, J. L. Kruger, A. B. la Grange, M. C. Lambrechts, F. W. Langbridge, E. O. le Riche, A. J. Louw, Jac. Louw, P. L. Louw, I. S. McFarlane, G. McIntyre, W. du Toit Malan, C. Maree, J. H. Mason, P. J. Meara, I. Mowat, R. W. Muir, J. J. Oberholster, J. J. Oosthuizen, B. T. Paine, R. K. Reinecke, J. T. R. Robinson, L. W. Rossiter, W. J. Ryksen, W. H. G. Schatz, J. A. Schutte, P. S. Snyman, S. Solomon, J. L. Stewart, Prof. D. G. Steyn, D. G. Steyn, H. P. Steyn, H. J. J. Terblanche, A. D. Thomas, J. K. Thompson, J. A. Thorburn, P. L. Uys, W. P. van Aardt, L. W. van den Heever, N. T. v.d. Linde, G. F. v.d. Merwe, J.P. v.d. Merwe, J. G. v.d. Wath, C. H. van Niekerk, J. van Niekerk, I. van Schalkwyk, D. C. L. Wacher, P. P. C. Wacher, J. S. Watt, C. C. Wessels, W. J. Wheeler, J. G. Williams, T. F. Adelaar, R. A. Alexander, J. H. R. Bisschop, R. Bigalke, J. M. M. Brown, R. Clark, J. D. Coles, R. B. Cumming, H. P. A. de Boom, M. de Lange, R. M. du Toit, P. J. Fourie, H. Graf, D. A. Haig, M. W. Henning, P. G. Howell, J. F. W. Grosskopf, J. M. W. le Roux, W. D. Malherbe, J. W. Pols, E. M. Robinson, K. Schultz, J. D. Smit, A. J. Snyders, N. C. Starke, G. D. Sutton, R. C. Tustin, G. C. van Drimmelen, J. S. van Heerden, S. W. J. van Rensburg, K. E. Weiss.

Apologies for Absence were received from Drs. D. L. McWhirter, H. C. Watson, S. G. Turner, A. F. Tarr, I. Canham, J. Quinlan, Major J. G. Keppel, Mr. J. E. R. Roe, Dr. J. E. Dorrington.

Tuesday, September 11th — Convocation of Meeting

At 9.10 a.m. the President, Dr. A. M. Diesel, called the gathered members to order.

The members were bid welcome, as were the delegated members from adjoining territories and municipalities. A special message of welcome was extended to visitors who were present, and others who would be attending part(s) of the proceedings.

Obituaries. Drs. J. Nicol, R. E. Hartig and Major Weir, had passed on during the year. In response to a request from the President, the meeting rose for a few seconds as a token of respect for departed colleagues.

Presidential Address: Approximately 80 persons were in the hall when the President delivered his address.

Opening of Congress by Professor C. H. Rautenbach, Rector and Vice-Chancellor of the University of Pretoria.

He mentioned that "Veterinarians have made great contributions towards the material welfare of our country.

Veterinary training and education has been given for 35 years, but it would appear that we have, for several years past now, reached the end of the present system of training. The Faculty of Veterinary Science has always been and still is, a guest of the Director of Veterinary Services.

Recommendations were made to the Minister for Agriculture twenty months ago, that a nucleus of lecturing staff should be full time lecturers. This has not yet come about.

We trust that we shall soon have a new pattern of training here at Onderstepoort.

It gives me great pleasure to declare this 51st Congress of the S.A. Veterinary Medical Association open."

The President thanked Professor Rautenbach for his opening address.

Opening of Trade Exhibition. The representatives of the firms exhibiting, were invited into the hall. The President delivered a short address, at the end of which he declared the Trade Exhibition open.

The Chairman of the Medical Exhibitors Association, Mr. Stabler, replied. He then handed the President, on behalf of the firms exhibiting at Congress, a cheque for £100, as a donation to the Benevolent Fund of the Association. The President thanked Mr. Stabler and the other representatives on behalf of the Association.

The President and Professosr Rautenbach, accompanied by Mr. Stabler and Mr. Oversby, did a tour of inspection of the exhibits, meeting and conversing with the representatives of the various firms exhibiting.

The rest of the day as well as the whole of the following day, was devoted to papers, discussions, demonstrations, films and slides.

THURSDAY, SEPTEMBER 13TH

Approximately 74 members were in the hall by 8.30 a.m., when the President, Dr. Diesel, asked Dr. Snyman, Vice-President, to take the Chair.

Dr. Diesel then proceeded to deliver the report drawn up by the sub-committee, appointed at the previous general meeting of members to investigate and report on the employment of veterinarians by Co-operative Societies and like organizations.

Copies of the report had been available to members at the Congress as from Tuesday morning, September 11th. It was accepted that members had had the time to read the report.

After some introductory remarks, Dr. Diesel asked that the report be discussed by members.

A lengthy discussion followed but details of it will not be published at present in view of the proposal made by Dr. Fourie and accepted by the meeting, to the effect that "The report be referred back to the committee and circulated to all members of the Association with a request that they comment on it. The committee should place a comprehensive report on the commentaries received before the Council for discussion. If necessary this discussion could be held at an extraordinary general meeting of the Association.

Professor Fourie's motion was put to the meeting and carried with two disssentient votes. Approximately eight members did not participate in the vote.

(a) *Minutes.* The minutes of the 50th Annual General Meeting having been published in the Journal of the S.A. Veterinary Medical Association, were taken as read and their adoption proposed by Dr. H. P. Steyn, seconded by Dr. J. D. Coles. — Agreed.

(b) *Matters arising from these minutes.*

(i) *Ante and Post Mortem Examination* of animals slaughtered for human consumption.

The President reported that the report of the Public Health Group had been submitted to Council and to branches.

Council had agreed and appointed a sub-committee, with Dr. P. S. Snyman as Convenor, to go into ways and means of implementing the contents of this memorandum. Noted.

(ii) *Veterinary Health Certificates.* These certificates were now available at 7/6 and 5/- per pad.

(iii) *Trust Fund to foster the Development of Veterinary Science and Research.*

The President stated that funds were already available for research and study overseas and Council considered it was not necessary to establish a further fund for this purpose.

(iv) *Resolutions.*

1. *Making State Service more attractive to Veterinarians.*
   The Director of Veterinary Services explained that this had been done by an increase in salaries.
2. *Reduction of purely routine administrative and supervisional work.*
   The Director of Veterinary Services stated that staff was being implemented which would release veterinarians to do more actual veterinary work.
3. *More acceptable Transport Arrangements.*
   The Director of Veterinary Services advised that the subsidisation of motor transport was being brought back.
4. *Employment of part-time Veterinarians.*
   The Director of Veterinary Services indicated that the Government was not in favour of part-time employment of veterinarians. This question however fell within the scope of the Committee of Inquiry into Control of Bovine Tuberculosis, so that the matter was not yet closed.
5. *Regional Diagnostic Laboratories.*
   The Director of Veterinary Services stated that these were being established; e.g., Louis Trichardt.
6. *The removal of Veterinary Research from the Control of the Public Service Commission.*
   Dr. Alexander was requested to address the meeting on this point.
   He stated that the matter had already been before the Cabinet and that Council had agreed to await developments.
   Dr. Henning disagreed with this decision. He said that Council had got a directive from the last Annual General Meeting to take action and they should not leave matters to develop. Dr. Alexander stated that at that stage the report of the Public Service Commission, for submission to the Cabinet, had already been drafted.
   Dr. Henning enquired whether the Association had been approached for evidence in this connection. Dr. Alexander stated that the Association had not been approached, nor as far as he knew, the profession. The Veterinary Board had been consulted.
   After further discussion the action of Council was approved.
7. *The Profession should have the power through the Veterinary Board to scrutinise the curriculum, etc., and to be represented at any examination at its discretion.*
   The President explained that Council was in favour of this provision, which could only be brought about by the amendment of the Veterinary Act. The Veterinary Act would be amended and Council would approach the responsible authorities to include this in the Act.
   Dr. Fourie asked the Chairman whether the profession would be granted opportunity for consultation and discussion in connection with the amendments to the Veterinary Act.
   The President stated that the Veterinary Board would be consulted and the draft bill would appear in the Government Gazette.
   Dr. Coles considered that at that stage it would be too late for the profession to express its views. After further discussion it was agreed that the Secretary would advise members by circular letter when the draft bill did appear in the Government Gazette.
8. *Separation of faculty teachers from the Department of Agriculture.*
   The President advised the meeting that negotiations were in progress. This was a contentious matter and at a difficult stage.
   Dr. Rautenbach in his opening address had outlined some of the difficulties, and any amendment in the Act, to bring this into effect, would have to be acceptable to the University authorities as well.

(c) *Election of New Members.*

The following candidates having been considered and recommended for acceptance by Council, were elected members:

M. Bachmann, P. B. Botha, R. de Bruyn, P. M. S. Masters, J. D. Poole, A. H. Pettigrew, H. Palmhert, J. T. R. Robinson, T. Robson, H. C. Theron, D. W. Verwoerd, J. van Niekerk, D. F. Wege, R. C. White.

Associate Members.

Council had considered and agreed unanimously to recommend to this meeting for consideration:

Professor H. v.d. Ende and Mr. J. Morris.

Agreed unanimously.

Honorary Life Vice-Presidents:

The President informed the meeting that Council had unanimously agreed to elect the following members Hon. Life Vice-Presidents:

Drs. E. M. Robinson, H. H. Curson, P. R. Viljoen and G. v.d. M. de Kock.

The meeting ratified this decision in unopposed motion

The President notified the meeting that the following members having paid subscription for 30 years, now become Life Members

Drs. J. D. W. Coles, C. H. Flight, L. L. Daly, G. J. de Wet, J. L. Dickson, H. Graf, D. A. Lawrence, H. O. Monnig, R. B. Osrin, N. Starke, K. Schulz.

(d) *Resignations.*

Dr. U. F. Richardson and Mrs. J. Hofmeyr (neé Verdurmen).

(e) *Reports of Standing Committees.*

Finance: The Balance Sheet and Income and Expenditure account for the year having been circularised to members and the Auditors' Report submitted to Council and discussed, their adoption was moved by Dr. Alexander and seconded by Dr. Clark.

The Hon. Treasurer requested authority to write off arrear subscriptions amounting to £9. 9s. due by Dr. L. Chisholm, whom he had been unable to trace, but was believed to now be resident in England.

Agreed.

General Purposes: The report of this Committee had been circularised to members.

Editorial Committee: This Committee had nothing to report, but commented on the rising cost of publishing and distributing the Journal, which would result in the subscription to the Journal having to be raised in the near future.

The Editor, Dr. E. M. Robinson, appealed for more contributions to the Journal, even if only in the form of letters. For instance, a member had wished the question of standing castration of horses to be discussed at the meeting. This had not been possible. Did members consider that this question should be sent to the Journal, either as an article or a letter inviting comment and views from other members, which could be published in the Journal.

The meeting agreed that such contributions be accepted for publication in the Journal.

(f) *Notification of Council and Induction of President.*

The election of Council was announced by the President:

President: Dr. P. S. Snyman.
Vice-President: Dr. H. P. Steyn.
Hon. Secretary: Dr. S. van Heerden.
Hon. Treasurer: Dr. G. D. Sutton.
Editor: Dr. E. M. Robinson.
Members — 1956/58: Drs. S. W. J. van Rensburg, R. Clark, L. W. v.d. Heever, M. C. Lambrechts.
Members — 1955/57: Drs. M. de Lange, R. M. du Toit, M. C. Robinson, C. F. B. Hofmeyr.
Hon. Life Vice-Presidents: Drs. P. J. du Toit, A. C. Kirkpatrick, J. A. Irvine-Smith, C. J. van Heerden, R. Alexander, E. M. Robinson, H. H. Curson, P. R. Viljoen and G. v.d. W. de Kock.

The newly elected President was then inducted in office by the retiring President.

Dr. P. S. Snyman thanked members for electing him as President and paid tribute to Dr. Diesel for the interest he had always shown and the valuable work he had done for the Association.

(g) *Notices of Motion to Amend Constitution.*

(i) Section 9 (c) paragraph (viii), the words "on the day preceding" to be substituted by the word ". . . before . . ."

(ii) Amendment of Section 7 (a), to provide for members, resident in places other than in Africa south of the Sahara, to pay half the membership fees.

These amendments had been discussed in Council and were recommended to the meeting. Their adoption proposed by Dr. Alexander. Agreed.

(iii) Dr. Clark stated that he had recently visited various branches of the Association and he was perturbed at the lack of liaison between branches and Council. He felt that some provision should be made for regional representation at Council meetings, and proposed the following resolution:

"That this meeting requests Council to investigate the possibility of:—

(1) Altering the constitution as regards the election of Council members, so as to allow of regional or group representation, with the object of bringing all members into closer contact with the activities of the Association.

(2) Establishing an Executive Committee of Council, with full powers of action within its discretion, but responsible to Council, with the objects of expediting the handling of the business of the Association."

The resolution was adopted and referred to Council for attention: Council to report to the next Annual General Meeting.

At this stage the President requested Dr. Clark to include in his resolution (3) "The amendment of the Constitution of the Association."

(h) (1) *International Association of Small Animal Specialists.*

Dr. Alexander explained to the meeting that he was the Association's representative on the Permanent Committee of the International Veterinary Congress, and as such required from them a directive as to whether they wished to form this Group within the Association.

Dr. Hofmeyr explained that he was the only member at the Council meeting at which this was discussed, who was vitally interested and he therefore asked that this item be placed on the agenda for the Annual General Meeting.

After discussion it was agreed that this Group should be formed.

Dr. H. P. Steyn asked that the name of the Group be amended to "International Association of Small Animal Practitioners" as the term "specialist" was not used in this country. — Agreed.

(h) (2) (i) Dr. Alexander then mentioned that there was a second Group — "International Association of Poultry Pathologists."

Dr. Coles stated that he had lately visited the meeting of such a group in North America, and it had been of great interest and most instructive. Poultry pathology had expanded to such a degree that it was practically divorced from other veterinary practices.

The meeting agreed that such a Group be formed, and Council was requested to take the necessary action.

(h) (2) (ii) *Report of Sub-committee appointed to investigate a Draft of Directive Fees for Veterinarians.*

Dr. Doré the Convenor stated that the Committee had been appointed to consider whether such a draft was necessary, and, if so, to consider and discuss the draft drawn up by Council.

He then read the report of the Committee.

After discussion it was agreed that the report of this sub-committee and its recommendations should be circularised to members, together with the Schedule of fees drawn up by Council, for comment and consideration and discussion at the next General Meeting.

Proposed by Dr. Diesel. Seconded Dr. R. du Toit.

Dr. Doré requested that this scale of fees should not go outside the veterinary profession, nor be available, in any form, to the press.

(h) (2) (iii) *Insurance of Veterinarians.*

Dr. H. P. Steyn was asked to report to the meeting. He stated that the General Purposes Committee had gone into the scheme offered by the Professsional Provident Society of S.A., and recommended it to members. Unfortunately in the case of veterinarians the premium would be loaded.

(h) (2) (iv) Dr. Grosskopf lees toe 'n brief deur hom aan die Raad gerig in verband met die*Registrasie van Sulfonamiede en Antibiotika as Veegeneesmiddels en die Onreëlmatige Verkoop van Ongeregistreerde Veegeneesmiddels aan die Publiek.*

Die President was van opinie dat die saak aan die Farmaseutiese Raad moet verwys word, en hul sal spesifieke gevalle wil hê.

Die vergadering het besluit dat die saak aan die Raad moet oorgelaat word om te sien wat die Raad daaromtrent kan doen.

(h) (2) (v) *Internship of Veterinary Graduates.*

The Secretary read a letter from Dr. Loveday, in regard to internship for veterinary graduates, which had been sent to the Faculty of Veterinary Science for its comments. He summarised the contents of the letter received in reply, in which Faculty agreed that this was desirable, but difficult to enforce, as in this country there are no veterinary hospitals where graduates could complete an internship, and this would have to be done with private practitioners.

The meeting agreed that such internship should, if possible, be required.

(i) (1) *Resolutions.*

A resolution submitted by the Natal branch, proposed by Dr. J. L. Doré and seconded by Dr. J. D. Coles:

"That this meeting of the S.A. Veterinary Medical Association suggests to the Faculty of Veterinary Science that there should be a compulsory post graduate course of one year similar to the compulsory medical housemanship of medical graduates. This will enable veterinary graduates to increase their practical knowledge of those branches of our science with which their activities will be associated as Veterinarians.

That the sixth year should be a post graduate course.

The reasons for this proposal are:

(1) Owing to the modern high standard of work required from the profession, it is felt that graduates immediately after qualifying are not sufficiently equipped in practical experience in all branches of veterinary science to meet this standard.

The branches referred to are:

(a) State administration and research.
(b) Veterinary Public Health.
(c) Large and small animal practice.
(d) Nutrition and pharmaceutical manufacture.

(2) The medical graduate during his year of housemanship is able to gain a vast practical knowledge by his close associataion with specialists. It is felt that similar facilities should be compulsory for the veterinary graduate.

(3) The graduate who begins his veterinary activities without adequate practical tuition has no means of measuring his capabilities because he is frequently isolated and consequently unable to compare his work with that of his colleagues who have the necessary experience.

(4) This additional year will assist greatly in instilling a truer perspective of confidence in his execution of his professional duties.

It is suggested that the methods of administering this course may be as follows:

The graduate will commence his post graduate course immediately after qualifying.

The course will last for a period of twelve months.

That a nominal remuneration be paid to the graduate during this period by the employer.

It is suggested that the year be divided into four terms of three months each. The graduate may have the choice of remaining in any one branch for the whole year, or he may spend a term or more in any one of the other branches, provided that a full term is spent on one branch at a time and that he completes four terms.

It is suggested that the post graduate training be done at centres approved by the Faculty in consultation with the Director of Veterinary Science and the Secretary for Health.

In the case of small and large animal practice, until the Faculty is in a position to provide sufficient clinical material, it is suggested that veterinary practices approved by the Faculty be used for tuition."

It was agreed that this resolution be passed to Council for discussion and investigation and report back to the next Annual General Meeting.

(i) (2) Dr. B. Paine stated that the number of deaths from strychnine poisoning was perturbing and he proposed the following resolution:

"That this 51st Annual General Meeting of the S.A. Veterinary Medical Association requests Council to investigate ways and means of making strychnine less freely available to the general public, for instance by a legal requirement that permits for purchase can only be obtained from a magistrate." Seconded Dr. le Riche.

It was agreed to refer this to Council.

(g) *Adjournment.* The Chairman thanked the Director of Veterinary Services for making Faculty buildings available for the meeting; Dr. E. M. Robinson for drawing up the programme and the various ladies who had done the floral arrangements and assisted at the Congress, and all members of Council and others who had assisted and contributed to the success of this congress.

The meeting closed at 1.10 p.m.

President.
Hon. Secretary.

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