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FIELD OBSERVATIONS ON WESSELSBRON DISEASE

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On 30/4/1956 three Merino hamels were brought in by Mr. G. Gilfillan, Glen Heath farm situated in the Conway area of the Middelburg District. The postmortem revealed changes resembling those of Enzootic Icterus described in detail by Belschner (1951). There was intense generalised icterus, a yellow, swollen, friable liver with a distended dark gall bladder and a very dark duodenum. The caecum and spiral gut contained lumps of hard, dark coloured dung.

On 9/5/1956 the services of Mr. J. P. H. Acocks, Plant Ecologist of Grootfontein became available and three farms were visited in the Conway area, for the purpose of a botanical survey.

1. *Mr. S. Gadd, Springfield farm.*

(a) River Camp No. 1: 270 young ewes and hamels approximately 12 months old were moved during April 1956 from the mountains to a spared river camp. During the period from 1-10/4/56 they started dying and 13 were lost. The flock was moved back into the mountain camp without any further losses. The cause of death was not determined except that the yellow appearance of the skin and carcass had been noticed. This flock had been inoculated against Pulpy Kidney during December 1955.

(b) River Camp No. 2: 300 ewes mated during November. In December 1955 they were moved into a spared river camp during the last week in March and deaths occurred during 1-10/4/56. Twenty-seven died, all of which showed jaundice. On 15/4/56 they were shifted to a higher camp. Three died within a week and there were no further losses. The subsequent lambing was normal. This flock had been inoculated with Bluetongue Vaccine and Pulpy Kidney Vaccine at 10 day intervals during December 1955.

The farm has been in possession of the Gadd family for over 80 years and no cases of this nature had been observed before. Both river camps were carefully examined and a comprehensive botanical survey made. These river camps have the Klein Brak River running through them.

2. *Mr. G. Gilfillan, Glen Heath farm.*

(a) River Camp. This camp borders river camp No. 1 of Mr. Gadd. About 300 Merino sheep of all sexes but no pregnant ewes were moved on 13/4/56 from the mountains to the spared river camp. On 16/4/56 the first death was recorded and five days later another two. From then on 14 died before the sheep were moved, but another 19 died within 10 days after being moved to another camp.

Approximately 60 bastard sheep (called slaggoed) had occupied the river camp continuously during this period. No cases occurred in this flock and they were left in the camp.

(b) On 9/5/56 the river camp was thoroughly examined by Mr. Acocks and a detailed botanical survey was made. Nine jaundiced sheep were examined. They were dosed with 2 ounces of fish-oil (Vitavet), injected with ¼ c.c. Carbachol and put on green lucerne lands. Two died, one on 9/5/56 and another on 12/5/56. The other 7 recovered. Postmortem performed on 9/5/56 corresponded in all details with the findings of the 3 hamels postmortemed at the office on 30/4/56.

The farm has been in possession of the Gilfillan family for over 80 years and no such cases had ever been observed before.

3. *Mr. T. Southey, Strathfillan farm.*

This farm adjoins Glen Heath and also has the Klein Brak River running through it. The history here was of 425 mated ewes moved on 2/5/56 from the mountain camp to the house-camp No. 1 which lies on the Klein Brak river bank. Two died after an interval of 6-7 days. About 440 ewes and lambs were moved from House Camp No. 1 to Camp 2 on the river bank, where 4 lambs sickened after an interval of seven days.

On 9/5/56 a postmortem on one of the ewes revealed the golden liver, darkened duodenum and hard lumps of faeces in the caecum and colon. No generalised icterus was observed but the ewe was very heavy in lamb. The possibility of pregnancy toxaemia could not be excluded.

Two sick lambs approximately 8 months old were examined. They had high temperatures 105-106°F with drooping heads, nasal discharge, did not feed and were disinclined to move. They had not been immunised against Bluetongue and as this disease occurs every year all along the Brak Rivers during late summer it was regarded as a mild form of Bluetongue.

4. The frosts occurred within the next week and all sheep mortality in this area ceased shortly afterwards. During 14-20/5/56 the author became ill with influenza-like symptoms insufficiently severe to require medical attention. From 20-22/5/56 an ever increasing sense of fullness developed over the hepatic

area which reached a climax in violent emesis after breakfast on bacon and eggs on 23/5/56. On 23/5/56 the urine became very dark with heavy urate deposit and the conjunctival mucuos membrane faintly yellow.

Medical aid was sought and the condition diagnosed as infectious hepatitis and sick leave granted for the period 23/5/56-16/6/56. There can be little doubt that the infection was picked up during the postmortems performed on 9/5/56. These were conducted in the veld and in a stable where the absence of facilities made the ordinary precautions against infection impossible.

1957

During the evening of 26/2/57 a hamel was brought in by Mr. J. Smit, Uithou farm in the Rosmead area of the Middleburg District. It was prostrate and comatose, the visible mucous membranes a bright colour. By next day the animal had died and a cursory examination revealed a badly decomposed carcass with postmortem changes indistinguishable from those encountered during 1956. On 27/2/57 the farm was visited and two sick hamels examined. They had fever, nasal discharge, a black tarry faeces with yellow discolouration of all visible mucous membranes.

The history here too was of sheep being moved to the river camp, which incidentally lies on the Klein Brak River.

The sheep were moved from mountain veld to the homestead where they were being shorn. The disease differed here from the outbreak of the previous year in so far as there was a haemorrhagic gastro-enteritis with a black tarry diarrhoea. The suspicion of an exogenous toxic factor as an aetiological cause of what was thought to be enzootic icterus could no longer be excluded. This river camp had tulp and tribulus species in abundance and it was considered that a synergistic action of both plants plus photosensitisation might be responsible for the present disease complex.

On 5/3/56 Mr. W. J. Theron, Crowboroughvlei farm, Conway area, brought in two live ewes for postmortem. One of them had a high temperature but the autopsies revealed changes similar to those found before except that gastro-enteritis was absent.

On 6/3/57 three live yearling lambs were brought in from Mr. D. Collett's farm, Dunblane. This farm lies also on the Klein Brak River between Rosemead and Conway and adjoins that of Mr. Smit. These lambs had typical symptoms of Geeldikkop, showing swollen lips, face and ears with no jaundice. At the same time a dead, young stud ram was brought in showing a most peculiar postmortem picture of massive haemorrhage in the subcutis and subserous surfaces of all organs without any jaundice. The postmortem picture was typical of generalised

septicaemia but all smears were negative for bacteria. Subsequently Wesselsbron virus was isolated from cases on this farm.

On the same day (6/3/57) a report was received from Grootfontein College of Agriculture that 200 Australian ram progeny inoculated with Bluetongue vaccine some 18 days before had reacted severely on the 14-16th day after injection. They were examined and three were found to be in such a bad state that they were conveyed to a special paddock. Two were found to have blanched mucous membranes and a moderate pyrexia, but the third was in extremis with a temperature of 108.4°F and a golden yellow discolouration of all visible mucous membranes. This sheep died during transport and revealed a generalized icterus with disseminated haemorrhages.

As this flock had been inoculated with a vaccine containing live virus a short period before, the possibility had to be considered that this might have had something to do with the appearance of this condition either by mutation of the vaccine strain itself, or by a combination of various climatic and ecological factors leading to liver damage or even by the subinoculation of a specific virus hepatitis during the process of inoculation of sheep by means of the automatic inoculation syringes used. Such syringes are only disinfected before use and only one needle is used for the whole flock.

The Middelburg Agricultural Society was holding its annual show during the period 4-7/3/57 and it was possible to contact a considerable number of farmers during this period. It immediately became evident that the disease was widespread and that its epidemiology closely resembled that of Bluetongue so that investigations into the possibility of virus causation became imperative. Specimens were forwarded on 7/3/57 to the Onderstepoort Laboratories some 550 miles away, and on 26/3/57 telegraphic results were received stating that an exceptionally virulent strain of Wesselsbron virus had been isolated.

Alarmed by the information given them during the Agricultural Show period farmers made a more strenuous effort in collecting sick and dead sheep for diagnostic purposes. The result is that fairly accurate knowledge of the extent of the disease is available.

The actual mortality is estimated at not less than 1500 sheep lost during February-April 1957 on 26 farms running approximately 65,000 sheep which is only a 2.3 per cent death rate. This at first would appear insignificant but it must be remembered that these deaths occurred only in the river camps and the sheep were moved out of these camps immediately owners detected that sheep were dying there. The Middelburg District is mountainous country and the Klein and Large Brak Rivers cause a deep channel to run through this area. The climatic conditions during the autumn of 1957 were such that the veld was dry and the only available waters were found in dams and in the rivers and their

tributaries. The actual numbers of sheep moved into river camps was small and the mortality sometimes considerable if sheep were not moved immediately. On one farm in the Conway area where sheep could not be moved away, nearly 500 out of 2000 sheep died within the period specified or a mortality rate of nearly 25 per cent.

Well over two hundred postmortems were conducted and a considerable number of affected sheep examined clinically. It has become possible to recognise the disease as occuring in several distinctive forms and for convenience they will be dealt with as follows:

Peracute Form.

Here the animal is invariably found dead. If found alive it stands with drooping head and ears, there is a nasal discharge which is usually blood-stained, and a rapid pulse and breathing. The animal, as a rule, is very dull and listless, eventually lies down, become comatose and dies without a struggle within 12 hours after the onset of symptoms.

The mucous membranes of the mouth and eyes are as a rule very pale and bloodless. On skinning the carcass, large blotchy haemorrhages are found in the skin. Disseminated petechial haemorrhages are invariably present in the fascia of the subcutis. On opening the abdomen large haemorrhages are seen on the omentum. These are variable in size being from pinhead size to irregular extravasations up to four inches in diameter. Similar haemorrhages are found in the sub-serous surface of the jejunum, caecum and colon. Severe haemorrhages may be found in the lumen of the duodenum, or into the caecum and colon. The faeces in the latter cases are usually black in colour and tarry in consistency.

The abdomen as a rule contains a considerable amount of blood-stained liquid. The liver is swollen and yellowish in colour, although of remarkable firm consistency. The gallbladder as a rule is very dark, containing dark-green bile. The kidneys are swollen, darker than normal in colour and softer than usual.

The thoracic cavity usually contains considerable amounts of blood-stained liquid. The lungs may be normal, sometimes pale in colour. When they are congested, foam will be present in the bronchi. The heart show massive haemorrhages under the epi- and endo cardium of both auricles and ventricles. The blood stains poorly and has a light orange appearance. There is no icterus visible in the carcass.

From clinical observation one is inclined to consider the possibility of death as a result of a purpura-like condition leading to widespread haemorrhages all over the body. To what extent the liver injuries, seen histologically in some of these cases, contribute towards it cannot be stated at this stage as no haematological work has been performed.

Acute Form.

This form lasts from two to four days, invariably ending fatally. The clinical symptoms are those of severe depression, the animal being listless, disinclined to move about and standing with drooping head and ears. The temperature is from 102.5°F to 107°F, and there is rapid breathing and pulse. There is a slimy nasal discharge containing dark crusts, and which may even be blood-stained. The flanks are sunken in, the animal is disinclined to move about and feed, although it frequently will drink water. In most cases the visible mucous membranes are pale and bloodless. In some there may be a black tarry discharge from the anus.

Those showing nasal haemorrhages usually die within two days. The nasal haemorrhage is not dark red in colour, but has an orange coloured appearance resembling haemolysed blood.

The affected animal weakens rapidly, lies down, becomes comatose with slow breathing and almost imperceptible pulse and eventually dies without any signs of struggling.

The post mortem again reveals the widely disseminated haemorrhages of varying sizes in the subcutis and intermuscular fascia. Subserous haemorrhages are invariably present in the heart and may be present in the jejunum and colon. Small petechial haemorrhages will be found in the submucosa of the abomasum. The duodenum or colon may contain very dark, almost black, blood. It is unusual to find blood in both localities, usually it is in the one or in the other.

The liver is pathognomonic for this form of the disease. It is as a rule a golden yellow colour and of remarkably firm consistency. This is the first thing farmers have noticed, and all of them remark on the cooked (gaar) appearance of the liver. The gallbladder is distended, very dark in colour and containing dark green bile. The appearance of the golden liver and the large, almost black gallbladder is startling in contrast.

As a rule there is a blood-stained liquid in all the serous cavities. The lungs are invariably congested, oedematous and the bronchi full of foam. The connective tissues, fat, tendons and fascia may have a very faint yellow tinge, which is not apparent in the visible mucous membranes or skin. This form is encountered at any age from seven days old. Sex and condition appear to play no role.

Subacute Form.

The predominant symptom here is the jaundice. All visible mucous membranes are a yellow colour, which varies from a pale lemon to deep canary. The skin, particularly of the flanks and below the eyes, may become similarly affected. Dark red to purple rings may be present around the base of the horns in young rams, and around the coronets of the hooves. There may be slight swelling of the ears and mouth. Clinically the symptoms are

identical with those of the acute form, in fact the subacute form can be regarded merely an extension of the acute form, with icterus developing rapidly.

This form is not necessarily fatal, although the mortality rate is well over 75%. If left in the veld and exposed to the sun's rays, the sheep die as a rule within one or two days, but if kept under a roof some will recover. Affected animals usually seek shade and are invariably found in localities where it occurs. They also go down, become comatose and die without any signs of struggling.

The post mortem is dominated by the yellow staining of all the body tissues and this is particularly noticeable in the fat, tendons, skin and subcutis. Haemorrhages in the skin and subcutis are always present but may not be as considerable as in the previous forms of the disease. Similar haemorrhages are found in the heart and subserous surfaces of the bowels, omentum and mesentery. The blood is again orange in colour and appears haemolyzed and watery, staining very poorly.

The liver is again very typical, being golden yellow in colour, against which the greatly enlarged black coloured gall-bladder shows up prominently. The wall of the gallbladder may be thickened to 1 cm., and the content altered from a dark green fluid to a black porridge containing floccules. In a few cases the bile had set like a jelly and could be cut with a knife.

The liver as a rule is remarkably firm, and when cut with a knife shows sharp edges. In a few cases it had become swollen, in one case enormously so. In these cases the texture was very soft and friable, appeared granular and crumpled on pressure with the thumb and forefinger.

The abomasum may show submucosal haemorrhages and its contents may be dark from partially digested blood. The mucous membrane of the duodenum is usually very dark red in colour, the contents mixed with blood. The caecum and colon may contain pure blood, but usually they contain blackish, hard lumps of faeces of a tarry consistency.

A yellow tinged fluid is invariably present in the serous cavities of the abdomen, thorax and pericardium. The lungs may be congested and foam may be present in the bronchi.

Chronic Form.

This is merely the sub-acute form which lingers on with eventual recovery or death from secondary causes, usually cardiac collapse, the result of the pulmonary congestion.

The jaundice is well-marked, the animal is lethargic, but it begins to nibble at food and convalesces slowly.

Mild or Abortive Form.

In this form there is a temperature varying from 103°F to 107°F. The animal is listless, lags behind the flock, the head

and ears droop, the eyes are dull, and the flanks are sunken in. There is a desire to look for shade. Invariably there is a slimy nasal discharge, containing dark crusts and sometimes blood. There may be black, tarry faeces clinging to the anus. Such cases were seen in yearling lambs of both sexes, and in adult sheep. Usually the signs of illness remain for two to five days, followed by recovery. The virus was isolated from such cases.

General Remarks.

The carcases decompose with extreme rapidity even if left in a cool place. When a jaundiced carcass is skinned and left exposed, the yellow discolouration on the outside of the body slowly changes to a dirty yellow-brown colour.

Three cases of encephalitis were encountered in ewes. They were already prostrate, but attempted to rise when approached. This caused convulsive shaking of the head, rolling of the eyes, twitching of lips and ears, and spasmodic movements of the limbs. The condition resembled epilepsy except that the ewes appeared conscious and were lying in a normal position on the brisket with the head up when undisturbed.

All died within 12 hours from the acute form of the disease.

Transmission and Susceptibility.

The seasonal incidence and behaviour of the disease suggested a method of transmission analogous to that of Bluetongue and Horsesickness. It was decided to assume that transmission was by an arthropod vector and steps were immediately taken to attempt to reduce their numbers.

At the Grootfontein College of Agriculture all sheep were sprayed with an insecticidal solution. At first D.D.T. was used, but later a Klipfontein Organic Product, Dazzle, containing diazinone was substituted for it. A powerspray consisting of a petrol engine, mounted on a light-delivery lorry was loaned from the Locust Division for this purpose and 6,000 sheep were sprayed with ease once a week. Although the insecticides used were contact poisons there are indications that the spread of the disease was definitely curtailed by this method. All water troughs and reservoirs were cleaned out at regular intervals. Most of the Grootfontein veld is low-lying with large dams and contour walls and the mortality of 30 sheep out of 6,000 gives an indication of the possible control exercised by this method. This disease was not confined to any particular locality but occurred more or less in all camps and paddocks.

On 2/4/57 Dr. B. de Meillon and his assistant Mr. Prinsloo arrived at Grootfontein. Because of very heavy mortality on the farm Crowboroughvlei in the Conway area it was considered that this area would prove ideal for the purpose of investigating arthropod vector transmission. These preliminary investigations incriminate a special species of mosquito as the principal vector.

This species apparently does not breed in running water or permanent dams, but prefers the small pools left after recent rains and which normally dry away. Another peculiarity appears to be its feeding habits which are apparently confined to a short period of activity towards dusk when transmission of the disease is thought to take place. Weiss, Haig and Alexander (1956) mention a case in the human being where infection is surmised to have occurred by inhalation. Enquiries were made as to the disposal of infected carcasses on farms in this area. In many cases they were issued to the farm labourers (natives and coloureds) and complaints were received that some suffered from ill-defined signs of illness such as headaches and pains in the joints to actual cases of gastro-enteritis. To what extent inhalation and ingestion may contribute towards the spread of the disease in nature is still unknown.

Most of the serum samples taken from cattle and horses on the farm Crowboroughvlei during June 1957 proved positive to the serum neutralisation tests conducted at Onderstepoort. Two of the cattle had aborted during the active outbreak of the disease in sheep during the autumn of 1957. One horse gave a positive reaction to both Wesselsbron and Rift Valley Fever but the rest proved negative to the latter disease. The significance of these findings is not clear. Abortion of unknown origin, occurred regularly in a stud Guernsey herd on a farm situated on the Klein Brak River, but where no sheep were lost during 1957. Blood samples submitted to Onderstepoort revealed that the majority were positive for anti-bodies against Wesselsbron but all negative for antibodies against Rift Valley Fever. These findings regarded as an indication that the bovines were exposed to Wesselsbron infection at some undetermined time before, but whether any relationship exists between infection and abortion is still to be determined.

The same situation was found to exist in cattle of the Grootfontein College of Agriculture. There antibodies were found against Wesselsbron infection or against Wesselsbron and Rift Valley Fever. Prenatal mortality and abortions occur periodically in this herd where Trichomoniasis, Vibrio Foetus, Contagious Abortion, Epi-vaginitis, Contagious granular vaginitis have all been excluded as possible causes and bulls are subjected to periodic examination for fertility.

The sub-acute form of the disease was found very prevalent in rams, ewes in lamb, and ewes with lambs, but it is not considered that sex is the deciding factor. It is more likely that rams and lambing ewes are given the best camps or lands. These are always low-lying, and at this particular time of the year, i.e. late summer and early autumn, when the Karroo Midlands experiences its maximum rainfall, collect the water in pools, dams and contour walls. These water accumulations provide ideal breeding places for insect vectors. This class of sheep is consequently the group

most exposed to infection, but because they received better food their condition and resistance increased. The result is the sub-acute form of the disease with icterus as the dominant symptom. Abortions have occurred but not to any appreciable extent as many ewes die before and after lambing.

Epizootiology.

The disease spread against the flow of the rivers, upwards to a higher plateau and against prevailing winds. The rivers in the Middelburg District drain into Lake Arthur and Grass Ridge dams, which are responsible for the large irrigation settlements along the Fish River Valley. That area did not come under the present investigation and consequently it is not known if the disease has spread downwards. Infection of those irrigation settlements may result in enormous financial losses and may very well bankrupt many a small holder.

In the Middelburg area the disease remained confined to the course of the rivers and their tributaries. Enormous soil and veld conservation schemes have resulted in permanent water reservoirs and formed foci of permanent breeding places of arthropod vectors.

Should the arthropod vector be the sole means of the spread of the disease, then epizootic outbreaks become totally dependent upon the climatic factors which favour multiplication of the insect(s) responsible. Although the position appears alarming on first sight it must be remembered that rivers in the Karroo Areas are usually deeply furrowed into the ground and mosquitoes and gnats rarely venture far away from these damp localities, except to vleis with pools of water. Outbreaks of Bluetongue for instance are normally controlled by moving sheep from river and vlei camps into mountain veld without undertaking any preventive inoculation with vaccine. The danger lies in the possibility of a combination of climatic factors occurring which will allow vectors to breed in the veld and mountains when the disease is present, in this manner spreading the disease over vast areas. Such a combination of factors fortunately rarely occurs.

Spraying stock with insecticidal fluids and treatment of breeding places is a method which will require more consideration for the purpose of controlling or reducing insect vectors, such as mosquitoes, gnats, etc. I feel that preventive inoculation of stock is only a partial measure of virus control and must take this opportunity of stressing the importance of reducing or eliminating arthropod vectors, as a practical means of disease control in the same manner that consistent dipping of cattle reduces tick life and the spread of tick-borne diseases. If this aspect is ignored it will only be a matter of time before the next virus makes its epidemic appearance. It is realised that the African Continent has many of them and the mutability of viruses is such that new strains form readily.

Differential Diagnosis.

Wesselsbron virus was isolated by Onderstepoort workers from blood samples taken from dead and sick sheep collected on several farms during the 1957 outbreak. This virus is described by Weiss et al, 1956, and they state that the virus encountered in the Wesselsbron District of the Orange Free State is characterised by a febrile reaction in adult sheep accompanied by a low mortality rate. The virus is thought to invade the foetus causing a very high death rate (practically 100 per cent) amongst foetuses carried to full-term and new-born lambs.

This was not the experience of the disease in this area during the 1956/57 outbreaks. On the contrary sheep of all ages, sex, size and condition appeared equally susceptible and the mortality rate was very high. Furthermore there appears to be the additional factor of generalised icterus which has not been reported on before.

The resemblance of the clinical appearance and post mortem symptoms of some of these cases and the description as well as illustration of toxaemic jaundice as described by Belschner (1951) have been commented on before.

De Boom (1947) stressed the peculiar brownish discolouration encountered in the outbreak diagnosed as Enzootic Icterus at Witteklip, falling in the Middelburg area, during 1946/47 and states that none of the cases was bright yellow. De Kock (1928) describes the jaundice of cases of Enzootic Icterus as a deep bright canary yellow which gradually changed to a somewhat dirty brownish yellow as the post mortem was proceeded with or if it had been delayed for some time. This corresponds to the type of jaundice found in these cases.

The similarity existing in the appearance of some post mortems of both diseases led to copper analysis of livers of affected cases. Liver specimens collected from fifteen sheep that succumbed to the disease on various forms were submitted to the Onderstepoort laboratories. Thirteen proved to contain copper between normal limits, but two contained such large quantities of copper (920 and 1,500 P.M.) that a diagnosis of possible Enzootic Icterus was made on the chemical analysis alone (D.V.S.O.P.) minute 18/18/2 of 15/10/57. These findings are of considerable interest as it opens up a new field of investigation in copper metabolism in particular its accumulation in the liver. These aspects have been dealt with in the Final Report on Toxaemic Jaundice of Sheep (1956) and by Pearson (1956), and require no further elaboration here. It would appear however, as if the copper content of the livers of sheep cannot be used as a single means of diagnosing Enzootic Icterus in the Karroo Midlands.

Although no haematological work was conducted on sheep suffering from Wesselsbron virus disease and proof is consequently lacking it would appear clinically at least, as if here too there is a haemolytic crisis and a haematogenous jaundice.

SUMMARY

A virus disease is described as the cause of heavy mortality in sheep in the Middelburg District of the Karroo Midlands, during the autumn of 1956/57. Certain aspects of its spread, control and differential diagnosis are discussed.

REFERENCES

1. Allcroft, R. (1955) quoted Pearson (1956).
2. Anonymous (1956) — Toxaemic Jaundice of Sheep. Austr. Vet. Jl. Vol. 32, No. 9, pp. 229-236.
3. Belschner, H. G. (1951) — Sheep Management and Disease. Angus and Robertson, Sydney.
4. De Boom, H. P. A. (1947) — Ensootiese Ikterus Navorsing Verslag 18/67 van 8/4/47.
5. De Kock G. v. d. W. (1928) — A Study of the reticulo-endothelial system of the Sheep 13th and 14th Rept of the Dir. of Vet. Ed. and Res., pp. 647-724.
6. Pearson, J. K. L. (1956) — Copper Poisoning in Sheep Following the Feeding of a Copper-Supplemented Diet. Vet. Rec. Vol. 68, No. 44, pp. 766-768.
7. Weiss, K. E., Haig, D. A., and Alexander, R. A. (1956) — Wesselsbron virus. O.P. Jnl. Vet. Res., Vol. 27, No. 2, pp. 183-195.

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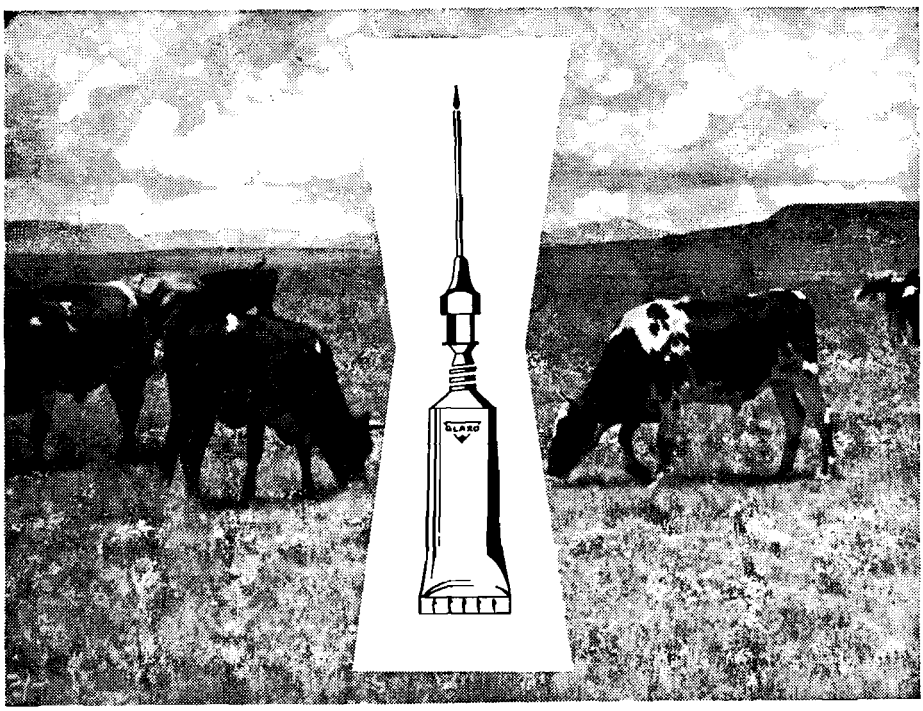

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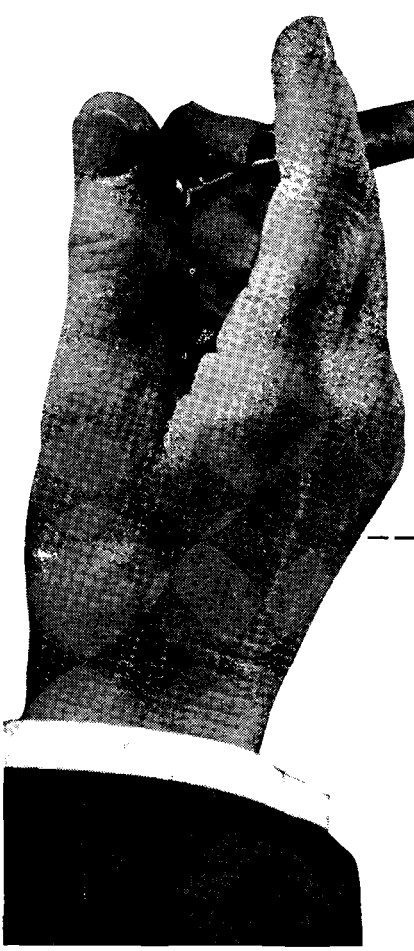

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VACCINATION AGAINST BRUCELLOSIS IN SHEEP AND GOATS

G. C. VAN DRIMMELEN

Onderstepoort

ABSTRACT: Brucella vaccines are discussed in relation to recent advances in the understanding of immunogenesis in brucellosis. Extension of tests on a South African vaccine strain for sheep is proposed.

Only in areas where the source of infection can be eliminated in the domestic animals is *Brucella* infection in man combated successfully. *Brucella abortus* infection in cattle can and has been eradicated entirely by the test and slaughter method using blood serum agglutination for diagnosis. With *Br. melitensis* in sheep and goats and with *Br. suis* in pigs this test is not sufficiently reliable and a herd slaughter plan is required. This frequently cannot be carried out.

Immunization against brucellosis affords an alternative method by markedly reducing the potential source of infection in the animal population. This is widely practised in cattle, which acquire satisfactory protection from inoculation with a live vaccine of low virulence usually prepared from the *Br. abortus* Strain 19 (Buck, 1930). The immunity produced is quantitative, not solid, but the incidence of active infection is negligible in a completely immunized cattle population. This is therefore an example of a zoonosis which can be combated by vaccination of animals.

The first attempts at immunizing small stock in North Africa with Strain 19 gave disappointing results. Recently Lisbonne, Roman and Renoux (1939), nevertheless, were able to show considerable protection in goats inoculated with live Strain 19 vaccine combined with killed virulent *Br. melitensis* organisms. This was followed up by Buddle (1956) who successfully immunized sheep against the *Brucella* like organism causing abortion in ewes and epididymitis in rams in New Zealand, by means of S. 19 with added killed *Br. ovis* antigen.

IMMUNIZATION OF HUMAN BEINGS

Man is susceptible to all species or types of *Brucella* organisms, but *Br. melitensis* and *Br. suis* produce a more destructive disease syndrome than *Br. abortus*. In many areas, especially around the Mediterranean sea, the test and slaughter policy for farm live

stock, which would eliminate human infection, is not generally practicable. In Russia it is reported that human brucellosis can be suppressed by immunizing human beings with a live vaccine prepared from a strain "BA" which was derived from strain 19. It appears from a very large programme of vaccination, that a significant reduction in the incidence of human *Br. melitensis* infection can be induced and that it is also effective against *Br. melitensis* in guinea-pigs and sheep.

Immunity in Brucellosis

The results of Elberg and his co-workers in California (Herzberg and Elberg, 1953; Herzberg, Elberg and Meyer, 1953; Herzberg and Elberg, 1955; Elberg, Henderson, Herzberg and Peacock, 1955; Elberg, Steiner and Doll, 1955) have recently added much to our understanding of the nature of immunity in brucellosis. Elberg and Faunce (1957) were able to induce resistance against 33 LD50 doses of virulent *Br. melitensis* in Angora goats by means of a non-dependent mutant from a streptomycin-dependent mutant strain of *Br. melitensis*.

Russian and Californian workers agree in the view that effective anti-brucellosis immunity depends on a long and intensive immunization process, such as can be achieved by an infection of low virulence. The vaccinal infection must be virulent enough to maintain a long non-sterile reactive phase, but, of course, considerably shorter than one induced by typical, fully virulent *Brucella* organisms. The variant of *Br. abortus* Strain 19 designated "BA" in Russia is specifically mentioned as an effective immunizing agent against *Br. melitensis* infection whilst its cultural characters are those of *Br. abortus*.

The Nature of Immunity

In the mice of Elberg, Steiner and Doll (1955) as well as in the guinea-pigs of Vershilova and Kokorin (1954) vaccination resulted in rapid, generalized infection and hyperplasia of all reticulo-endothelial elements in the body. A period of increased hyperplasia was followed by a gradual decrease with elimination of the infection and this by complete recovery without any histo-pathological changes.

Immune serum enhances the resistance of immune monocytic cells to degeneration caused by the phagocytized bacteria (Fong, Schneider and Elberg, 1956). If monocytes obtained from an immunized rabbit, are allowed to phagocytize virulent *Br. melitensis* and after washing off the extra-cellular bacteria in suspension, are bathed in non-immune normal serum they degenerate and the *Brucella* organisms multiply. The *Brucella* bacteria have then performed an invasive role successfully. In immune serum, immune and non-immune monocytes are protected from degeneration and immune monocytes are enabled to retard multiplication of the intracellular *Brucella* organisms. The *Brucella* bacteria have then not been able to complete the invasive role by destroying the host cells,

but the phagocytes have completed phagocytosis by destroying the bacteria. Thus it appears that, contrary to the classical view, the humoral antibody does play a role in *Brucella* immunity by (a) protecting the RE cells against destruction by invading (phagocytized) *Brucella* organisms; (b) maintaining the integrity of immune phagocytes while these actively retard the multiplication of invading (phagocytized) *Brucella* organisms in their cytoplasm.

Elberg and Meyer (1957) report that this humoral antibody need not be specified but that anti-*Salmonella* and anti-albumin sera have the same effect.

Brucella Types in South Africa

The distribution of *Brucella* types or species in South Africa is peculiar in that the more populated areas generally suffer wide spread *Br. abortus* infection especially in cattle; but no *Br. melitensis* or *Br. suis.*

Br. melitensis has been isolated from small stock and human cases in thinly populated western areas (also in some individual cases in cities and sea ports in the east). Indirect microscopical or serological evidence of *Brucella* infection has, however, sometimes been demonstrated by the author in specimens from sheep and pigs at Estcourt, Kroonstad, Thaba'Nchu, Zastron and Aliwal North.

Vaccination of Small Stock in S.A.

As *Br. abortus* strains have also been obtained from sheep in some of the melitensis-infected areas a programme of vaccination with Strain 19 as used for cattle has been instituted on an experimental basis in some large flocks of sheep. In these areas universal vaccination of calves is actively encouraged as much as possible.

The results of vaccinating small stock have apparently justified continuation of the practice but no reliable results are available. The effect of the general anti-brucellosis vaccination campaign in cattle may have influenced the results. Reports from the western areas of this country indicate that abortion and infertility in small stock is reduced by vaccination with Strain 19. The application of Strain 19 in sheep is safe and should be advocated at present.

A variant of experimental findings *Br. melitensis* designated *Br. melitensis var. karakul* was isolated from karakul sheep and passaged in guinea pigs. A homogeneous sub-strain of this has been found to be of low persistance in guinea pigs and rabbits. Spleen cultures are positive at 11 and 25 days after inoculation but negative after 46 days. Tumor splenis is not produced. Only low titres have been produced in 10 merino ewes inoculated with about 60 x 10^9 living organisms, washed from 48 hour potato agar culture. The titres have dropped consistently during 6 months observation and susceptible rams exposed to the ewes have not shown signs of infection. Spleen and mammary lymph gland cultures made at slaughter have been completely negative. (Table 1).

TABLE I.

SHEEP VACCINATED WITH STRAIN 5711. (A derivative of Br. melitensis var. karakul.)

Sheep Identity Number	Sex	Dates, Treatment, and Titres.												
		5/11/53	22/11/53	1/12/53	5/12/53	10/12/53	22/12/53	15/7/54	5/8/54	10/9/54	25/9/54	27/10/54	16/11/54	6/12/54	19/6/57
83982	F	Vaccinated	2560	2560	2560	1280	320	80	80	80		80	40	Slg. PM Neg.	
84020	F	,,	1280	1280	1280	640	160	5	25	5		5	5	,, ,, ,,	
84287	F	—	—	—	—			2.5	2.5	N	Dis-charged.	N	—		
85126	F	Vaccinated	2560	1280	640	640	40	80	40	N		20	10	,, ,, ,,	
85141	F	,,	N	N	N	2.5	N	5	5	5		2.5	2.5	,, ,, ,,	
85198	F	,,	1280	1280	640	1280	320	20	N	N		10	10	,, ,, ,,	
85258	F	,,	1280	640	320	160	80	2.5	20	10		2.5	2.5	,, ,, ,,	
85266	F	,,	2560	1280	640	640	160	20	20	N		10	10	,, ,, ,,	
88318	F	—	10	10	10	10	10	10	10	N		5	10	,, ,, ,,	
82446	M	—	—	—	—	—	—	2.5	N	N	Dis-charged.	2.5	—		
86257	M	—	—	—	—	—	—	N	N	N		N	N	N	Slg. PM Neg.

Conclusion

The recent reports from California, Russia and Israel supply sufficient collateral evidence to suggest that this variant of a South African field strain as well as Strain 19, may be suitable to be tested as vaccine organisms in small stock on a fairly large scale.

At this stage importation of a new vaccine strain is not indicated. *Br. melitensis* is notorious for its ability to revert to virulence on culture. It would therefore require considerable time and expense before the essential extensive tests with imported mutants of *Br. melitensis* could be launched in South Africa.

ACKNOWLEDGEMENTS

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REFERENCES

Buck, J. M. (1930) — Studies on vaccination during calfhood. *Jnl. Agric. Res.* 41: 557-689.

Buddle, M. B. (1956) — Ovine Brucellosis in New Zealand. *Proc. III Int. Congr. on An. Reprod.* Cambridge. Publication 217.

Elberg, S. S. and Faunce, K. Jn. (1957) — Immunization against *Brucella* infection. VI. Immunity conferred on goats by a non-dependent mutant from a streptomycin-dependent mutant strain of *Br. melitensis*. *Am. J. Path.* 31:1065-1075.

Elberg, S. S., Henderson, D. W., Herzberg, M. and Peacock, S. (1955) — Immunization against *Brucella* infection IV. Response of monkeys to infection of a streptomycin-dependent strain of *B. melitensis*. *J. Bact.* 69. 643-648.

Elberg, S. S. and Meyer, K. F. (1957) — Caprine immunization against brucellosis. A summary of experiments concerned with isolation, properties and behaviour of a vaccine strain. *Fourth Inter-American Congress on Brucellosis.* 9-14 *October*, 1957.

Elberg, S. S., Steiner, P. A. and Doll, J. P. (1955) — Immunization against *Brucella* infection V. Histopathologic appraisal of immunity induced in mice by a streptomycin-dependent mutant of *B. melitensis*. *Am. J. Pathol.* 31:1065-1075.

Herzberg, M. and Elberg, S. S. (1953) — Immunization against *Brucella* infection. I. Isolation and characterization of a streptomycin-dependent mutant. *J. Bact.* 66: 585-599.

Herzberg, M., Elberg, S. S. and Meyer, K. F. (1953) — Immunization against *Brucella* infection II. Effectiveness of a streptomycin-dependent Strain of *Brucella melitensis*. *J. Bact.* 66:600-605.

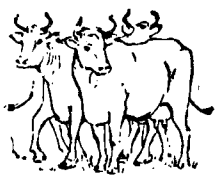
Herzberg, M. and Elberg, S. S. (1955) — Immunization against *Brucella* infection III. Response of mice and guinea-pigs to injection of viable and non-viable suspensions of a Streptomycin-dependent mutant of *Br. melitensis*. *J. Bact.* 73:211-217.

Lisbonne, M., Roman, G. and Renoux, G. (1939) — Vaccination de la Brebis contre l'infection brucellique. *Bull. Acad. Vet. Fr.* 12:1-4.

Van Drimmelen, G. C. (1953) — *Br. melitensis* isolated from the karakul sheep of S.W. Africa. *S.A. Jnl. Sci.* 49:299-302.

Vershilova, P. A. (1954) — The characteristics of immunogenesis following vaccination with live brucellosis vaccine. *Zhurn. Mikrobiol., Epidemiol & Immunobiol.* 10:38-44. (Cited by Elberg et al. 1957).

Vershilova, P. A. and Kokorin, I. N. (1954) — The morphological and bacteriological characteristics of the vaccine process in brucellosis. *Zhurn. Mikrobiol. & Immunobiol.* 1:7-13.



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THE HEALTH OF THE BABY PIG

M. W. HENNING

Agricultural Research Institute, University of Pretoria

Like poultry farming pig breeding is becoming a highly specialised undertaking requiring increased efficiency in the methods of farming practised, particularly in matters of housing, feeding, husbandry and in the general health of the pig. If the animal is properly cared for, particularly during its extreme youth, losses can be considerably reduced with excellent dividends to the breeder.

Commencing with the sow it must be stressed that no female should be accepted for breeding purposes unless she conforms to certain accepted lines of breeding, and unless she is of proven fertility and equipped with twelve sound well-formed teats. Allowing for a wastage of 20 to 25 per cent from birth to weaning every breeding sow would be able to raise not less than three litters of nine healthy pigs each, every two years, and she should produce enough milk to enable each pig to attain a weight of at least 30 pounds at 8 weeks of age.

It should, however, be pointed out that small litters may also be due to faulty mating, e.g. to too early or too late mating during the heat period, overwork of the boar, especially of a young one, or to the use of a partially infertile boar.

Provided the mating is in order and the sow does not comply with the requirements mentioned, she should be treated as unsuitable for breeding purposes and sold to the butcher.

Whenever possible the pregnant sow should be allowed to run on free range so that she can get sufficient exercise and have access to certain food factors that are not always readily available under stabled conditions. In addition the feed should be supplemented with sufficient animal protein, particularly during the last three or four weeks of the gestation period in order to stimulate the development of the mammary tissue and thereby the production of milk. The usual precautions against ascaris infection should of course be taken.

A few days before the time of parturition the sow should be placed in a special farrowing pen so that she can get accustomed to her surroundings before the pigs arrive. The pen should be constructed in such a way that the baby pig can be protected from overlaying, injury and exposure. After birth the baby pigs should be allowed to remain with their dam in the farrowing pen for one to three weeks or more depending on the type of management practised.

Allowing for a gestation period of 112 days, a suckling period of 56 days and a rest of about 14 days after weaning before service the sow should be able to produce and raise a second litter before the end of 365 days. This is seldom practicable under ordinary farming conditions but can be more effectively carried out when early weaning is practised.

Under natural conditions the wild pig selects a well-protected secluded spot provided with a warm bed of dry leaves or grass for delivering her young. In this bed the baby pigs are protected against exposure to inclement weather during the most critical first few weeks of their lives. Under conditions of domestication, therefore, provision should be made to furnish an environment that complies at least with the conditions obtaining in nature.

Although older pigs may be able, within certain limits, to adapt themselves to a fairly wide range of environmental conditions, the baby pig is much more exacting in its requirements. For example, housing conditions that are regarded as reasonably satisfactory for older pigs may prove to be detrimental to the health of the new-born. In planning a pighouse, therefore, certain principles must be observed in order to ensure that the health of the pig is maintained properly during all the stages of its growth.

One of the biggest hazards to pig farming is the susceptibility of the pig to sudden changes in the environmental temperature. As the skin temperatures of the pig is relatively high, about 80 to 85°F. and its hairy coat not very effective, a sudden drop in the temperature of its surroundings may lead to excessive dissipation of the body heat, which in turn predisposes the pig to diseases of the respiratory and digestive organs. In South Africa where a drop in temperature of as much as 40°F. may occur during a period of 24 hours the pig may not always succeed in adjusting its body temperature soon enough to prevent an undue loss of heat. The exposure which inevitably results may then lead to a decreased resistance and the development of respiratory disorders. This is particulary the case with pigs transported by rail or road during the night. On the other hand, the pig is also highly sensitive to the effects of too much heat in summer, and often suffers from heat apoplexy when not provided with enough shade and wallows.

The skin of the baby pig in particular, provides very little protection and its heat regulating mechanism is not well developed so that the piglet is extremely susceptible to the effects of a too low temperature. Unless a constant environmental temperature of about 75°F. is provided the baby pig will suffer. This no doubt accounts for the reason why piglets during cold weather always crawl so close up to the sow that they are often lain upon.

During winter the piggery can be heated either by conserving the heat evolved by the pig's body or by artificial means. For the conservation of the natural heat during cold weather it may be advisable to concentrate the available warmth in a small well-

insulated compartment, situated in the pig house, rather than to attempt to maintain an overall house temperature at the expense of reduced ventilation. This compartment is known as a "sleeper" and its entrance is protected against air currents by a swing door or by means of thick sacking loosely suspended from the top of the opening. During cold weather the pigs crowd together in the sleeper and the restricted air space helps to maintain a satisfactory temperature and relative humidity even under very adverse climatic conditions. The relative humidity of the piggery should not exceed 60 per cent.

It is well-known that damp floors, which conduct away a great deal of the heat available in the house, may cause excessive chilling of the pigs during cold weather and therefore predispose them to respiratory and digestive diseases. The house should, therefore, be provided with a feeding area and an outside run or dung passage, which would encourage the pigs to keep the sleeper area clean and free from excreta.

For reasons of efficiency, health, economy and increased production it may be advisable to separate the baby pig from its dam a few days after birth and raise it on an artificial diet. *Actually early weaning properly carried out may have many advantages over suckling up to 8 weeks of age.* It will eliminate many of the troubles and draw-backs associated with the rearing of pigs on sows, e.g. those due to overlaying and injury, piglet anaemia, diseases transmitted from sow to pig, insufficient milk yield, agalactia and stunted growth. In addition it will be possible to feed and rear all or nearly all the pigs in abnormally large litters; there will be a saving in the feed bill, a saving in the weight normally lost by the sow during lactation and it will be possible to breed the sow much sooner and thus produce more litters.

1. *Diseases.*

Some diseases are transmitted from the sow to the suckling pig during the nursing period. Although the sow may have been a carrier of the infection for some time she does not transfer a colostral immunity to her offspring, and the baby-pig remains fully susceptible. Diseases like virus pneumonia of pigs, infectious atrophic rhinitis, parasitic diseases and possibly other ones may fall under this category. The incidence of these diseases can be considerably reduced and even eliminated by means of early weaning judiciously carried out. In due course it may be possible to breed strains or races of pigs that are entirely free from these diseases, and if the pigs are kept from contact with infected ones they will remain disease-free indefinitely. The drawbacks associated with the rearing of pigs on a colostrum-free diet can thus be overcome.

A disease like virus pneumonia of pigs (V.P.P.) has become so widespread that breeders may be forced to introduce early weaning in order to clean their herds and prevent direct or

indirect losses. Although delivery by Caesarean section has been advised by some workers, weaning at 5 days of age when judiciously carried out in conjunction with strict isolation may suffice to build up a disease-free herd in due course, moreover delivery by Caesarean Section is not practical.

Another disease, piglet anaemia, can also be prevented by the addition of a suitable mineral salt mixture to the ration given to the pigs weaned early.

2. *Runts.*

The feeding of large litters of baby pigs through the sow is not a very efficient or dependable method. Small and weak pigs do not get a fair share of the available milk supply. No wonder that such a large percentage of pigs have to be sacrificed during the critical age up to weaning. It is understandable therefore that weak and backward pigs will have a far better chance of surviving and of growing into normal healthy pigs if weaned early and reared on a suitable prestarter. The problem of being robbed of their food supply by stronger pigs will be eliminated. A normal sow cannot rear more than ten or at most twelve pigs at a time. If more than this number are born the rest are doomed to perish from starvation. By means of early weaning therefore, many pigs that would otherwise die from undernourishment would be provided with an opportunity of growing into healthy, fully-grown, normal animals.

3. It a suitable ration or prestarter containing all the essential constituents for purposes of growth can be fed, pigs will not be dependent on the sow's uncertain milk supply.

Baby pigs are highly efficient converters of food, their conversion rate being approximately 1.8 lbs. of the ration per pound gain in body weight, whereas older pigs require from 3.5 to 4.5 pounds of food per pound gain. It may, therefore, actually be cheaper to feed a small amount of relatively expensive prestarter or starter to baby pigs then a considerably larger quantity of a cheaper growing ration to older pigs later on.

4. When a litter is weaned at the age of five or six days the sow can be dried off at once without any trouble, and can be rebred or slaughtered soon afterwards. As a rule, however, it may not be advisable to breed the sow in less than two or three weeks after weaning. This will nevertheless allow the sow to produce the next litter about 50 to 55 days sooner. A considerable saving in the breeding time of the sow can thus be obtained and it may be possible to produce an extra litter at least every two years. Moreover, a considerable saving in the feed bill of the sow can be affected.

During the nursing period the sow requires an extra seven or eight pounds of feed hay a day for the production of milk,

and she loses from 60 to 70 pounds of body weight. At a conversion rate of 3.5 to 4.5 pounds of feed per pound body gain it would require from 200 to 337 pounds of feed to restore her previous weight. If the sow consumes seven pounds of extra feed a day during 50 days of the suckling period, provision will have to be made for 350 pounds additional meal. In other words the sow will require from 550 to 650 pounds of extra feed in order to provide milk for the suckling pigs, the normal maintenance ration not being included.

In a preliminary experiment carried out by the author the value of early weaning and of raising baby pigs on prestarters, starters and growing meal was demonstrated under South African conditions. As it was not possible for him to continue with this study he thought that the preliminary results were sufficiently encouraging to warrant their publication.

About one half of the baby pigs (Groups I, II and III) from three litters were separated at random from their dams at five to seven days after birth, and raised artificially, the other half being left as controls with the sows. Some of the pigs of a fourth litter were weaned at 36 hours old. (Group IV).

The pigs were housed in pairs in small pens, three by five feet in size, previously used as dog kennels. Each pen was provided with a sleeping platform made of wood. The room in which the pens were situated was centrally heated and the temperature was maintained at approximately 75°F. After two weeks the temperature was allowed to drop gradually to 55°F. At the age of five weeks the pigs were transferred to pens provided with an outside run, the doors of the pen being protected by sacking suspended from the top. The pens were warm enough and central heating was not required.

Soon after the pigs of Group IV were introduced the heating system failed, and the pigs were badly exposed to cold. Two of them perished before an infra-red lamp could be introduced. The lamp was suspended from the roof and reached to about 15 inches from the sleeping platform, to provide a temperature of approximately 75°F. for a few inches above the floor. Sufficient heat was generated and no cross-draughts were allowed. The two remaining pigs were free to move in and out of the heated areas, and appeared quite warm and happy, and did not show evidence of cold or discomfort. After two weeks the lamp was periodically raised and the temperature gradually dropped to 50°F.

Self-breeders were not available and the pigs were fed out of improvised feeding troughs. This inevitably led to a great deal of wastage and unreliable records of the amounts of feed actually consumed as well as unreliable conversion rates. Nevertheless, it appeared that the baby pigs gained one pound body weight for approximately every two pounds of prestarter or starter consumed.

The pre-starter was first given in the form of a paste of the consistency of pea-soup. The amount of water added was gradually decreased until ultimately it was fed dry. But dry feeding can be introduced from the start. An ample supply of fresh water was placed within easy reach of the pigs. Pigs that have not continuous access to water will suffer.

Before the pre-starter was given the pigs were starved for a while. A little of the mixture was then placed in the mouth of a pig and it was shown where the feed was located. If an older pig that is accustomed to the method of feeding is placed with them they are soon taught how to feed. As soon as one pig commences to eat the others readily follow.

For about two weeks the pigs were fed on prestarter and were then gradually changed over to a starter composed of a routine growing mixture (IV) fortified with brown sugar and fish meal. The protein content of the starter was adjusted at a level of approximately 20 per cent. After 8 weeks the pigs were fed exclusively on growing meal containing about 18 per cent protein. All the pigs received a small supply of green lucerne every day. The minimum amount of prestarter that should be fed has not yet been determined, and is probably much less than the amount fed in the experiment.

The most essential ingredients of the prestarter were dried milk products viz. skim milk powder, whey powder, lactose and casein (mixtures I, II and III). According to Prof. Damon V. Catron and co-workers (1953), of the Iowa State College a decrease in feed efficiency and a retardation of growth invariably results if milk products in the ration of baby pigs are replaced exclusively by other foodstuffs e.g. soya beans, maize meal and distillers dried solubles. This inefficiency is ascribed to the inability of the enzyme system of the baby pig to digest rations devoid of or low in milk products. As the pigs, however, grow older their enzyme systems rapidly improve and after about five weeks of age the baby pig no longer suffers from an insufficiency of digestive enzymes. A significant proportion of milk products was therefore incorporated in the three prestarters employed in this study.

But for the difference in mineral salts ration I was the same as ration II, the protein content being approximately 31 per cent in both. Although the protein of prestarter III amounted to barely 21 per cent the pigs in Group III fed on it showed nearly the same growth rate as those (Group II) fed on ration II.

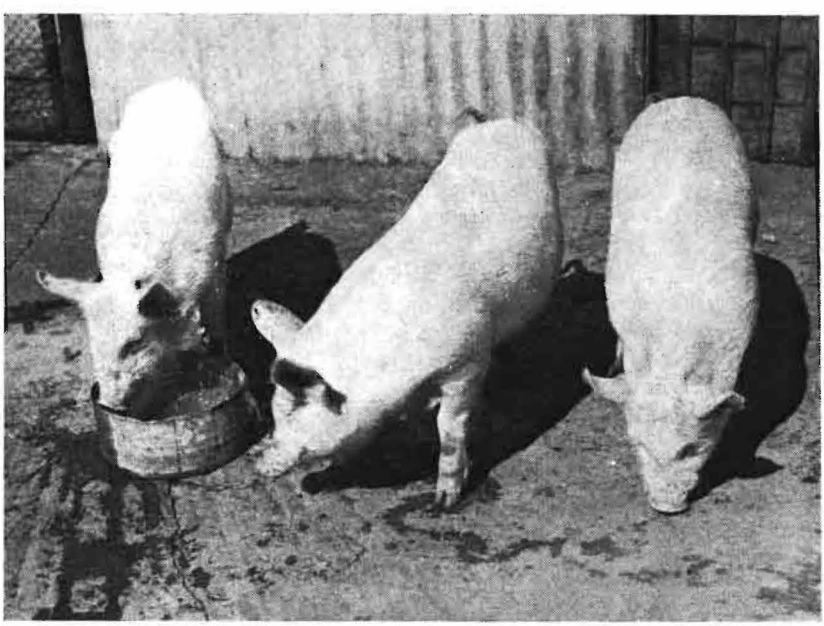
Apart from the small amount of residual fat contained in the milk products used, no fat was included in any of the rations fed. The apparent deficiency in fat, however, did not seem to have an adverse effect on the growth rate of any of the pigs in the experiment, and all the pigs grew better than their litter mates that were left with the sow, thus receiving much more than their normal rations of sow's milk. Fortification of the prestarters and

starters with sucrose considerably improved their palatability and encouraged the pigs to take the rations more readily.

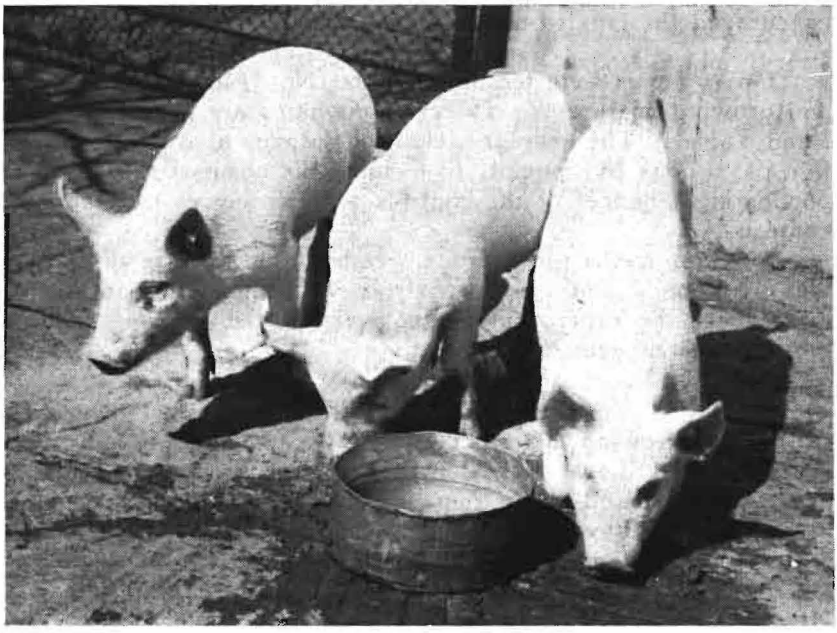
Group I pigs were fed on prestarter No. I, followed by starter and growing mixture No. IV. Weight gains are given in Graph I and Table I. The average weight of the pigs at weaning (i.e. at five days) was five pounds five ounces as compared with seven pounds eight ounces of the controls (i.e. 35 ounces less than the controls).

At eight weeks the average weight of the pigs in this group was 41 pounds and of the controls 41 pounds 15 ounces. At nine weeks the experimental pigs overtook the controls and exhibited greater gains subsequently.

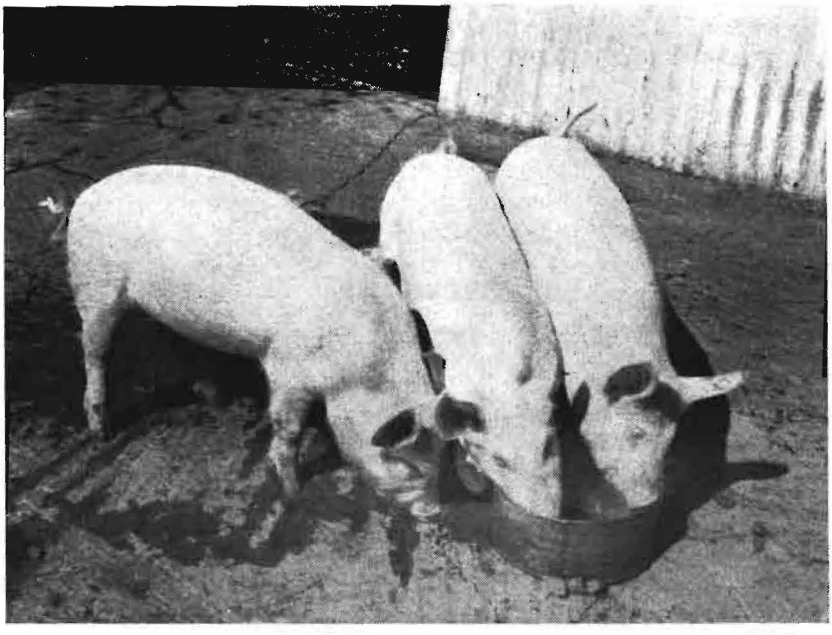
Group II pigs were fed on prestarter No. II followed by starter and growing mixture No. IV. Weight gains are given in Graph II and Table II. At weaning the pigs weighed on an average five pounds eight ounces, and the controls five pounds eight ounces. At eight weeks the average weight of the group was 47 pounds 4 ounces which was 14 pounds 4 ounces more than the average of the controls. One of the pigs of this group, viz. No. 1493, weighed as much as 54 pounds 4 ounces at eight weeks, but as it developed a prolapsus ani it was slaughtered. The heaviest pig in the control group, viz. No. 1491, weighed 40 pounds at eight weeks.



Pigs at 9 weeks of age.
Group I



Pigs at 9 weeks of age.
Group II



Pigs at 9 weeks of age.
Group III

Group III pigs were fed on prestarter No. III, followed by starter and growing meal No. IV. Weight gains are given on Graph III and Table III. At the beginning of the experiment their average weight was five pounds five ounces and that of the controls six pounds, which was 11 ounces in favour of the controls. At four weeks they overtook the control pigs. At eight weeks they weighed 41 pounds 12 ounces and the controls 36 pounds 5 ounces, a difference of five pounds seven ounces in favour of the experimental pigs.

Group IV pigs were fed on prestarter No. II followed by starter and growing meal. Weight gains are given in Graph IV and Table IV. They were separated from their dams at 36 hours when their average weight was three pounds six ounces compared with three pounds four ounces of the controls. Two of the pigs, Nos. 1537 and 1540, however, perished as a result of exposure, and three of the controls, Nos. 1542, 1544 and 1545 developed into runts.

After the initial set-back during the failing of the heating system the weight gain of the two pigs that survived (Pigs 1538 and 1539) was fairly satisfactory and averaged 33 pounds 6 ounces at eight weeks, No. 1538 weighing 29 pounds 8 ounces and No. 1539 37 pounds 4 ounces. The average weight of the controls, viz. 22 pounds 11 ounces, however, does not reflect the true state of affairs, as the three of them which develop into runts failed to show a reasonable weight gain. The other two, Nos. 1541 and 1543, weighed 37 and 31 pounds respectively at eight weeks averaging twelve ounces more than pigs 1538 and 1540 in the experiment. But they started with an average weight of four ounces more.

Discussion.

The baby pigs in Groups II and III were weaned successfully at five, and those in Group I at seven days old. All showed a much more marked gain in weight than their litter mates left with the dams and thus allowed much more than their normal ration of sow's milk. Although the average weight of pigs in Group I was only 41 pounds or 15 ounces less than the controls, at eight weeks, it should be pointed out that they started with 35 ounces less than their litter mates. It is possible that the small amount of mineral salt (0.5 per cent) in ration I was not sufficient to cause the same rate of growth as in Groups II and III. Nevertheless, their increase in weight can be regarded as satisfactory. The average weight of the pigs in Group II at eight weeks was 47 pounds 4 ounces, or 14 pounds 4 ounces more than the average of the controls. The small advantage of four ounces per pig which this group had over their litter mates at weaning cannot account for the great difference at eight weeks.

GROUP I.

Age: 7 days when weaned.
Born 2.5.56.
Sow No. 1293.

No. of Pig.	WEIGHTS IN WEEKS.															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.
1482	5 2	8 4	13 2	17 8	22 4	26 0	30 8	36 0	40 8	50 0	54 12	63 4	71 4	86 0	95 8	
1484	5 13	9 6	15 10	20 10	27 0	33 8	42 0	50 0	60 0	71 0	79 0	87 0	95 8	111 0	122 8	
1486	4 11	7 9	13 2	16 4	20 0	24 0	28 8	32 0	38 0	45 8	50 12	57 8	62 0	71 0	73 8	
1489	4 5	6 15	11 14	13 2	16 0	23 8	29 8	35 8	43 8	52 4	59 8	67 0	73 4	89 0	100 0	
1490	6 11	10 10	16 14	22 8	30 0	35 0	45 8	51 8	60 0	70 4	77 12	85 0	94 8	111 0	120 0	
Average	5 5	8 9	13 14	18 0	23 1	28 6	35 5	41 0	48 4	57 13	64 5	71 6	79 4	93 9	102 5	
CONTROLS.																
1481	7 3	10 10	16 3	21 0	26 0	35 8	42 0	49 0	56 8	66 4	71 8	77 8	81 0	102 0	106 0	
1483	8 0	11 14	16 9	21 8	25 8	34 8	41 0	45 12	52 0	62 0	68 8	73 12	76 0	86 0	98 8	
1485	6 5	9 6	13 0	16 8	19 8	26 8	30 8	35 8	40 0	46 0	52 0	56 0	57 0	76 0	86 0	
1487	8 7	12 8	18 8	28 8	26 0	36 12	41 8	46 0	52 8	59 4	67 0	70 8	75 0	97 8	103 0	
1488	7 9	11 4	14 1	16 8	17 8	25 8	31 0	33 8	40 8	47 12	53 8	56 8	62 0	78 8	84 8	
Average	7 8	11 2	15 10	20 0	22 14	31 12	37 5	41 15	48 4	56 4	62 8	66 10	70 3	88 0	95 0	

GROUP II.

Age: 5 days when weaned.
Born 4.5.56.
Sow. No. 1225.

No. of Pig.	WEIGHTS IN WEEKS.														
	1	2	3	4	5	6	7	8	9	10	11	12	13	15	16
	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.
1493	5 15	8 4	14 6	20 10	28 8	37 0	47 8	54 4	Slaughtered 29.6.56						
1496	6 6	8 14	14 6	18 2	25 8	33 4	42 0	50 0	58 8	70 4	78 8	87 0	92 0	100 0	100 0
1497	5 15	8 4	13 2	19 6	24 8	32 4	38 8	46 8	52 8	59 12	67 0	75 8	85 8	100 0	110 8
1498	5 7	7 9	11 4	15 0	21 0	27 0	33 12	38 4	46 0	54 8	63 4	70 8	78 0	88 0	93 0
Average	5 12	8 0	13 4	18 8	24 14	32 6	40 7	47 4	52 5	61 8	69 9	77 5	85 10	96 0	101 2
CONTROLS.															
1491	7 4	10 0	14 1	18 0	22 0	28 12	34 12	40 0	47 0	56 4	59 8	65 0	67 0	88 0	97 0
1492	6 13	9 6	13 2	16 8	20 0	26 8	28 8	32 8	37 8	43 8	47 8	48 8	47 0	59 8	64 0
1495	5 0	6 15	10 2	13 12	15 8	21 4	24 8	26 8	33 0	41 0	45 0	46 0	49 0	67 8	76 0
Average	5 8	7 10	12 7	16 1	19 3	25 8	29 4	33 0	39 2	46 9	50 11	53 3	54 5	71 10	79 0

GROUP III.

Age: 5 days when weaned.
Born 4.5.56.
Sow. No. 1206.

No. of Pig.	WEIGHTS IN WEEKS.														
	1 lb. oz.	2 lb. oz.	3 lb. oz.	4 lb. oz.	5 lb. oz.	6 lb. oz.	7 lb. oz.	8 lb. oz.	9 lb. oz.	10 lb. oz.	11 lb. oz.	12 lb. oz.	13 lb. oz.	15 lb. oz.	16 lb. oz.
1500	4 8	5 10	10 0	13 12	20 0	25 0	31 12	37 0	45 8	52 8	61 0	68 0	75 0	84 0	87 0
1502	5 0	6 4	11 4	15 10	20 4	28 8	37 0	43 8	53 0	63 0	73 8	79 8	88 8	100 8	108 0
1504	3 8	4 6	8 2	11 14	17 0	22 8	26 8	34 8	43 8	50 0	58 0	63 0	68 8	79 0	81 0
1506	6 1	7 9	11 14	16 14	22 8	29 8	37 0	43 8	52 0	59 0	68 8	77 0	87 0	104 8	112 0
1509	7 8	9 6	15 10	21 4	29 0	36 12	44 0	53 0	61 8	70 8	77 0	87 0	96 0	115 4	123 0
1511	6 1	7 9	10 10	13 12	18 12	25 8	33 8	38 8	47 0	52 12	61 0	67 0	80 0	90 0	99 0
Average	5 5	6 12	11 5	15 6	21 4	27 15	34 14	41 12	50 0	57 14	66 8	73 9	82 8	95 10	102 3
CONTROLS.															
1499	5 6	8 4	13 3	18 0	20 0	26 8	31 4	34 8	40 8	49 0	55 0	61 0	66 0	85 0	97 0
1501	7 6	10 10	15 3	20 0	20 8	22 8	29 8	35 0	41 0	48 0	53 0	59 12	63 0	83 0	95 4
1503	4 13	6 15	11 2	14 0	15 8	20 4	24 0	27 8	34 0	39 4	44 0	50 0	52 0	72 8	78 0
1507	5 12	8 4	8 2	8 0	6 12										
1508	6 3	8 14	18 2	21 0	24 8	34 0	41 6	46 8	58 8	62 8	68 8	75 8	80 0	103 0	113 12
1510	6 8	9 6	14 2	19 8	21 8	28 8	35 4	38 0	43 0	50 8	55 8	60 0	64 0	84 0	95 0
Average	6 0	8 11	13 5	16 12	18 2	26 5	32 2	36 5	42 6	49 14	55 3	61 4	65 0	85 8	95 12

GROUP IV.

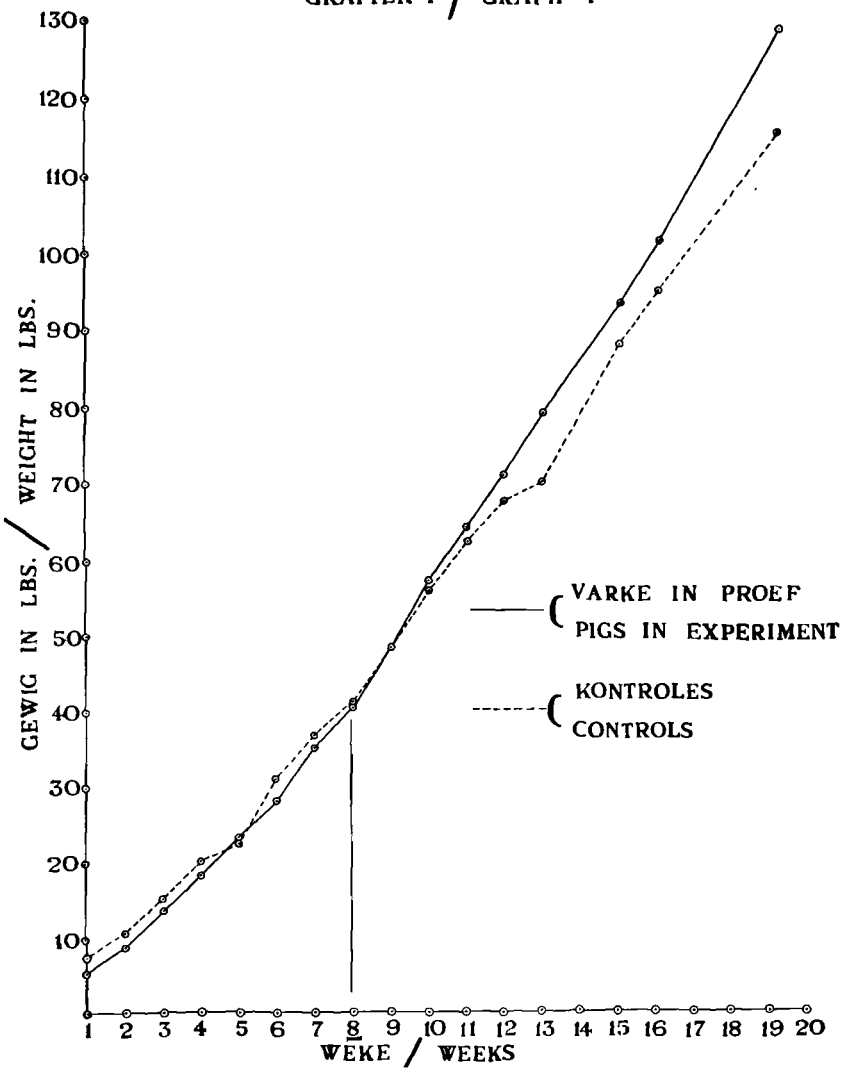
Age: 36 hours when weaned.
Born 9.7.56.
Sow No. 1294.

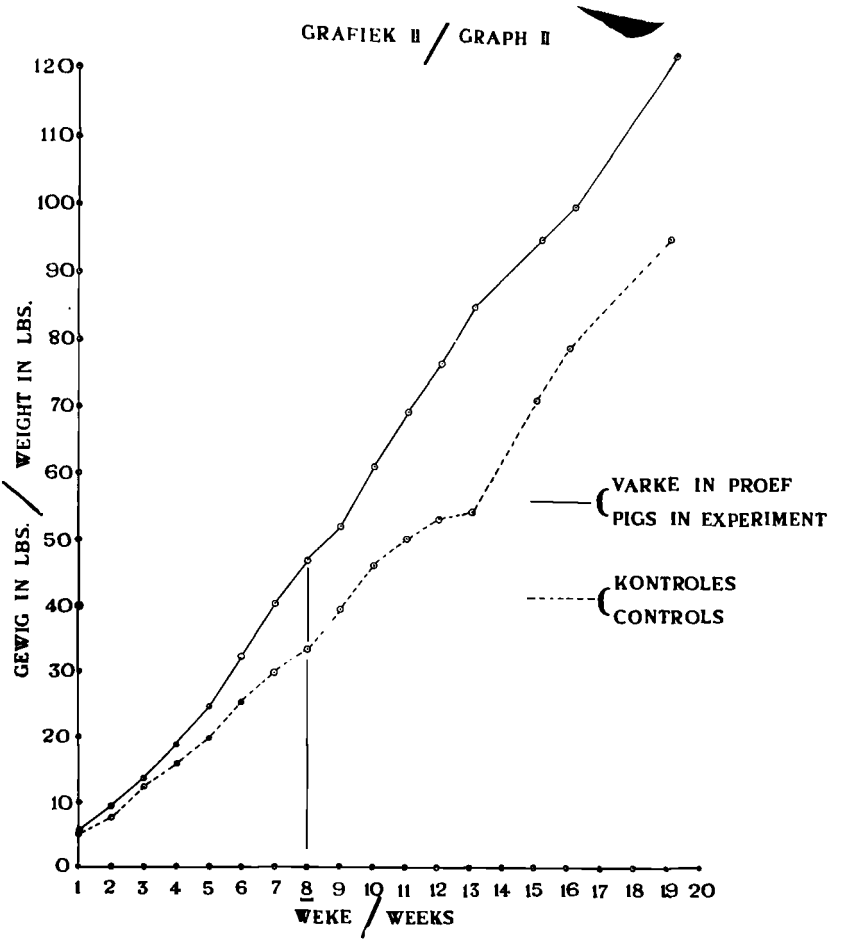
No. of Pig.	WEIGHTS IN WEEKS.												
	0 lb. oz.	1 lb. oz.	2 lb. oz.	3 lb. oz.	4 lb. oz.	5 lb. oz.	6 lb. oz.	7 lb. oz.	8 lb. oz.	10 lb. oz.			
1537	3 8	3 2	Died 19.7.56										
1538	3 0	3 4	4 8	8 0	12 0	17 6	20 8	25 8	29 8				
1539	4 0	4 4	4 8	7 8	11 8	17 0	25 8	33 12	37 4				
1540	3 0	2 10											
Average	3 6	3 6	4 8	7 12	11 12	17 3	23 0	29 10	33 6				
CONTROLS.													
1541	3 8	4 12	9 12	13 8	17 8	20 0	28 8	33 8	37 0				
1542	2 12	3 12	7 12	11 0	14 8	17 8	21 0	23 8	17 12				
1543	4 0	5 8	10 8	13 4	14 12	17 12	24 0	29 8	31 0				
1544	3 8	4 4	7 8	9 0	9 0	11 0	11 0	12 12	16 4				
1545	2 8	3 4	6 12	9 0	10 0	12 8	14 4	12 0	11 8				
Average	3 4	4 5	8 7	11 2	13 2	15 12	19 12	22 4	22 11				

The average weight of the pigs of Group III at eight weeks was 41 pounds 12 ounces, being five pounds seven ounces more than that of the controls. At the time of weaning, however, they weighed eleven ounces less.

It may be interesting to note that even the smallest pig in the experiment, viz. No. 1504 of Group III grew satisfactorily and would probably have developed into a runt had it been left with the sow. Although it weighed only three pounds eight ounces at weaning it reached 34 pounds 8 ounces at eight weeks. This is significant, as a weight of not less than 30 pounds at eight weeks is generally believed to be satisfactory. The heaviest pig in the

GRAFIEK I / GRAPH I



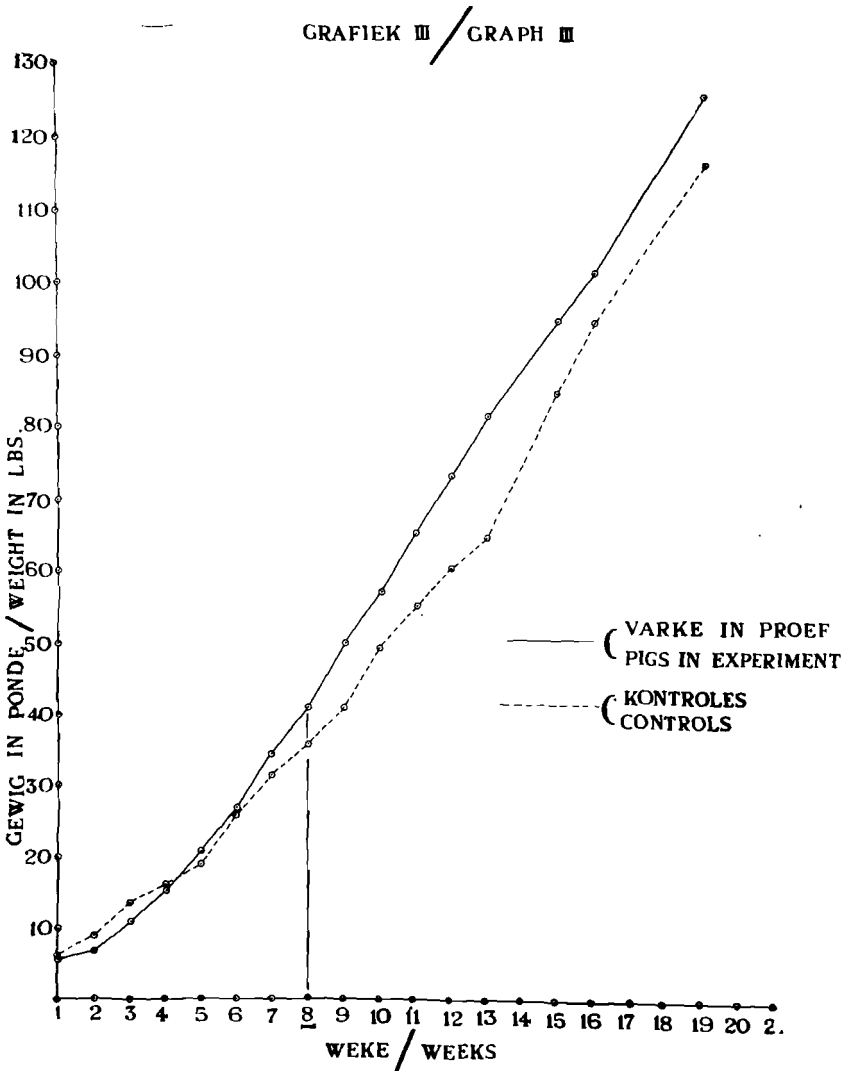


group which weighed four pounds more than it at weaning reached 53 pounds at eight weeks.

The growth rate of the pigs in Group IV that were weaned at 36 hours was much less satisfactory, the average weight of the two pigs at eight weeks being only 33 pounds 6 ounces. But their average weight at weaning was only three pounds six ounces.

From the results obtained in this experiment it appears that the weight of the baby pig at the time of weaning has a marked influence on its subsequent growth-rate; the pigs which were heaviest at weaning showed the greatest gain. Thus, pigs 1484, 1490, 1493, 1496 and 1509 which weighed most at the start of the experiment all reached at least 50 pounds at eight weeks. On the other hand, not one of their litter mates in the control groups, even those that weighed from seven to eight pounds at weaning, attained 50 pounds at eight weeks.

Although fairly satisfactory growth-rates were obtained in pigs 1486, 1489, 1500, 1504, 1538 and 1539, all of which weighed



less than five pounds at the time of weaning, not one of them reached 36 pounds at eight weeks. A weaning weight of at least five pounds seems to be advisable for a satisfactory growth rate. Five pounds is, therefore, advised as the minimum weight for weaning of pigs that are to be reared on prestarter. This weight is seldom reached before the pig is five days old. The age of weaning recommended, therefore, should not be less than five days.

It will be evident from this preliminary study that, provided baby pigs are suitably housed and cared for, maintained in a satisfactory environmental temperature and fed on a properly constituted prestarter, starter and growing meal, they can be

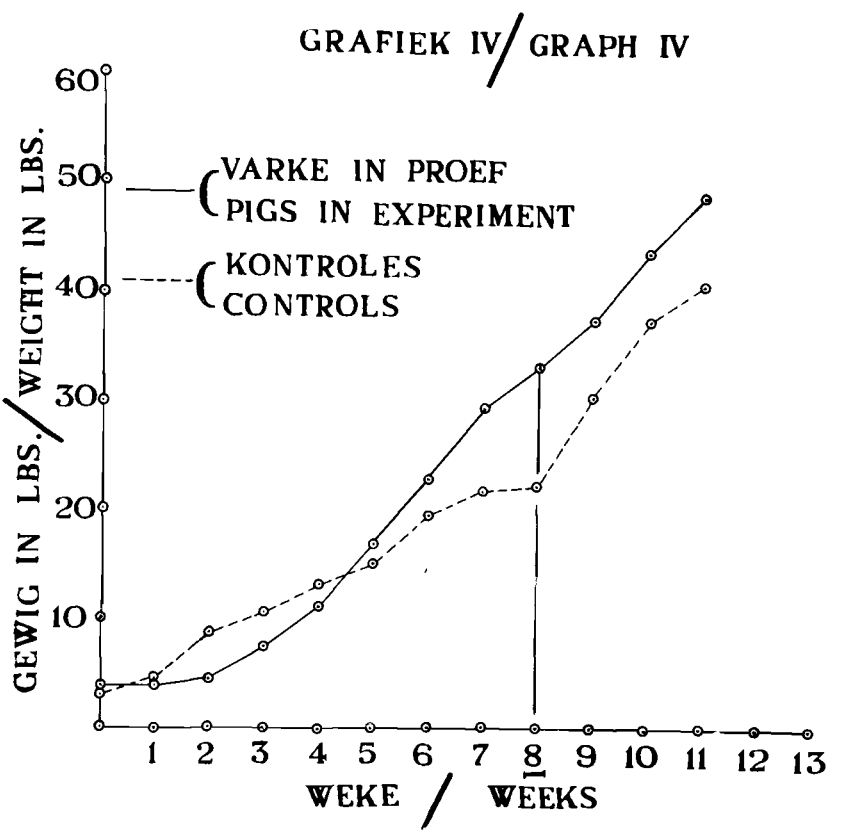
weaned profitably without any ill effects at five to seven days of age. Early weaning has many advantages over suckling from the dam, and will help to increase production, reduce cost, and reduce the number of runts as well as much of the 20 to 25 per cent wastage of baby pigs from disease, malnutrition and improper management. It is the best means of preventing the transmission of diseases from the carrier sow to the suckling pig during the nursing period, and it is the best safeguard against piglet anaemia.

Early weaning may, therefore, prove to be of considerable value to both the enterprising breeder as well as to the pig breeding industry as a whole. But the success of any scheme will depend entirely on the care and management of the baby pigs. Unless the breeder is provided with suitable facilities to maintain the baby pig at an even temperature of approximately 70°F. at least during the first few weeks after birth, he should not undertake early weaning.

REFERENCES

Catron, D. V., Nelson, L. F., Ashton, J. C. and Maddock, Helen M. (1953) — Development of practical synthetic milk formulas for baby pigs. *J. Animal Sc.* 12: 62-76.

Tribe, D. G. (1954) — The nutrition of the baby pig. *Vet. Rec.* 66:862.



PRE-STARTER I

Casein	30%	Skimmilk Powder	20%
Sucrose	25%	Food Yeast	2%
Maize Starch	10%	Mineral Salt	0.5%
Whey Powder	20%	Vitamin A & D.	

MINERAL SALT

Sodium Chloride	356 gram	Potassium Iodide	1.7 gram
Potassium Phosphate	773 ,,	Manganese Sulphate	3.0 ,,
Calcium Phosphate	1014 ,,	Zinc Chloride	0.5 ,,
Magnesium Sulphate	106 ,,	Copper Sulphate	0.6 ,,
Calcium Carbonate	686 ,,	Calcium Chloride	0.2 ,,
Iron Citrate (Ferric)	58 ,,	Calcium Fluoride	1.0 ,,

PRE-STARTER II

Casein	30%	Skimmilk Powder	20%
Sucrose	25%	Food Yeast	2%
Maize Starch	10%	Mineral Salt	2%
Whey Powder	20%	Vitamin A & D.	

MINERAL SALT

Di-Calcium Phosphate	70.0	Calcium Carbonate	10.0
Iron Sulphate	1.0	Molasses	10.0
Copper Sulphate	0.4	Food Yeast	8
Cobalt nitrate	0.35		
Manganese Sulphate	0.6		100.35

PRE-STARTER III (Tribe, 1954)

Sucrose	40 lbs.	Milk Powder	10 lbs.
Maize Starch	20 lbs.	Mineral Salt	5 lbs.
Dried Yeast	3 lbs.	Vitamin A & D.	
Casein	22 lbs.		

MINERAL SALT

Ferric Citrate	6.4%	Potassium Phosphate	24.7%
Sodium Chloride	4.5%	Tri-Calcium Phosphate	14.0%
Magnesium Sulphate	11.0%	Calcium Lactate	30.4%
Sodium Dihydrogen Phosphate	9.0%		

GROWING MIXTURE NO. IV

Yellow Mealie Meal	65	Wheaten Bran	5
Lucerne Meal	10	Bone Meal	3
White Fish Meal	10	Lime	1
Peanut Cake Meal	5	Mineral Salt	1

STARTER NO. V

Growing Mixture	72
Brown Sugar	15
Irish Meal	3

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Jl. S.A.V.M.A. 29 (1), 1958

RHIPICEPHALINE TICK TOXICOSIS IN CATTLE: ITS POSSIBLE AGGRAVATING EFFECTS ON CERTAIN DISEASES

by

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Veterinary Investigation Centre, Louis Trichardt

and

W. O. NEITZ

Onderstepoort

INTRODUCTION

It has been part of our investigations during the last year to establish why results obtained with heartwater immunization of cattle have at times been disappointing, and if possible, (a) to find ways and means of improving the technique in use at present, and (b) to determine the cause or causes, other than the complications associated with intercurrent diseases, which interfere with the immunization process in heavily tick infested regions of Southern Africa. Some of the difficulties following artificial heartwater infection are:-

(a) i. Afebrile reactions which fail to disclose the commencement of the disease thus preventing the timely treatment of affected animals.
ii. Fulminating reactions.
iii. Failure to induce heartwater in approximately five per cent of animals.
iv. Breakdown in immunity in animals immunized as young calves, and not immediately exposed to natural infection.
v. Shock during injection.

(b) Intercurrent tick-borne diseases (redwater, benign bovine gonderiosis, gallsickness and spirochaetosis) developing in immunized cattle upon exposure to tick infestation.

FIELD OBSERVATIONS

During the course of the investigations, however, the most serious complication of all, namely rhipicephaline tick toxicosis, which forms the subject of this paper, was discovered almost by

accident. Certainly many conditions combined quite fortuitously to accentuate, and even exaggerate this condition to a point where its significance could not be left in doubt. How its effects are usually masked by, and intricately mixed up with other concurrent diseases was also demonstrated. One of the sequelae, often overlooked, is that under stress of these circumstances the erythrocytic stages of *Gonderia mutans* can produce a pronounced anaemia in the complete absence of either *Babesia bigemina, B. bovis* or *Anaplasma marginale*. This matter is stressed as specific treatment with either pamaquin or pentaquine should be resorted to before *G. mutans* has had an opportunity of exerting its pathogenic effect.

The observations were made on some 50 young oxen which were being employed in heartwater immunization experiments at the Veterinary Investigation Centre, Louis Trichardt, Soutpansberg District, Northern Transvaal. These animals were grades of either Friesland, Sussex or Red poll breed, about 18 months old, and all reared at Armoedsvlakte, Vryburg district, North Western Cape Province, where tick-borne diseases are practically non-existent. They arrived in three groups at different times, and were drafted into three experiments Nos. I, II and III respectively.

Experiment No. I.

Sixteen tollies arrived on 29/9/56, and were immunized against heartwater. A month later they were put out to graze and exposed to tick infestation. All except one contracted natural redwater, and many had several relapses which were treated as they recurred. One tollie died of redwater. They were inoculated with gallsickness vaccine (*A. centrale* citrated blood) on the 21/11/56, and all except one eventually reacted to it.

From about the 15/1/57 the temperatures of these heavily tick infested cattle started to fluctuate more than usual. The febrile exacerbations were accompanied or caused by recently acquired *G. mutans* infections, *B. bigemina* relapses and gallsickness vaccine reactions. The condition of the animals deteriorated, and many had swollen parotid lymphatic glands. Six tollies became very anaemic, emaciated and weak and one died. The swelling of the parotid lymphatic glands in six animals was marked, and gradually softened to form abscesses which later ruptured, evacuated and healed up. Only towards the end of March did this group start picking up condition again.

N.B. — These animals were safely and well over the heartwater reaction before natural redwater broke out. Unfortunately they had considerable difficulty in overcoming the redwater. The severe set back coincided with the period of brown tick infestation and glandular swelling.

Experiment No. II.

The eighteen tollies for this experiment arrived on 1/11/56 and were immunized immediately against heartwater. They also received redwater and gallsickness vaccine on 21/11/56, and shortly afterwards (1/12/56) were put out to graze and exposed to tick infestation. During December and January these animals suffered from either an artificially or naturally acquired redwater usually followed by relapses. From about the 20/1/57, however, there was rapid deterioration of their condition coincident with a marked increase of tick life particularly *Rhipicephalus appendiculatus*. There were great fluctuations in the daily temperatures accompanied by the presence of either *G. mutans, B. bigemina, A. marginale* or *Spirochaeta theileri* or a mixture of these infections in blood smears.

The parotid lymphatic glands became swollen but anaemia, emaciation and weakness were the predominant symptoms. In spite of timely treatment 7 out of 18 tollies died. All the others were similarly affected to a greater or lesser degree, and some recovered with great difficulty. Two survivors were still walking skeletons at the end of April, 1957.

Experiment No. III.

The last sixteen tollies arrived on 1/12/56. In order to avoid some of the complications experienced in the previous two experiments, this group was inoculated with redwater and gallsickness vaccine at our request, before being railed on the 21/11/56 from Armoedsvlakte. The animals were immunized against heartwater on arrival using a modified suppressive treatment method (treatment in the incubation period). It was believed that it would be a good test of the heartwater immunity to expose them immediately to natural virulent veld conditions instead of challenging them with heartwater blood as had been done for the other two groups. Accordingly all 16 oxen were transferred for four days and three nights to a camp on the Rietvlei farm known to be badly tick infested, and then returned to graze with the other two groups at the Veterinary Investigation Centre. (The fact that this sortie coincided with the mounting brown tick activity was quite unintentional and not known to us at the time). Two days later the temperatures in all the animals of this group rose abruptly to 104 to 106°F. Smear examination failed to reveal any blood parasites.

Symptoms:-

The next few days showed that something very unusual was happening. The animals were feeding very little or not at all. They were lethargic, and the respirations were accelerated and shallow. Nearly all started lachrymating more or less profusely and started swelling about the head. In many the face and mandibular region were swollen and puffy all over, giving the animals a rather gro-

tesque look. In some the eye-lids were swollen as if stung by bees so that the eyes could scarcely be opened. The conjunctiva was intensely inflamed and moist.

In all the animals the ears were markedly swollen and infested with a large number of brown ticks, the thickness being increased to about 1 to 2 cm. and pitting on pressure. Due to the increased weight the ears were hanging down. The animals often shook their heads very gingerly or attempted to scratch the ears and head with their hind feet. Obviously there was considerable irritation and pain associated with the condition.

At this stage it was thought that a photodynamic condition had developed as a result of the ingestion of some plant but the skin of the body, even where non-pigmented, did not show oedema or photosensitivity. It became apparent, however, that there was a great concentration of brown ticks (*Rhipicephalus appendiculatus*) on the head region particularly on the outer edge and inner surface of the ears, and in a dense circle along the rims of the eyelids. Other ticks (*Rh. evertsi* and *Boophilus decoloratus*) were present too but the latter species was mainly on the body.

Puncture of these puffy swellings with a hypodermic needle resulted in a dark red fluid (haemorrhagic lymph) exuding from the subcutis. Microscopical examination of this fluid revealed nothing unusual. A few days later the facial oedema started to subside, and the regional lymphatic glands (parotid, mandibular and prescapular) became prominent. Gland puncture smears showed occasional Koch bodies.

The animals remained dejected, feeding very little and for the most part standing or lying in the shade of trees. They lost condition very rapidly and became weaker by the day. Twenty-four days after exposure in the tick infested camp they started dying.

In spite of the obvious presence of *babesiosis* and *gonderiosis*, one could not help feeling that these diseases were not the only cause of the anaemia and weakness leading to death. The cachexia which developed, the necrosis of the lymphatic glands, the failure of the redwater to respond to chemotherapy, and the presence of a large number of endoglobular *G. mutans* parasites, accompanied by *A. marginale*, all pointed to some other agency having a powerful provocative effect on the blood parasites harboured by the animals. On account of the confused picture produced by the combined effects of so many factors it was impossible to determine the role each one played.

Relapses to redwater recurred at irregular and frequent intervals, in spite of alternating treatment with a variety of available piroplasmocides, e.g. pirevan, phenamidine, euflavine and trypan blue. *G. mutans* infection seemed to be more active than usual judging by the prolonged, irregular intermittent, febrile reactions produced, and by the numbers of parasites in the blood. *Sp. theileri* occurred in a few cases, and later anaplasmosis joined in to aggravate the condition.

Haematinics such as ferrivenin, ferromyl, rubramin, repeated subcutaneous blood injections and massive intravenous blood transfusions were tried. They had little or no lasting effect in bad cases but may have helped in a few milder infections. There were a few cases in which *B. bigemina* and *A. marginale* seemed absent, and yet the anaemia was quite severe in the presence of large numbers of endoglobular *G. mutans* parasites. Sustained treatment with pamaquin was tried but although the *Gonderia* infection disappeared from the blood for a time, it did not lead to recovery.

Supporting treatment such as intravenous glucose and calcium borogluconate, trace elements mixed with concentrates (dairy meal), hand fed, sugar and vinegar drenches etc. did prolong life in some instances, and probably saved a few of the milder cases but had no visible beneficial effect on severe infections.

In many of the earliest cases one got the impression that death was due to heart failure as judged from the behaviour just before death. The animals continued to die at intervals over a period of three months. A total of 14 were lost out of the 16 tollies. The two survivors staggered around for another month before they could reasonably be assumed to be recovering. Such a severe set back makes it doubtful whether they will ever recover their full growth potential.

Post Mortem Lesions:-

The severe anaemia was the most constant pathological change seen. The blood was often watery to an extreme degree. Rapid and progressive emaciation going over to exaggerated cachexia in some cases of longer standing, pulmonary oedema with froth in the air passages, and moderate to marked hydrothorax and hydropericardium were common lesions. Icterus, haemoglobinuria and tumor splenis were present in some cases only. The heart frequently presented an unhealthy greyish appearance with pinkish suffusion.

The changes in the lymphatic glands were also characteristic and fairly constant. All the lymphatic glands of the head, neck and prescapular region were affected but the parotid ones usually more severely so. They were swollen, oedematous and haemorrhagic with a tendency to form a greyish firm necrotic core. In longer standing cases the firm necrosis gradually softened from invasion with pus cells and finally ruptured to evacuate the purulent greyish, mushy contents onto the surface. This occurred at between 4 to 8 weeks after exposure to ticks and thereafter the wound healed rapidly, leaving a visible scar or a hard persistent swelling of scar tissue.

The skin changes seen on the head but more particularly on the ears followed a definite pattern and were quite characteristic. Their development could be followed fairly easily by examining animals in other groups in which ticks were few and scattered. For instance in a lightly pigmented ear, the point of attachment of a brown adult tick was seen to be surrounded by a pink or reddish

papule raised in the centre, its diameter being about 0.5 to 0.75 cm. If the tick was pulled off a drop of blood or bloody lymph would exude, and sometimes continue to drip for a while.

When ticks (all *Rh. appendiculatus*) were numerous, and practically touching one another, there was considerably more than just confluence of such papules. The entire cutis and subcutis in the area became thickened and reddened due to infiltration with blood stained lymph. At the height of the tick activity an affected animal would stand with its head down, ears sagging, and blood stained fluid sometimes dripping from the site of infection. Subsequently the epidermis became mushy and sticky, and eventually macerated due to this exuding lymph, it formed an ideal striking site for the screw-worm fly or served as a portal of entry for bacteria to set up secondary infection. Abscessation of the outer ear was seen in several cases. The stench emitted at this stage was quite nauseating.

When healing takes place, either the ear resumes its normal appearance or, as often happens, disfigurement by the action of contracting scar tissue occurs. Thus the tip of the ear may be permanently bent or curled inwardly or alternatively the whole ear may be crumpled up to resemble a cauliflower like appendage.

The term "Kruloor" (Afrikaans for crumpled ear) seems quite appropriate for the final after-effect of this process. Such deformed ears have often been encountered in herds maintained in heavily tick infested regions where dipping and handdressing are not very thorough. Swollen parotid lymphatic glands followed by abscessation are also common and well-known to stock owners who associate these changes with severe tick infestation.

LABORATORY OBSERVATIONS

It has already been suggested that rhipicephaline tick toxicosis with the resulting relapses of various blood parasite infections were responsible for the clinical syndrome exhibited by several groups of cattle exposed to a massive tick infestation. The severity of the condition in all animals was of the same degree irrespective of whether they harboured a microscopic infection of *B. bigemina, A. marginale* and *G. mutans* or a pure infection of the latter protozoon alone. Since the impression was gained that the reticulo-endothelial system had lost its ability to maintain the premunity, experimental evidence was necessary to support this impression. Since it is known that both *B. bigemina* and *A. marginale* are capable of producing severe anaemia in cattle having a normally functioning reticulo-endothelial system it was thought that no good purpose would be served by conducting biological studies with these parasites. Experiments were, therefore carried out to determine whether or not a pure endoglobular infection of the mildly pathogenic parasite *G. mutans* could produce an equally severe form of anaemia in cattle in which the normal defensive mechanism of the reticulo-endothelial system had been impaired by splenectomy. With this

object in view blood was collected in citrate from an affected ox, No. 7179, which, according to systematic smear examinations over a period of several weeks, harboured a pure *G. mutans* infection. This blood from ox No. 7179 was injected intravenously into a fully susceptible splenectomized ox No. 5546 (*vide infra Table* I). After an incubation period of 44 days endoglobular parasites of *G. mutans* appeared in the peripheral blood. The parasites multiplied rapidly, and 12 days later 50 per cent of the erythrocytes were found infected. This was followed by a progressive anaemia. On the 25th day after the first appearance of parasites the red blood cell count had dropped from 7.0 million to 1.28 million per c.mm. The anaemia remained more or less at this level for 14 days. On the 15th day the count had risen to 2.0 million per c.mm., by the 40th day it reached 4.0 million per c.mm., and three weeks later the erythrocytic count returned to its original level. A leucocytosis also developed, and when the anaemia was at its worst the white blood cell was 58,000 per c.mm. This animal also showed anorexia, loss in condition, icterus and an irregularly intermittent fever (104-106°F) for a period of a month.

In order to exclude the presence of a concurrent infection which might have provoked the *G. mutans* infection in the splenectomized ox No. 5546, blood was subinoculated from this animal into two non-splenectomized oxen Nos. 5729 and 7552 premune to the Soutpansberg form of benign bovine gonderiosis (*vide infra* Table I and II), a splenectomized tollie No. 8408 premune to the Onderstepoort form of benign bovine gonderiosis and *A. centrale,* and a susceptible splenectomized ox No. 5757 (*vide infra* Table I). The former three premune animals proved to be solidly immune, while the latter susceptible animal developed a severe anaemia similar to that observed in the donor. *G. mutans* appeared in the peripheral circulation eight days after the artificial infection. As the infection progressed, up to 40 per cent of the erythrocytes became parasitized. When a period of 29 days had elapsed the erythrocytic count dropped from 7.0 million to 1.9 million per c.mm. The anaemia remained more or less at this level for seven days whereupon the red blood cell count gradually returned to normal, and reached 7.0 million per c.mm. 75 days after the first appearance of the endoglobular parasites. A moderate leucocytosis was also observed. The anaemia was accompanied by anorexia and listlessness but not by fever. In order to gain further information on the pathogenicity of the Soutpansberg strain of *G. mutans,* a fairly large number of adult *Rh. appendiculatus* ticks were gathered on the farm Rietvlei where the cattle of group III had been exposed.

The observations on feeding experiments carried out with these ticks are listed in Table II. The ticks employed consisted of two batches of adult drag ticks gathered on the farm Rietvlei and of a batch of adult ticks which in the nymphal stage had fed on ox No. 7552 which had reacted to the Soutpansberg form of

TABLE I.

THE PATHOGENICITY OF THE SOUTPANSBERG ENDOGLOBULAR *GONDERIA MUTANS* PARASITES.

No. of Animal.	History of Animal.	Inoculum.	Date of Injection.	COURSE OF DISEASE.			
				Incub. period (days).	Durat. of disease (days).	Characteristic feature of disease.	Remarks.
5546	Splenectomized 5 year old ox	15.0 c.c. blood of ox No. 7179 reacting to Soutpansberg *G. mutans* strain	28.1.57	44	72	Very severe anaemia and icterus. Red blood cell count dropped to 1.28 million per c.mm.	Highly susceptible to erythrocytic stages of *G. mutans*
5757	Splenectomized 5 year old ox	25.0 c.c. blood of ox No. 5546	8.4.57	8	75	Very severe anaemia and icterus. Red blood cell count dropped to 1.9 million per c.mm.	Highly susceptible to erythrocytic stages of *G. mutans*
5729	Non-splenectomized 4 year old ox premune to the Soutpansberg form of benign bovine gonderiosis	20.0 c.c. blood of ox No. 5546	30.4.57	—	—	No reaction.	Solidly immune.
7552	Non-splenectomized 3 year old ox premune to the Soutpansberg form of benign bovine gonderiosis	20.0 c.c. blood of ox No. 5546	30.4.57	—	—	No reaction.	Solidly immune.
8408	Splenectomized 1 year old ox premune to *A. centrale* and the Onderstepoort form of benign bovine gonderiosis	20.0 c.c. blood of ox No. 5546	30.4.57	—	—	No reaction.	Solidly immune.

TABLE II.

THE PATHOGENICITY OF THE SOUTPANSBERG *GONDERIA MUTANS* STRAIN HARBOURED BY ADULT *RHIPICEPHALUS APPENDICULATUS*.

No. of Animal.	History of Animal.	Batch No. of Ticks.	History of Ticks.	Date of infest.	No. of ticks collected.	Course of Disease.				Remarks.
						Incub. period (days).	Durat. of disease (days).	Koch bodies seen from	Erythrocytic parasites appeared	
7552	Non-splenectomized 3 year old ox raised under tick-free conditions.	2263 Aa1	Drag ticks gathered on the farm Rietvlei, Soutpansberg District.	31.1.57	64	12	9	14.2.57 to 21.2.57	18.2.57	A very mild fever but no anaemia.
5729	Non-splenectomized 4 year old ox raised under tick-free conditions.	2263 Aa2	Same history as Batch No. 2263 Aa1.	6.3.57	56	14	3	21.3.57 to 23.3.57	27.3.57	A very mild fever but no anaemia.
5125	Non-splenectomized 7 year old ox premune to the Port Shepstone form of benign bovine gonderiosis.	2275 Aa1	Same history as Batch No. 2263 Aa1.	12.4.57	14	—	—	—	—	No reaction.
		2262 Aa1	Ticks fed on ox No. 7552.	12.4.57	30	—	—	—	—	
5130	Same history as ox No. 5125.	2275 Aa2	Same history as Batch No. 2263 Aa1.	12.4.57	26	—	—	—	—	No reaction.
		2262 Aa2	Ticks fed on ox No. 7552.	12.4.57	4	—	—	—	—	
5757	Splenectomized 5 year old ox harbouring the erythrocytic stages of the Soutpansberg *G. mutans* strain.	2262 Aa4	Ticks fed on ox No. 7552.	21.8.57	10	15	5	5.9.57 to 9.9.57	Already present	A very mild fever but no anaemia.

benign gonderiosis. The latter batch will be referred to as laboratory ticks.

The susceptible non-splenectomized oxen Nos. 7552 and 5729 were infested with drag ticks, the splenectomized ox No. 5757 which harboured only the endoglobular stages of the Soutpansberg *G. mutans* strain was infested with laboratory ticks, while drag ticks together with laboratory ticks were allowed to engorge to repletion on two premune benign bovine gonderiosis oxen Nos. 5125 and 5129 which had recovered from a natural infection at Port Shepstone.

The results of the tick feeding experiments showed that the Rietvlei drag ticks produced a mild form of benign bovine gonderiosis in the two susceptible oxen Nos. 7552 and 5729. Koch bodies in lymphatic glands, and endoglobular parasites in relatively small numbers could be demonstrated but no anaemia developed. The infestation with laboratory ticks of ox No. 5757, which harboured a latent *G. mutans* infection, was followed by a very mild thermal reaction, and the appearance of a few Koch bodies in the lymphatic glands but not by a relapse of endoglobular parasites. The two premune Port Shepstone benign bovine gonderiosis oxen proved to be solidly immune.

Consideration of the results of the laboratory investigations permits the following conclusions:-

i. There is no immunological difference between the Soutpansberg, Onderstepoort and Port Shepstone strains of *G. mutans*.

ii. The appearance of Koch bodies, but not that of any anaemic complications, in a splenectomized ox harbouring a latent endoglobular *G. mutans* infection after tick infestation, indicates that schizonts are not responsible for the clinical syndrome exhibited by several groups of cattle exposed to tick infestation

iii. The inability to reproduce the clinical syndrome, exhibited by cattle exposed in the Soutpansberg district, in two susceptible oxen with drag ticks from that area is attributed to the relatively small number of ticks that fed on both animals. This experiment also shows that the Soutpansberg *G. mutans* strain is only mildly pathogenic when introduced into the bovine reticulo-endothelial system.

iv. Ox No. 7179 which had been exposed to tick infestation in the Soutpansberg district harboured a pure *G. mutans* infection. Subinoculation of this parasite into two splenectomized oxen produced an anaemia as severe as in the donor. The inference is drawn that the defensive mechanism of the reticulo-endothelial system of the two recipients had been impaired to such a degree by splenectomy that the practically harmless *G. mutans* parasites were capable of bringing their pathogenic effect into operation. Consideration of this manifestation which, in exposed cattle was preceded by a pronounced oedema of the head and ears, suggest that the massive tick infestation was

followed by the liberation of a large quantity of a toxin. This agent has a suppressive action on the defensive mechanism of the reticulo-endothelial system thereby permitting blood parasites to exert their pathogenic effect on the host.

DISCUSSION

The field experiments were neither planned nor carried out with a view to demonstrating the effects of ticks on animals. The observations were made spontaneously, trying to follow the developments as they took place. They are of necessity incomplete and fragmentary. Nevertheless, these manifestations together with the laboratory observations seem to warrant the preliminary conclusions and conjectures now put forward.

1. Although the first three groups of animals came at different times and were subjected to somewhat different treatment, *they all suffered the set-back coincident with mass brown tick infestation at about the same period extending from January to February,* 1957. Groups I and II were exposed in the veld to milder and more gradual tick infestation. They had thus a chance to develop some degree of tolerance and/or immunity. Group III on the other hand was plunged into a badly tick infested camp, and what is more, just at the time when tick activity was reaching its peak.
2. The behaviour of all the groups in relation to babesiosis was unusual. The fact that two groups were inoculated with the Onderstepoort redwater vaccine seems to have made no difference whatever to the clinical syndrome. Relapses recurred at intervals in spite of treatment. It should be noted that relapses also occurred prior to the gross tick infestation period commencing from the end of January 1957. The animals appeared to suffer more severely from the disease and therapeutic treatment during this period seemed to have had little or no effect on the course of babesiosis.
3. In the area around Louis Trichardt *G. mutans* infection in cattle is the rule. Every animal born locally or introduced into the area from the highveld contracts benign bovine gonderiosis sooner or later. When uncomplicated, pyrexia, persisting for periods of up to seven days, is about all one observes. During the period of mass tick infestation as from the 20th January 1957, the reactions due to *G. mutans* seemed accentuated. The course of the disease lasted longer and endoglobular parasites appeared in extremely large numbers in the peripheral blood. Laboratory observations subsequently showed that endo globular parasites of *G. mutans* produced a pronounced anaemia in the complete absence of either *B. bigemina, B. bovis* and *A. marginale.*
4. Unquestionably the oedematous lesions of the face, eye-lids and ears are due to ticks. Exactly how they are produced needs

to be determined. At this stage of the investigation it is believed that the lesions are produced either by a toxin injected by the ticks at the site of and during the period of attachment; by trauma, irritation, pain and loss of blood; by secondary bacterial invaders, screw worms, and maggots, or by a combination of all these agencies.

5. The fairly constant severe inflammation and frequent necrosis of the lymphatic glands draining the site of tick infestation of the ears, face and eyelids points to the presence or passage along these lymphatic vessels of a highly toxic substance which is capable of immediately producing a coagulative necrosis of the glandular parenchyma. It can also be assumed that this toxin will find its way into the systemic circulation causing either a general intoxication and even death when present in a high concentration or if diffuse, and possibly produce inapparent cellular damage and even remote nervous disturbances.
6. In regard to the latter possibility, and taking into account the seeming lack of resistance, exhibited by the animals in the different groups to various infections such as babesiosis, gonderiosis and heartwater, it is suggested that the defensive mechanism of the body, namely the reticulo-endothelial system is impaired or even paralyzed by the action of the toxin. That the same injurious effect might extend to the red bone marrow must not be lost sight of. If this were so it would retard or stop the regeneration of erythrocytes, thus causing or contributing to the extreme anaemia which was such a pronounced symptom in these cases. The development of a severe anaemia due to the erythrocytic stages of *G. mutans* in splenectomized cattle gives support to this supposition.
7. Apart from the disease aspect, and the danger to the lives of cattle, due consideration should be paid to the economic implications of tick toxicosis. Granted that such extreme conditions which here combined to annihilate groups of animals will seldom operate in practice, the loss of condition and the retardation of the growth, which so far have not been directly attributed to ticks, must in future be taken into account.

ACKNOWLEDGMENTS

The authors wish to express their indebtedness to Dr. P. R. Mansvelt, Senior State Veterinarian, Louis Trichardt, for his interest and willing help whenever difficulties arose, to Assistant Stock Inspector G. J. van Eden for carrying out many routine duties, and to Mr. Boughton for his assistance in rearing the ticks.

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Ear case 1-33-4-1956

COCKER—Male—3 years of age

History: Inflammation of ear with odour and extensive head shaking.
Symptoms: Inflammation of external ear canal, typical pseudomonas odour, small laceration in external canal.
Diagnosis: TRAUMATIC OTITIS.
Treatment: Ear cleaned with chlorinated oil solution. METIMYD with NEOMYCIN applied twice daily for 10 days.
Results: Complete healing.

Eye case T-21-4-1956

COLLIE—Female—6 years of age

History: Corneal ulcer measuring 1/16" x 1", following traumatic injury.
Symptoms: Light sensitivity, discharge, irritation.
Diagnosis: CORNEAL ULCER.
Treatment: METIMYD OINTMENT with NEOMYCIN applied twice daily for 12 days. On first and third days 5 cc. of foreign protein were given.
Results: Complete repair of ulcer with slight scar formation.

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GERMAN SHEPHERD—Female—2 years of age

History: Dry eczema of two months duration.

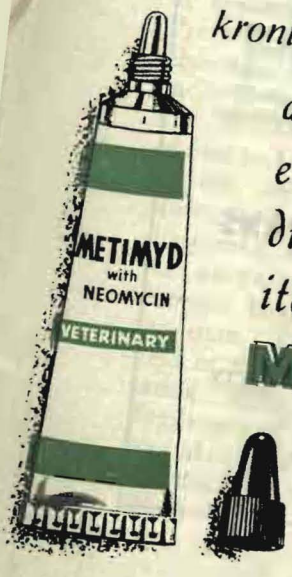
Symptoms: Dermatitis and alopecia involving left labial commissure and left external ear flap. Severe pruritus of involved areas.

Diagnosis: DRY ECZEMA.

Previous Treatment: Sodium caprylate solution and sulfa ointments.

Treatment: METIMYD OINTMENT with NEOMYCIN applied twice daily for one week.

Results: Pruritus ceased after the first application of METIMYD. Within one week all symptoms of dermatitis had disappeared.



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SOME AETIOLOGICAL AGENTS OF BOVINE ABORTIONS IN SOUTHERN RHODESIA

D. K. Shone, J. R. Philip, R. M. Roberts and G. J. Christie

Salisbury

Outbreaks of abortion in cattle in Southern Rhodesia have occurred as far back as 1906, when, according to Sinclair (1922), a large number of cows on the Salisbury commonage aborted. He also records that in 1909 more than thirty cows of a herd of forty five, on the farm Newton, Marandellas, aborted within a period of twelve months.

The first definite diagnosis of an agent causing abortion in Rhodesia, was that of bovine contagious abortion by Bevan (1914). In November 1913, a herd of cattle imported from Northern Rhodesia, while in quarantine on the Zambesi, was reported as suffering from contagious abortion. On arrival at Sipolilo, blood samples were collected and four animals gave positive reactions to the agglutination test. At about the same time sera from cows on the farm Gatsi, Marandellas were also found to be positive. According to Robinson (1918) brucellosis was first diagnosed in the Union of South Africa in 1913 when a pure culture of the organism was obtained from the stomach of an aborted foetus by G. N. Hall.

Vibrio fetus was diagnosed in South Africa for the first time by Snyman (1931) when he demonstrated the presence of the organisms in the stomach contents of aborted foetuses from a herd in the Pretoria area. Thirteen cows in a herd of one hundred and sixty aborted. Canham (1948) records that three abortions in Natal in 1940 were due to vibrio fetus.

Robinson (1937) was the first to diagnose trichomonas foetus in South Africa when he demonstrated the presence of the organisms in wet preparations prepared from the foetal membranes and stomach contents of an aborted foetus. Trichomonas foetus was diagnosed in Southern Rhodesia for the first time in 1948, when the parasites were demonstrated in the stomach contents of an aborted bovine foetus as well as in the uterine discharge from the dam. The heifer was imported from Britain and was being held at the Veterinary Research Laboratory, Salisbury for immunisation against redwater and gallsickness (Lawrence, 1948). Trichomonas foetus was again demonstrated in 1956 when it was shown to be associated with cases of pyometra, but not with abortions, in a herd in the Chipinga area of Southern Rhodesia (Boyt 1956).

Two abortions in a herd in Natal, South Africa, were ascribed to tuberculosis by Canham (1937). He demonstrated the presence of the organisms in both foetuses, and he also records extensive involvement of the uteri of both cows.

Salmonella enteriditis var. Dublin as a cause of abortion in South Africa was recorded by Bishop, Schatz and Canham (1943) in a seven and a half month old foetus.

Van der Linde (1953) ascribed five abortions in two herds of cattle in the Orange Free State area of the Union of South Africa to Rift Valley fever.

The isolation of Rift Valley fever virus in Southern Rhodesia for the first time, from eight bovine foetal specimens, by Shone (1957), is included in this report.

MATERIALS

It is not intended to list the source of all the material examined but reference will be made to the origin of specimens of particular interest under the section dealing with results. No attempt has been made to differentiate between abortions and so called premature calves born dead, as a number of conditions exist which may produce abortions at any stage of a gestation and the stillborn calf may well be one of these.

The chief source of material has been submission of foetal specimens to the Veterinary Research Laboratory, Salisbury, by farmers, private practitioners and members of the field staff of the Veterinary Department.

The submission of the complete foetus together with a portion of the foetal membranes, thirty millilitres of sterile whole blood and a blood smear from the dam is requested where practicable. In those cases where it is not feasible to submit the whole foetus portions of liver and brain, the stomach (tied off at either end), together with the specimens from the dam are required.

In general where the foetus is reasonably fresh and an overnight journey only is involved, no preservatives are recommended, beyond, where possible, holding the specimen at a low temperature, say plus 4°C, until immediately before despatch. In those cases, however, where decomposition has already set in and where a longer journey is likely to be entailed, preservation in fifty per cent glycerine-saline is recommended.

METHODS

Since this work was initiated it has from time to time been found necessary to expand the scope of the examinations. The system detailed below is that followed at the time of writing when a complete foetus and other specimens are received. In other cases the system is adapted accordingly.

Wet preparations of stomach contents and foetal membranes under coverslips are examined by phase contrast illumination. We

have found the phase contrast microscope extremely valuable for this work. Both cases of vibrionic abortion were diagnosed by this means and the demonstration of fungi and yeasts is far more readily made.

Smears from the foetal membranes and stomach contents are examined after staining by Grams method.

Cultures from liver, brain, foetal membranes and stomach contents are made on duplicate ten per cent bovine blood agar plates and MacConkey agar plates. One set of blood agar plates is incubated in an atmosphere of ten per cent CO_2 in air at 37°C. The other set of blood agar plates and the MacConkey agar plates are incubated aerobically at 37°C. The plates incubated aerobically, are examined daily for four days and those incubated in the ten per cent CO_2 atmosphere after three days. If negative after three days the latter are reincubated and examined again three days later. Bacto-Thiol semi-solid medium (Difco) containing ten per cent bovine serum is inoculated with stomach contents and incubated in a ten per cent CO_2 atmosphere. Wet preparations are examined after three days and again after six days under the phase contrast microscope for the presence of vibrios.

Twenty millilitres of dextrose broth to which is added 15 mgm. of oxytetracycline is inoculated with stomach contents and foetal membrane material for yeast isolations. Yeast isolations were also made in pure culture on blood agar plates and in thiol medium.

Brain and liver tissue emulsions are utilised for viral isolations in infant mice. Details of the technique followed have been given by Shone (1957).

Two millilitres of stomach contents are inoculated subcutaneously into a guinea pig. After thirty days a blood sample is collected by intracardiac puncture and a brucella agglutination test undertaken on the serum. If positive, reisolation from the spleen is made. Guinea pigs negative to the agglutination test are observed for a further two to three weeks when they are destroyed and a post mortem examination undertaken.

The blood smear from the dam is examined after fixation with May Grunwald and staining with Giemsa.

In selected cases foetal and maternal specimens are utilised for transmission experiments on pregnant cows.

RESULTS

During the twelve months from 1st October, 1956 to the 30th September, 1957, eighty-four specimens of aborted bovine foetuses were examined. Five of the specimens were classified as being "very decomposed" and as such may be disregarded as far as any possibility having existed of reaching a diagnosis. A definite diagnosis of the casual agent of the abortion was reached in twenty-one cases. (26.6 per cent of the seventy-nine specimens).

These seventy-nine specimens comprised:-

Complete foetuses	55
Liver, brain and stomach	6
Brain, spleen and stomach	1
Liver and stomach	3
Liver and brain	1
Stomach	6
Brain	7

TABLE I.

Agents determined as causing bovine in Southern Rhodesia from 1.10.1956 to 30.9.1957

Agent	Number	Percentage of all specimens examined *
Rift Valley fever	8	10.1
Brucella abortus	2	2.5
Vibrio fetus	2	2.5
Yeast (a)	1	1.3
Yeast (b)	1	1.3
Mucor pusillus	1	1.3
Streptococcus	1	1.3
Corynebacterium pyogenes	1	1.3
Salmonella enteriditis	1	1.3
Babesia bigemina	2	2.5
Lantana camara	1	1.3

* This does not include the five very decomposed specimens.

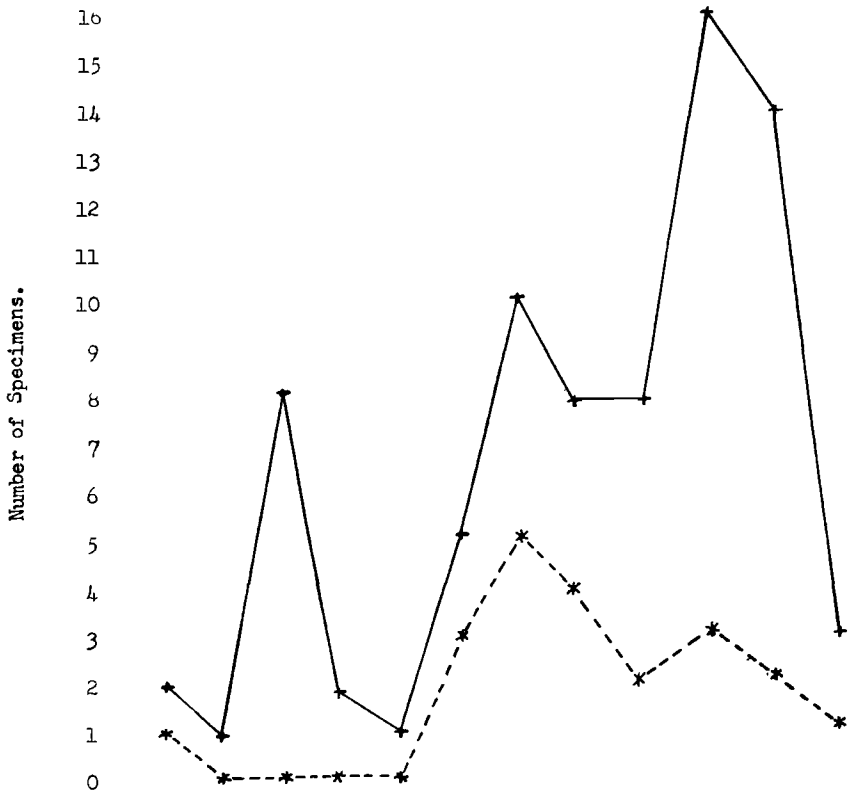
In table I are listed the agents which have been determined as having caused abortion in the seventy-nine specimens examined. It will be noted that Rift Valley fever comprises the largest group and that an equal number were due to vibriosis and brucellosis. The remaining agents can be classed together as producing sporadic abortions.

Graph 1. The monthly distribution of specimens received for examination and of the specimens in which a diagnosis was established.

From Graph I it will be noted that there was a marked increase in specimens examined in December, 1956, without the aetiological agents being determined.

In March, April and May a further increase in specimens examined was recorded with a corresponding increase in the number of determined aetiological agents. In July and August a marked increase in the number of specimens examined took place but no corresponding increase in the diagnosis of the casual agent was recorded. The greatest number of abortions of an undetermined nature therefore occurred in this period with a short sharp rise also being recorded in December.

GRAPH 1.



——— indicates specimens submitted.
— — — indicates specimens in which a diagnosis was established.

Rift Valley Fever. The isolation of Rift Valley fever virus from eight aborted bovine foetal specimens has been dealt with in detail by Shone (1957). Seven of the isolations were obtained in the period March, April, May and one on the first of June, 1957. It is interesting to note that on two occasions the virus was recovered from brain and not from liver tissue. On three farms several abortions had already occurred before specimens were submitted and the diagnosis established.

Brucella abortus. Brucellosis as a cause of abortion was established in two cases by direct cultures from stomach contents and by guinea pig inoculation. In neither of the cases was an abortion storm recorded.

Vibrio fetus. The presence of vibrio fetus in Southern Rhodesia was demonstrated for the first time, in October, 1956, in the stomach contents of an aborted bovine foetus. A second case of vibrionic abortion was diagnosed in September, 1957. In both cases the diagnosis was made with the phase contrast microscope, but only in the first instance was the organism isolated in pure culture. In

the second case heavy overgrowth by contaminating organisms made isolation impossible. This specimen which originated from the Bulawayo area was examined approximately 58 hours after the abortion. The stomach, tied off at either end, had been placed in fifty per cent glycerine saline some 43 hours previously.

Mycotic Abortions. (a) Yeasts. Two strains of yeast organisms were isolated in pure culture from two aborted foetuses.* At the time of writing they have not been identified but distinct morphological differences exist between the two strains. One of the foetuses originated from Salisbury and the other from Bulawayo. In both cases pure cultures of the organisms were obtained from the stomach contents in thiol semi-solid medium as well as on blood agar plates. In the case of the Bulawayo specimen portions of the foetal membranes were available and the organisms were demonstrated in and isolated from the cotyledons. Dextrose broth containing oxytetracycline had to be used to obtain a pure culture.

The Bulawayo foetus was aborted in the eighth month and the Salisbury foetus in the sixth month of pregnancy.

(b) *Fungi.* Mucor pusillus was obtained in pure culture from the stomach contents of a seven month's old foetus and was also isolated from foetal membranes. Hyphae were demonstrated in great profusion in wet preparations from both stomach contents and foetal membranes.

Aspergillus fumigatus. Abortions due to this fungus were not encountered in this series but cases had previously been diagnosed. Mummification of the foetal membranes in all the cases was very marked.

Corynebacterium pyogenes. A pure culture of corynebacterium pyogenes was obtained from the stomach of a foetus.

Streptococcus. A beta-haemolytic streptococcus was obtained in pure culture from the stomach contents of an aborted foetus. It was unfortunately not possible to determine the serological type. The dam was reported to have shown a febrile reaction which responded to anti-biotic therapy. Blood smears from the cow were examined and found to be free of protozoal parasites.

Salmonella enteriditis was isolated from the liver of a foetus of a single case of abortion in a herd. Mortality in young calves on the farm, at the same time, was also diagnosed as being due to Salmonella infection.

Babesia bigemina. Two abortions, the result of a babesia bigemina infection were diagnosed by the examination of blood smears taken from the dams. No parasites were demonstrated in the erythrocytes of either of the foetuses.

Lantana camara. One of the foetuses which was received for examination was aborted during an outbreak of Lantana camara poisoning. Three abortions were recorded in the affected animals. All the dams showed marked symptoms of poisoning.

*These yeast abortions will be dealt with in greater detail in a later publication.

DISCUSSION

The necessity for investigational work into the causes of abortions, other than the more commonly recognised agents, is evident in view of the large numbers of abortions which take place and cannot be ascribed to these agents. It is also clearly apparent that investigations should not be restricted to the foetus and foetal membranes, but, as thorough an examination as possible of the dam should also be undertaken.

In this series of examinations a diagnosis was reached in 26.6 per cent of the seventy-nine foetal specimens examined. This percentage would probably have been greater had more complete specimens been submitted but the number of unexplained abortions would have formed at least two thirds of the total.

The low incidence of brucellosis encountered is probably due to the increasingly wide spread use of strain 19 brucella vaccine. An abortion storm was not associated with either of the two cases.

Rift valley fever was found to occupy the position of prime importance as the causal agent of abortions. It was responsible for 10 per cent of all abortions investigated. On three of the farms an abortion wave was reported to have taken place. It is not possible to assess what losses may have been incurred in ranch herds but it could be considerable. All the specimens examined were from dairy and pedigree beef herds where the supervision is fairly close and abortions would be readily detected.

Two abortions were diagnosed as being due to yeasts. Only one previous case of the recovery of a yeast from a foetus has been recorded, viz. that of Candida tropicalis by Austwick and Venn, (1957).

The greatest number of abortions took place in July and August without a concomitant increase in the aetiology of the abortions being determined. This falls outside the period in which the arthropod borne viruses, which have a definite seasonal incidence, occur. There is no evidence to suggest at this stage that an infectious agent is involved.

A short sharp rise of unexplained abortions was also recorded in December. This corresponds with the period of greatest flush of green grass but this association may be coincidental.

In order to find the cause of some of these abortions it will probably prove necessary to investigate the basic processes of an abortion. It would, for instance, be of value to be able to determine whether an abortion was primarily due to death of the foetus or to some failure of the attachment of the foetal and maternal cotyledons.

It has long been considered that a number of abortions in this country take place as a result of injury to pregnant cows when they are put through a dip tank but no definite evidence has as yet been offered of the correctness of this belief.

SUMMARY

The examination of a series of seventy-nine aborted bovine foetal specimens over a twelve month period is recorded. The agents responsible for the abortions were:-

Rift Valley fever	8	cases
Mycotic	3	,,
Brucella abortus	2	,,
Vibrio fetus	2	,,
Babesia bigemina	2	,,
Corynebacterium pyogenes	1	,,
Salmonella enteriditis	1	,,
Streptococcus	1	,,
Lantana camara poisoning	1	,,

A marked increase was noted in the number of unexplained abortions in July and August as well as a short sharp rise in December.

Two cases of abortion due to yeasts are recorded.

ACKNOWLEDGEMENTS

We wish to express our appreciation to Messrs. F. J. Becks and B. M. Vickers for their technical assistance and to Messrs. F. J. A. Waller and A. Craddock for their care and attention of the cattle used for experimental purposes.

We also wish to express our appreciation to all those who submitted specimens, many of whom undertook considerable journeys to ensure their receipt in a good condition.

REFERENCES

Austwick, P. K. C. and Venn, J. A. J. — Routine investigations into mycotic abortion. Vet. Rec. *69*: 488-491.

Bevan, L. E. W. (1914) — Annual report of the Government Veterinary Bacteriologist for the year ending 31st March, 1914.

Bishop, G., Schatz, W., and Canham, A. S. (1943) — Salmonella enteriditis var. Dublin infection in adult cattle. J. S.A. Vet. Med. Ass. *14*: 67-72.

Boyt, W. (1956) — Personal communication.

Canham, A. S. (1937) — Tuberculosis — an occasional cause of abortion in cattle. J. S.A. Vet. Med. Ass. *8*: 147-150.

Canham, A. S. (1948) — Vibrio foetus infection in cattle. J. S.A. Vet. Med. Ass. *19*: 103-104.

Lawrence, D. A. (1948) — Annual report of the Assistant Director of Veterinary Services (Research) for the year ending 30th September, 1948.

Robinson, E. M. (1918) — Contagious abortion of cattle in South Africa. 5th and 6th Rep. D.V.R., Union of S.A. p.p. 337-373.

Robinson, E. M. (1937) — Trichomonas infection in a heifer and a brief review of abortion in bovines due to trichomonas infection. J. S.A. Vet. Med. Ass. *8*: 134-140.

Shone, D. K. (1957) — Rift Valley fever in Southern Rhodesia. Central African J. of Med. In press.

Sinclair, J. M. (1922) — A short history of the infective diseases amongst domestic animals of Southern Rhodesia since the occupation.

Snyman, P. S. (1931) — Vibrio foetus as a cause of bovine abortion in South Africa. 17th Rep. D.V.S., Union of S.A. p.p. 197-201.

Van der Linde (1953) — A recent epidemic of Rift Valley fever in the Orange Free State J. S.A. Vet. Med. Ass. *24*: 145-148.

THE TREATMENT OF LUNGWORM IN SHEEP

J. E. DORRINGTON

Bellville.

The following is a report on the use of the new drugs "Dictycide" and "Helmox" (Cyanacethydrazide) (I.C.I.) for the treatment of lungworm. (The former administered subcutaneously and the latter per os.).

History.

Some 250 Merino sheep were brought from Ceres and the Karroo to a farm here in the Western Province in March, 1957. Their average condition was fair. After a month or so they showed signs of intestinal parasitic infection and were twice treated with a marked subsequent improvement. From the beginning of August however, the farmer informed me that they were not doing very well even though they were on luscious mixed lucerne pastures. I advised supplement grain feeding and housing under shelter at night as we were experiencing a very wet and cold August and the ewes were lambing down at the time. By the end of August there was no improvement and deaths were occurring almost daily.

On 2.9.57 I was called out to perform an autopsy and diagnosed Dictyocaulus filaria infestation as the cause of death. Careful examination for intestinal worm parasites proved negative. Clinical examination of the rest of the flock showed general emaciation with coughing a prominent symptom amongst the Merinos but not amongst the German Merinos resident on the farm for some time. Worm specimens obtained from the terminal bronchi were sent up to Dr. R. J. Ortlepp, Onderstepoort who subsequently confirmed my diagnosis. Extensive enquiries were made to obtain the newly advertised drug 'dictycide' and on 20.9.57 a limited quantity was gratefully received.

Procedure.

Due to the scarcity of the drug, the whole flock was divided into two groups. The first group consisted of 190 Merino sheep showing no coughing and was given only one dose of the orally administered "helmox." The second group consisted of 56 coughing Merinos and was given the full recommended schedule of treatment as follows:-

On 20.9.57 they were given the subcutaneously administered "dictycide" made up according to the instructions. Although some were given twice the recommended dosage no adverse symptoms were seen while in fact the next day the farmer reported a marked decrease in coughing and to date no single death has subsequently occurred. On the 5th day following the first treatment, the orally

administered "helmox" was given and again on the 21st day. No adverse symptoms were observed where "helmox" was used and there was no marked difference between the time taken in administering the two forms of the drug.

Efficacy of the Drug.

Although I was unable to examine any lungs again after the treatment (because none died) I feel justified in saying that this first limited clinical trial in S.A. of the drugs "dictycide" and "helmox" for lungworms in sheep, demonstrated a very marked beneficial effect on the treated sheep for the following reasons:-

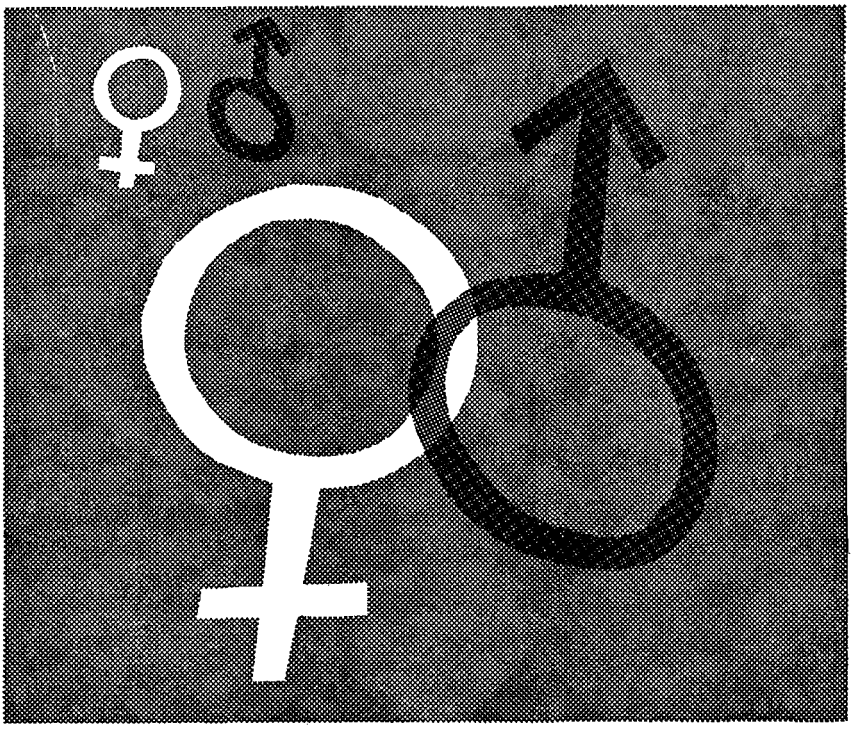
(1) Mortality suddenly dropped after the first treatment even though climatic, housing and grazing conditions remained exactly the same.

(2) Coughing rapidly decreased with a few isolated coughs still persisting today (probably as a result of secondary lung damage by the heavy infestation of the lungworms) and

(3) The general condition of the flock has improved markedly.

Thanks.

A special word of grateful thanks to Mr. G. Whittington-Jones of I.C.I. (Cape Town) for his keen interest and unstinting help in procuring the limited supply of "dictycide" and "helmox."



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MESENTERIC THROMBOSIS IN EQUINES: WITH A NOTE ON A POSSIBLE LINE OF TREATMENT

A. LITTLEJOHN
Mooi River.

The following five cases of Mesenteric Thrombosis are presented with a note on the diagnosis and suggested treatment.

Case 1.

"Tiller Girl."

A promising "Tenon" filly, showed the usual acute abdominal distress of a more or less continuous nature. A diagnosis of acute abdominal catastrophe was made — either a complete stoppage or a mesenteric thrombosis — and a near hopeless prognosis was given. Treatment, as is usual in cases of this nature, produced no results, either in the faeces or in alleviation of symptoms.

The filly died within a few hours and a post-mortem showed a thrombus adherent to the wall of the anterior mesenteric artery. The thrombus was in the nature of a plug, firmly affixed to the intima, but not completely occluding the artery. No parasitic larvae could be found. The caecum, colon and small intestines were haemorrhagic and friable. The filly lived for approximately 20 hours after symptoms were first noticed.

The case is of interest since this filly had been injected with gonacrin a few weeks previously by a layman — unfortunately resulting in a jugular phlebitis with a slough 9 inches by 5 inches. No relation however, could be established between the jugular phlebitis and the mesenteric thrombosis.

Case 2.

"Fatima."

A "Nord Express" grey mare, 20 years old, and the dam of "Magic Carpet." This case showed a continuous colic of gradually increasing severity unimportant, though occasionally alleviated, by treatment. A diagnosis of mesenteric thrombosis was made in this case, and the mare died three days after the onset of symptoms. Autopsy disclosed a large thrombus in the anterior mesenteric artery, almost totally occluding the lumen of the vessel. No parasitic infestation could be found embedded in the anterior mesenteric artery. The caecum, colon and small intestines were intensely haemorrhagic, and in a few places the contents were bloodstained.

Case 3.

"Hyaline."

A 19 year old imported "Hyperion" mare. In extremis on my arrival at the farm, and showed continuous colic increasing in

severity until death. A tentative diagnosis of mesenteric thrombosis was also made in this case, but only pethidine was administered, for humane reasons. The mare died approximately 24 hours after the onset of the symptoms, and a post mortem disclosed a well developed thrombus in the anterior mesenteric artery, infested with parasitic larvae. Thrombi were also present in the ileo — caeco— colic artery, and along the course of the lateral caecal artery for a distance of 18 inches. Parasitic larvae were present in nearly all of these thrombi which were associated with numerous small abscesses varying in size from a pin's head to a pea along the course of the lateral caecal artery.

Case 4.

A two month old thoroughbred foal. This case showed acute symptoms of colic suggestive of mesenteric thrombosis and was treated with prostigmin and large doses (68) of liquid paraffin. The tentative (and wrong) diagnosis was made, and the foal was treated for biliary fever with Trypan blue, penicillin and adrenalin. The foal died the same morning, and autopsy disclosed a large thrombosis in the cranial mesenteric artery infested with parasitic larvae, an abscess in the internal inguinal lymphatic gland, the size of a large orange, a gross infestation with tapeworms and strongyles, and a swollen and degenerated liver.

Case 5.

An 18 year old light draught mare. This mare showed symptoms of colic suggestive of mesenteric thrombosis and was treated with prostigmin and large doses of liquid paraffin. The mare showed patchy sweating, continuous pain evidenced by a fast pulse, somewhat injected mucous membrane, and an almost complete cessation of peristalsis, with faeces being voided in very small quantities, and at excessively long intervals. She would lie down for long periods at a time with occasional kicking, and rolling and showed no interest in food. Treatment gave no improvement.

A definite diagnosis of mesenteric thrombosis was made the following day, and permission obtained from the owner to try what the writer believes to be an original approach to thrombosis in equines. Sodium nitrite was administered slowly intravenously. At this stage the mare was down, rolling and kicking occasionally; she had eaten nothing for at least 24 hours. A favourable result was obtained when the mare rose after 20 minutes, walked outside, and started grazing. Both pulse and respiration were markedly improved. For nearly 24 hours the mare continued to improve but the following day she relapsed, and again showed colic symptoms. Another intravenous injection of sodium nitrite produced the same favourable response. She again got up, walked out of the shed, in which she was lying, and began to graze. On both occasions no treatment other than sodium nitrite was given. Administration of the drug produced a shivering of the shoulder and flank muscles,

a temporary quickening of the pulse, and a slight watering of the eye.

The mare continued in good fettle for one week, and then relapsed once more showing the same symptoms. It was decided to destroy the mare, both on account of her age and on economic grounds. Autopsy disclosed a well developed thrombus in the anterior mesenteric artery with numerous parasitic larvae present.

The action of the nitrites on blood vessels is put to use particularly in the medical world. Amyl nitrite, for instance, is used by sufferers from coronary thrombosis, as an inhalation. Sodium nitrite is however, the only one suitable for intravenous use and in addition is thought to have an effect on blood vessels of the splanchnic area. It thus presents itself as a suitable drug for use in mesenteric thrombosis in equines.

The diagnosis does present difficulties; the following may serve as a guide.

(1) Colic symptoms are continuous but vary in severity according to the extent of the thrombus.

(2) There is no flatulence (this, in the writers opinion, is of great diagnostic significance).

(3) Cessation of peristalis and almost total cessation of defoecation.

(4) Administration of prostigmin or similar drugs produces little or no defoecation.

(5) Rectal examination shows a flaccid bowel with no flatulence. Differential diagnosis — (a) Twisted bowel. (b) acute obstruction of bowel. (c) rupture of stomach. (d) biliary fever (as the writer admits with humility).

Both "Fatima" and "Hyaline" were heavy in foal at the time of death. This may have accelerated the onset of symptoms, due to the heavy demands made by pregnancy on the blood vascular system. It is possible however, that treatment with sodium nitrite, (supplemented with symptomatic treatment as required) might have kept these two mares alive until the birth of their foals, the value of which, in the case of "Fatima" at any rate, would possibly have exceeded four figures.

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AFRICA SPECIAL

NEW YORK, December — Discovery of a deterrent against East coast fever, costly cattle plague in the Union of South Africa and other countries where ticks abound, is reported in the Bulletin of the International Bureau of Epizootics.

The report, by J. Euzeby, summarizing the latest international studies on tick-bone animal diseases discloses that resistance against the malady can be provided with a feed addition called aurofac.

The scientist notes that tick-borne diseases of the type of East coast fever have been found stubborn to cure, and asserts: "The use of aurofac xxx administered by mouth during 28 days to calves exposed to the infection (of East coast fever) permits the animals to avoid serious illness and to acquire a specific resistance."

Continuing the analysis of aurofac, use of which in animal feeding is standard procedure in many countries, the report notes: "This chemopreventative can be had at a price compatible with cattle raising income."

The scientist reports that East Coast fever (*Theileria parva* infection) is responsible for high mortality among the 12 million head of cattle in East Africa. A related disease, "Tropical Gonderiosis" (*Gonderia annulata,* infection) causes severe losses in Asia. By way of example, latest figures of the Epizootic Bureau, with headquarters in Paris, show that in Iraq the disease took a month's toll of 141 head in deaths and sacrifice slaughter.

Veterinarians from South Africa, England, Kenya, Uganda, Tanganyika, Southern Rhodesia, Malaya, Australia, United States, West Germany, Italy, Denmark, Yugoslavia, Spain, Holland, Argentina, Egypt, Sudan, Libya, South Korea, France and Algiers participated in a meeting in Rome on which the scientist's report was based. The meeting was sponsored jointly by the U.N. Food and Agriculture Organization and the Epizootics Bureau.

BLOAT

(News Letter)

Recent work in America claiming good results in the prevention of bloat by dosing small amounts of penicillin, has aroused considerable interest in South Africa and many farmers are apparently trying the method on their own initiative. The present position is hereby summarized for the information of veterinarians.

The original work was done by Barrentine, who claimed that 50,000 to 75,000 units of procaine penicillin *per os* protected steers weighing some 900 lbs. from bloat for $1\frac{1}{2}$ to 3 days. The protective action commenced some 8 to 12 hours after dosing. The penicillin was given in salt (50 mg.=50,000 units per oz.) and was stabilized by the addition of 0.25% mineral oil.

Dr. Roux, Agricultural Attaché in Washington, has kept me informed of the subsequent developments. The following are the most important points.

The salt mixing has not proved entirely satisfactory and many workers have tried dosing in capsules. Trace elements in the lick destroy the penicillin very rapidly.

Several unsuccesful experiments have been reported and in some cases the animals have gone off their feed.

Dr. Johns of New Zealand reports as follows:-
Doses of 100,000 to 200,000 units were tried on identical twins. "Good control was obtained. In no case did treated animals bloat as badly as untreated controls." Another experiment is reported as being only 50% effective."

It is claimed that no penicillin passes into the milk and the treatment causes no significant effect on the quantity or quality of the milk or butter fat.

Dr. Johns concludes — "The use of penicillin in the control of bloat is still in the experimental stage."

It will therefore be seen that the use of penicillin is not the complete answer to the bloat problem. The following questions have still to be answered.

(1) Is all frothy bloat caused by penicillin susceptible organisms? The varying results reported indicate the answer — no.

(2) Even if such organisms are responsible, can they develop a resistance? It is quite likely. A recent report from Iowa states:- "Penicillin reduced bloat initially but the effect was transient."

(3) Can continued dosing affect the functional organisms? See the report that animals went off their feed.

(4) Can such small doses cause sensitization or the development of resistant pathological strains?

After working with penicillin in New Zealand, Dr. Johns concludes that oil is still the safest and most effective remedy.

In the face of the evidence available we still maintain that bloat should be combated by:-

1. *Feeding Roughage.*

Ruminants on finely ground concentrates and succulent greens require coarse hay. Not only does it help to reduce bloat but it also increases butter fat. We consider that it also aids in preventing metabolic disturbances such as milk fever and acetonaemia.

2. *The Dosing of Oil.*

There are numerous reports on the successful control of bloat by dosing vegetable oil regularly. (See the Farmers Weekly — October 16, 1957). One to three ounces per day are usually required. The oil may be dosed or fed in a mash before the animals are grazed. The oil works purely by surface tension action and its effectiveness is therefore independent of the type or organism involved. The best and cheapest oil available is probably peanut oil.

Many farmers use motor oil, new or used. In the case of used oil there is a possible danger of chronic lead poisoning. Even where new oil is used there is the danger that the mineral oil, being indigestible, may carry fat soluble vitamins and other nutriments through the tract and so prevent their absorption. Both these effects would take a considerable time to show up. Long term experiments are being planned to determine the effect of continuous dosing with motor oil.

3. *The cautious use of penicillin where the above methods fail.*

In conclusion we would appeal to all veterinarians to keep us informed on the bloat position in their areas and the methods used by farmers to combat it. Any information on the effects of long term dosing of motor oil would also be of great value.

A CASE OF CLOSTRIDIUM WELCHII (TYPE A) INFECTION IN A DOG

J. K. THOMPSON and C. H. BASSON
Cape Town.

The subject was a valuable pedigree dog belonging to a farmer in a remote area. It had shown symptoms of biliary fever and had been treated by the owner, who had given it a subcutaneous injection of one of the standard drugs in general use for the treatment of this disease. The injection site was on a hairless patch on the abdomen, two inches lateral to the preputial opening.

A few hours after the injection the animal was in great distress, and the owner decided to call in a veterinary surgeon.

At the site of the injection there was a circular area of dark purple discolouration approximately one and a half inches in diameter. From this an oedematous swelling approximately three inches in depth extended along the ventral surface of the abdomen to the axilla of the left fore-leg. The temperature was 106 degrees F. and the animal showed symptoms of acute toxaemia. 400 mgms. Terramycin were given intravenously at intervals of 6 hours, but the condition of the patient rapidly deteriorated, and death occurred 14 hours after the commencement of the treatment.

On P.M. examination the changes were confined to the abdominal and pectoral muscles which were swollen and dark red in colour. The possibility of gas-gangrene was considered, and a portion of muscle was taken to the Regional Veterinary Laboratory.

From the deeper layers of the specimen, small portions were excised and used as inocula for Robertson's-cooked meat medium. On subculture, little difficulty was experienced in the production of typically colonies of Clostridium welchii under anaerobic conditions. Specific confirmation was obtained on Nagler's medium and a typical Nagler's reaction was obtained.

Two swabs from a pure culture were sent to Onderstepoort for typing and the organism was found to belong to type A.

The main points of interest are the relatively rare occurrence of Cl. welchii infection in the dog, the unusual mode of it, and the clinical symptoms.

ACKNOWLEDGEMENTS

We wish to acknowledge the kindness of Dr. B. C. Jansen of Onderstepoort who typed the organism. Our special thanks are also due to Mr. D. van der Merwe of the Union Health Laboratory and his staff for valuable advice and assistance in its isolation and identification.

BEPALING VAN BLOEDGROEPE BY HUISDIERE

D. R. OSTERHOFF

Onderstepoort.

Bloedgroepbepaling is die belangrikste hulpmiddel in immuno-genetika, wat omtrent 50 jaar oud is. Onder immuno-genetika word daardie deel van die erflikheidsleer verstaan, wat te doen het met die oorerwing van spesiale bloedeienskappe. Die vader van Immuno-genetika is die Amerikaner M. R. Irwin. Bloedgroep-bepaling berus op die immuniteitsreaksie van die liggaam, d.w.s. op sy vermoë om beskermings-stowwe teen sekere vreemde stowwe wat in die bloedstroom ingevoer word, op te bou.

Vanaf 1938 word die immuniteitsreaksie ook gebruik om die bloedgroepe by huisdiere te bestudeer. Na 'n lang en moeilike tydperk het die navorsing sowat tien jaar gelede 'n stadium bereik waar dit prakties aangewend kan word. In 1952 is bloedlaboratoria vir diere in Kanada en Denemarke gestig, in 1953 in Swede, Norweë en Holland, en 'n jaar gelede ook in Suid-Afrika.

Dit word gehoop en verwag dat die studie van bloedgroepe ons 'n duidelike beeld sal verskaf van die erflikheidskema van die hoëre diere. Die hoop bestaan dat resultate, soortgelyk aan die by die mens, verkry sal word. Daarom is dit belangrik om 'n kort oorsig oor navorsing van bloedgroepe by die mens te gee.

In hierdie opsig is Karl Landsteiner, wat reeds in 1901 met die navorsing begin het, veral bekend. Hy het bloedliggaampies van sy kollegas gemeng met bloedsera en bewys dat die bloed-liggaampies eienskappe besit wat hul indeling in groepe moontlik maak. Terselfdertyd het hy gevind dat die sera teenliggaampies (agglutinines) teen daardie bloedseleienskappe, wat hy die hoof-letters A en B gegee het, bevat. Individue wat nog A, nog B bevat, is in 'n derde groep geplaas wat die hoofletter O gegee is. Ander navorsers het 'n vierde groep gevind, wat hulle AB genoem het.

In 1926 het Landsteiner saam met Levine nuwe bloedgroep-eienskappe ontdek, waaraan die hoofletters M, N en P toegeken is. In 1939-1940 het Lewine en Stetson, en Landsteiner en Wiener gelyktydig die Rhesusfaktor ontdek.

Die huidige stand van kennis kan as volg opgesom word: Die bloedgroepeienskappe, bloedfaktore, of bloedantigene is aan die oppervlakte van die rooibloedliggaampies gebind. Hulle het gewoonlik antigeniese eienskappe, wat die opbou van teenliggame bewerkstellig sodra hulle in die bloedstroom van 'n ander individu ingevoer word. Hierdie teenliggaampies word gebruik om die bloedfaktore te diagnoseer. Sommige teenliggame kom normaal in die serum voor, ander word gedurende swangerskap opgebou,

terwyl nog ander deur bloedoortappings (immuniserings) verwek word. Die hele bloedgroepbepaling is dus op 'n antigeen-teenliggaamreaksie gebaseer. 'n Bepaalde antiserum kom ooreen met 'n bepaalde bloedfaktor of antigeen. Die woord „bloedgroep" kan misleidend wees; in die reël word bedoel een of meer bloedfaktore of antigene, terwyl bloedgroep O beteken, dat 'n bepaalde antigeen afwesig is.

Die bloedantigene is almal eienskappe, wat volgens die wet van Mendel oorgeerf word. Die genes vir die bloedantigene het hul plekke (*loci*) op die 24 kromosoompare, saam met dié vir al die ander oorerflike eienskappe.

Die bloedgroepe A, B en O het hul genes op 'n bepaalde kromosoompaar, en die vir die bloedgroepe M, en N op 'n ander kromosoompaar. Die bloedgroepgenes is dus „allelomorfe genes" of „veelvuldige allelle". Die bloedgroepe, wat op dieselfde kromosoompaar behoort, vorm saam 'n sisteem. Die tot sover bekende bloedgroepsisteme word by wyse van oorsig genoem, naamlik:

1. die ABO-sisteem
2. die MNS-sisteem
3. die Rh-Hr-sisteem
4. die P-sisteem
5. die Kell-sisteem
6. die Lutheran-sisteem
7. die Duffy-sisteem
8. die Lewis-sisteem
9. die Kidd-sisteem
10. die Diego-sisteem; en
11. seldsame faktore soos: Levay, Gr (Graydon), Mi^a (Miltenberger), Becker, Be^a (Berrens), Ca (Cavahire), Wr^a. Die genes wat aan verskillende kromosoompare gebind is, word onafhanklik van mekaar oorgeërf; gevolglik word ook die verskillende bloedgroepsisteme onafhanklik van mekaar oorgeërf.

Die bloedtipe van 'n individu beteken dus: die som van alle bloedgroepe wat in die individu voorkom, dit is die bloedgroepe van 10 verskillende sisteme.

Die betekenis van die bloedgroepe en hul toepassing by die mens

Dit is wenslik om die toepassing van bloedgroepe by die mens in breë trekke te bespreek, aangesien hierdie gebiede by die mens en by huisdiere, en in besonder by beeste, baie ooreenstem. Hulle is as volg:

1. Bloedoortapping.
2. Vaderskapbepaling.
3. Bepaling van rasse-verskille (Antropologie).
4. Ondersoek van fetale sterfte (*erythroblastosis foetalis*).

1. Reeds kort na Landsteiner se eerste proewe in 1901, is die praktiese betekenis van bloedgroepe by bloedoortappings erken. Voor daardie jaar het oortappings met groot risiko's gepaard gegaan, en het dit dikwels ernstige reaksies in die ontvanger veroorsaak, omdat die ontvanger teenliggamme teen die bloedliggaampies van die gewer besit het. In die meeste gevalle was dit teenliggame teen die A- en B-antigene.

   Die ABO-sisteem speel 'n groot rol by bloedoortappings; die Rh-Hr-sisteem is die oorsaak van die meeste gevalle van oortappingshemolise; die Lewis-sisteem speel geen rol nie, en al die ander sisteme kan partykeer hemolise veroorsaak.

2. Nadat die oorerwing van die bloedgroepe bekend geword is, is dit met sukses in die regsgeneeskunde toegepas. Waar meer as een man van vaderskap verdink word, kan die bepaling van hul bloedgroepe help om die werklike vader aan te toon, en alhoewel dit selde gebeur dat die moeder van 'n kind nie bekend is, is bloedgroepbepalings al gebruik om die moeder aan te toon waar babas per ongeluk in Kraaminrigtings omgeruil is.

   Die kanse om met behulp van die ABO-sisteem en die MN-sisteem die regte vader te vind is slegs 33%. Daarenteen styg die kanse tot 60-70%, met die gebruik van die orige sisteme. Ongelukkig is daar net 'n beperkte aantal faktore wat in roetinetoetse gebruik kan word naamlik:-
   A, B, O, M, N, Rh, rh′, rh″ en hr′.

3. Bloedgroepbepaling speel ook 'n belangrike rol in die Antropologie en die Etnologie. Die grondslag vorm die verspreiding van die verskillende bloedgroepe onder die verskillende volke. Taylor en Fisher het byvoorbeeld gevind dat die verhouding tussen A, B, AB, en O in Skotland, Noord-Ierland en Ysland naastenby dieselfde is, en ook in die Skandinawiese lande. 'n Mens kan daaruit aflei, dat die kolonisasie van Skotland, Ierland en Ysland vanuit Skandinawië in die tyd van die Noormanne plaasgevind het.

   Tyd laat nie toe om alle rasonderskeide te noem wat op bloedgroepe gegrond is nie. Volgens Boyd kan die volke van die wêreld volgens hul bloedgroepe naastenby as volg ingedeel word:-

   A. EUROPA.
      1. Vroeë Europeane (Baske, Berber).
      2. Laplanders.
      3. Noord-Wes-Europeane.
      4. Oos- en Sentraal-Europeane.
      5. Bewoners van die lande om die Middellandse See.

   B. AFRIKA EN ASIË.
      6. Nie-blanke rasse van Afrika.
      7. Asiatiese rasse.
      8. Indo-Dravidiese rasse.

C. AMERIKA.
9. Indiaanse rasse.

D. STILLE OSEAAN GEBIET.
10. Indonesiese rasse.
11. Melanesiese rasse.
12. Polinesiese rasse.
13. Australiese rasse (inboorlinge).

4. Die huidige verklaring van fetale sterfte is algemeen bekend. Die Rhesusfaktor — genoem na die Rhesusaap (*Macacus rhesus*) is omtrent terselfdertyd deur Landsteiner en Wiener en deur Levine en Stetson ontdek. Hierdie faktor is teenwoordig in sowat 85% van die blanke bevolking van Amerika en Wes-Europa. Die Baske in Noord-Spanje is 'n uitsondering; by hulle verskyn die faktor in sowat 65%. Die geel en swart rasse is omtrent 100% Rh-positief.

Die oorerwing van die Rh-faktor geskied op dieselfde manier as die ander bloedfaktore, maar dit is meer ingewikkeld, omdat daar nie minder as 28 ondergroepe in die betrokke sisteem gevind word nie. Die hoofindeling in Rh- positief en Rh-negatief het dieselfde gebly.

Die Rh-faktor is van groot betekenis, omdat teenliggame teen hierdie faktor deur die moeder opgebou en na die kind oorgedra kan word. Die Rh-positiewe kind van 'n Rh-negatiewe moeder en 'n Rh-positiewe vader kan die opbouing van sulke teenliggame in die moeder aan die gang sit. In so 'n geval kan óf 'n aborsie plaasvind, óf 'n normale geboorte, met die gevaar van hemolitiese ikterus, wat die kind se dood mag veroorsaak (*Erythroblastosis foetalis*).

Die kans vir hierdie toestande is groter by vroue wat alreeds kinders gehad het. Die rede is, dat vrouens, wat normale Rh-positiewe kinders gehad het, makliker gedurende die volgende swangerskap geïmmuniseer word. Teoreties word sowat 10 persent van huwelike daardeur getref. In die praktyk, egter, kom hemolitiese ikterus net in één uit 400 geboortes voor. Die rede hiervoor is nog nie vasgestel nie. As 'n Rh-negatiewe vrou deurgaans geboorte gee aan kinders met hemolitiese ikterus, word daardeur bewys dat haar man homosigoties Rh-positief is. As die man egter heterosigoties is, dan is die kanse 50-50 dat die vrou 'n gesonde kind sal hê.

Verdere samehang tussen bloedgroepe en siektes is in die laaste tyd deur Britse navorsers vasgestel. Aird en medewerkers konstateer, dat in sommige volke 'n persoon met bloedgroep O 'n amper 35% groter kans het om 'n maagsweer te kry as persone met ander bloedgroepe. Verder word beweer dat mense met bloedgroep A meer vatbaar is vir maagkanker as ander mense. Pike en medewerkers het bewys, dat by vroue met die bloedgroep O die gevaar vir toksemie by swangerskap groter is as by vroue met ander bloedgroepe.

Al hierdie feite is goeie vingerwysings by die ondersoek van die verband tussen bloedgroepe en siektes by diere, veral omdat daar tot datum so min bekend is op hierdie gebied.

Bloedgroepe by Perde

Verskillende navorsers het op hierdie gebied gewerk, maar die resultate is nog nie opgesom en vergelyk nie. Daarom kan vaderskapbepalings nog nie gedoen word nie.

In 1935 het Kaempffer die bloedgroepe van perde ondersoek. Hy beweer, dat hy 6 paar agglutinines en hul ooreenstemmende teenliggaampies gevind het, d.i. A-a, B-b, C-c, D-d, E-e, en F-f. In 1939 het Lehnert beweer, dat sekere bloedgroepe van die perd ooreenstem met die ABO-groepe van die mens. Hosoda (1947) het dieselfde resultate as Lehnert gekry. Eyquem, Mme. L. Podliachouk en P. Millot van die Instituut Pasteur het die bloedgroepe van perde in vier klasse ingedeel: O, B, A, AB. Daar was egter baie uitsonderings, en op die ou end het hulle 11 hoofantigene by die ekwide gevind, en hulle die letters A tot K gegee. Al hierdie antigene is by muile gevind, 10 daarvan by perde, terwyl antigeen B veral by donkies voorkom. Om die aanwesigheid van die antigene by verskillende rasse aan te dui is 162 volbloedperde, 47 koubloedperde, 21 muile en 112 ander perde gebruik.
Dit is vasgestel, dat:

1. die antigene dominant oorgeërf word.
2. die allele pare onafhanklik oorgeërf word.
3. 'n koppeling bestaan tussen antigene A en E.

Op een gebied skyn praktiese toepassingsmoontlikhede te bestaan. Van Engeland, Amerika en Holland word berig, dat hemolitiese ikterus direk na geboorte in vullens kan voorkom. Dit is moontlik vergelykbaar met die fetussterfte by die mens (Rh-faktor). Hierdie hemolitiese ikterus tree van 12-96 uur na 'n normale geboorte in, en gewoonlik eers nadat die vul gesuip het. Dat die siekte eers optree nadat die vul gesuip het, toon dat die teenliggaampies in die moedersmelk voorkom. Die verskil tussen hierdie vorm van mortaliteit by die mens en by die perd rus daarop, dat by die perd die opgeboude teenliggaampies nie deur die plasenta van die merrie na die vul oorgedra word nie. Die verklaring lê daarin, dat daar by die mens prakties gesproke net één sellaag, behalwe die fetale endoteel, voorkom, terwyl by die perd vier lae selle die bloed van die moeder en fetus skei.

Bruner e.a. (1950) kon bewys, dat die vul die vermoë verloor om teenliggaampies deur die dermwand te absorbeer as hulle 24-36 uur na geboorte in die maag van die vul geplaas word. Een moontlikheid om die siekte te vermy, is om die vul van die merrie te skei. 'n Mens melk die merrie gedurende die eerste 36 uur met die hand; daarna kan die vul weer gesoog word.

'n Soortgelyke toestand word volgens Franse berigte by muile aangetref.

Bloedgroepe by Varke

Die bloedgroepe by varke kon vroeër op grond van normaal verskynende teenliggaampies in drie ingedeel word. Party navorsers was van mening dat hierdie indeling te streng skematies was en nie alle kombinasies ingesluit het nie. In 1954 het Szent en Szabo vier normaal verskynende agglutinines A, B, C en D, in varkbloed gevind.

Skynbaar is dit nie moontlik om 'n groter aantal normaal verskynende, agglutinines in varkbloed te vind nie; daarom het Andresen met iso-immunisering begin. Hy kon op hierdie manier deur die direkte agglutinasietoets E, F en G vind, terwyl H, I, J en K net deur die indirekte antiglobulinetoets vasgestel kon word. Vir roetinetoetse is lg. te ingewikkeld, en Andresen is nou besig om eenvoudiger metodes te ontwikkel. Sy breedvoerige genetiese studies het bewys dat die drie faktore E, F en G onafhanklik en dominant oorgeërf word.

Ek wil graag meld dat ons hier in Suid-Afrika ook die toetssera van Andresen ontvang het, ten einde 'n rassevergelyking tussen die ingevoerde Sweedse en Hollandse „Landras"-varke te tref.

Dit is noemenswaardig dat Amerikaanse en Hongaarse navorsers bewys het dat hemolitiese ikterus ook by varke voorkom. Vir die ontwikkeling van hierdie siekte by speenvarkies is die onderlinge antagonisme van die bloedgroepe verantwoordelik; dit kan met die Rh-faktor by die mens vergelyk word en verloop soos hemolitiese ikterus by perde. In al hierdie gevalle skyn dit asof die nakomelinge sekere antigene wat nie in die bloed van die moeder aanwesig was nie, van hul vader oorgeërf het.

Die antigeen wat die oorsaak is van die immunisering van die sog en die hemolitiese ikterus by speenvarkies verwek, word deur die Hongaarse navorsers die Su-faktor genoem. Die vraag is nog nie beantwoord, wat die verband is tussen die Su-faktor, die normaal voorkomende eritrosietantigene A, B, C en D en die faktore E, F, G, H, I, J en K, wat deur immunisering geproduseer word nie.

In hierdie simptoomkompleks is die foetusontwikkeling heeltemal normaal en die bigge word gesond gebore. Omtrent 48 uur na geboorte, hou die varkies op met suip en begin te bewe, struikel en kreun. Hul urine is rooi of koffiekleurig. Die meeste van die aangetaste varkies gaan dood omtrent 36 uur na die aanval. Die sterftesyfer kan so hoog as 70% wees, en die oorlewende varkies bly verpot. Die enigste wat 'n mens kan doen is om die varkies aan 'n ander sog te laat suip, en die sog deur 'n ander beer te laat dek.

Bloedgroepe by Skape

In 1938 het T. Andresen by die skaap 'n antigeniese faktor R gevind, wat met normaal verskynende teenliggaampies (anti-R) reageer. Die meeste diere waar die faktor R ontbreek, het 'n ander

faktor r, wat deur reaksies met teenliggaampies in beesbloed vasgestel is. Diegene wat die R-faktor dra is dominant oor die wat die r-faktor dra, maar daar is tog individue wat nog met anti-R nog met anti-r reageer. Dit is bewys dat hierdie individue, wat met die letter i benoem is, homosigoties is vir 'n resessiewe gene wat sowel die R as die r faktore onderdruk. Die oorerwing van hierdie drie bloedtipes R, r, i word as volg uitgelê: die resessiewe gene i is epistaties wat betref die dominante R en waarskynlik ook tot r, sodat die groep R = i/–, R/–;

,, r = i/–, r/r; en

,, i = i/i, R/–; of i/i, r/r.

Die antigeniese hoedanigheid van die skaapbloedliggaampies is dus die resultaat sowel van dominansie as van epistase, iets wat baie selde in die immunogenetika voorkom.

Behalwe die drie normaal verskynende antigeniese faktore, is daar nog 9 wat deur iso-immunisering met skape, of deur heteroimmunisering met konyne gevind is. Hierdie 9 faktore, wat A, B, C, D, E, F, G, H en K genoem word, word deur verskillende genes gedra en is dominant. Hierdie navorsingswerk is nog in die beginstadium, en waarskynlik sal daar nog meer faktore gevind word.

Bloedgroepe by Hoenders

Deur iso-immunisering is by hoenders twee onafhanklike reekse allelle gevind: een A-allelreeks met 9 allelle en een B-allelreeks met 5 verskillende allelle. Ons het met veelvuldige allelle te doen, wat as antigeniese komplekse van generasie tot generasie oorgedra word. Die antigeniese komplekse toon 'n afwesigheid van dominansie, elke allel produseer sy eie antigeniese stof onafhanklik van die ander allelle.

Hierdie vorm van antigeniese kompleksopbouing, en van onafhanklike oorerwing, word later by die bees verduidelik.

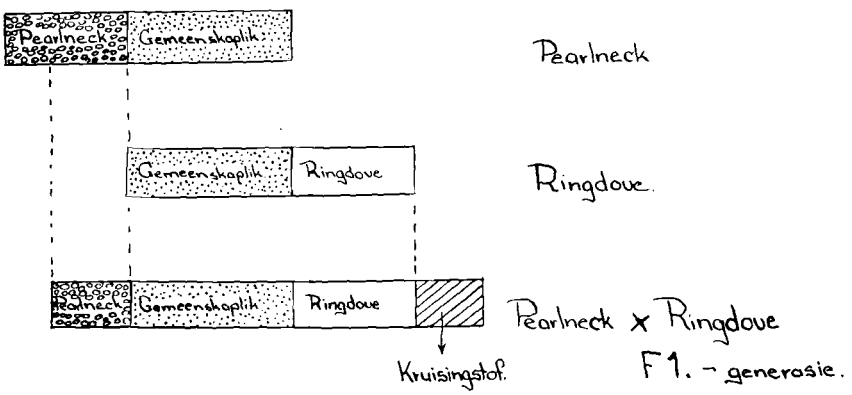
Hoenders, en veral duiwe, vorm die interessantste navorsingsmateriaal vir die immuno-genetika. In Wisconsin, in die instituut van die beroemdste man op die gebied van immuno-genetika, prof. M. R. Irwin, word immunologiese proewe gedoen om die heterositiese effek van kruisings, dit is „basterkrag", te verduidelik.

Een van daardie kruisings is bv. die van mannetjies van die asiatiese duiweras, Pearlneck (*Streptopelia chinensis*), met Ringduif-wyfies (*Streptopelia risoria*). Die bloedselle van die kruisings bevat wel stowwe gelyk aan die van hul ouers, maar tog nie identies met al die spesifieke substansies van elke ouer nie. Boonop besit die basterselle 'n kompleks van antigeniese substansies, wat nie by die selle van die ouers voorkom nie. Hierdie nuwe antigeniese stowwe word „baster" of „kruising"-stof genoem, en word in elke kruising tussen die genoemde spesies gevind.

Die „kruisingstof" toon 'n afwyking van die direkte inwerking van genes op die antigeniese substansie. Dit lyk asof daar 'n samewerking van twee of meer genes plaasvind, om 'n geheel-en-al nuwe antigeniese stof te produseer.

Melding moet gemaak word van die tegniek, wat gebruik word om die „kruisingstof" aan te toon. Irwin onderskei sowel geneties as immunologies 10 verskillende eenhede: d-1, d-2, d-3, d-4, d-5, d-6, d-7, d-8, d-11 en d-12.

As 'n antiserum geproduseer word teen die selle van 'n bepaalde individu — baster of nie — en daardie antiserum dan met selle van altwee ouers geabsorbeer word en dan tog nog reageer met selle van dieselfde individu — maar nie met die selle van elke ouer nie — dan word die teenwoordigheid van nuwe antigeniese substansie op die selle van die bepaalde individu, wat vir die immunisasie gebruik was, bewys.



Antigeniese stowwe in „Pearlneck" en Ringduiwe en hul F1.-generasie-kruising skematies voorgestel.

In hoever hierdie navorsing daartoe kan bydra, om „Basterkrag" of „Heterose", wat by alle kruisings teenwoordig is, te verduidelik, sal die toekoms ons leer.

Bloedgroepe by Honde

Vyf verskillende iso-teenliggaampies is in die serum van ingespuite honde vasgestel en is genoem anti-A, anti-B, -C, -D, en -E in die volgorde van hul ontdekking. Natuurlik voorkomende teenliggaampies is gevind in sowat 15% van honde wat voor die voet ondersoek is, en wat nooit ingespuit was nie. Meer as die helfte van hierdie teenliggaampies het 'n anti-D spesifieke reaksie gewys, terwyl ander 'n anti-B of 'n onbekende spesifieke reaksie getoon het.

Die ander teenliggaampies agglutineer, maar hemoliseer nooit honde-bloedliggaampies *in vitro* nie. Daarom het hulle ook nie enige invloed op die rooibloedselle by 'n inspuiting of oortapping nie. Die belangrikste faktor in hierdie opsig is die A-faktor.

Omdat 37% van alle honde rooi selle sonder faktor A het, en 63% van alle honde rooi selle met faktor B, kan bereken word (0.37 x 0.63) dat amper 23% van alle inspuitings in die ontvanger-honde, die opbou van anti-A sal bewerkstellig. Dit is gevind dat

die faktor A baie antigenies is, en dat anti-A liggaampies reeds 9 dae na 'n enkele oortapping kan verskyn.

Die faktor A verskyn in verskillende sterktes, die swakkere antigeen (A') kan nie maklik deur roetinetoetse in die rooibloedliggaampies van die hond gevind word nie.

Die verskil tussen gewer- en ontvangerhonde, ten opsigte van die antigeniese faktore behalwe A, kan gewoonlik geïgnoreer word. Hemolitiese anemie is gevind in A-positiewe hondjies, wat gebore is van A-negatiewe tewe, wat op hul beurt geïmmuniseer is deur oortappings van A-positiewe bloed. Die teenliggaampies is gevind in hondjies, wat op hul eerste lewensdag melk van die moeder gekry het.

Dit is moontlik dat daar ook 'n natuurlike iso-immunisering (sonder bloedoortapping) voorkom, maar verdere ondersoek is in hierdie verband nodig.

Bloedgroepe by Konyne

Volledigheidshalwe sal hierdie bloedgroepe net genoem word. Op die konyn is baie navorsing gedoen; 6 bloedgroepfaktore is geïdentifiseer deur die gebruik van iso-immune sera. 'n Konyn kan van nul tot al 6 faktore wys. Twee van die faktore, A en F, word gekenmerk deur 'n enkele *locus*. Al die ander word onafhanklik as enkele dominante faktore oorgeërf. Ook in die konyn is navorsing nog in die beginstadium. Kort gelede is 'n sewende faktor gevind.

Bloedgroepe by Beeste

Vroeëre pogings tot bloedgroepbepaling by beeste het geen definitiewe resultate afgewerp nie. In die laaste tyd het veral twee groepe navorsers die probleem aangepak: die een verbonde aan die Madisonuniversiteit in Wisconsin, V.S.A., en die ander aan die Instituut vir Veeartsenykunde in Göttingen, Duitsland. Die twee groepe het verskillende rigtings ingeslaan.

In Göttingen word 'n studie gemaak van bloedseleienskappe deur die gebruik van normale sera van onbehandelde beeste. 'n Konglutinasiesisteem word gebruik, wat bestaan uit beeskomplement, beesserum en beeseritrosiete. Schermer, Otte en Tolle het op hierdie manier 8 verskillende faktore geïdentifiseer. Rasverskille is deur verskillende kombinasies van die 8 faktore vasgestel.

In Amerika het Irwin, Ferguson en Stormont bloedgroepfaktore vasgestel deur immuunsera wat deur eksperimentele immunisering van beeste en konyne geproduseer is. Vir die bepaling van bloedgroepe word 'n hemolitiese sisteem gebruik, wat bestaan uit konynkomplement, beesserum en beeseritrosiete. Tot dusver is op hierdie manier 42 verskillende bloedantigene geïdentifiseer.

'n Vergelykende toets deur die skrywer in Swede tussen die Duitse en Amerikaanse toetssera uitgevoer het aangetoon dat van die Duitse bloedgroepfaktore, 6 met die van die Amerikaanse oor-

eenstem. Om verwarring te voorkom, word hierdie ooreenstemmende faktore vanaf 1956 dieselfde benamings gegee.

Hier in Suid-Afrika is van die begin af die Amerikaanse navorsingssisteem gevolg.

'n Uitvoerige beskrywing van die proses van immunisering en opbou van teenliggaampies is reeds gegee (Osterhoff, 1957). In kort is dit soos volg. Die beeste word een tot twee keer per week, vir 'n tydperk van 3 tot 5 weke, geïmmuniseer. Om bloedkoagulasie te verhoed word isotoniese natriumsitraat in 'n verhouding van een deel sitraat tot vyf dele bloed bygevoeg. Die hoeveelheid is by die eerste inspuiting 100 ml. bloed en vanaf die tweede inspuiting 50 ml. per bees. By elke inspuiting word 'n bloedmonster van die ontvanger geneem, om die verhoging van die titer teen die antigene van die gewer se bloed te bepaal. As die titer na 6 tot 8 oortappings hoog genoeg is, word omtrent 2 tot 3 liter bloed getap.

Tot nou is op Kaalplaas, Onderstepoort, en op die Universiteitsplaas 766 immuniserings op 114 beeste uitgevoer, dit wil sê, omtrent 7 per bees. 'n Bevredigende opbou van teenliggaampies is by omtrent die helfte (66) vasgestel. Van die 42 bekende toetssera is omtrent 30 geproduseer, asook 2 of 3 nuwes.

By die immunisering word alleen bloed ingespuit wat faktore bevat, wat nie in die bloed van die ontvanger voorkom nie. In die praktyk is dit amper onmoontlik om die gewer-ontvanger kombinasie so te kies, dat teenliggaampies net teen een faktor opgebou word. Gewoonlik bevat die immuunsera teenliggaampies teen verskillende faktore.

Om uit 'n saamgestelde serum 'n skoon toetsserum te berei, moet absorpsies gedoen word. By hierdie absorpsies word gewaste rooibloedselle, wat al die faktore bevat, by die serum gevoeg en word die ooreenstemmende tenliggaampies dus uit die serum verwyder. Meesal is hiervoor 'n kombinasie van bloed van verskillende diere nodig. Om die spesifisiteit van 'n toetsserum te kontroleer, is dus 'n toets met 'n groot aantal bloedmonsters noodsaaklik.

Die bloedmonsters, wat in 'n 3.5% sitraatoplossing opgevang is, word 3 tot 4 keer met 'n fisiologiese soutoplossing gewas. In die toets word hulle gebruik in 'n suspensie van 3%; 30 tot 40 bloedmonsters kan gelyktydig getoets word. Die kamertemperatuur moet ten minste 22°C wees. Die toets word as volg uitgevoer.

0.05 ml. van 'n 3% suspensie van rooibloedselle word in 42 agglutinasiebuisies geplaas. By elke buisie word daarna 0.10 ml. van die 42 verskillende toetssera gevoeg. Die buisies word geskud, om 'n goeie verdeling van die rooi bloedselle in die sera te verkry, en 15 minute later word by elke buisie 0.05 ml. konynserum gevoeg. Deur die komplement in hierdie serum vind 'n hemolitiese reaksie plaas, waar die hemolisine aan die bloedselle gebind is.

Die tyd waarin die hemoliese voltrek word, kan sterk varieer. Daarom word die toetsresultate ten minste 3 keer gelees, d.w.s.

na 30 minute, na 120 minute en dan 210 minute na die toevoeging van die komplement.

Die Oorerwing van Bloedgroepe

Die oorerwing van die bloedgroepfaktore is reeds kortliks uiteengesit (Osterhoff, *Loc. cit.*). In werklikheid is die oorerwing baie meer ingewikkeld as wat daaruit blyk.

Tot nou toe is daar 11 genetiese sisteme beskrywe. Elke sisteem bevat veelvuldige allelle wat die oorerwing van die antigeniese faktore beheers.

1. *Die AH-sisteem* met die faktore A en H waaruit 4 fenotipes en 10 genotipes opgebou kan word.
2. *die B-sisteem* — die belangrikste sisteem met 21 faktore, wat deur 112 tot nou toe bekende veelvuldige allelle gekontroleer word.
3. *die C-sisteem* — met 7 faktore, wat deur 22 verskillende allelle gekontroleer word.
4. *die FV-sisteem* — bevat die twee eienskappe F en V, dit is twee allelomorfe genes, wat nie dominant is nie. Die drie moontlike kombinasies is FF, FV en VV. In hierdie sisteem kan die genotipes deur serologiese toetse vasgestel word.
5. *die J-sisteem* — wat uit een faktor bestaan wat normaal voorkom en sowat 14 dae na die geboorte ten volle ontwikkel is.
6. *die L-sisteem* — wat uit een faktor bestaan en dominant oorgeërf word.
8. *die SU-sisteem* — wat uit die faktore S en U bestaan, met ondergroepe U_1 en U_2 waaruit 7 fenotipes en 15 genotipes opgebou kan word, wat deur 5 verskillende allelle gekontroleer en dominant oorgeërf word.
9. *die Z-sisteem* — wat uit een faktor bestaan. Die bloedgroeptoets maak dit moontlik om homo- en heterosigotiese individue te onderskei. Die faktor word dominant aangetref.
10. *die H^1-sisteem* — wat uit een faktor bestaan en dominant oorgeërf word.
11. die *Z^1-sisteem* — wat ook uit een faktor bestaan en ook dominant oorgeërf word.

Die Praktiese Aanwending van die Bloedgroepbepaling

Die belangrikste toepassings is deur Osterhoff (*loc. cit.*) bespreek. Hulle is:

1. Identiteitsbewys.
2. Vaderskapbepaling.
3. Differensiaaldiagnose van tweelinge.
4. Diagnose van steriele verse in gemengde tweelinge.
5. Bepaling van rasverskille.

6. Ondersoek na moontlike korrelasie tussen bloedgroep-genes en genes wat vir belangrike morfologiese en fisiologiese einskappe verantwoordelik is.

1. Omdat die aantal bloedfaktore so groot is, is die aantal verskillende moontlike kombinasies baie groot. Meer as 10 miljoen genotipiese kombinasies is teoreties moontlik. Dit volg dat die bloedgroeptoets ontwikkel kan word tot 'n vertroubare individualiteitsindeks, soos vingerafdrukke by die mens.

2. Die basiese prinsipe is deur toetse van diere met bekende ouers vasgestel, nl. „'n individu besit 'n bepaalde antigeen slegs as een of altwee ouers daardie antigeen besit".

   Dit gebeur dikwels dat 'n koei gedurende twee op mekaar volgende bronstigheidsperiodes of gedurende een en dieselfde bronstigheidstydperk, deur twee verskillende bulle gedek, of met saad van twee verskillende bulle geïnsemineer word. In die meeste gevalle is dit onmoontlik om te sê watter bul die vader van die kalf is.

   Die volgende geval dien as voorbeeld:

   Kalf 8126 se moeder is 6323. In die dekregister is twee moontlike vaders aangegee: naamlik 7532 of 7533. Die bul 7532 is dood voordat sy bloedgroepe bepaal kon word, maar bloedtoetse op die tweede bul en op die kalf en koei het die volgende resultate gegee.

   Bul 7533: A E_2GYD'I' . C_1W FF
   Koei 6323: A BO_3YA' E_3' I' W VV H'
   Kalf 8126: — BO_3YA' D' E_3' I' WX_2 FF J L Z

   Hulle toon aan dat die kalf die volgende faktore besit wat nie by die moeder voorkom nie: D', X_2, F, J, L, Z. Hierdie faktore moet dus van die vader gekom het. Bul 7533 besit egter geen X_2, J, L en Z faktore nie, en kan dus nie die kalf se vader wees nie.

3. In verskillende lande word in teelt- en voedingsproewe al meer en meer gebruik gemaak van eeneisellige tweelinge, omdat hulle geneties identies is. Dikwels is dit baie moeilik om fenotipes vas te stel of 'n tweelingpaar eeneisellig of tweeeisellig is. Die bloedtoets is 'n goeie hulpmiddel vir hierdie doel. As die tweelinge in hul uiterlik ewebeelde is, en identies bloedeienskappe besit, is dit bewys dat hulle beide uit 'n enkele bevrugte eiersel ontwikkel het.

   Twee-eisellige tweelinge toon 'n mengsel van bloedliggaampies: sogenaamde „Eritrosietmosaiek". Hierdie patroon is die geval van binnebaarmoederlike bloedvatanastomose, dit wil sê as die bloedsomlope van die plasenta's van die tweeling met mekaar verbonde was. Die verhouding van die twee bloedliggaampietipes bly gedurende die hele lewe dieselfde. Hierdie eritrosietmosaiek kom alleen by nie-identiese tweelinge voor, nooit by identiese tweelinge nie.

'n Ander moontlikheid vir die onderskeiding van verskillende tweelinge, is deur die faktor J. Tweelinge, wat in hierdie faktor verskil, is die produkte van twee apart bevrugte eiselle.

4. 47% van alle tweelinge is van verskillende geslagte. Dit is al lank bekend, dat versies, wat saam met bulletjies as tweeling gebore word („freemartin of kween") meesal onvrugbaar is. Deur die bloedgroepbepaling is dit nou moontlik om spoedig na geboorte vas te stel of sulke verse vrugbaar of onvrugbaar sal wees. Word 'n eritrosietmosaiek gevind, dan het bloedvatanastomoses plaasgevind. In so 'n geval het die manlike hormone die vroulike hormone onderdruk, en is die vroulike dier 'n „freemartin" of „kween".

5. Soos onder die hoof „Bloedgroepe by die Mens" vermeld, kan ook by beeste rasverskille vasgestel word. Interessante navorsing is reeds op hierdie gebied gedoen. Miskien kan deur bloedgroepbepalings die afstamming van beeste vasgestel word.

   In hierdie verband het die ondersoek hier op Onderstepoort getoon dat al die Afrikanerbeeste en Afrikanerkruisbeeste wat ondersoek is, die faktor A besit, terwyl van al die Friese, net 40% die faktor A toon.

   Die faktore op die B-*locus*, verskaf die grootste moontlikhede om verwantskappe tussen verskillende rasse vas te stel. Tipiese faktorekombinasies op die B-*locus* is bv. by:

   Afrikaner: IO_2A' E_1' I' K'; DE_2E_3'; O_2YA' I'
   Fries: BO_1YD'; O_1Y; GYE_1'
   Jersey: BE_1GKO_1YA' E_3' J' K'

   Tot dusver is sowat 400 beeste getoets, maar grotere familie en verwantskapstoetse is nog nie uitgevoer nie, omdat daar te min volledige families — dit is vader, moeder, seun en dogter — beskikbaar was.

6. Die bepaling van moontlike korrelasies tussen bloedgroepgenes en genes wat vir ander belangrike eienskappe verantwoordelik is, is besonder belangrik. Teoreties kan sodanige korrelasies op die volgende manier verklaar word:

   (a) Dit is moontlik dat die bloedgroep-genes met ander genes gekoppel is, en gekoppel oorgeërf word.

   (b) Dit is moontlik dat bepaalde bloedgroep-genes 'n veelvoudige funksie het (Pleiotropie); dit is nie alleen verantwoordelik vir die opbou van 'n bepaalde bloedfaktor nie, maar ook vir ander eienskappe.

   Sommige ondersoeke is reeds uitgevoer:

   McClure het nie 'n statisties beduidende korrelasie tussen bloedgroepfaktor A en die vetgehalte van die melk kon vind nie. Dunlop het in Guernseybeeste korrelasies vasgestel tussen bloedgroepfaktore en liggaamsbouvorme. Nair e.a. het kor-

relasies gevind tussen bloedgroepfaktore en sekere defekte by beeste.

Verdere ondersoek is in hierdie verband nodig. Miskien kan mens ook die intelingskoëffisient van 'n beesbevolking uitwerk deur gene- en allel-frekwensieberekening.

OPSOMMING:

A. Waar daar twyfel bestaan omtrent die ouers van 'n bees is bloedgroepbepaling 'n betroubare metode om die werklike ouers aan te wys.

B. Deur bloedgroeptoetse kan bepaal word of tweelinge identies of nie-identies is, en kan in geval van 'n gemengde tweeling vasgestel word of die vers vrugbaar of steriel is.

C. Dit word gehoop dat verdere bloedgroepnavorsing sal bydra om die volgende probleme op te los.
   (a) Om die genefrekwensie vir die antigene van rasse in die verskillende lande vas te stel.
   (b) Om die rol van antigene in die hemolitiese siekte van pasgeborenes in die verskillende rasse en hul genotipe vas te stel.
   (c) Om deur bloedgroepbepaling die homosigose van ongeteelde diere te kan meet.
   (d) Om die korrelasie vas te stel wat bestaan tussen bloedgroepe-genes en genes wat vir anatomiese en fisiologiese eienskappe verantwoordelik is.

BLOOD GROUPS IN DOMESTICATED ANIMALS

SUMMARY:

The determination of blood groups is the most important resource of immunogenetics, i.e. a combination of the two scientific fields, genetics and immunology. In essence, the experimental findings in this field of experimentation require the use of the techniques and concepts employed in both genetics and immunology.

Landsteiner in 1901 made his fundamental discovery of the A, B and O groups of human blood. The serum from individuals of group O contained antibodies with the ability to agglutinate both A- and B- erythrocytes, while A- blood contained antibodies only against B and B- blood only against A. These findings were soon followed by the detection of a fourth group of blood, AB, the serum of which contained no antibodies, while the red cells reacted with the sera from subjects of both groups A and B.

The discovery of the ABO groups has been followed by the detection of a great number of other genetically determined blood group systems in man, e.g. MNS, Rh, P, Kell, Lutheran, Duffy, Lewis, Kidd and Diego. Some of these groups have been studied extensively because of their importance in the aetiology of haemolytic disease of the newborn, e.g. the Rh system, or because of

their interest from a genetical point of view, e.g. MNS, Rh and Lewis system. No human trait has been subjected to such far reaching genetical and anthropological investigations as the blood groups.

The study of the blood groups of our domesticated animals has made much progress during the last 30 years and in the past ten years the bearing of the results of this research on practical breeding has become more significant.

Blood Groups in Horses

The studies of blood groups in horses have been limited mainly to the use of normally occurring antibodies in the sera of certain individuals. Some workers found serological similarities between the ABO systems of man and the horse. *Kaempffer* was able to demonstrate 6 antigenic factors, which were probably determined by genes at different loci. *Eyquem* et al have been able to separate in all 11 antigenic factors / A . . . . . K / in the mule, of which one seemed to be limited to the ass species, while the remaining 10 were detectable in the horse. Each factor was determined by dominant genes at different loci, most of which were independent. The A and E factors, however, were genetically associated.

Bruner et al identified cases of haemolytic icterus in newborn foals. This haemolytic icterus occurred when mares sensitized to certain types of erythrocytes were bred to stallions which transmitted their type of blood cells to the offspring. The condition was observed in apparently normal newborn foals after they had obtained from the dams colostral milk the antibodies which destroyed their erythrocytes. Bruner found further that a newborn foal between the ages of 24-36 hours loses the ability to absorb antibodies from horse serum placed in its stomach.

Blood Groups in Pigs

Experiments with naturally occurring antibodies have made it possible to divide pigs into 3 classes. *Szent* and *Szabo* identified four naturally occurring agglutinins, A, B, C and D. Immunization experiments by *Andresen* have demonstrated the presence of 7 antigenic factors, which appear to be determined by dominant genes.

Haemolytic disease of newborn pigs has been diagnosed by Hungarian workers. It has been pointed out that in the development of haemolytic disease in newborn pigs the role is being played by a blood group incompatibility which is similar to that in man's Rh incompatibility and in the haemolytic disease described in newborn foals. The antigen, which is probably the causative agent of haemolytic disease in pigs, is designated the "Su" factor. It is not yet known if any correlation exists between the blood group factor termed "Su" and the above-mentioned antigenic factors.

The clinical symptoms are as follows: the piglets are well developed, healthy at birth, and suck normally. Yet later, and invariably within the first 48 hours of life, most of them leave off sucking and tremble and squeal. The urine is red or coffee-coloured and most of the affected piglets die 36 hours after farrowing. The only thing to do is that individual sows which had lost their litters should in the next season be mated to different boars.

Blood Groups in Sheep

Only a few studies have been performed on sheep blood groups, and these have on the whole been limited to antigenic factors detectable by naturally occurring antibodies. The presence of one antigenic factor — called R — is reported, which is detectable with antibodies present in the sera of some sheep lacking the factor. Later on it was found that a new antigen — called r — was determined by a gene recessive to that of R. Some individuals, however, had an additional group, i, which lacked the R as well as the r substances. The group i was determined by a recessive gene which suppressed the development of the R substance.

Antigenic factors have also been detected in sheep by immune antisera, 9 different factors could be found after iso-immunization of sheep.

Blood Groups in Fowls

By iso-immunisations two different allele series could be identified: one A series with 9 antigenic factors and one B series with 5 factors. It has been possible by immunological techniques to make a sharp distinction between the cells of closely related species, especially in doves. In bird species which produce viable hybrids the antigens have been found to be gene-controlled.

One such species hybrid is that obtained from a mating between males of an Asiatic species, the Pearlneck (*Streptopelia chinensis*) and the domesticated Ring dove females (*Streptopelia risoria*). The corpuscles of these hybrids contained all the substances common to each parental species, but did not contain quite all the specific substances of either parental species. Further, the cells of these hybrids possessed a complex of antigenic substances not found in the cells of the parents. This antigenic substance has been called the "hybrid substance", and it is present in every hybrid produced by these two species. It would be interesting, however, to know whether these results could explain the "hybrid vigour" which is present in every cross-breed.

Blood Groups in Dogs

Five different iso-antibodies have been demonstrated in the sera from transfused dogs and designated anti-A . . . . anti-E in the order of their demonstration. Naturally occurring antibodies

have been found in about 15% of dogs that have never been transfused. The importance of considering the canine A factor in planning dog transfusion is stressed. Since 37% of all dogs have red cells lacking the factor and 63% have red cells containing this factor, it can be calculated, 0.37 x 0.63, that opproximately 23% of transfusions have the potentiality for production of anti-A in the recipient.

Haemolytic anaemia has been observed regularly in A positive pups born to A negative bitches immunized by transfusions of A positive blood. Natural iso-immunization of the bitch during pregnancy, without transfusions, may occur and is a problem deserving of further investigation.

Blood Groups in Cattle

The investigations of blood groups in cattle, have followed two different lines: the one, at the Madison University at Wisconsin, U.S.A., has followed and developed further the immunization and absorption techniques, while the other, at the Veterinary Institute at Göttingen, Germany, has been exclusively concerned with normally occurring antibodies.

In South Africa we followed from the beginning the American system of experimental immunizations. In the "Journal of the South African Veterinary Medical Association", 28.2.57, the author gives a representation of the production of test sera and the haemolysis reaction in the article "Blood Grouping and its Utilisation in Cattle Breeding". It is not necessary to show the inheritance of antigens and the practical applications of blood group tests in this summary. It can be mentioned, that the South African Blood Group Laboratory is now, after the basic investigations, ready to start the routine work for practical applications.

REFERENCES

Aird, I., Bentall, H. H., Mehigan, J. A. & Frazer, J. A., 1954 — The blood groups in relation to peptic ulceration, carcinoma of colon, rectum, breast and bronchus. Brit. Med. Jnl. 2: 315.

Andresen, E. 1955 — Svinets blodtyper. Ugeskrift for Landmaend, Nr. 35:1.

Andresen, T., 1938 — Untersuchungen über die Blutgruppeneigenschaften der Schafe. Zeitschur. f. Rassenphysiologie Nr. 10:88.

Boyd, W. C., 1956 — Anthropologie und Blutgruppen. Klin. Wochenschrift 34 Jahrg., Heft 37/38.

Bruner, D. W., 1950 — Laboratory diagnosis of hemolytic icterus in foals. Cornell Veterinarian 40:11.

Cohen, C., 1955 — Blood group factors in the rabbit. Jnl. Immunol. 74:432.

Dunlop, A. A., 1951 — Type differences and blood antigens in a Guernsey herd. Jnl. of Dairy Science 34:154.

Eyquem, A., Podliachouk, L., and Millot, P., 1956 — Les groupes sanguins des animaux domestiques et leur intérêt pour l'élevage. 7th int. Congr. Anim. Husb. Madr., 1956, Subj. 2:125.

Ferguson, L. C., 1941 — Heritable antigens in the erythrocytes of cattle. Jnl. Immunol. 40:213.

Ferguson, L. C., Stormont, C., and Irwin, M. R., 1942 — On additional antigens in the erythrocytes of cattle. Jnl. Immunol. 44:147.
Hosoda, T., 1947 — Studies on blood groups of horses. Res. Rep. Inst. Horse Breed. Hyg., Japan. 10-11.
Irwin, M. R., 1951 — Genetics and Immunology. Chapter in "Genetics in the 20th Century," L. C. Dunn. Ed. The MacMillan Company, N.Y.
Irwin, M. R., 1952 — Specificity of gene effects. Chapter in "Heterosis," J. W. Gowen, Ed. Iowa State Press, Ames, Iowa.
Kaempffer, A. 1935 — Die Blutgruppeneigenschaften der Pferde und ihre Vererbung Zeitschr. f. Tierz. u. Zücht. Biol. 32:169.
Landsteiner, K., 1901 — Ueber Agglutinationserscheinungen normalen menschlichen Blutes. Wien. Klin. Wschr. 14:1132.
Levine, P., Ref. Race and Sanger.
McClure, T. J., 1952 — Correlation study of bovine erythrocyte antigen A and butterfat test. Nature 170:327.
Nair, P. G., Ludwick, T. M., Lazear, E. J., and Ferguson, L. C., 1955 — Preliminary report comparing cellular antigens with type defects in dairy cattle. Jnl. of Dairy Science. 38:615.
Osterhoff, D. R., 1957 — B'ood grouping and its utilization in cattle breeding. Jnl. S.A. Vet. Med. Ass. 28:155.
Pike, L. A., and Dickins, A. M., 1954 — A B O - Blood groups and toxaemia of pregnancy. Brit. Med. Jnl. 2:321.
Race, R. R., and Sanger, R., 1950 — Blood groups in man. Blackwell Scientific Publications, Oxford.
Schermer, S., and Otte, E., 1953 — Die Blutgruppen des Rindes. Zeitschr. f. Immunität u. exp. Ther. 110:296.
Stetson, R. Ref. Race and Stanger.
Stormont, C., 1949 — Acquisition of the J substance by the bovine erythrocyte. Proc. nat. Acad. Sci. Wash. 35:232.
Stormont, C. 1950 — Additional gene-controlled antigenic factors in the bovine erythrocyte. Genetics 35: 76.
Stormont, C., 1952 — The F-V and Z systems of bovine blood groups. Genetics 37-39.
Stormont, C., 1955 — Linked genes, pseudoalleles and blood groups. Amer. Nat. 89:105.
Stormont, C., Owen, R. D., and Irwin, M. R., 1951 — The B and C systems of bovine blood groups. Genetics 36:134.
Szent-Iványi, T., and Szabó, S., 1954 — Blood groups in pigs. Acta vet. Budapest, 4:429.
Taylor, G. L., and Fisher, R. A., Ref. Race and Sanger.
Tolle, A., 1956 — Der Stand der Blutgruppenforschung beim Rind. Berl. u. Münch. Tierärztl. Wschr. 69:406.
Wiener, A. S., 1946. Blood groups and transfusions. Springfield, III. C. C. Thomas.
Ycas, M. K. W., 1949 — Studies of the development of a normal antibody and of cellular antigens in the blood of sheep. Jnl. Immunol. 61:327.
Young, L. E., O'Brien, W. A., Swisher, S. N., Miller, G., and Yuile, C. L., 1952 — Blood groups in dogs — their significance to the Veterinarian. Amer. Jnl. of Vet. Res. 13:207.

CONGRATULATIONS

to the

PROFESSIONAL PROVIDENT SOCIETY OF SOUTH AFRICA on having achieved two milestones in its development during October, 1957. Its assets passed the quarter million mark and its membership rose to over one thousand. There can be no doubt that this Society, run by the professions for their members, is in a very sound position and those who have not yet done so should take the advantage of the unequalled benefits it offers.

THORNTON'S TEXTBOOK OF MEAT INSPECTION THIRD EDITION

Bailliére Tindall & Cox; Price 60/-; 592 pages.

This edition (1957) has just appeared. No single individual can be an authority on all the conditions and diseases which must be dealt with in a textbook. It is therefore not surprising to find mistakes and omissions, also in this edition, examples of which are :-

1. Anthrax is very fully discussed but no directives are given for the action to be taken in the case of the animals of the same lot, one of which was found dead from Anthrax in a lairage.
2. Giemsa staining of smears for the diagnosis of Anthrax is an alternative method (to methylene blue) preferred by many workers of experience.
3. The author remains completely out of date in using the term Osteohämatochromatosis for Bovine Congenital Porphyrinuria (Pink Tooth).
4. The author describes what is undoubtedly the phase test for differentiating the yellowish discoloration due to bile pigments and carotenes, but does not name the test.
5. In my opinion it is not good abattoir practice to pass a carcass as fit for human consumption even if the animal is slaughtered immediately after being bitten by a rabid animal, as not only the site of the bite may contain infective saliva but other portions of the hide,etc. Rabies is such a serious disease and one for which there is no curative remedy that one cannot take even the smallest chance in the interest of public health.

I would also have liked to have seen a definition of the term "Veal" as used in Great Britain and other countries.

In spite of these remarks the 3rd edition of this work is a definite improvement on the previous editions. One is very pleased to see that responsible British authorities are now also emphasising the importance of the laboratory in the abattoir organisation and the necessity of a bacteriological examination in certain cases. Directors of abattoirs will find this work of great value.

P.J.J.F.

LETTERS TO THE EDITOR

The Editor,
Journal of the South African Veterinary Medical Association,
P.O. Onderstepoort, Transvaal,
Union of South Africa.
Dear Sir,

On page 257 of the issue of your Journal for September, 1957, you have an interesting note regarding William Jarman the earliest private practitioner in Natal. He described himself as "Veterinary Surgeon, Member of the Royal College of Veterinary Surgeons, Edinburgh." Your note states that Dr. Curson wonders what happened to him subsequently.

The interesting point is really what happened to Mr. Jarman before, for despite his claim to be a Veterinary Surgeon and a member of the Royal College of Veterinary Surgeons, Edinburgh, no trace of him can be found in any of the Registers or records of the Royal College of Veterinary Surgeons. Professor A. Robertson, M.A., B.Sc., Ph.D., M.R.C.V.S., F.R.I.C., F.R.S.E., Director of the Royal (Dick) School of Veterinary Studies, most kindly has made extensive searches in the records of the original Royal (Dick) Veterinary College, Edinburgh, and has also caused the "Veterinarian" round about that period to be searched, but without result.

Professor Robertson's conclusion is that Jarman may have been one of upwards of a thousand students who attended at various times Professor Dick's lectures at Edinburgh, but who never formally obtained or applied for a diploma.

On the other hand, as the keeper of a Register of Veterinary Surgeons, I find that even in this modern age, there are persons who claim to have veterinary or other qualifications which they do not possess. Both the early history and the late history of Mr. Jarman would be interesting.

Yours faithfully,
W. G. R. Oates.
Registrar.
Royal College of Veterinary Surgeons, England.

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c/o Polyclinic,
Box 145,
Germiston.
19th November, 1957.

The Editor,
Journal of the S.A.V.M.A.,
Onderstepoort.

Dear Sir,

In the recent issue of the Journal 28(3)1957. Dr. von Backström mentions a case of septicaemic tuberculosis in a dog, and in the past others have also recorded the incidence of this disease in domestic animals living in close contact with their owners, e.g. dogs and cats.

An interesting paper by Hawthorne, Jarrett, Lander, Martin and Roberts (3 veterinary and 2 medical graduates) appeared in the British Medical Journal, Sept. 21, 1957, No. 5046, on "Tuberculosis in Man, Dog and Cat." They investigated the human contacts of 14 tuberculosis dogs, and found nine persons with tuberculosis which might otherwise not have been discovered. They also investigated the animal contacts of 37 human T.B. patients and found M. tuberculosis (human strain) in rectal and throat swabs from two cats and two dogs.

The question of the advisability of allowing dogs and cats to live in tuberculous households is very pertinent, inasmuch as actively infectious animals

may form an important reservoir of infection. It would appear that all household pets should be examined when a human case occurs. Conversely, the diagnosis of tuberculosis in a cat or dog should be brought to the notice of the family or preferably the local health officer so that the necessary tests may be carried out to determine whether:-

(a) There is an undiagnosed case of tuberculosis in the family or amongst their servants or

(b) Whether the milk supply is in order.

It may also be worth mentioning that the authors in the article quoted above found no typical lesions in the course of P.M. examination of the two dogs and two cats. One dog showed no lesions whatsoever, whilst the other three animals showed enlarged and slightly haemorrhagic prescapular, mesenteric, and submandibular and mesenteric glands respectively. Microscopically "reactive changes" were seen, and it is stated that Langhans giant cells do not usually occur in dogs and cats.

It would seem that this is another instance where closer collaboration between medical and veterinary practitioners would be of mutual benefit.

Yours faithfully,

L. W. van den Heever.

c/o Polyclinic, Germiston.

BOOK REVIEW

The Infectious Diseases of Domestic Animals by W. A. Hogan and D. W. Bruner (Third Edition) 1957. 968 pages. Price 84/-. Balliére, Tindall and Cox London.

The authors are to be complimented on the publication of a third edition of their valuable text book, without the drawback of a material increase in size. Nowadays with the great volume of new research work which is being undertaken it is very difficult to keep a text book such as this one up to date. The authors have realized this and have made it essentially a text book, mainly for students. Almost half the book is still devoted to bacterial diseases as compared with protozoal with about 130 pages and virus diseases with 200. A considerable amount of recent information has been included, more particularly in the section on virus diseases. There is a valuable summary of our present knowledge of "hard pad" in dogs.

Under the section on protozoal diseases the information on Theileriosis has now been brought up to date and includes a mention of "corridor disease" in South Africa.

In the section on Rickettsial diseases, two conditions are described which were not in the previous edition. They are Salmon poisoning in dogs and Enzootic Abortion in ewes. A welcome addition is the part played by P.P.L.O. (pleuro pneumonia like organisms) in animal diseases as a great deal of attention has been paid to them in present years.

A very brief mention is made in this edition of purified protein derivative (PPD) tuberculins and the reviewer feels that perhaps a bit more could have been said about them in view of their increasing use.

In conclusion one may repeat what was said about the previous edition, that it can be recommended as a valuable text book for students requiring a concise and comprehensive description of the infectious diseases of domestic animals, more particularly as regards those of bacterial origin.

E.M.R.

Richardson, U. F., and Kendall, S. B. (1957) — Veterinary Protozoology. Second Edition. pp vi + 260, 34 Illustrations, 15 Chapters. Edinburgh and London, Oliver and Boyd. Price £1-2-6.

The first edition of Richardson's Veterinary Protozoology was published in 1948. Since then advances have been made in our knowledge of protozoal diseases, particularly in the field of chemotherapy. For some time the need of a further edition became necessary. The appearance of this new edition which has been revised by Richardson and Kendall is therefore timely.

Although this book is intended for veterinary students it will undoubtedly also be welcomed by veterinarians engaged in the control of protozoal diseases. It is an excellent contribution and bridges a gap in veterinary science. The way of presentation short and clear.

The number of chapters has been increased from 12 to 15, and the headings have been printed more prominently. In the text the morphology and the classification of the protozoa, the distribution, pathogenicity, transmission, symptomatology, pathology, diagnosis, treatment and control are discussed. The section on chemotherapy has been extended. Detailed information is given about the chemotherapeutic agents and their use in practice. In the final chapter techniques and equipment required for making a diagnosis of protozoal diseases is given.

"THE MERCK VETERINARY MANUAL"

Published by Merck & Co., Inc., Rahway, N.J., U.S.A.

Obtainable through all technical book stores, costing 7.50 dollars plus shipping.

In the publication of the Merck Veterinary Manual the authors have decidedly attained their object, namely, that of providing the veterinarian with concise authoratative and readily available information on the diagnosis and treatment of the diseases of animals kept by man for use or pleasure.

This book, by virtue of its up-to-date information, is indispensable to the practicing veterinarian who, through pressure of work, does not find time for extensive reading. It is fully indexed and contains chapters on the most modern treatments such as antibiotics and adrenocortical hormones. The subject of animal feeding is treated extensively from a practical angle. Even the veterinrian dealing with diseases of poultry and fur-bearing animals will find this book extremely useful. The epidemiologist will benefit by the information on infectious diseases of large and small animals.

There are remarkably few errors and omissions in this volumiminous treatise. The most obvious of these are:-

The Asiatic type of foot-and-mouth diseases virus is not mentioned.

Streptothricosis is described as a symptom of rinderpest and not recognised as a distinct fungous disease.

The susceptibility of swine to Clostridium feseri infection is ignored.

Clostridium botulinum Types C and D occur in South Africa, but not Type E. Under prophylaxis against botulism should be listed vaccination which is extremely effective.

These, however, do not retract from the value of the manual.

SALMONELLOSIS IN ANIMALS

A Review by A. Buxton, Ph.D., M.R.C.V.S.

Review Series No. 5 of the Commonwealth Bureau of Animal Health. 209 pages, price 25 shillings. Published by the Commonwealth Agricultural Bureaux, Farnham Royal, Bucks, England.

Since Bruce White and Kauffmann succeeded in unravelling many of the intricacies of the antigenic structure of the Salmonella group of micro-organisms many excellent contributions have appeared on this extremely fascinating subject. But much of the published information has not always been readily available to the ordinary laboratory worker. He is extremely fortunate therefore on being provided with a review which covers the whole field of the genus *Salmonella* in a concise and lucid manner.

In this treatise Buxton not only gives the main characteristics of the group, the various animal hosts, the epidemiology, the prophylaxis and the antigenic structure of each species, but he also furnishes the reader with a bibliography that is probably the most comprehensive ever published. There can be no doubt that this review will be an indispensable reference book to the student of bacteriology in general and the worker on *Enterobacteriaceae* in particular.

Both the author and the commonwealth Bureau of Animal Health must be congratulated on the production of this excellent work.

M.W.H.

COUNCIL MATTERS

SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION

THE MINUTES OF THE MEETING OF COUNCIL HELD ON MONDAY, THE 11th OF NOVEMBER, 1957, IN THE MEAT BOARD BUILDING, PRETORIA.

PRESENT: Dr. P. S. Snyman (President), Drs. H. P. Steyn, S. W. J. van Rensburg, J. W. Pols, P. J. du Toit, M. C. Lambrechts, R. du Toit, R. A. Alexander, C. F. B. Hofmeyr, A. C. Kirkpatrick, A. F. Tarr, R. Clark, L. v.d. Heever, G. D. Sutton, A. M. Diesel.

APOLOGIES were received from Drs. H. H. Curson, E. M. Robinson and M. W. Henning.

The President thanked Council for the letter he had received from Council during his illness.

He also welcomed Drs. Pols, Henning and Tarr to Council.

Dr. H. P. Steyn (Vice-President), on behalf of Council, welcomed Dr. Snyman back to the deliberations of Council after his prolonged absence and expressed the hope that his health would be unimpaired for a long time to come.

I. *Inadequacy of fees of State Veterinarians.* A letter from the Director of Veterinary Services was read. The following extract epitomises the views of the Director: "...and if it was found that any State Veterinarian was indulging in private practice to an extent that the practice would constitute competition with practising veterinarians, that would mean that his duties as a State Veterinarian would have been neglected, in that case the Director of Veterinary Services would call for an explanation and thereafter would act!"

It was agreed that the Hon. Secretary of the Cape Western Branch be advised accordingly.

II. MATTERS ARISING FROM THE MINUTES OF THE ANNUAL GENERAL MEETING.

1. *Co-operative Employment of Veterinarians.* Dr. Snyman outlined briefly the discussions which had been held earlier in the day between representatives of the S.A.A.U. and Council. The S.A.A.U. had undertaken to submit a report of the discussions to the Association. Agreed that this report be submitted to the sub-committee for consideration.

Letters received from Drs. W. A. de Waal and W. J. Ryksen, were next considered. (Appendices C & D.) After a full discussion it was agreed, on a proposal by Dr. Alexander, that both Drs. de Waal and Ryksen be advised that Council had no objection to the post of veterinarian in the Senekal district being advertised and that the Co-op. would select a candidate from the applications received.

2. *Faculty Posts.*

The Selection Committee had consisted of:

Professor C. H. Rautenbach (Rector of the University of Pretoria), Chairman.
Dr. H. O. Mönnig
Dr. F. J. Veldman
Dr. R. A. Alexander
Dr. P. S. Snyman
Dr. Douw Steyn
Dr. P. J. J. Fourie
Dr. H. W. Snyman (Dean of Faculty of Medicine, University of Pretoria)

Dr. J. W. C. Geyer (Dean of Faculty of Agriculture, University of Pretoria)
Dr. H. L. de Waal (Dean of Faculty of Physical Science, University of Pretoria)

3. *Report of Commission of Inquiry into Co-ordination of Medical Research.*

As Dr. P. J. du Toit, the Chairman of the Commission, was present, the President asked him to address Council.

Dr. du Toit assured Council that if the Association still wished to comment on the report, he would very gladly receive such comments and discuss it with such members of the Commission as are available, and also with the Secretary for Public Health.

Drs. Diesel and Lambrechts expressed concern over the possibility that the Veterinary Research Division and the Veterinary Field Division would be separated under the recommended scheme!

No decision was taken in regard to this matter.

4. *Training of and Employment Facilities for Scientists and Technicians.*

Dr. Steyn reported that he had attended a Congress of representatives of organisations interested in this matter, organised by the Department of Education, Arts and Science.

Dr. Steyn informed the meeting that Minister A. J. van Rhijn had appointed a Commission of Inquiry to investigate and report on this matter. Dr. Steyn expressed surprise that the Director of Veterinary Services had not been invited to attend this Congress.

It was agreed that the General Purposes Committee would deal with and report to Council on matters arising or developing in this connection.

5. *Annual General Meeting,* 1958.

Dr. Steyn reported that the Witwatersrand branch had asked that preparations for the Congress be begun well in advance. This was generally agreed to, and it was further agreed that Council would consider the final programme (to be drawn up by the Congress Committee) at the Council meeting in May.

6. *Election of Representatives of the S.A.V.M.A. to the Veterinary Board.*

The Hon. Secretary reported that numerous nomination forms, nominating Dr. A. M. Diesel, had been submitted. In view of the fact that no other nominations had been received the President declared Dr. Diesel elected, in accordance with accepted practice.

Agreed that the Secretary for Agriculture be advised that Dr. Diesel has been nominated by the Association for appointment by the Minister to the Veterinary Board.

7. Letter dated 5th August, 1957, from the Association of Veterinary Boards of Western Germany.

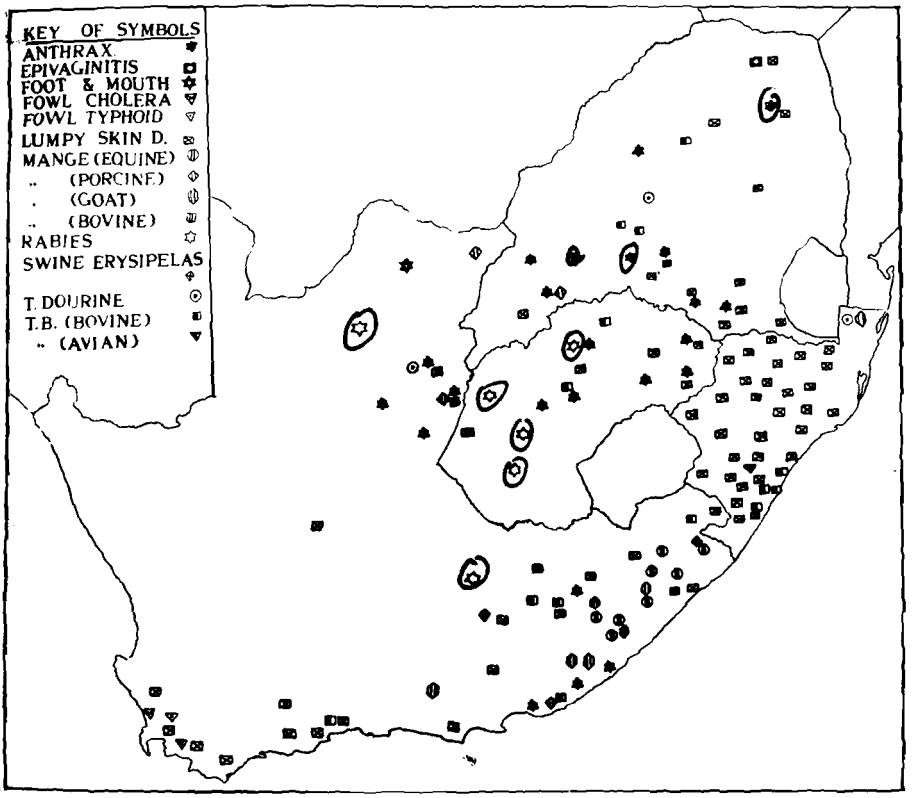
As this letter contained a large amount of information relative to the inquiry of the sub-committee of Dr. Diesel into Co-operative Employment of Veterinarians (and in reply to a letter from the S.A.V.M.A. seeking information), it was decided to pass the letter and enclosures to Dr. Diesel. Letter of appreciation to be forwarded.

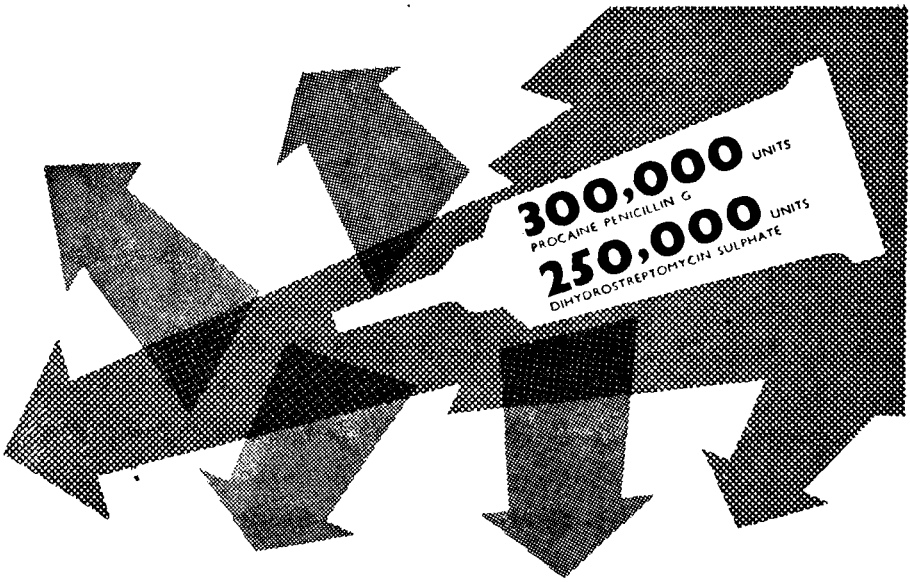
8. Letter from the Professional Provident Society of S.A., dated 1st November, 1957, read.

It was agreed that Dr. Steyn be nominated to be the representative of the Association to attend Board meetings of this Society in terms of Rule 3(c)(iii)

OUTBREAKS OF SCHEDULED DISEASES IN THE UNION OF SOUTH AFRICA DURING THE PERIOD 1.12.57-28.2.58.

DISEASES	*CAPE*	*NATAL*	*O.F.S.*	*TRANSVAAL*
Anthrax	(1) Barkly West (1) East London (1) Postmasburg (2) Herbert (2) Peddie (1) Alexandria (1) Warrenton (1) Glen Grey		(1) Windburg (2) Vrede (3) Harrismith (1) Kroonstad (1) Brandfort (1) Bethlehem	(1) Springs (1) Waterberg (3) Klerksdorp (1) Amersfoort (1) Standerton (1) Lichtenburg
Epivaginitis				(1) Zoutpansberg
Foot and Mouth	(1) Vryburg			
Fowl Cholera	(1) Bellville	(1) Pietermaritzburg		
Fowl Typhoid	(1) Paarl			
Lumpy Skin Disease	(1) Bredasdorp (1) Carnavon (1) Mosselbaai (1) Stellenbosch (1) Barkly West (1) Molteno (8) Cradock (2) Indwe (7) Caledon (1) Malmesbury (1) Humansdorp (6) Riversdal (2) Ngqeleni (3) Mosselbaai (1) Indwe (1) Queenstown (2) Port St. Johns (1) Maclear (3) George (2) Umzimkulu (1) New Hanover (1) Somerset East (1) Ladysmith	(13) Kliprivier (1) Underberg (48) Louwsburg (57) Babanango (71) Vryheid (41) Paul Pietersburg (3) Etonjaneni (35) Richmond (5) Lionsriver (9) Utrecht (1) Bergville (4) Eshowe (38) Umzinto (13) Nongoma (5) Dundee (1) Tugela (1) Ixopo (1) Harding (13) Camperdown (1) Nkandla (5) Helpmekaar (9) Estcourt (6) Newcastle (2) Ngutu (10) Mgudu (15) Mahlabatini (3) Weenen (1) Lower Umfolozi (12) Umvoti	(4) Harrismith (1) Jacobsdal (3) Reitz (6) Vrede (1) Ventersburg	(15) Zoutpansberg (14) Pietersburg (2) Letaba (25) Piet Retief (12) Wakkerstroom (1) Wolmaranstad (4) Standerton (5) Ermelo (4) Heidelberg (1) Nigel (2) Volksrust (1) Lydenburg
Mange (Goat)	(2) Kingwilliamstown (1) St. Marks (2) Umtata (2) Butterworth (1) Middeldrift (1) Steytlerville	(2) Imgwavuma		
Bovine	(1) Warrenton			
Equine	(1) Bathurst (10) Umtata (1) Nqamkwe (2) Qumbu (5) Libode (1) St. Marks (1) Butterworth (1) Tsolo			
Porcine	(1) Flagstaff (3) Warrenton (1) Flagstaff (1) Bathurst (3) Mafeking			(2) Klerksdorp
Rabies	(1) Kuruman (1) Middelburg		(3) Bloemfontein (1) Kroonstad (1) Edenburg (1) Boshof	(2) Letaba (1) Ventersdorp (1) Johannesburg
Swine Erysipelas	(1) Cradock			
Trypanosomiasis (dourine)	(1) Barkly West	(1) Imgwavuma		(1) Warmbad
Tuberculosis (avain)	(1) Caledon			
(bovine)	(1) Mt. Currie (1) Queenstown (1) Tarkastad (1) George	(2) Durban (1) Pinetown (1) Umzinto (1) Inanda	(2) Winburg (1) Koppies	(1) Potgietersrust (1) Brits (1) Pretoria





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THE 1956 CAMPAIGN AGAINST FOOT AND MOUTH DISEASE IN THE EASTERN CAPRIVI ZIPFEL.

P. R. MANSVELT, Louis Trichardt,
and
T. W. NAUDÉ, Pretoria.

Introduction:

On the 24th of August, 1956, a telegram, to the effect that Foot and Mouth disease had been diagnosed in the Eastern Caprivi Zipfel, was received from the Director of Veterinary Services, Mazabuka. As it was ruled that the control of this outbreak was the responsibility of the Union Veterinary Division, an immediate start was made with preparations for a campaign there.

On the 31st of August, an advance party consisting of Dr. J. G. Williams, Sub-Director of Veterinary Services for the Transvaal, Assistant Stock Inspector Keyter and the authors left Pretoria by military Dakota to the affected area.

We reached Katima Mulile (our future headquarters in the Caprivi) the afternoon after touching down at Livingstone where we conferred with the Government Veterinary Officer at Livingstone, Mr. McLaren and Dr. Reichert from the Bechuanaland Protectorate.

The same day the rest of the party, consisting of two Supervising Stock Inspectors, five Stock Inspectors and one Assistant Stock Inspector, left by road from Pretoria in five brand new Landrover ¾ ton trucks and a three ton Chevrolet lorry.

The main objects of this campaign were:—

(1) To find out to what extent the disease had spread and what strain was concerned.
(2) If it had not already spread right through the area's cattle population, to collect virus material and spread the disease.
(3) To ascertain from where it had originated as this was the first recorded outbreak of Foot and Mouth disease in the Caprivi.

History of the Outbreak:

During May and June 1956, an outbreak of Foot and Mouth disease occurred in Barotseland, i.e. that area of Northern Rhodesia lying just north across the Zambesi river from the Eastern

Caprivi Zipfel, and by the end of August this whole area had already been artificially infected and the cattle had practically recovered.

This outbreak was thought to be associated with the S.A.T. 1 outbreak encountered in Northern Rhodesia during 1954-55. Typing, however, proved it to be S.A.T. 2 and as there was a history of movement of cattle from the Caprivi to the infected area during May 1956, it was suggested that the disease might have originated from the Caprivi.

After discussing this matter with the Northern Rhodesian Veterinary authorities, a Live Stock Officer, from Northern Rhodesia, visited the Caprivi at the request of the Magistrate in the Caprivi in approximately the middle of August. He inspected about 50% of the herds and discovered a few freshly infected herds in the mid-eastern sections of the Zipfel.

This infection was confirmed as Foot and Mouth disease by Mr. Goulestone, a Northern Rhodesian Government Veterinarian, a few days later. He reported it to the Director of Veterinary Services for Northern Rhodesia who informed the Union authorities.

Topography and Set-up in the Eastern Caprivi Zipfel.

The Eastern Caprivi Zipfel is a native reserve situated about one hundred miles west of the Victoria Falls, between the Bechuanaland Protectorate in the south and Northern Rhodesia in the north. It is roughly 150 miles long by 50 miles wide and lies between the Zambesi and Chobe rivers which form the boundaries of this area except the western half of the northern boundary which consists of an imaginary line. The area can be pin-pointed by saying that it starts from the south eastern corner of Angola and runs more or less east to the confluence of the Zambesi and Chobe rivers.

The only means of entry by road to the Caprivi Zipfel, is by crossing either the Chobe river in the south or the Zambesi river in the north by pontoon.

Very effective natural barriers were formed by the two rivers and impenetrable swamps adjoining them in the north east and south, a tsetse fly belt, devoid of all cattle, in the west, and the aridness of the area through which the man-made northern boundary passes. This assisted greatly in making the " setting alight " of the disease safe for the adjoining territories. Only along about twenty miles of the Chobe river was there any real danger of cattle crossing and infecting Bechuanaland and here a cordon was set up by the Bechuanaland Veterinary authorities.

The Caprivi Zipfel is a very level, low-lying area and has the appearance of an old lake, the southern bank of the Zambesi and the northern bank of the Chobe rivers being much lower than their counterparts on the Northern Rhodesian and Bechuanaland sides. The highest point in the Zipfel is only about 25 ft. above the Zambesi's flood water mark and consequently about a

third of the area is inundated from March to July when this river is in flood. This seasonally inundated area lies mainly along the banks of the rivers and at their confluence in the eastern section of the area.

The water of the Zambesi is clear whilst the Chobe's has a brownish tinge. A peculiar phenomenon occurs when the Zambesi is in flood — it dams up so far in the Chobe that the latter eventually overflows into the Okavango Swamps in the Bechuanaland Protectorate and thus part of the year this river flows towards the sea and part of the year it flows away from the sea.

The middle dry area of the Caprivi is very similar in vegetation to our own lowveld. The seasonally inundated area consists of miles and miles of absolutely level, sandy flats with a coarse grass covering and sparsely distributed islands of dense green bush on slight rises, each not more than a few acres in extent. The average rainfall in the Zipfel is about 25 inches per annum and it falls from December to March.

Approximately 15,000 natives populate this area and they consist of three main tribes. The most developed of these are the Mafue who are agriculturalists and live along the borders of the swamps and in the drier middle part. The Basubia, a very primitive type of native, live on islands right in the marshes and live mainly by catching fish which they eat but also dry and exchange for grain from the Mafue. A small tribe of Bushman origin, the Mambagush, lives in the arid western section.

The administrative set-up in the Caprivi is peculiar in that although part of South West Africa, it is administered directly from Pretoria by the Department of Native Affairs. The Magistrate cum Native Commissioner, Mr. A. B. Colenbrander at the time, is the only official representative of the Union there and in charge of the area. Due to a unique legal set-up, he practically has to administer through the force of his own personality and commonsense.

Apart from the latter and his wife, there are only a handful of other Europeans living in the Zipfel, e.g., a medical doctor and his family, a pontoon keeper and his family, a trader and the personnel of a Roman Catholic Mission Station. However, just across the border in Northern Rhodesia, there are about 25 Europeans in the employment of the Witwatersrand Native Labour Association (W.N.L.A.) and Zambesi River Transport, the latter recruiting for the Southern Rhodesian Government. Apart from the pontoon keeper and his wife, living on the Chobe river, all the other Europeans live within a few miles of each other at Katima Mulilo on the most northern point of the Zipfel and practically form one community.

It was from the W.N.L.A. depot at Katima Mulilo that we were able to draw our necessary petrol and oil and from whom we received invaluable assistance in acquiring spare parts for a damaged vehicle. The petrol actually came from Livingstone and

was transported by road to Kasane, a distance of about 80 miles, and from there by motor barge, 110 miles along the Zambesi to this depot.

Except for a very sandy road, extending from the Chobe crossing to Katima Mulilo, which was kept in order by W.N.L.A. for their heavy transport trucks, roads are non-existent. To the majority of places where we had to go, there were only very little used tracks, if any at all, and had it not been for the 14 native policemen or scouts the Magistrate had placed at our disposal as guides and interpreters, we would have been at a complete loss. Here we also found the four-wheel drive Landrover trucks indispensable, and had it not been for these wonderful little vehicles, our work would have been dragged out over many more tedious days or even weeks.

Distribution of Stock and Game.

The stock population consists almost entirely of cattle. A few small isolated herds of goats were encountered and only an odd donkey occasionally. Except for a small herd of pigs owned by the European trader at Katima Mulilo, they are virtually unknown in the area. Apart from an isolated group in the dry western area the 17,500 head of cattle are concentrated along the two rivers and the marshes. In general the animals are small and do not differ materially from the native cattle of the Northern Transvaal.

The main cattle diseases, apart from Foot and Mouth disease, encountered in this area are Nagana, Anthrax, Quarter Evil, Globidiosis and Demodectic mange. The latter seems to be quite a serious affliction there and an animal is regarded as practically " written off " once it shows symptoms.

The western part of the Zipfel falls on the edge of a slowly widening fly belt stretching from Bechuanaland into Angola and during the last years Nagana has killed off thousands of cattle and completely depleted this area. Apparently the disease is still slowly but surely spreading further eastward into the Zipfel.

Ticks and tick-borne diseases are amazingly rare in this area where no dipping whatsoever is undertaken.

Generally speaking the animals are all severely infested and suffer badly from every conceivable form of internal parasite. This can be explained easily as they have to graze in such swampy areas.

Rabies frequently occurs in the Caprivi and as a protective measure about 1,000 dogs around the European settlement were innoculated during the campaign.

Although a large variety of game was encountered, it was not as plentiful as we had anticipated. This is mainly due to the fact that the natives are allowed to have fire-arms. Their ammunition is rationed but they make sure that each shot counts. A fantastic variety of guns, ranging from antique muzzle loaders and Martini Henry's to shotguns and modern .303's, are to be found here.

Reasonably large herds of buffalo are however still to be seen in the western part of the Zipfel as well as along the Bechuanaland border. Relatively large numbers of elephant were also encountered in this area and were a real nuisance in breaking down trees and obstructing the road.

Some 25,000 Lechwe, a water-loving buck about the size of an Impala, roam the swamps. They seasonally migrate across the Zambesi to Northern Rhodesia and they often swim the Chobe too. The latter species and the buffalo were the main danger as far as game was concerned in transmitting Foot and Mouth disease to Bechuanaland and there was no effective way to prevent this. Luckily, no such transmission is known to have occurred.

In all, approximately 75 antelopes were shot for the pot and disease observation but none showed any evidence of infection.

In the course of our work we also came across a few pride of lion and leopard. A wonderful variety of birds is to be found there, especially waterbirds which were encountered in very large numbers. The rivers and swamps simply abound with fish, especially varieties of Tilapia (Kurper), Tiger fish and Barbel. Ingenious methods of catching fish have been invented by the native here. Quite a lot of dried fish is exported to the Copper Belt. As can be expected, excellent angling is to be found around these parts.

Crocodiles and hippos are plentiful in the swamps but around the settlements the former have been shot out to a large extent both for safety reasons and for their hide value.

Malaria was practically our only concern as far as human diseases went. The systematic use of " Aralen " prophylactically gave excellent results; while camping along the Swamps we were all severely exposed to the disease but none of us contracted it.

The Disease as Encountered on Our Arrival and on Subsequent Inspections.

The same afternoon that the Dakota touched down at Katima Mulilo, we inspected the remainder of the herd from which the movement to Northern Rhodesia had taken place in May 1956, and from which it was thought that the disease might have spread to there. It was freshly infected with Foot and Mouth disease (later on typed as S.A.T. 2) and it was from this herd that we were lucky enough to obtain fresh virus material for our " vaccine ".

On the 5th of September the convoy arrived with our supplies and equipment at Katima Mulilo. Here we had a guest house at our disposal which served as headquarters. All staff at first assisted in propagating the virus material and only when a large enough stock for inoculation had been collected, set off to do this.

The oldest infection (of some two and a half to three months' standing) was encountered in the eastern section of the Zipfel at Schuckmannsburg and Kalaluka — two places situated right in the seasonally inundated area on the banks of the Zambesi.

Further west near the fringes of the swamps the infection varied from fresh to about 4—6 weeks' standing. The further west, the less the age of infection became and along the western part of the Chobe's bank it was spreading like wild fire.

Although the infection was relatively widespread throughout the area, the majority of herds were not infected as yet. It was, therefore, of utmost importance to ensure that all cattle became artificially infected.

The susceptibility of animals to our virus inoculations as reflected by inspections on the 7th and again on the 14th day after inoculation, proved our previous observations from the first inspections to be correct. In old infected herds only calves were reacting and in newly and non-infected herds all animals became infected. No superimposed infection occurred after inoculation and we were therefore sure that we were not dealing with two different strains of virus.

Virus Production and Inoculation.

We were very fortunate to obtain fresh virus material from an unruptured foot vesicle in a calf which was noticed by Dr. Williams on the very first day after our arrival in the Zipfel.

After dilution, this material was propagated in susceptible animals by intralingual inoculation until enough material had been obtained for the campaign.

The procedure followed was on the lines of that described and used by Dr. P. G. Howell in the 1954-55 Letaba district outbreak.

After 18—24 hours we harvested the fluid from the tongue vesicles, as well as the covering membranes. Three days after inoculation all these animals were again individually examined after casting and all the available foot blisters aspirated. All the vesicular fluid was stored in a refrigerator at a concentration of 1:20 in phosphate buffered saline solution with penicillin and streptomycin added to counteract bacterial activity, whilst the covering membranes were stored in phosphate buffered glycerine.

Incidentally, the bulk of our virus material was obtained from foot vesicles. The tongue vesicles were rather disappointing in that they were very flat, did not contain much fluid and were ruptured much more easily than the foot blisters.

Just before issue, all the collected membranes were emulsified and added to the 1:20 solution of vesicular fluid. This concentrated solution was issued to the staff in non-actinic bottles, which were kept cool by wet rags in the veld. They were also issued with 500 c.c. bottles of buffered saline solution and instructed how to dilute the concentrated solution down to 1:500. This was only done immediately before inoculation. The finally diluted virus was injected intramuscularly in 1 c.c. doses.

Eight crushpens were erected at strategic points for inoculations and inspections. Cattle sometimes had to come many miles and swim rivers and swamps to get there. Notwithstanding all

these hardships we found the native most co-operative and had no trouble at all to get the work done.

The cattle were inspected one week and again two weeks after inoculation to ascertain whether they had become infected. After seven days the vast majority had already taken and it was found easier to estimate the percentage of infection in a herd at this stage when freshly ruptured foot vesicles could easily be noticed, than 14 days after inoculation when one had to look for early slippers or partly healed tongue lesions.

Some Remarks on the Origin and Spread of the Infection.

In our opinion the Northern Rhodesian outbreak could not have originated in the Eastern Caprivi Zipfel as the remainder of the herd, from which the movement took place in March, 1956, was freshly infected with S.A.T. 2 type virus on our arrival five months later.

Judging from all the known information, it seems that the disease in the Zipfel started approximately in June in the eastern section around Schuckmannsburg. Because this area was inundated at that time and the herds were therefore isolated on many small islands and consequently little or no contact between herds existed, the disease spread very slowly. This fact also explains the peculiar instances encountered where for instance in one herd an infection of two or three months' standing would be encountered, whilst at another kraal, almost within sight of the previous one, the cattle escaped natural infection altogether.

As the floodwaters receded the natives from the swamps started trading their dried fish for grain from the natives in the higher situated areas. This was done exclusively by cattle drawn transport by which means the disease got out of the marshes, and once it got onto higher country, where contact between herds was more frequent, began spreading at a fast rate.

The first infection discovered during the recent outbreak in Barotseland, Northern Rhodesia, was at Sankalonga, approximately 15 miles north, directly across the Zambesi from Schuckmannsburg where the oldest infection in the Zipfel was encountered.

The only conclusion that could be arrived at was that the infection had started in the Sankalonga-Schuckmannsburg area and had then spread northwards into Northern Rhodesia and southwards into the Eastern Caprivi Zipfel.

Conclusion of Campaign.

The immunisation was completed exactly three weeks after we had arrived in the Zipfel. A little more than two weeks later, we left for the Union. A conference with Veterinary representatives from Northern and Southern Rhodesia, Bechuanaland Protectorate and the Union was held at Livingstone to discuss the outbreak and its possible implications after which we departed and were back in Pretoria just over six weeks after we had set out.

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References.

Howell, P. G. (1955) Propagation of Foot and Mouth disease virus (unpublished).

McIntyre, G. (1939): The Lungsickness campagn in the Caprivi Zipfel, Jnl. S.A.V.M.A., Vol X, No. 1, p.p. 4—12.

ERRATA

In the June 1957 issue of this journal under registration of Fertilizers, Farm Seeds, etc., Act 36 of 1947, the following errors in description occurred and should be corrected under Maybaker's (S.A. (Pty.), Ltd)., products:—

Arisol was incorrectly described as Aristol.

Embazin was called E. M. Bazin.

Vesadin was referred to as Vegadin. The latter drug is a brand of sulphadimidine sodium injection which has only been made available to the Veterinary profession this year.

A NOTE ON THE ANTIBIOTIC CONTAMINATION OF MILK SUPPLIES AS A VETERINARY AND PUBLIC HEALTH PROBLEM.

P. J. MEARA
Johannesburg

(A) **General Considerations:**

1. The extent of antibiotic contamination of milk supplies.
2. The degree of contamination harmful to cheese manufacture.
3. The period of excretion after intramammary treatment.
4. The effect of pasteurising contaminated milk.
5. The testing of milk for antibiotic contamination.
6. The preservative effect of antibiotics in the milk supply.

(B) **Mastitis in Relation to Antibiotic Therapy:**

1. Incidence of Mastitis.
2. Changing etiology.
3. Antibiotic resistance.

(C) **Health Hazards Presented by Contaminated Milk Supplies:**

1. Sensitisation and Allergic Responses.
2. Antibiotic resistance.
3. Increasing incidence of staphylococcal mastitis.
4. General considerations.

(D) **Measures for Overcoming the Antibiotic Milk Problem:**

1. General Measures.
   (i) The need for investigation.
   (ii) Educational and information services.
2. Factors Relating to the Cow and to Mastitis Therapy.
   (i) Ready access to antibiotic remedies.
   (ii) Irrational udder therapy.
   (iii) Limitation of dosage.
   (iv) Improved diagnostic facilities.
3. Factors Relating to Contaminated Milk.
   (i) The bulking of milk supplies.
   (ii) Inactivation of penicillin contamination.
   (iii) Incorporation of dye with intramammary antibiotics.
   (iv) Discarding the milk from treated cows.

GENERAL CONSIDERATIONS.

Mastitis is still relatively common amongst dairy cows and intramammary treatment with antibiotic remedies is widely practised by owners of cattle. When milk from recently treated cows is mixed into the herd milk, the bulked milk supply contains varying traces of antibiotic and is potentially harmful in two respects:

(a) **Cheese manufacture and cultured milk products:**

If contaminated milk is used for manufacturing purposes the normal growth of the starter cultures may be inhibited and the product spoiled. A comprehensive survey by Overby (1954) deals with all aspects of this problem, from the earliest indication of penicillin starter failure reported by a Danish dairy manager, Hansen, in 1947, and Doan (1956) too, review the problem admirably and express concern at the threat to the dairy industry.

(b) **Milk consumption:**

Medical authorities are concerned that persons may suffer harmful effects as a result of consuming contaminated milk, especially in respect of sensitisation to penicillin and allergic manifestations.

The probably harmful antibiotic milk threshhold and the other factors likely to affect the milk-consuming public adversely are difficult to assess. However, many aspects of this antibiotic problem are indirectly related to problems associated with cheese manufacture, and it appears advantageous to approach the public health problem from this angle, and to consider briefly certain aspects of the cheese production investigations.

(1) **The extent of Antibiotic Contamination of Milk Supplies:**

In the U.S.A. three surveys were reported where respectively 3.2%, 11.6% and 5.9% of market milk samples revealed antibiotic traces (Welch et al: 1955, 1956). Shahani et al (1956) found 7.3% of raw milk samples in an Ohio area contained antibiotics, with a critical concentration present in 1.3% of these samples. In Wisconsin 4.3% of herd milk samples showed antibiotic activity, and in a subsequent second survey 2.4% of samples were strongly, 6.3% mildly and 17.8% slightly inhibitory (Neal & Calbert, (1954).

A survey of English herds by Storrs and Hiett Brown (1954) revealed an incidence of penicillin-containing milk of the order of 3% in composite churn milk samples. Occasional bulk milk samples from road tanks also showed penicillin activity, but in general the bulking of supplies to 2,000—3,000 gallons served to dilute the antibiotic to such a degree that no penicillin could be detected in supplies from 33 road tanks tested. Panes et al (1957) found a penicillin concentration of 0.05 i.u./ml. or more in 3 to 4% of samples taken from creameries in Wales. Berridge (1956b) co-ordinated the results of a joint survey covering a wide area of England and Wales, and comprising 5,000 samples taken from vat, churn or farm. Penicillin was present in concentrations

of 0.04 i.u./ml. or more in 3.7% of the farm samples, and in 2.3% of the samples, and in 2.3% of the samples of bulk milk taken from tankers, storage tanks and cheese vats.

Overby (1954) too, cites many workers in Scandinavian and other European countries who report the presence of antibiotic substances in milk.

These surveys in the U.S.A., Great Britain and Europe leave little doubt that penicillin and other antibiotic traces are frequently present in herd milk supplies. The degree of penicillin contamination depends on many factors such as the dosage of intramammary penicillin, the number of quarters infused, the amount of milk produced by each infected cow, the number of infected animals in a herd and the volume of milk from treated cows in relation to the total herd milk supply. Scientific evidence of the position in South Africa is still lacking, but in the face of overseas evidence it seems unlikely that our own milk supplies are not contaminated with antibiotics.

(2) **The degree of contamination harmful to cheese manufacture:**

The influence of penicillin and other antibiotics on starter cultures used in cheese making has been studied by very many workers, but restricted library facilities make it possible to mention a few workers only, mainly selected in order to illustrate certain specific lines of enquiry.

Hunter (1949a) indicated a maximum permissible level of penicillin in cheese-making milk of less than 0.10 i.u./ml. Higher concentrations of penicillin in milk than 0.10 i.u./ml. regularly result in poor quality cheese (Whitehead and Lane, 1956). This level seems to be accepted as the critical level by most workers, but even when lower concentrations are present the cheese is likely to be inferior (Thomas et al, 1955).

Berridge (1956c) described a differential antibiotic effect on different strains of the same species of cheese starter organisms. Some strains did not suffer until the penicillin concentration exceeded 0.096 i.u./ml., whereas others suffered a diminution of activity of about 50 per cent. at this level.

The method effectively employed to keep the degree of contamination to minimal levels is to mix individual farm milks into large volumes of up to 3,000 gallons, to reduce by dilution the penicillin content of contaminated milk. Provided the milk supplies are bulked sufficiently and mixed adequately, antibiotic contamination does not appear to be a serious problem, but many authorities issue a warning that the position may become more difficult if the veterinary use of penicillin and other antibiotics increases considerably, and more potent remedies and combinations continue to be developed (Bell, Flora, Reaves and Holdaway, 1951).

(3) **The period of excretion after intramammary treatment:**

The amount of penicillin is usually greatest at the first milking after treatment and decreases progressively, but effective quanti-

ties may still remain up to 3—5 days according to the preparation used and the dose administered.

Storrs and Hiett Brown (1954) investigated a herd of 50 cows 37 of which had received intramammary treatment. The first milking after the second administration of penicillin contained 29 i.u./ml. in 60 gallons of milk, a concentration sufficient to cause inhibition even if bulked with 6,000 gallons of penicillin-free milk. The bulked herd milk contained amounts of penicillin exceeding 0.10 i.u./ml. up to the fifth milking after treatment. This is important in considering the period during which milk should be discarded after penicillin treatment.

The issue is, however, complicated by the dissimilarity of the various antibiotics, and the differential activity they display in the milk after intramammary treatment. Thus, whereas 2 per cent. of the first milk after aureomycin treatment added to normal milk completely inhibited acid production of starter cultures, in order to obtain the same effect with the other antibiotics, 5 per cent. of the first milk after streptomycin treatment, 10 per cent. of that after penicillin and terramycin treatment, and as much as 40 per cent. of the first milk after treatment with chloromycetin were required (Overby, 1954). Consequently it has been recommended that milk should be discarded for at least two days following treatment with chloromycetin, for three days following treatment with penicillin, streptomycin or terramycin, and for four days after aureomycin treatment.

(4) **The effect of pasteurising contaminated milk:**

Unfortunately pasteurisation does not appreciably inactivate penicillin in milk, either by the flash method at 150°—160°F. or by the holder method at 145°F for 30 minutes, and it is generally accepted that penicillin and other antibiotics are heat resistant at pasteurisation temperature (Hunter, 1949a and 1949b; Foster and Wilker, 1943; Katznelson and Hood, 1949). Overby (1954), page 15, has shown that aureomycin, chloromycetin, streptomycin and terramycin are also heat-resistant.

Steaming milk for a period of one hour resulted in a loss of potency of penicillin preparations of only 50 per cent. (Hunter, 1949a), and Watts and McLeod (1946) heated milk to 100°C and detected no destruction of penicillin within 15 minutes and only 75 per cent. destruction after one hour.

(5) **The testing of milk for antibiotic contamination:**

Many different methods have been used for testing purposes and reference to the workers cited reveals a variety of procedures. Mostly they rely on assessing the rate of growth of selected test organisms, by laboratory procedures which are unfortunately incapable of application in milk depots and dairies.

The increasing use of quaternary ammonium compounds for cleansing dairy equipment also creates new problems, as these substances too, inhibit the growth of lactic acid streptococci and

other bacteria. Residual sulphonamides in milk, and other chemical substances such as disinfectants and detergents, may also have similar effects and it is essential to show that the antibacterial activity of a milk sample is due exclusively to antibiotic substances. When testing for penicillin, for example, a control sample should be used in which any penicillin present has been destroyed by the addition of penicillinase (Foster and Woodruff, 1943: Overby, 1954), but as antibiotics other than penicillin become increasingly used for intramammary therapy the testing of milk for antibiotic activity becomes correspondingly complicated.

Berridge (1956a) demonstrated the possibility of assaying penicillin in milk in 30 minutes, and subsequently he also used an electrometric method to observe minute by minute the production of acid by a normal vigorous starter culture (Berridge, 1957), but a satisfactory field test is still not available.

Ideally it should be possible to employ a test at the loading platform to detect any contaminated milk supplies immediately, and it is a prime requisite for overcoming the problem that a rapid test be devised which can be applied in the receiving-line operation. By this means control measures could be applied, even to the extent of rejecting the milk in extreme cases or enforcing price discrimination, and educational programmes could also be developed for the good of the dairy industry.

(6) **The Preservative Effect of Antibiotics in the Milk Supply:**

Apart from antibiotic contamination resulting from intramammary therapy there is also a possibility that producers may add antibiotics directly to milk in an effort to improve the keeping quality, but the method appears likely to prove erratic. Penicillin inhibits the growth of certain contaminating organisms only, and whereas the lactic acid streptococci are sensitive to penicillin the coliform bacteria are non-sensitive. Depending on the relative proportions of these two main classes of comtaminating organism a variable end result could be expected (Hunter, 1949c).

A concentration of 1 u./ml. of penicillin in raw milk reduced the total bacterial count during three days' storage at 50°F, but the coliform count was not affected at a concentration of 10 u./ml., and 1,000 u./ml. were required for complete coliform inactivation (Wilkowske and Krienke, 1951). The other antibiotics commonly used for treating the udder exert differential inhibitory effects (Overby, 1954).

Another aspect of penicillin contamination of general interest to milk sanitarians is the interference with dye reduction tests commonly used as an index of the keeping quality (Hunter, 1949c). By virtue of its bacteriostatic properties penicillin may have a definite but variable effect in prolonging the period required to reduce the dye, consequently a misleading improvement in the quality of milk may be shown by the test, without any real improvement in sanitary conditions or efficiency in cooling on the farm. This concept becomes more complex when the entire range of

antibiotics is taken into consideration, especially considering those antibiotics of increased potency with a wide range of bacterial effectivity.

(B) MASTITIS IN RELATION TO ANTIBIOTIC THERAPY.

(a) **Incidence.** After a decade of antibiotic therapy mastitis is still a major problem in milk-producing areas [Edit. (1958) Vet. Record]. In Great Britain Laing and Malcolm (1956) estimate the total annual loss due to mastitis to be about £19,000,000, and they emphasise that it is still one of the most serious causes of loss to the dairy farmer.

During the period 1951-54 they determined that roughly 37 per cent. of cows examined were affected with mastitis, in spite of modern chemotherapy and antibiotics. Their method of using the cell count test in addition to the culture test showed an incidence of 12 per cent. staphylococcal mastitis, 6 per cent. streptococcal, 5 per cent. of mixed-infections, and 14 per cent. non-specific mastitis.

In America, Murphy (1956) too, reports that mastitis is still the most costly dairy cattle disease, not under control in the U.S.A., and he believes further information is necessary if the disease is to be precisely controlled.

(2) **Changing etiology.**

(i) **Str. agalactiae.** In view of this organism's restricted habitat and its vulnerability to properly applied penicillin it is understandable that the evidence from many sources indicates a greatly reduced incidence of mastitis due to Str. agalactiae (Laing and Malcolm, 1956: Wilson, 1958). The fact that it has been possible to propound a scheme for the eradication of Str. agalactiae from dairy herds represents a triumph for penicillin, and has resulted in substantial improvements in the milk yields of such herds. (Stableforth, 1950: Tech. Comm. on Mastitis of the Agric. Res. Council, 1955).

(ii) **Other forms of infectious mastitis.** A less satisfactory outlook prevails with regard to the other forms of infectious mastitis [Edwards (1954)]. Wilson (1952, 1958) points out the ubiquitous nature of these organisms, and the impossibility of eradicating them from dairy cattle, and stresses that where they constitute a herd problem special attention must be directed towards management generally and particularly to the milking technique.

In Britain staphylococcal infections and non-specific mastitis now far outnumber streptococcal infections, in the proportion of roughly 3:1, and in recent years three-quarters of the specific infections were due to staphylococci, which are in general less highly responsive to antibiotics (Laing and Malcolm, 1956). Schalm (1953) noted an etiological shift towards M. pyogenes as the primary organism associated with chronic mastitis and Edwards (1958) found that Staph. aureus is the most common organism associated with clinical disease in herds free from Str. agalactiae.

Wilson (1958) too, mentions the increasing importance of Staph. pyogenes, and the disquieting frequency whereby the occasional pathogens of a few years ago are now recovered from severely affected udders.

(c) **Antibiotic Resistance.**

An increased incidence of antibiotic-resistant strains is reported by various workers. During a two-year period penicillin-resistant M. pyogenes var. aureus increased from 9 to 37 per cent. in Dorset (Tee, 1957). Price et al (1954) found penicillin-resistant staphylococci particularly in herds receiving the most treatment with penicillin. Berthelon and Rampin (1953) too, described the development of antibiotic resistance in two herds, treated for chronic staphylococcal mastitis, and Worseck (1956) found that six of 39 strains of staphylococci isolated from cases of mastitis were resistant to penicillin.

(C) HEALTH HAZARDS PRESENTED BY CONTAMINATED MILK SUPPLIES.

The possibility that antibiotics in foodstuffs may produce harmful effects has long been considered, and the problem was discussed at length at the First International Conference on Antibiotics in Agriculture in October 1955 (National Res. Council Pub., 397).

The U.S.A. Food and Drug Administration also met representatives from numerous organisations in any way connected with the problem to discuss the public health significance of antibiotics in milk, and in general, it was agreed that penicillin, because of its sensitising action, might produce a public health problem (Anon., 1957).

1. **Sensitisation and Allergic Responses.**

As a result of their survey establishing penicillin concentrations of 0.003—0.08 units/ml. in 11.6 per cent. of market milk samples in the U.S.A., Welch and his associates (1955) consulted 31 authorities in the fields of antibiotic therapy, allergy and pediatrics. Their general feeling was that these concentrations might induce reactions in exquisitely sensitive consumers. It was believed that these concentrations were unlikely to modify the oral or intestinal flora, cause the emergence of resistant strains, or to provoke sensitisation of the non-sensitive consumer.

Subsequently a U.S.A. Medical Advisory Panel considered the public health problems involving the presence of antibiotics in market milk (Welch, 1957). Certain findings may be quoted verbatim, because of the authoritative source of this opinion:

"Our main health problem is concerned with penicillin to the exclusion of the other antibiotics that are used in mastitis preparations . . . even though they may find their way into market milk . . . Penicillin is a highly-active antigenic substance and even in the very small concentrations found in milk, might well cause

reactions in highly-sensitive individuals . . . The latter individuals are most concerned with the public health problem and they constitute something less than 10 per cent. of the population . . . It seemed certain that reactions could occur in these individuals, of varying intensity from mild transient ones to possibly serious ones . . . The problem of contamination with antibiotics in our foods and particularly in milk is a small one compared to our other current food safety problems . . . Nevertheless, milk is consumed by the strong and the weak, the old and the young, the well and the sick, and the allergic and the non-allergic individual . . . Even though the adulteration of milk with penicillin may affect only a small percentage of the population, this percentage can represent several million people all of whom must and will be fully protected . . . "

In Britain Vickers and his co-workers (1958) recently described dermatitis caused by penicillin in milk. They believe that when patients previously sensitised to penicillin by local application drink milk containing penicillin, dermatitis may develop and persist indefinitely if its true nature is not recognised. They state that although the penicillin content of bulked milk is so low as to be innocuous to normal persons, the average maximum quantity of up to about 20 units per glass in contaminated milk supplies affects sensitive persons and provokes a reaction. Erskine (1958) also records the reactivation of severe dermatitis, after trying a Swedish milk diet, in a patient originally sensitized by a course of penicillin injections.

2. **Antibiotic Resistance.**

Antibiotic resistance was studied by Thatcher and Simon (1955), who found that 67 per cent. of streptococci and 15 per cent. of micrococci isolated in a survey of cheese purchased from the Canadian retail market were penicillin resistant. The organisms were most often resistant to penicillin and dihydrostreptomycin, the two antibiotics most frequently used in treating cows for mastitis. They suggest the possibility that where antibiotics are used to treat dairy cows the survival of resistant organisms may contaminate foods, and contribute to the problem of infections with resistant strains, of persons with no history of hospitalization or antibiotic therapy.

Indirect support of this concept is afforded by Tee (1957), who observed a four-fold increase of penicillin resistant M. pyogenes *var* aureus in herd milk samples over a period of two years, and suggested that the use of penicillin in treating mastitis might be responsible for the emergence of the resistant strains. Mention has already been made of antibiotic-resistant strains reported by Berthelon and Rampin (1953), Price et al (1954) and Worseck (1956) from dairy herds.

(3) **Increasing Incidence of Staphylococcal Mastitis.**

Commenting on outbreaks of staphylococcal food poisoning, attention has also been directed to the possible implications of

the relatively increased incidence of staphylococcal udder infections as a result of the widespread antibiotic treatment of bovine mastitis (Annot, 1956).

(4) **General Considerations.**

In July, 1957, a joint conference was convened in London by the Food Law Institute of the U.S.A., the Food Group of the Society of Chemical Industry and the Association of Public Analysts of Great Britain (Confer., 1957).

Attention was directed to the necessity for discarding the milk from cows being treated for mastitis for at least 72 hours from the final treatment, and three further measures were reported as being applied in the U.S.A.:

(i) An intensive programme to educate farmers of the importance of the problem.

(ii) A warning statement to be required on the containers of antibiotic drugs for intramammary use that milk from cows being treated for mastitis should be discarded for at least 72 hours from the final treatment.

(iii) A proposal was made to limit the penicillin content of mastitis preparations to 100,000 units per dose.

(D) MEASURES FOR OVERCOMING THE ANTIBIOTIC MILK PROBLEM.

(1) **General Measures:**

(i) **The need for investigation.** In the absence of information regarding antibiotic contamination in South Africa there is a need to investigate local milk supplies to determine the extent of our own problem.

While the large institutes have the advantage of being able to apply precise scientific procedures, relatively accurate simplified methods are available for small laboratories which would also provide useful information.

(ii) **Educational and Information Services.** Dairy farmers generally require to be educated regarding the importance of the problem. Information needs to be disseminated as widely as possible, especially concerning the need to discard milk from cows recently treated for mastitis and the wisdom of applying rational mastitis therapy.

(2) **Factors Relating to the Cow and Mastitis Therapy.**

(i) **Ready access to antibiotic remedies.** Intramammary remedies are readily obtainable in South Africa from chemists, agricultural co-operatives, veterinary firms and wholesale agencies, and most farmers resort to antibiotic therapy immediately they wish to overcome mastitis. This availability of antibiotics, allied often with a remoteness from veterinary assistance or a disinclination to seek professional guidance, makes empirical trial-and-error mastitis medication usual, and abuse of antibiotics frequently occurs.

Dairy herds with a relatively minor mastitis problem often suffer maltreatment or over-treatment, resulting in mammary irritation, loss of milk and other consequencse. If the free supply of antibiotic remedies cannot be restrained, then dairymen require to be discouraged from using them irresponsibly and warned of possible ill-effects.

(ii) **Irrational Udder Therapy.** A separate approach to the herd mastitis problem caused by different types of infectious mastitis is often required (Hughes, 1954), but the average dairyman usually employs empirical antibiotic therapy, and if one remedy fails another more potent combination is often used, irrespective of other requirements such as improved animal husbandry practices.

(a) Str. agalactiae as a herd mastitis problem can be eradicated completely by treating simultaneously all quarters of all infected cows with two doses of 100,000 units per quarter of procaine penicillin, with an interval of 3 days between the two treatment, and by attending to the milkers' hands and cows' teats with antiseptic cream in accordance with the recommendations of the Technical Committee on Mastitis (1955). The organism is sensitive to penicillin and there is no evidence that resistant strains of this organism can develop.

(b) Herd mastitis problems due to the other forms of infectious mastitis usually require a careful study of environmental conditions such as feeding, stabling, general management, especially the milking technique, before applying appropriate antibiotic therapy, e.g. streptococcal mastitis, staphylococcal and bacillary mastitis.

(c) Non-specific mastitis resulting from various forms of trauma is relatively common amongst dairy cows (Laing and Malcolm, 1956), and antibiotic treatment of the clinical form of this disease is irrational. Apart from eliminating faulty methods, and drying off the cow rather quickly and giving her a suitable rest between lactations there is little one can do.

(iii) **Limitation of Dosage.** A proposal to limit intramammary penicillin to a packing of 100,000 units dosage has been mentioned.

Packings of 300,000 units penicillin appear to be becoming commonplace, and the milk may require to be discarded for a longer period than 72 hours after treatment, if the increased dosage is accepted as a desirable therapeutic measure.

(iv) **Improved Diagnostic Facilities.** The remoteness or lack of milk diagnostic facilities in many regions tends to complicate the dairyman's task of maintaining healthy udders.

In order to illustrate the beneficial influence of **periodical microscopic examination of quarter samples** the mastitis record of a dairy herd operated by alcoholics and mentally and physically handicapped persons is cited in Table I:

TABLE I.

A comparison of the mastitis incidence in one herd undergoing regular microscopical tests with 96 commercial herds tested for survey purposes ony.

Year	No. of Quarter Samples	Positive Samples No. of	Per Cent. Positive	Period	Cow Samples from 96 Commercial Dairy Herds	No. of Samples Positive
1949	596	2	0.3%	1949	6,449	878
1950	530	1	0.2			or
1951	937	3	0.3			13.6 per
1952	522	2	0.4			cent.
1953	707	1	0.1			
1954	742	5	0.7			
1955	896	4	0.4			
1956	673	1	0.15			
1957	540	6	1.0			
Total	6,143	25	0.41%			

It is true this herd comprising 70 cattle is small, and is also a self-contained unit, but it also suffers the disadvantages inherent with labour of this type. Nevertheless, very favourable comparison is made with the results obtained by survey tests of other herds supplying milk to Johannesburg during the period 1948—1958, which are not tested regularly.

The comparison is unscientific for many reasons but it does illustrate the favourable influence afforded by periodical milk examination, as compared with the position prevailing in other dairy herds which do not enjoy this facility.

It is a matter for regret that dairymen generally are not able to avail themselves of a service of this nature, microscopic or cultural, which would facilitate mastitis control immeasurably and rationalise antibiotic therapy.

(3) Factors Relating to Contaminated Milk.

(i) **The bulking of milk supplies.** The principle of bulking individual farm supplies into large volumes of up to 3,000 gallons is a simple and economical means of reducing antibiotic contamination to a minimal level by dilution. Unfortunately, it cannot be applied generally in respect of fresh milk supplies, because many milk shops handle a relatively small gallonage from a limited number of dairymen.

Reference to the accompanying table summarises the position in Johannesburg (Table II).

TABLE II.

The distribution of milk volumes handled by milk shops and depots.

No. of Milk Shops and Depots.	Approximate Daily Gallonage of Milk Handled.
7	Less than 100 gallons
24	100—400
10	400—700
5	700—1,000
7	1,000—1,500
5	1,500—3,000
1	4,500
1	13,000

(ii) **Inactivation of Penicillin Contamination.** A calculated amount of penicillinase may be added to the milk from cows which have been treated with penicillin, to inactivate any penicillin which may be present (Chapman, 1956). The method is however expensive, and the ethics of adding an enzyme to neutralise penicillin which should not be present in the milk, are questionable

(iii) **Incorporation of dye with intramammary antibiotics.** Scientists in the U.S.A. are trying to develop a dye that can be added to penicillin preparations for mastitis, but it is proving difficult to find a dye which will discolour the milk for 72 hours without being toxic to the cow. A red dye has been found harmless, but its effect wears off in about 30 hours (Annot, 1957), and the investigations are proceeding.

Provided this method can be successfully developed, and made compulsory in respect of antibiotic preparations, the problem of contamination of the milk supplies would seem to be much nearer to a practical solution.

(iv) **The Discarding of milk from treated cows.** Many dairy farmers do not appreciate that the elimination of antibiotics from the udder in the milk continues for several days after intramammary treatment, and that the milk is unsuitable for consumption. Actually the milk is also adulterated by its pus content, which persists for a variable period after treatment (Blackburn, 1955, 1956), and may be considered unsuitable on this account too.

Other farmers are unwilling to discard milk from cows treated for mastitis because of financial loss. The milk may appear normal and is included with the milk from healthy cows, so contaminating an entire herd milk supply. Especially when milk is in short supply, due to seasonal or other influences, the temptation is correspondingly increased. Similarly when a large number of cows receive antibiotic therapy, either resulting from a herd mastitis problem or because of pressure from public health supervision, a fairly large gallonage of milk is involved and the producer may be tempted to consign milk from recently treated cows.

There are two methods for informing the dairyman of the necessity to discard contaminated milk:

(a) **Professional Guidance.** The practitioner undertaking treatment of infected herds is fortunately placed to issue personal instructions regarding the precautions necessary after completion of treatment.

(b) **Adequate Warning by the Manufacturer.** It is axiomatic that full directions should accompany any medicine, no less in the case of potent substances like antibiotics than any other remedy. Instructions are provided with an antibiotic packing regarding administration, **but adequate warning should also be given to the purchaser that the milk from treated cows must be discarded until 72 hours after the final treatment.**

It is suggested that the registration of intramammary antibiotic remedies should be conditional on compliance with this requirement. Experience in the U.S.A. may also be taken into account, for whereas from 1951 a warning slip was inserted within the intramammary packing, in order to carry the warning more directly to the user it is now required that the warning be placed prominently on the label of each intramammary container.

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REFERENCES

Annotation (1956) — Food Poisoning and Dried Milk. Lancet, CCLXX, 6910, p. 240.

Annotation (1957) — Penicillin in Milk. Vet. Rec., 69, 36, p. 868.

Anonymous (1957) — Queries and Minor Notes — Antibiotics in Milk. J. Amer. Med. Assoc., 163, 10, pp. 904-905.

Bell, W. B., Flora, C. C., Reaves, P. M. and Holdaway, C. W. (1951). Aureomycin concentration in milk following intramammary infusion and its effect on starter activity. (J. Dairy Sci., 34, pp. 675-679.

Berridge, N. J. (1956a) — Penicillin in Milk. II: The rapid routine assay of low concentrations of penicillin in milk. J. Dairy Res., 23, 3, pp. 336-341.

Berridge, N. J. (1956b) — Penicillin in Milk. II: The incidence of penicillin J. Dairy Res., 23, 3, pp. 342-347.

Berridge, N. J. 1956c) — Penicillin in milk. III: The effect of low concentrations of penicillin on the rate of acid production by starter cultures. J. Dairy Res., 23, 3, pp. 348-354.

Berridge, N. J. (1957) — Some advantages of a very sensitive pH discriminator. Dairy Ind., 22, 12, pp. 1022-1023.

Berthelon, M. and Rampin, D. (1953) — (Chronic staphylococcal mastitis in cows). Rev. Méd. vét., 104 (12) 657-74. (Dairy Sci. Abs., 16, 3, 1009a).

Blackburn, P. S., Laing, Constance, M. and Malcolm, D. F. (1955) — A comparison of the diagnostic value of the total and differential cell counts of bovine milk. J. Dairy Res., 22, pp. 37-42.

Blackburn, P. S. (1956) — J. Dairy Res., 23, p. 225.

Chapman, H. R. (1956) — The addition of penicillinase to milk of cows receiving penicillin. Dairy Ind., 21, 12, pp. 970-971.
Conferences (1957) — Chemical Additives in Foods. Lancet, CCLXXIII, 6990, pp. 336-337.
Doan, F. J. (1956) — Antibiotics in milk from farms. J. Dairy Sci., 39, 12, pp. 1766-1767.
Editorial (1958) — Bovine mastitis. Vet. Rec., 70, 6, p. 113.
Edwards, S. J. (1954) — The control and treatment of certain forms of mastitis. Vet. Rec., 66, 3. pp. 37-41.
Edwards. S. J. (1958) — Mastitis caused by bacterial infection. Vet. Rec., 70, 7, pp. 139-141.
Erskine, David (1958) — Dermatitis caused by penicillin in milk. Lancet, 1, 7017, pp. 431-432.
Foster, J. W. and Wilker, B. L. (1943) — Microbiological aspects of penicillin. II: Turbidimetric studies of penicillin inhibition. J. Bact., 46, pp. 377-389.
Foster, J. W. and Woodruff, H. B. (1943) — Microbiological aspects of penicillin. I: Methods of assay. J. Bact., 46, pp. 187-202.
Hunter, G. J. E. (1949a) — The effect of penicillin on lactic streptococci. J. Dairy Res., 16, 1, pp. 39-45.
Hunter, G. J. E. (1949b) — The effect of penicillin in milk on the manufacture of cheddar cheese. J. Dairy Res., 16, pp. 235-241.
Hunter, G. J. E. (1949c) — A note on the effect of penicillin on the reductase test for milk quality. J. Dairy Res., 16, pp. 149-151.
Katznelson, H. and Hood, E. G. (1949) — Influence of penicillin and other antibiotics on lactic streptococci in starter cultures used in cheddar cheese making. J. Dairy Sci., 32, pp. 961-968.
Laing, Constance, M. and Malcolm, J. F. (1956) — The incidence of Bovine Mastitis with special reference to the non-specific condition. Vet Rec., 68, 28, pp. 447-455.
Murphy, J. M. (1956) — Mastitis — The struggle for understanding. J. Dairy Sci., 39, 12, pp. 1768-1773.
Neal and Calbert (1956) — Milk Dealer, 45, 49. (J. Dairy Res., 24, 3, p. 394).
Overby, A. J. (1954) — Antibiotics in milk. Dairy Sci. Abs., 16, 1, pp. 2-23.
Panes, Edge, Hobson and Thomas (1957) — J. Soc. Dairy Tech., 10, 81. (J. Dairy Res., 24, 3, p. 394).
Price, P., Neave, F. K., Rippen, J. E. and Williams, R. E. O. 1954) — The use of phage typing and penicillin sensitivity tests in studies of staphylococci from bovine mastitis. J. Dairy Res., 21, p. 342.
Schalm, O. W. (1953) — J. Amer. Vet. Med. Assoc., 122, 915, pp. 462-467. (Dairy Sci. Abs., 16, 3, 228b).
Shahani, K. M., Gould, I. A., Weiser, H. H. and Slatter, W. L. (1956) — Observations on antibiotics in a market milk supply and the effect of certain antibiotics on the keeping quality of milk. Antibiotics and Chemotherapy, 6, pp. 544-549.
Stableforth, A. W. (1950) — Bovine mastitis with particular regard to eradication of Streptococcus agalactiae. Vet. Rec., 62, 15, pp. 219-224
Storrs, F. C. and Hiett Brown, W. (1954) — The incidence of penicillin in milk supplies. J. Dairy Res., 21, pp. 337-341.
Technical Committee on Mastitis of the Agricultural Research Council (1955) — A method for the eradication of Str. agalactiae. Vet. Rec., 67, 22, pp. 410-411.
Tee, G. H. (1957) — The incidence of penicillin — resistant strains of Staph. aureus in dairy herd samples. Month. Bull. Min. Health, 16, pp. 141-144.
Thatcher, F. S. and Simon, W. (1955) — The resistance of staphylococci and streptococci isolated from cheese to various antibiotics. Canad. J. Pub. Health, 46, 407-409.
Thomas, S. B., Panese, J. J. and Lewis, J. (1955) — Soc. Dairy Tech., 8, 202.

Vickers, H. R., Bagratuni, L. and Alexander, Suzanne (1958) — Dermatitis caused by penicillin in milk. Lancet, 1, 7016, pp. 351-352.

Watts, P. S. and McLeod, D. H. (1946) — The estimation of penicillin in blood serum and milk of bovines after intramuscular injection. J. Comp. Path., 56, pp. 170-179.

Welch, H. Jester, W. R. and Burton, J. M. (1955) — Antibiotics in fluid milk. Antibiotics and Chemotherapy, 5, 10, pp. 571-573.

Welch, H., Jester, W. R. and Burton, J. M. (1956) — Antibiotics in fluid market milk. Antibiotics and Chemotherapy, 6, 5, pp. 369-374.

Welch, H. (1957) — Problems of Antibiotics in food as the food and drug administration sees them. Amer. J. Publ. Health, 47, 6, pp. 701-705.

Whitehead, H. R. and Lane, D. J. (1956) — The influence of penicillin on the manufacture and ripening of cheddar cheese. J. Dairy Res., 23, pp. 355-360.

Wilkowske and Krienke (1951) — J. Milk Tech., 14, 92. (J. Dairy Res., 20, 3, p. 401).

Wilson, C. D. (1952) — The control of bovine mastitis. Vet. Rec., 64, 36, pp. 525-530.

Wilson, C. D. (1958) — Factors that predispose to mastitis with special reference to milking technique. Vet. Rec., 70, 8, pp. 159-166.

Worseck, M. (1956) — (Bacteriology of stphylococcal mastitis). Berl. Munch. tierarztl. Wschr. 69, 146. (Vet. Bull. (1956), 26, p. 509).

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TUBERCULOSIS IN PIGS IN SOUTH AFRICA

E. M. ROBINSON
Onderstepoort

Tuberculosis has been known to exist in pigs in South Africa for a good many years, but no particular attention was paid to it until comparatively recently when the prospect of an eradication campaign against bovine tuberculosis again came to the fore and a commission was appointed to go into the matter. Statistics from the larger abattoirs in the Union show that tuberculosis in pigs is not uncommon. At the Johannesburg Municipal Abattoirs there is a considerable variation in the number of pigs slaughtered annually, from 95,000 to 230,000 over a period of 12 years, so the percentage of cases would vary considerably and the number has been from 267 to 610 in different years.

At the Pretoria Abattoirs up to 25,000 pigs are slaughtered annually with an average of 50 to 60 cases per annum. There is evidence that the position is very similar at Durban Abattoir and at Estcourt Bacon Factory both of which receive pigs from widely separated areas in Natal but mainly from the neighbouring country districts.

In the great majority of the cases the lesions are confined to the lymphatic glands of the head, more particularly the submaxillary ones. The frequence of infection of the submaxillary glands was observed by Prosch (1938). In 95% of cases the primary complex was in the submaxillary, the mesenteric or the periportal glands. In 500 cases, 279 showed lesions in the submaxillary glands. From time to time material has been sent in to Onderstepoort from cases of generalized tuberculosis on farms and it is probable that many of the abattoir cases would have developed generalized infection if they had been allowed to live.

Fourie, de Wet and van Drimmelen (1950) described an outbreak of subclinical tuberculosis in pigs in the Transvaal. Pigs from the farm had been condemned for tuberculosis at the abattoir. Several reactors to the tuberculin test were slaughtered and showed limited lesions, mainly in the head region. The causal organism was typed and found to be the human one. The origin of the infection could not be traced as the farm personnel could not be subjected to clinical or X-ray examination. In a short article on tuberculosis in pigs the writer (1955) mentioned that in 1953, 48 specimens from pigs were obtained from Durban Abattoir, of which 36 showed acid fast bacteria and those which were typed were of bovine origin. About that time an article on tuberculosis-like lesions in the submaxillary lymphatic glands of pigs in Queensland, Australia, by Tammemagi (1953) appeared which described an

extensive study of lesions in pigs in which it was shown that in a number, tubercle bacilli could not be found but Corynebacterium equi could be isolated from them. This article followed on another by Ginsberg and Fitzpatrick (1950) who found C. equi in a third of the lymphatic glands of pigs, where the lesions had been given as tuberculosis at the abattoirs. Tammemagi (1953) is of the opinion that the lesions due to C. equi could be distinguished from those of tuberculosis but mentions that different opinions have been expressed in the literature and the matter was still controversial. Hagen and Bruner (1957) mention that certain workers in Scandinavia believed that C. equi produced a tuberculosis like disease in pigs. This view is not accepted by some American workers who were able to isolate the organism from as many apparently normal glands as diseased. They consider the organisms described as acid fast forms of C. equi to be tubercle bacilli growing concurrently with the latter. They consider C. equi to be relatively non-pathogenic and if lesions are present, tubercle bacilli will be found as well. At present, therefore, the relationship of C. equi to these lesions is not quite clear.

Rittershaus (1956) described a condition in pigs in Germany condemned for tuberculosis of the mesenteric glands, caused by a mycobacterium which did not conform to either of the human, bovine or avian types and was not associated with C. equi. The lesions occurred in the form of millet seed to pea size lesions which were dry and crumbly, sometimes localized under the serosa, sometimes projecting and often confluent. The lesions were yellowish-white to grey in colour. Acid-fast organisms were seen, some short and plump, others long and slender, often S-formed and contracted. Colonies on media only appeared after some weeks and were very small, round and with an orange pigmentation.

Distribution of Tuberculosis in Pigs

As mentioned in the article by the writer (1955) tuberculosis in pigs is very widespread in the Union of South Africa. A study of about 250 specimens from pigs slaughtered at different abattoirs indicates that it occurs in all provinces of the Union and in specimens from some farms it has been diagnosed in several lots sent for slaughter. Unfortunately, on account of a shortage of staff it has not been possible to investigate the disease on these farms but only to type the specimens received from the abattoirs from pigs sent in for slaughter. The association of the disease with that in cattle, human beings and poultry on these farms has not been investigated yet and should prove of great interest.

Examination of Specimens

In all, about 200 specimens of tuberculous glands from pigs have been examined in the last two years, all from the Johannesburg and Pretoria abattoirs, but the great majority from the former. All the specimens were sent in 10% formalin and 50% glycerine, half of each in each of the two preservatives and were examined within a few days of taking. In examining the specimens in gly-

cerine a description of the lesions was taken, after which smears were made from some of the material to see if acid-fast organisms could be demonstrated. Some of the material in the lesions was broken up in a stainless steel grinding tube in which the pestle just fitted the tube and the material could be well ground up in sterile saline. Cultures were made on serum agar for C. equi and after treatment with 4% KOH, on Lowenstein Jensen medium with and without glycerine. Two guinea pigs were inoculated subcutaneously with material from each specimen. The cultures on Lowenstein Jensen medium were incubated for six weeks before being finally discarded if negative. After isolation of strains, they were inoculated into rabbits in a dose of .01 mg of a 14-day-old culture on serum agar intravenously. The formalin specimens were sent to the Department of Pathology for examination.

In determining whether strains were human or bovine, if there were extensive lesions in the lungs and in some cases in the spleen and kidneys as well, the organism was considered to be bovine in type. Where there were no lesions or very few nodules in the lungs, human infection was diagnosed. In a number of cultures where the organism was grown on Lowenstein Jensen medium with and without glycerine it was difficult to determine whether it was human or bovine so the biological test on rabbits was relied on mainly.

Pathological Examination

The great majority of the lesions were in submaxillary lymphatic glands but an occasional one was seen in a pharyngeal or mesenteric gland. There was a similarity between the lesions in most cases and nearly all showed whitish semicalcareous centres about 2 mm. to up to 1 cm. in diameter to one occupying the whole of the gland or a considerable portion of it. Sometimes only a single centre would be found or very few. In some cases a number of centres varying in size would be found in a gland. Small, easily enucleated lesions, similar to those described by Tammemagi (1953) were sometimes seen but could not be definitely associated with C. equi infection. In one case the material in the gland appeared in the form of striation giving it the appearance of a section of brain tissue.

All the lesions were subjected to histopathological examination and neither on it or macroscopical examination of the lesions was it possible to differentiate definitely between tuberculosis and corynebacterium infection.

Bacteriological Examination

In most of the specimens examined acid-fast bacteria when found were rare as is so often the case in tuberculous material. Generally speaking, in most cases the organisms had the characteristic morphology but certain variations were observed. In five cases the organisms were long, up to 10 μ in length, or even more, thin and bent, sometimes almost into a loop. In two of these cases uneven staining was seen. In two cases there were a few chains

of acid-fast organisms, each about 2 u in length. Tuberculosis was confirmed in these two cases as well as in the other five. In one case a few small acid-fast coccobacilli were seen but tuberculosis could not be demonstrated. In another case a few acid-fast granules were seen but a diagnosis of tuberculosis could not be made.

Out of the 200 specimens examined, 163 showed acid-fast bacteria, usually only a few, but in some the organisms were very frequent. In 116 of these cases a definite diagnosis of tuberculosis was made and in 76 typing was carried out. It was not possible to type all the positive strains in rabbits on account of a periodical shortage of these animals at the institution. In 13 cases Corynebacterium equi infection was demonstrated, in two in the absence of tuberculosis but in the remainder it was associated with tuberculosis. No diagnosis of tuberculosis or corynebacterium infection could be made in 37 of the specimens.

Of the 76 specimens which were typed, 57 were definitely bovine and 19 human judging from the inoculation experiments in rabbits. This gives an indication of the wide distribution of bovine tuberculosis in the country.

Where cultural results and the inoculation of guinea pigs suggested that the avian organism might be concerned, pigeons were inoculated intramuscularly with culture material. In no case was avian tuberculosis demonstrated. Avian tuberculosis appears to be very rare in pigs in South Africa and even in poultry it is rather uncommon as judged by the number of outbreaks diagnosed annually in the poultry disease clinic at Onderstepoort laboratory.

Experimental Work

Tuberculosis in pigs as seen in abattoirs in different parts of the world is usually characterized by lesions in the submaxillary glands but an occasional one will be seen in a pharyngeal gland or a mesenteric. In glanders and strangles in the horse, lesions are usually found in the submaxillary glands in view of the fact that they drain the nasal cavity. It was thought that in pigs infection might occur via the nasal mucous membrane or that perhaps a minimal infection per os might produce lesions in these glands.

To get some idea as to what dose to use for infecting pigs, a preliminary experiment was done using cultures of the human, bovine and avian types. The human type was the well-known H37RV strain, the bovine H1637 was isolated from an infected bull at Onderstepoort and the avian (Coles) strain was isolated from a fowl in the poultry disease clinique. Six pigs were used, about three months old, negative reactors to the tuberculin and haemagglutination tests. They were dosed as follows:—

5/4/54	Pig	1145	3 mg.	per os M tuberculosis	(Avian)
	,,	1146	,,	,, ,,	,,
	,,	1147	,,	,, ,,	(Bovine)
	,,	1148	,,	,, ,,	,,
	,,	1149	,,	,, ,,	(Human)
	,,	1150	,,	,, ,,	,,

Pig 1147 died of a haemorrhagic gastritis on 9.5.54. At post mortem there were small lesions of tuberculosis in the submaxillary, bronchial, periportal and mesenteric lymphatic glands but they were not the cause of death. In a tuberculin test carried out on 10.5.54 using human PPD which was being issued for field diagnosis, only one pig 1148, showed a slight reaction in the ear with reddening and swelling. This pig died on 22.5.54 with extensive caseous and calcified lesions in the lungs and death could be definitely attributed to tuberculosis. Haemagglutination tests were carried out on all six pigs before dosing, with negative results. The animals were retested on 12.2.54 using human and avian antigens but only 1148 (bovine infection) showed a definite reaction. The other four pigs did not show any symptoms subsequently and on 2.7.54 were re-dosed with two additional ones which were given bovine organisms. They were dosed as follows:—

2/7/54	Pig	1145	10 mg.	per os	Avian culture (Coles)
	,,	1149	,,	,,	,,
	,,	1149	10 mg.	per os	Human strain (H37RV)
	,,	1150	,,	,,	,,
	,,	1160	3 mg.	per os	Bovine strain (Bull 1637)
	,,	1169	,,	,,	,,

In a tuberculin test carried out on 12.8.54 with mammalian PPD only the two pigs with bovine infection gave well-marked reactions. They gave slight reactions to avian tuberculin as well. Pig 1150 was found dead on 21.10.54. At post mortem there were no lesions of tuberculosis and the cause of death was uncertain.

Haemagglutination tests were carried out on the sera of the pigs on 1.10.54 using a human antigen. The two pigs with bovine infection reacted at 1/64, the human at 1/32 and the avian at 1/8. A definitely positive titre is considered to be 1/8.

In a tuberculin test carried out on 5.10.54 both the bovine infected pigs gave good reactions but those of the human and avian pigs were indefinite. A further tuberculin test was carried out on 20.11.54 using both mammalian and avian tuberculins (PPD). The avian infected pigs reacted only to the avian tuberculin. The bovine infected ones reacted strongly to mammalian tuberculin and also gave slightly positive reactions to avian tuberculin. The human infected one gave no reaction to either.

A final tuberculin test was carried out on 23.2.55 when only the bovine infected pigs reacted.

The five pigs which survived were killed with the following results at post mortems:—

Pig 1149 (Human) killed 5.3.55. Extensive lesions of tuberculosis were found in the lungs, bronchial and mediastinal glands, liver and periportal glands. No lesions were seen in the lymph glands of the head or mesentery.

Pigs 1145 and 1146 (1.3.55). No lesions of tuberculosis.

Pigs 1160 (7.3.55). Generalized tuberculosis with lesions in the lungs, liver, spleen and most of the lymphatic glands.

Pig 1169 (2.3.55). Generalized tuberculosis but no lesions in the spleen or liver.

In this experiment the bovine infection was successful and human infection in one surviving pig but no lesions were caused by the avian infection.

Experiment 2 (19.4.55).

In order to see whether by infecting pigs intranasally one could produce an infection limited to the head region, a further experiment was carried out. The material was injected into the nasal cavity with a syringe and a piece of fine flexible rubber tubing. Some of the material was lost in the dosing as the pigs blew it out but most of it went in. Two pigs were dosed with the same material per os and two with human cultures again.

Pig 1232 1 mg. Culture bovine 1637 per os.
,, 1244 ,, ,, ,, ,,
,, 1243 ,, ,, ,, intranasally
,, 1267 ,, ,, ,, ,,
,, 1253 3 mg. Culture Human (H37RV) per os.
,, 1279 ,, ,, ,, ,,

The pigs were all killed on 4.11.55, seven months later. The results of the post mortems were as follows:—

Pig 1232: There were a few small calcified lesions in the lungs, liver and periportal glands. Lesions were present in the pharyngeal and mediastinal lymph glands.

Pig 1244: Partially caseous and calcareous lesions seen in the pharyngeal lymphatic glands. No other lesions were seen.

Pig 1243: There were very limited lesions of tuberculosis in the pharyngeal lymph glands but extensive ones in the bronchial and mediastinal glands.

Pig 1267: Calcareous lesions in the bronchial and mediastinal glands only.

Pigs 1253 and 1279: No lesions.

Injection of culture material intranasally from a virulent bovine strain did not produce lesions limited to the head region. In one pig dosed per os only lesions of the pharyngeal glands were seen. The human culture in the dose per os did not produce any lesions.

Experiment 3 (9.12.55).

A further experiment was carried out using four pigs which were given 1 mg. again of the same bovine strain 1637 used in the previous experiments, per os. The pigs were dosed as follows:—

Pig 1393 1 mg. per os culture 1637 (bovine).
,, 1404 ,, ,, ,, ,,
,, 1386 ,, ,, ,, ,,
,, 1387 ,, ,, ,, ,,
,, 1390 5 mg. per os culture H37RV (human).
,, 1397 ,, ,, ,, ,,

The two pigs given the human infection were put in to see the effect of a 5 mg. dose per os.

The pigs were all negative to the tuberculin test at the com-

TABLE I.

TUBERCULIN TESTS ON PIGS (Human PPD).

	20.1.56		26.3.56		21.5.56		23.7.56		1.10.56	
	N	72 hrs.	N	72 hrs.	N	72 hrs.	N	72 hrs.	N	72 hrs.
1393	4	20 H.P.O. purple centre	4.5	D bluish centre	3.5	8.5 H.P.D.	4.5	17.5 H.P.O.D. Purple centre		Dead
1404	5	Not measurable P.H.O. purple centre	6	21.5 H.D. blue centre	6	16 H.P.D. necrotic centre	7	16 H.P.O.D. Purple centre		Dead
1386	5.5	15.5 P.H.O. necrotic centre	5	21.5 O.D.	5	9 Sl. 0	4.5	8 Sl. & O Purple centre	6.5	14 O.P.H. Purple centre
1387	3.5	21 H.P. Light purple centre	5	8.5 O.D.	5	7.5 Discol. centre	5	CH Purple centre	5 s1	9 Sl. O Red centre Sl. O
1390	4.5	23 H.P. bluish red centre	6	15 O.D. purple centre	4.5	8.5 Sl. 0 Necrotic centre	6	11.5 O.H.P. Purple centre	6	10 Red centre
1397	4.5	14 D.H.P.	4.5	10 0 blue centre	5	7.5 Sl. 0	6	10 Sl. O Red centre	6	9.5 Sl. D.
Control 1411			4	5.5						
,, 1422							4	4.5		
,, 1449							3.4	4		

H: lot. O: oedema. D: diffuse. P: painful. N: Initial reading.

mencement of the experiment. Tuberculin tests were carried out at intervals of about two months subsequently. As testing in the ears was not found to be ideal, at the suggestion of Dr. M. C. Lambrechts who was carrying out experimental work on tuberculosis at the time, the pigs were done intradermally in the skin of the outside of the shoulder between the point of the elbow and the beginning of the neck. In this position, it was possible to take measurements of the reactions. In positive reactions a local swelling occurred, 15 to 20 mm. in width usually with a bluish-red colour in the central part. The reactions shown by the pigs are seen in Table I.

The pigs were all killed with the following results:—

Pig 1386 (12.10.56). Generalized tuberculosis. Lesions were found in the bronchial, mediastinal and mesenteric lymph glands. There were a few miliary lesions in the lungs and liver.

Pig 1387 (12.10.56). No lesions of tuberculosis seen but there were pus centres in the muscles of the head, of a greenish colour. No acid-fast bacteria were seen in the pus.

Pig 1393 (26.9.56). Lesions of tuberculosis were seen in the submaxillary and pharyngeal glands. There were a few lesions in the lungs and mesenteric glands and extensive ones in the bronchial and mediastinal glands.

Pig 1404 (26.9.56). The submaxillary and retropharyngeal glands were enlarged and showed yellow caseous and calcareous centres. One mesenteric gland showed a yellow caseous centre.

Pigs 1390 and 1397 (28.11.56). No lesions of tuberculosis were seen.

In this experiment three out of four pigs dosed with 1 mg. per os of a bovine culture developed generalized tuberculosis though in one the lesions were very limited. In no case were the lesions confined to the head.

Conclusions

In these infection experiments on pigs an infection limited to the lymphatic glands of the head was not produced. In one case only one lesion in a mesenteric gland was found in association with lesions in the head. It is possible that if the mesenteric and other glands were examined in all cases where lesions were found in the head, that lesions might be found.

References

Fourie, P. J. J., de Wet, G. J., and van Drimmelen, G. C. (1950). Tuberculosis in pigs caused by M. tuberculosis var. hominis. J.S.A.V.M.A., V. 21, p. 70.

Ginsberg, A., Fitzpatrick, M. J. (1950). Vet. Rec. 62, p. 808.
Hagan, W. A., Bruner, D. W. (1957). The Infectious Diseases of Domestic Animals, 3rd Edition.

Prosch (1938) Inaug. Dissertation, Leipzig.

Rittershaus, E. (1956). Die Rindertuberkulose, B.J.S.

Robinson, E. M. (1955). Tuberculosis in pigs. J.S.A.V.M.A., 26, 4, p. 259.

Tammemagi, L. (1953). Tuberculosis-like lesions in the submaxillary lymph nodes of pigs in Queensland. Queensland J., Agric. Sc. 28, 399.

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FIRING IN THE DOG

D. G. H. IRWIN
Onderstepoort

It appears that firing is not widely practised in the dog. Limited personal experience seems to indicate that the actual cautery may be rewarding in certain lesions in the dog. Three case reports are presented, and some general remarks offered.

Case 1. Robust Alsatian puppy presented on 29/6/53.

Diagnosis: Tear fracture of the accessory carpal bone, with only a thin plate of bone remaining attached to the insertion of the flexor carpi ulnari tendon (confirmed by radiograph). The bone plate was too small to consider affixation to the accessory carpal by a screw.

Treatment: First, splinting in maximum flexion was adopted, with a plaster cast support. This was soon chewed to pieces, in spite of various methods applied to prevent this. A heavy specially prepared wire splint was also found ineffectual. Firing was suggested to the owner as the only method likely to obtain rest in the flexed position.

9/7/53. The volar surfaces of the leg was prepared for operation. Under general anaesthesia, deep penetrating pinpoint firing was carried out along the tendon and its insertion, using a No. 1 hypodermic needle at just off red heat. Tr. Iodi was painted on the area.

10/7/53. Limb not painful, temperature and appetite normal, habitus excellent.

11/7/53. Walking sound. Leg, still very sloping. Perhaps the needle cooled too fast and did not cause sufficient irritation. It was decided to repeat the operation.

12/7/53. Premedicated with morphine sulphate and atropine sulphate, before anaethetizing with thiopentone sodium. Fired again with red-hot needle.

13/7/53. Not limping at all. Discharged under expectant treatment and limited exercise.

23/7/53. Leg much straighter, difficult to discern any difference in the legs except for the firing marks. When seen again in March 1956 the dog was completely normal and the owner mentioned that it had won prizes at championship shows.

Case 2. A seven-month male Ridgeback puppy was presented on 8/6/53.

Diagnosis: Bilateral olecranon bursitis (cysts about 3 cm. diam.) and enlargement of both lateral tarsal bursae, all with sterile contents. Blood was negative serologically for brucellosis.

Treatment by aspiration of bursal contents followed by iodine ointment massage failed.

23/6/53 — the cysts on the right elbow and right hock were removed surgically.

18/7/53 — the left elbow and left hock swellings were subjected to deep penetrating pin-point firing.

On 22/7/55 the patient was discharged from hospital. After one month all the limbs were devoid of swellings, and had recovered equally well.

Case 3. An adult overweight Bull Mastiff was presented on 5/6/53, with the complaint that he was lame off and on, and made a peculiar clicking noise during progression.

Diagnosis: Chronic sub-luxation of one patella. This dog was referred to neighbouring colleagues (Drs. Faull and Burgess, Cape Town) who fired the stifle joint and immediate surroundings. Complete recovery followed.

14/7/53 — the dog showed the same condition on the other side. This joint was also fired, and complete clinical recovery followed. Dusting powder (sulphanilamide, boracic acid, urea, starch and kaolin) was used to seal the pits, and carbolized glycerin locally and aspirin per os were used to break the irritation-lick-eczema cycle.

Infection has not been common, and was readily overcome with systematic penicillin and local infra-red irradiation. Other patients fired successfully included five cases of chronic patella subluxation and two cases of excessive dorsal flexion of the carpus. Two stifles did not respond to firing for chronic patella subluxation.

The firing iron used in nearly all cases was fashioned from an iron bar 35 cm. long and about 1 cm. diameter. A right angle bend was made 4.5 cm. from one end, and the free end of this fashioned so as to make a 1 cm. point with a 1.5 mm. diameter. The long arm was provided with an asbestos grip. The iron retained its heat better than a needle (held in a pair of old artery forceps), and was heated in the flame of a primus stove.

Discussion: Firing in veterinary practice has long been derided as barbaric, archaic and unscientific. However, empirical methods providing a good clinical cure should not be discontinued arbitrarily. The technique used in this series is simple and time-saving. It causes surprisingly little distress to the patient.

Acknowledgements

Thanks are due to the Director of Veterinary Services for permission to publish this article, and to Professor Hofmeyr, Department of Surgery, for encouragement.

DIE VERBAND TUSSEN BEVRUGTINGSRESULTATE EN DIE TYDSTIP VAN INSEMINASIE

BEN LA GRANGE
Kempton Park

Bevredigende konsepsiesyfers is natuurlik die eerste vereiste wat enige boer stel aan 'n K.I. Organisasie. Dit spreek ook vanself dat bevredigende bevrugtingsyfers net so belangrik is vir K.I. Organisasies, as hulle K.I. op 'n ekonomiese basis wil toepas.

Daar is natuurlik menigvuldige faktore wat bydra tot goeie konsepsiesyfers, bv. die boer, die insemineerder, fertiliteit van die koei, semen-kwaliteit, verdunning en bewaring, en so ook die belangrike aspek van in watter stadium van bronstigheid insemineer moet word.

Vandag weet ons dat die gemiddelde bronsperiode vir 'n koei ongeveer 15—18 uur duur, en dat ovulasie van 8—12 uur na die end van die bronsperiode plaasvind. Hierdie algemene fisiologiese beginsel met die wete dat bulsaad van 12—24 uur of 'n bietjie langer, in 'n koei leef na inseminasie is die rede waarom inseminasies vandag internasionaal teen die end van bronstigheid gedoen word of selfs 'n paar uur daarna. Dit word ook by ons nagestreef sover dit prakties moontlik is.

Trimberger en Davis het uitstekende werk gelewer op bostaande probleem. Hulle het op 'n groot groep van vroulike diere gewerk en deeglike bronstigheid observasies gedoen dag en nag met twee-uurlike tussenposes.

Trimberger het gevind dat as koeie insemineer word aan die begin van bronstigheid, met meer dan 24 uur voor ovulasie, die kans op bevrugting 53% is. Sy maksimum konsepsiesyfer was 85% deur te insemineer van 13—18 uur voor ovulasie, d.w.s. in die laaste gedeelte van bronstigheid. Sy bevrugtingsyfer was 0 waar hy insemineer het voor die begin van bronstigheid.

Dit is interessant om op te merk dat Vandeplassche en Paredis koeie in kalf gekry het deur te insemineer voordat bronstigheid begin het, hierdie prestasie vestig dan ook die geloof by die twee werkers dat bulsaad op tot 50 uur in die geslagsorgane van 'n koei fertiliteit behou.

Die werk van etlike werkers bevestig dat optimum resultate verkry word deur te insemineer 13—18 uur voor ovulasie, en dat konsepsies nog baie bevredigend is tot en met 7 uur voor ovulasie. Met minder as ses uur voor ovulasie is daar 'n val in konsepsies na 75%, en met twee uur of minder voor ovulasie val dit na 30%.

Hierdie bevinding strook met die ou geloof dat bulsaad van 4—6 uur neem om die voorste gedeeltes van die buise van Fallopius te bereik en die wete dat 'n eisel 'n uiters beperkte leeftyd het.

Maar onlangse werk van Van Demark en Moeller bewys dat sperma die voorste gedeeltes van die buise bereik in so min as 2—4 minute.

Dit blyk dus asof ons die antwoord van swak bevrugtings in die laaste ses uur voor ovulasie elders moet soek.

Chang het op werk by konyne gevind dat spermatozoa aan die vroulike geslagskanale vir 'n paar uur blootgestel behoort te word om optimum fertiliteitsvermoë te verkry. Dat hierdie beginsel toegepas kan word op bulsaad word vandag aanvaar en ons weet dat bronstigheidslym 'n reinigende en heilsame effek het op bulsaad.

Die algemene probleem in K.I. ondernemings is egter tot hoe 'n mate bostaande beginsels toegepas kan word in die praktyk.

Daar moet onthou word dat Trimberger se observasies twee uurliks gedoen was. Hoe vergelyk dit nou met boere wat op die meeste twee observasies per dag doen en tot hoe 'n mate word dit gereflekteer in die bevrugtingsyfers?

Met die doel om Trimberger en andere se bevindings aan die praktyk te onderwerp is laasjaar aan ons betroubaarste inseminеerders opdrag gegee, om 'n klompie akkurate boere se gegewens te aanvaar waar met sekerheid verklaar kon word wanneer koeie met bronstigheid begin het. Uit 'n totaal van duisende koeie wat vir K.I. aangebied was, kon slegs 'n paar honderd met sekerheid verklaar word.

Die bronstigheidsperiode was in vyf fases van ses-uur elk verdeel. Vir die doel van ons observasie was die finale afleidings gemaak vir die eerste 12 uur (d.w.s. 2 fases) en van 13—30 uur (of die laaste 3 fases) vanaf die begin van bronstigheid.

In die eerste fase d.w.s. eerste 12 uur van bronstigheid was 473 koeie vir eerste inseminasies aangebied, met 'n eerste persentasie konsepsei van 58.6%. In die tweede fase d.w.s. 13—30 uur was 657 koeie aangebied met 'n konsepsiesyfer van 60%. Die berekenings is almal gebaseer op 'n 90—120 dae nie-herhaal basis.

Olds en Seath het resultate getabuleer van 19,665 koeie wat onderskeidelik in die oggend gesien was en dieselfde oggend, middag en volgende dag gedoen was, en wat in die middag gesien was en dieselfde aand, volgende oggend en middag gedoen was. Ook in hulle publikasie is daar geen noemenswaardige verskil in konsepsies t.o.v. die stadium waarin geïnsemineer was nie.

Dit kom dus voor dat onder normale praktiese toestande op plase diere nie genoeg gesien word om werklike tye te selekteer waarin hulle bedien moet word nie.

Om die probleem nog meer te vertroebel, mag ek noem dat Aschbacher en sy werkers koeie se bronstigheidsperiodes nagegaan

het en hulle van twee tot drie keer in dieselfde bronstigheid geinsemineer het, sonder enige noemenswaardige verhoging in konsepsiesyfers.

Met die versameling van ons gegewens het 'n ander baie interessante feit aan die lig gekom.

Ons weet vandag dat fertiliteit mag wissel van kudde tot kudde en selfs tussen vroulike families in dieselfde kudde. Dit is op rekord by etlike boere dat dieselfde klompie koeie vat elke jaar met slegs een inseminasie en dieselfde klompie koeie is in die reël sy probleme.

In die praktyk beteken dit dat die klomp goeie vrugbare diere na een bevrugting dragtig is, en dat ons dan oorbly met die minder vrugbare diere vir die herhaal-inseminasies.

Etlikes van ons wat in die veld werk was altyd van mening, dat indien geslagsiektes, ens., uitgeskakel is, hierdie herhaalgroep van diere die is wat of vroeër, of later ovuleer as die gemiddelde koei.

Aandagtig hieraan was 'n klomp koeie wat vir die eerste keer herhaal het ook ondersoek.

Die bevinding hier is dat by 140 van die herhale wat binne 12 uur vanaf die begin van bronstigheid gedoen was, die konsepsie 47.1% is. Hierteenoor was 240 koeie van 13—30 uur na die begin van bronstigheid ondersoek met 'n konsepsiesyfer van 70% d.w.s. 'n verskil van 23% in die guns van die laat-inseminasies.

Die verskil is te groot om toevallig te wees en ook is dit te groot om aan te neem dat die 240 koeie in die tweede groep hoofsaaklik in die vroeë stadium gedoen was toe hulle vir die eerste diens aangebied was.

Van 'n wetenskaplike oogpunt weet ek dis gevaarlik om herhaal-inseminasies te gebruik as 'n basis van definitiewe afleidings, maar tog glo ek dat ons suspisies in 'n sterk mate deur bostaande bevestig word nl. vertraagde ovulasie.

Dit is ongelukkig in 'n groot substasie nie prakties om eerste inseminasies op ongeveer 18 uur te doen (en volgens syfers sal daar ook geen verskil wees nie), en herhaal-inseminasies later nie. Maar dit kom tog voor dat in klein substasies en by private inseminasies, groter welslae behaal sal word met die tweede inseminasies as daar minstens nie insemineer word binne 18 uur vanaf die begin van bronstigheid nie.

Na aanleiding van die voorgaande, wat behoort ons aanbevelings te wees aan beesboere t.o.v. die tyd van inseminasie?

Na my mening behoort koeie wat in die voormiddag gesien word dieselfde dag gedoen word en die wat in die middag gesien word, die volgende voormiddag of vroeg namiddag. Dit is vir sover dit prakties moontlik is.

LITERATUUR

ASDELL, S. A. (1955): "Cattle Fertility and Sterility". J. & A. Churchill, Ltdr., London.

CHANG, M. C. (1951): "Fertilizing Capacity of spermatozoa deposited in the fallopian tubes". Nature, 168:697.

OLDS, D. (1958): "Practical importance of time of breeding". A.I. Digest, Vol. 6-2, p. 7.

OLDS, D. and SEATH, D. M. (1954): "Factors affecting reproduction efficiency in dairy cattle". Kentucky Agr. Assn. Stat Bull., No. 605.

TRIMBERGER, G. W. and DAVIS H. P. (1943): "Conception rate in dairy cattle by artificial insemination at various stages". Nebr. Agr. Soc. Sta. Res. Bull., No. 129.

VAN DE MARK, N. L. and MOELLER, A. N. (1951): "Speed of spermatozoa transport in reproductive tract of estrous cows". Am. Jl. Physiol., 165:674-679.

VANDEPLASSCHE M. and PAREDIS, F. (1958): "Preservation of the fertilizing capacity of bull semen in the genital tract of the cow". Nature, 162:813.

VAN RENSBURG, S. W. J. (1957): "Teelprobleme en kunsmatige insemi-nering". Libagric., Pretoria.

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CASE REPORT

K. DALZELL
Durban

INTRA-ARTICULAR METICORTELONE IN A THOROUGHBRED HORSE

Much literature has been presented concerning the use of Metisteroids in veterinary medicine in the treatment of certain forms of lameness in the equine, but I feel the following is worth recording on account of the wonderful success produced in a case of acute carpitis in a thoroughbred horse.

The subject was a five-year-old mare domiciled about thirty miles from Durban, a winner of two races and placed on three occasions.

I was requested by the owner on September 27th, 1957, to fire this animal as she had gone sore in the near fore-knee. Upon examination I found a typical clinical picture of carpitis, inflammation, distension of the joint and lameness. Firing would have entailed six months of inactivity, so I suggested Meticortelone therapy instead, to which the owner readily agreed.

The outer aspect of the knee was shaved, sterilized with pHisoHex and Spirit, and a local anaesthetic given by means of a fine dental syringe. Restraint was not necessary.

Using a 20 gauge 1½" needle and having the leg slightly flexed insertion was made at the point of greatest distension, and entry into the carpal joint achieved with the minimum of difficulty, with no objection on the part of the patient.

A flow of synovial fluid was immediately apparent, the latter portion of which was slightly blood-stained. When the flow tended to cease I maintained it with a gentle massage from the anterior aspect of the knee where the needle was inserted until no further fluid came.

75 mg. Prednisolone Acetate Aqueous Suspension was then injected into the joint cavity, after which the needle was withdrawn, the site again cleaned and flexion and straightening of the knee carried out a few times to allow complete dispersal of the Meti-steroid throughout the cavity.

The mare subsequently had her first race on the 19th October, 1957, and ran unplaced. After that she ran seven times for three places until on the 7th January, 1958, I was again asked to examine

her and found the trouble had recurred. Considering the success of the first treatment I decided to repeat the procedure, but on this occasion injected 150 mg. of the Meti-steroid.

The mare subsequently raced four times, was twice unplaced, then second, and on the 22nd February, 1958, won a good race. The mare is still sound, and in my opinion will stand up to further training for some time.

This article serves to emphasise the great value of intra-articular therapy, especially in this particular case where a limited racing career was left to a mare earmarked for stud the following year.

'N UITBREEK VAN SNOTSIEKTE ONDER BEESTE IN WES-VRYSTAAT

D. J. LOUW
Bloemfontein

Op 28 Oktober 1957 is ek deur mnr. W. J. Pretorius, L.U.K., telefonies versoek om ondersoek in te stel na siekte onder sy beeste op sy plaas, De Dam, 26 myl wes van Bloemfontein, op die Petrusburg pad. Volgens hom is daar reeds tot op daardie datum twee beeste dood en een siek. Hy het sy toestemming verleen om die bees te vernietig vir volledige ondersoek indien nodig. /Sy vermoeding was dat die siekte Snotsiekte is, daar hy wildebeeste op die plaas aanhou.

Volgens mnr. Pretorius is die wildebeeste van Kroonstad afkomstig en loop reeds sewe jaar op die plaas. Tevore was daar direkte kontak tussen wildebeeste, skape en beeste sonder enige gevalle van onverklaarbare siekte onder die beeste.

Gedurende die seisoen toe die siekte voorgekom het, het daar 80 skape en 30 beeste in die kamp by die 22 wildebeeste geloop. Onder hierdie beeste was daar geen gevalle van siekte nie.

Die watervoorsiening bestaan uit 'n sementdam en krip wat ook 'n aangrensende kamp voorsien waarin 100 beeste loop. Onder laasgenoemde groep beeste het drie gevalle van siek beeste voorgekom, twee is dood en die derde het ek antemortem en post mortem ondersoek.

Die skape is plus-minus 4 jaar oud en is op die plaas geteel. Veertien dae tot 'n maand? voor die eerste geval van siekte onder die 100 beeste is die skape uit die wildebeeskamp geneem en oorgeplaas na die tweede kamp waar die 100 beeste loop. Die tydperk tussen die eerste en derde geval, wat volgens die voorman identies was, was 6 weke. Die plaas val in die panwêreld en na milde lente reëns was die veld weelderig.

Die koei, 'n Fries, was reeds 3—4 dae siek voor die ondersoek plaasgevind het. Alhoewel sy uiters vermaer was, was sy nog aktief en dit het heelwat moeite geverg om haar te vang. Sy het kromrug gestaan, effens gehoes en kon maklik vir 'n geval van traumatiese gastritis aangesien word. Die neus is met vloeibare en verdroogde mucus aangepak, die oë het 'n keratitis met uitskeiding getoon, die prescapularis limfkliere was vergroot. Daar was ook 'n ligte ontsteking en erosies van die tandvleise en mucosa van die lippe. Die vulva was hiperemies. Die vel was geel oor die abdomen en uier.

Die dier is toe doodgeskiet en 'n nadoodse ondersoek uitgevoer met die volgende bevindings:—

(1) Vermaering en kakeksie ooglopend.

(2) Alle Limfkliere vergroot met duidelike bousenters.

(3) Een lob van die long het etterige konsolidasie getoon, verder normaal.

(4) Spysverteringskanaal feitlik leeg.

(5) Lewer normale grootte, effens koper verkleur, glinsterende oppervlak en gevlekte voorkoms op snit.

(6) Die galblaas baie vergroot, vol donkergroen gal. Mucosa groot aantal petechiae.

(7) Milt normale grootte, op snit is malpighiese liggame duidelik vergroot.

Die abomasum het 'n aantal erosies gewys. Monsters vir patologiese ondersoek is na Onderstepoort gestuur waar dit deur die vriendelike samewerking van dr. de Boom ondersoek, en die siekte as Snotsiekte bevestig is.

Gekleurde kiekies sowel as mikroskopiese seksies van weefsels sal demonstreer word by die Jaarlikse Kongres.

OFFICE OF THE SURGEON-GENERAL
Department of the Air Force
Headquarters United States Air Force
Washington 25, D.C.

NEW CHIEF OF THE U.S.A.F. VETERINARY CORPS

Colonel Robert R. Miller, U.S.A.F. (V.C.), has been appointed Assistant for Veterinary Services, it was announced by Major-General Dan C. Ogle, U.S.A.F. Surgeon-General.

Colonel Miller was born in Boston, Massachusetts, in 1910. He attended grade and high school in Somerville, Massachusetts, and graduated from Ohio State University College of Veterinary Medicine in 1942.

Colenel Miller entered on active duty in 1943 and after his training at Brooklyn Army Base and Fort McPherson, Georgia, he was assigned to the United States Armed Forces, South Atlantic, as Theatre Veterinarian with headquarters at Recife, Brazil. Later he was attached to the Joint United States-Brazilian Military Commission at Rio de Janeiro, Brazil.

On his return from Brazil in 1945, Colonel Miller served with the Military District of Washington, and in 1946 was assigned as the North Sector Veterinarian for Oahu, Territory of Hawaii.

In 1949 he became Deputy Chief of the Veterinary Service in the Office of the Surgeon-General, Headquarters U.S.A.F., and two years later was appointed to the Armed Forces Medical Policy Council in the office of the Secretary of Defense.

During 1951-52 he was Veterinary Staff Officer with the Headquarters U.S.A.F. Inspector General's Office with field office at Kelly Air Force Base, Texas. After graduating from Air War College in 1958, he became the Command Veterinarian for the Air Defense Command, Colorado Springs, Colorado. He assumed his present position as head of the U.S. Air Force Veterinary Service on 3 September 1957.

Colonel Miller attended the Medical Field Service School at Carlisle Barracks, 1943; Chicago Quartermaster School, 1943; Nutrition School, Quartermaster Food and Container Institute, 1950; Air War College, 1953; Oak Ridge Institute of Nuclear Studies, 1954; Food Technology School, Massachusetts Institute of Technology, 1955; and Mass Casualty School, Medical Field Service School, Fort Sam Houston, Texas, 1956.

He has been awarded the Commendation Medal with Oak Leaf Cluster, the Soldier's Medal, the diploma and medal pertaining to the Primerira Jornado do Service de Saude de Aeronautica of Brazil, and the honorary Brazilian Air Force Flight Surgeon's Wings and diploma.

Colonel Miller was married to the former Gloria Vandenberg in 1946 and they have two daughters, Susan Hoyt, age 10, and Lisa Ransome, age 4½.

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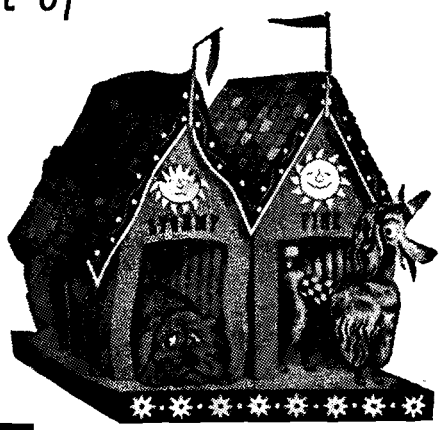

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Phy 54.

POST URETHROLITHOTOMY CATHETERISATION OF THE DOG

D. J. LOUW
Bloemfontein

On the 10th March, 1958, an overweight male Fox terrier was presented for examination by a native woman. A history of dysuria of some weeks' standing was given. Bilateral pressure on the abdomen elicited signs of pain. The animal was anaesthetised with Intraval Sodium and placed in a dorsal position with the hindlegs wide apart. It was then observed that the testicles were atrophied and the penis somewhat under-developed. Difficulty was experienced in passing a gum elastic catheter through the os penis after extruding it from the prepuce, due to its narrow lumen and a long milking tube was resorted to. This met with an obstruction in the posterior portion of the os penis. Using the obstructed end of the milking tube in the penis as a director, a small incision was made onto it and this then enlarged by tearing open with the points of a pair of surgical scissors, exposing two hard roughened calculi approximately 3 mm. long by 2 mm. broad, which were removed with dissecting forceps. A 14 inch length of " sterivac " polythene tubing, 1 mm. bore, was then introduced into the orifice of the penis and passed into the bladder without any difficulty.

The urine drained very slowly, however, and it was decided to introduce a larger tube, but there was bound to be difficulty in negotiating the section of the urethra which had been incised. This was surmounted by withdrawing the 1 mm. bore tubing to just posterior to the incision, and passing the external end of the tube through a nine-inch length of 1.5 mm. bore polythene tubing. By holding the small bore tubing at the end of the penis the larger bore tube was pushed over the smaller one until the external end of the latter emerged from that of the former. The two were now pushed back into the bladder and the small bore tube withdrawn directly urine emerged from the end.

Urine escaped freely and when the bladder appeared to be empty 3 cc. of acqueous penicillin was introduced into it via the tube followed by the same amount of air from the empty syringe to clear the tube.

No attempt was made to suture the wound. A thread of linen was passed laterally through the one side of the prepuce, through the walls and lumen of the tube and the other side of the

prepuce and knotted. The tube was then cut flush with the end of the prepuce.

The owner was instructed to cut the knot after three days and withdraw the tube.

A week later the owner returned the tube with the news that the animal had made an uneventful recovery and was urinating normally.

Though this is the first and only time that I have applied this technique it is felt that leaving the canula in situ for a few days avoids infiltration of the wound with urine with subsequent sloughing. There is no necessity for incision of the skin around the penis, and adequate drainage of the bladder is ensured.

Whether any damage to the mucosa of the urethra results during the period of close opposition between the mucosa and the polythene tubing is open to speculation as is also the period for which the tube may be left in situ without complications ensuing.

The procedure of introducing a larger bore of tubing over a smaller one also greatly facilitates catheterisation and drainage of the bladder and may perhaps be of practical application in catheterisation where urethrotomy has to be performed on larger animals such as bovines.

It may then be possible to introduce the catheter through the urethral wound in both directions, i.e. one end towards the bladder and the other towards the penis, removing the catheter from the end of the penis once the urethral wound has healed.

PERMANENT COMMITTEE FOR THE INTERNATIONAL VETERINARY CONGRESSES

Nr. 4810
JJ/CS

Utrecht, December 2nd, 1957.
Biltstraat 168.

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

Dear Colleague,

RESOLUTIONS OF THE XVth INTERNATIONAL CONGRESS — STOCKHOLM 1953.

For the first time in 1953 the General Secretary of the time, Prof. Dr. L. de Blieck, made a survey of the reports received from various countries re the results of the Resolutions of the XIVth International Veterinary Congress (London — 1949). As this survey was considered by the member of the Permanent Committee to be very useful, it is my intention to report also on the results of the Resolutions of the XVth International Veterinary Congress (Stockholm 1953). Please find a copy of these Resolutions enclosed.

I shall, therefore, very much appreciate if you will fully inform me as soon as possible, but not later than February 1st, 1958, about the measures taken in your country to give effect to these Resolutions, so that a good report can be made, which can be of use to the veterinarians all over the world.

As regards the Resolutions I, III, IV, V, XI and XII, the international organizations mentioned therein, will also be consulted. Regarding Resolution VIII I shall apply to the International Veterinary Federation of Zootechnics in Madrid, which — as you know — will affiliate to the I.V.C. In case, however, you should wish to report also on these Resolutions, I shall be pleased to hear from you.

RESOLUTION IV. Establishing suitable post-graduate scholarships in the field of veterinary parisitology.

Could you let me know what has been done in your country to give effect to this Resolution, if possible with a list of the names of those veterinarians who have been sent out and to which countries? Has the demand for post-graduate scholarships been met or not?

RESOLUTION VII. Veterinary education regarding physiology and pathology of reproduction and lactation.

1. Will you please make inquiries of the veterinary schools in your country and give a brief summary of the situation? To what extent has this Resolution been carried into effect and if so, in which way?

2. Has specialisation in the tuition already been introduced in your country, e.g. for small animals, meat and dairy hygiene, etc.? If so, does this specialisation appear from the certificate granted to the veterinarian?

RESOLUTION IX. International exchange of veterinarians.

1. Do (does) the veterinary organization(s) in your country have concern with the exchange of veterinarians and if so, to what extent?

2. Is an exchange of veterinarians in future intended?

3. Could you let me know how many veterinarians have been sent out and to which countries?

RESOLUTION X. The use of vaccines in the fight against infectious diseases and epizootics.

Referring to the second paragraph of this Resolution, please let me know:—

1. Whether in your country research work has been done as to the stable character of the viruses of which the vaccines are composed?

2. Which so-called " living " vaccines are being used?

3. Which control is being exercised by the authorities on the characteristics of the vaccines in question?

4. Are these vaccines used by veterinarians and which of them are exclusively used by veterinarians? If not, which vaccines are used by non-veterinarians?

5. Why is the use of these vaccines not reserved for veterinarians?

RESOLUTION XI. Food hygiene and public health.

Please let me know what has been done in your country ..... viewed from the standpoint of organization — with regord to the fight against zoonoses, etc., in brief: what has been done in the period from 1953 till now with regard to the paragraphs 1, 2 and 3 of this Resolution? As regards paragraph 4, the international organizations are being consulted.

RESOLUTION XII. Control of rabiees.

In case rabies occurs in your country, which measures are being taken to control and eradicate this disease as indicated in this Resolution?

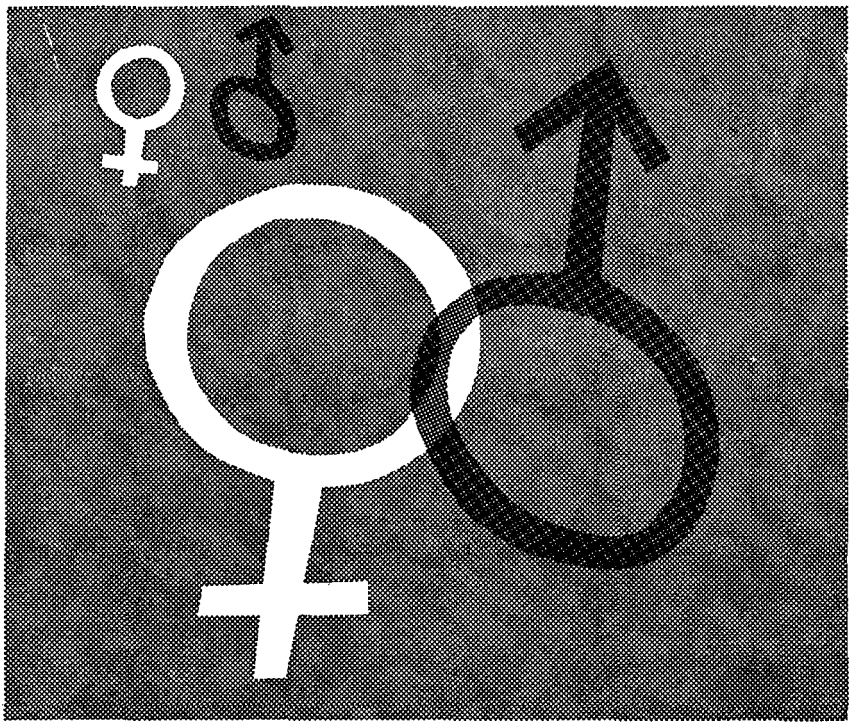
The work connected with the preparation of a report, containing a summary of the replies received from the members of the Permanent Committee and the international organizations, will be much easier for me if you will kindly use a separate sheet for your remarks on every Resolution, mentioning at the top of the page the name of your country and the number of the Resolution.

Looking forward to hear from you as soon as possible, but not later than February 1st, 1958, I am,

Yours sincerely,

DR. JAC. JANSEN,

General Secretary.



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VARIATION OF BRUCELLA MELITENSIS

G. C. VAN DRIMMELEN
Onderstepoort

I. Biochemical and serological variation *in vivo* in the rabbit and the demonstration of proagglutinoids in some *Brucella* antisera.

ABSTRACT: Brucella *organisms in a lapinized and a cavianized strain, derived from* Brucella melitensis (*Strain: Foster, Weybridge*) *show that the mutation spectrum of* Brucella melitensis *can include forms with " abortus " characteristics. The species name* Br. abortus *probably describes a field variant or type showing constant degrees of certain characteristics of the species.*

It is suggested that the genus Brucella *contains only one species: Brucella melitensis, of which a number of different types occur.*

Evidence is presented of the presence of proagglutinoids in Br. abortus *antiserum which can be partially absorbed by incomplete absorption with* Br. melitensis *and also totally absorbed by incomplete absorption with lapinized and cavianized strains of* Br. melitensis.

Variation of colonial morphology in the genus *Brucella* and variation in the growth requirements or biochemical sensitivities of *Brucella* strains have received frequent attention. These variations are the result of mutations which originate population changes.

The characteristics in which mutations manifest themselves have been shown to be correlated in some instances with pathogenic and antigenic qualities. For example the " Rough " variants of *Br. abortus* strain 19 are inferior to the " Smooth " variants in antigenic and immunogenic properties.

Serological variants have, however, received scant recognition. The description of serological differences of *Brucella* "species", led to a fairly rigid classification which has resulted in difficulties when applied to the epidemiological and cultural findings. The differences in the major antigens of *Br. melitensis* and *Br. abortus* were demonstrated by Wilson and Miles (1932) and were quantitative only. *Brucella* species possess major and minor agglutinins e.g. *Br. abortus* has major "abortus" and minor "melitensis" agglutinins. The whole of the minor and part of the major agglutinins of an " abortus " antiserum can be removed by absorption with " melitensis " antigen to produce a " monospecific " " abortus " antiserum.

It has never been explained satisfactorily why the " melitensis " cells, which possess "abortus " agglutinogens, are unable to absorb

all the major ("abortus") agglutinins out of "abortus" antiserum; nor is it clear why monospecific abortus antiserum fails to agglutinate "melitensis" cells which are capable of stimulating antibodies that will freely agglutinate Br. abortus to titre.

A number of workers have questioned the usefulness of the serological classification for example Renoux (1952) did not consider serological classification very valuable having found intermediate forms with characteristics of both "species".

Carrère and Renoux (1952) found that some strains after passage through animals, differed in biochemical behaviour from the parent type. Jacotot and Vallee (1954) expressed the opinion that the French strains of *Br. abortus* and *Br. melitensis* might acquire the characteristics of *Br. suis* (Danish type) by passage through wild hares which were found to be naturally infected in Switzerland, central France and Denmark.

However, no serological variation after passage through animals, other than the "S" to "R" change has yet been demonstrated.

The purpose of this report is to describe the characteristics of two variants isolated from a lesion in a rabbit in solitary confinement and infected 18 months previously with a laboratory strain of *Br. melitensis,* the first variant, isolated by cultural methods (lapinized *Br. melitensis*), the second variant, isolated by guinea-pig inoculation (cavianized Br. melitensis).

The work was prompted by the finding, similar to the experience in North Africa (Renoux, 1952), that sheep and goats carry infections of *Brucella* organisms showing characteristics of both "melitensis" and "abortus" typees.

Earlier isolations at this laboratory showed a measure of instability at first suspected of being due to lack of standardized culture methods. Strains isolated directly from ovine foetal and milk specimens and from testicular lesions, showed predominantly "melitensis" characteristics, whereas in strains isolated indirectly by means of guinea-pig inoculation "abortus" characteristics predominated. Rabbits inoculated with live strains for antiserum production, frequently developed chronic abscesses in the vicinity of nerve trunks from which variant strains of *Brucella* were cultured (v. Drimmelen, 1949). The doubts about *Brucella* taxonomy, originating from these random observations, were supported by the suggestion of Renoux that a new species *Brucella brucei* be created to accommodate all the types described.

MATERIALS AND METHODS

A stock "melitensis" strain obtained from Dr. A. W. Stableforth of Weybridge (*Br. Melitensis,* Foster) was cultured on standard potato agar slants from an ampoule of cell suspension freeze-dried *in vacuo,* dated 1953 and designated Nr. M.53.3.We.

Four healthy albino rabbits from the Onderestepoort small animal plant were inoculated intramuscularly in the right thigh

with 2.5 ml. of a dense suspension of cells from a 48-hour culture (approx. 10^{11} viable organisms) of this strain.

This parent culture was freeze-dried in lactose-ascorbic-acid-thiourea mixture and recovered at later dates by reconstitution (M.53.3.We). The other strain isolated later from the rabbit and the subsequent isolation through a guinea-pig were all similarly treated.

For comparison Strain 99 (Weybridge) was used as a stable aerobic "abortus" antigen and designated: A.49.9We.

At long intervals the rabbits inoculated with *Br. melitensis* (M.53.3.We) were tested for Brucella agglutinins by the routine tube test, examined for palpable lesions and slaughtered for examination of the abscess contents. After three to eleven months only "R" cultures were obtained on agar slopes. Biochemical and dye inhibition tests showed typical "melitensis" characteristics.

The last rabbit, which also showed the least prominent palpable abscesses at the site of inoculation, was kept for 18 months and then sacrificed. The contents of the abscesses were sub-inoculated into 10 adult male guinea-pigs and direct cultures made on Albimi agar plates, and horse serum agar slants were grown in 10% CO_2 and in air at 37°C. The culture was aerobic (CO_2 independent) and was freeze-dried and designated: R.56.13.Op.

After 4 weeks the guinea-pigs were tested for agglutinins. Five were completely negative and were sacrificed to be examined for macroscopic lesions. No lesions were found. Four weeks later the remaining guinea-pigs were slaughtered and their spleens cultured although again no lesions were found. The cultures in air showed no growth but in 10% CO_2 a pure *Brucella* culture was obtained from one guinea-pig spleen. This culture was freeze-dried and designated: G.57.3.Op.

Work was now undertaken on the following cultures:—

(1) M.53.3.We.: A typical *Br. melitensis* culture derived from a suspension of organisms freeze-dried at Weybridge Laboratory and propagated on potato infusion agar; hereinafter referred to as the parent strain.

(2) R.56.13.Op.: A lapinized variant of *Br. melitensis* (M.53.3.We.) derived from a single smooth colony on an Albimi agar plate culture from the pus of an abscess in a rabbit inoculated 18 months previously with the parent culture: the lapinized strain.

(3) G.57.3.Op.: A cavianized variant of *Br. melitensis* (M.53.3.We.) derived from a single smooth colony on an Albimi agar plate sub-culture from the spleen of one of ten guinea-pigs inoculated with the pus of the rabbit abscess mentioned in (2): the cavianized strain.

(4) G.57.3.(Air): An aerobic variant of No. (3) selected by heavy inoculation of a potato agar slant and incubating in air. A sub-culture made after 8 days supplied four aerobic colonies. These were used for the stock culture of the cavianized strain.

(5) *Br. abortus* control strain A.49.9.We. an aerobic laboratory strain (Strain 99 of Weybridge): the abortus control strain.

Examination of strains was carried out as follows:—

(a) Microscopic morphology of cells:
(Methods of Hansen (1939) and Sterne (1952) modified Muir's capsule staining method).
(b) Colonial morphology (Henry, 1933).
(c) H_2S production (Huddleson, 1943).
(d) CO_2 dependence.
(e) Dye inhibition (Pickett, Nelson, Hoyt and Eisenstein, 1952).
(f) sodium-di-ethyl-di-thio-carbamate inhibition (Pickett, Nelson and Liberman, 1953).
(g) Urease activity was measured at 37°C in the medium of Rustigian and Stuart (1941).
(h) Antiserum was produced in rabbits inoculated with large numbers of heat-killed or live organisms.
(i) Absorption was carried out by adding two parts of serum to three parts of wet packed cells, mixing and incubating for 6 hours and holding at 4°C overnight. The supernatant harvested after centrifuging was used as absorbed serum designated: dilution 1:2.5.

The characteristics of the culture were deduced from reproducible results. Tests were repeated at least four times depending on the degree of similarity of the findings.

RESULTS.

In table 1, the strain characteristics are given:—

(a) CO_2 requirement only occurs with the cavianized strain. It is a typical "abortus" characteristic. Not a single aerobic colony appeared on primary culture of the guinea-pig spleen.
(b) H_2S production for two days was demonstrated with both the lapinized and cavianized cultures. It was completely absent from laboratory stock cultures of *Br. melitensis* as well as the *Br. abortus* control.
(c) Thionin inhibition in the aerobic cavianized strain was found to be as strong as in the control *Br. abortus*. It was weaker in the CO_2 dependent cavianized strain and absent in the lapinized and parent strain.
No basic fuchsin sensitivity was found. Methyl violet sensitivity was only present in the lapinized strain and pyronin sensitivity was strongest in the aerobic cavianized strain.
(d) Diethyldithiocarbamate sensitivity was of the "melitensis" type in the parent and lapinized strains only.
(e) Urease activity was slight in the parent strain, very slight in the "abortus" control strain and absent in both the derived strains. After repeated sub-culture on potato agar

a very slight reaction was elicited from the lapinized strain.

(f) Mono-specific sera showed " melitensis " antigens in the parent and lapinized strains and " abortus " antigens in the cavianized and control strains.

This justifies the following taxonomic results:—

M.53.3.We.: The parent strain = *Br. melitensis.*

R.56.13.Op.: The lapinized strain = *Br. melitensis.*

G.57.3.Op.: The cavianized strain = *Br. abortus.*

A.49.9.We.: The abortus control strain = *Br. abortus.*

In table 2 is shown a summary of the absorption tests carried out to date with the aerobic cultures. The table is self-explanatory and illustrates results which show the following features:—

(1) The lapinized strain (R.56.13.Op.) is NOT agglutinated by non-absorbed " melitensis " and " abortus " antisera; yet the lapinized strain can be agglutinated by sera prepared from the abortus control strain (A.49.9.We.) following incomplete absorption with cells of the cavianized strain (a. in table 2) and of the parent strain (M.53.3.We.) (b. in table 2). In fact, agglutinins for the lapinized strain (R.56.13.Op.) apparently absent in unabsorbed anti-sera from the parent strain, the cavianized strain and the abortus control strain were demonstrated following a number of different absorptions. For instance:—

A titre of 1:50 was found in antiserum of the parent strain (M.53.3.We.) absorbed by the abortus control strain (A.49.9.We.) (See c. in table 2).

A titre of 1:640 was found in antiserum of the abortus control strain (A.49.9.We.) absorbed by the parent strain (M.53.3.We.) (See b. in table 2).

A titre of 1:20,480 was found in antiserum of the abortus strain incompletely absorbed by the cavianized strain (G.57.3.Op.) (See a. in tatble 2).

A titre of 1:20,480 was found in antiserum of the cavianized strain (G.57.3.Op.) incompletely absorbed by itself. (See d. in table 2).

(2) Evidence of " abortus " antigens was absent in the parent strain and in the lapinized strain but the cavianized strain (G.53.3.Op.) was agglutinated by mono-specific " abortus " serum. (See e. in table 2).

This cavianized strain was, nevertheless, repeatedly proved to be incapable of differentially absorbing only the minor " abortus " agglutinins from antiserum of the parent strain. (See f. in table 2).

(3) The lapinized strain (R.56.13.Op.), whilst failing to absorb any of the major agglutinins in the stock laboratory strains, produced high titre agglutinins for both, which were absorbed by them as well as by the cavianized strains. This lapinized strain produced (G.57.3.Op.) which were masked by proagglutinoids and were absorbed with difficulty. (See g. in table 2)

TABLE I.

CHARACTERISTICS OF *BRUCELLA ABORTUS* AND *BRUCELLA MELITENSIS* STOCK STRAINS AND OF *BRUCELLA* STRAINS DERIVED FROM THE *BRUCELLA MELITENSIS* STOCK.

Strain	Agar Colonies	CO_2 Requirement Nil to 4 plus	H_2S Production Days	Dye Inhibition in mm.				DEDTC. Sensitivity (millimetres)	Urease Activity (minutes)	Monospecific Serum Agglutination
				Thionin (mm)	B. Fuchsin (mm)	M. Violet (mm).	Pyronin (mm)			
M.53.3.We. (Parent)	100% S	0	0	0	0	0	2	3(8)	90	melitensis
R.56.13.Op. (Lapinized	90% S	0	2	0	0	2	2	2(8)	(180)	melitensis
G.57.3.Op. (original Cavianized)	100% S	4	2	3	0	1	4	2	0	abortus
G.57.3.(Air)	100% S	0	2	4	0	0	5	3	0	abortus
A.49.9.We. ("abortus" control)	95% S	0	0	4	0	0	1	2	120	abortus

Designation: A = abortus
M = melitensis
R = Rabbit
G = Guinea-pig
We = Weybridge
Op = Onderstepoort
49, 53, 56, 57 = year when freeze dried
3, 9, 16 = no. of strain freeze dried in that year.

TABLE II.

PRODUCTION OF AGGLUTININS AND AGGLUTININ-ABSORPTION BY 4 STRAINS OF *BRUCELLA*.

Antigen	Inoculation Date	Serum	Date Bled	Bacterial Cells Used for Absorption	Absorption Date	Remarks	Date Tested	Result of Test (Titre)				Date Read
								Antigen M.53.3.We. Br. melitensis	Antigen R.56.13.Op. Lapinized Br. melitensis	Antigen G.57.3.Op. Cavianized Br. melitensis	Antigen A.49.9.We. Br. abortus	
M.53.3.We Killed (Parent)	8. 5.57	53.3	38. 8.57	—	—		4. 9.57	20,480	0	20,480	20,480	5. 9.57
				53.3				0	0	0	0	12. 9.57
				56.13				20,480	0	10,240	20,480	12. 9.57
				57.3				0	0	10	0(f.	12. 9.57
				49.9				320	40c.	0	0	12. 9.57
R.56.13.Op Killed (Lapinized)	8. 5.57	56.13	30. 8 57	—			4. 9.57	20,480	5,120	640	10,240	5. 9.57
				53.3	6. 7.57		11. 9.57	0	20,480	0	0	12. 9.57
				56.13	6. 7.57		11. 9.57	20,480	0	2.560	20.480	12. 9.57
				57.3	14.10.57	Complete absorption	11. 9.57	10	20,480	10	0	12. 9.57
				49.9			15.10.57	0	5,120	0	0	16.10.57
R.56.13.Op Live (Lapinized)	8 5.57	56.13	30. 8.57	—	—		8.10.57	1,280	20,480	160	1,280	9.10.57
				53.3	7.10.57		8.10.57	0	20,480	0	0	9.10.57
				56.13	7.10.57		8.10.57	0	0	40(g.	0	9.10.57
				57.3	7.10.57		8.10.57	0	10.240	0	0	9.10.57
				49.9			8.10.57	0	24,480	0	0	9.10.57
G.57.3.Op Killed (Cavianized)	8. 5 57	57.3	30. 8.57	—	—		4. 9.57	20,480	0	20,480	20,480	5. 9.57
				53.3	6. 7.57		11. 9.57	20	0	10	20	12. 9.57
				56.13	6. 7.57		11. 9.57	5,120	0	10,240	20,480	12. 9.57
				57.3	6. 7.57	Incomplete absorption	11. 9.57	10	20,480(d.	10	0	12. 9.57
					14.10.57	Complete absorption	15.10.57	0	0	0	0	16.10.57
				49.9	6. 7.57			0	0	0	0	12. 9.57
A.49.9.We. control) Killed (abortus	8. 5.57	49.9	38. 8.57	—	—	Incomplete absorption	4. 9.57	20,480	0	10,240	20,480	5. 9.57
				53.3	6. 7.57		1.10.57	0	640(b.	640(e.	640	2.10.57
					14.10.57	Complete absorption	15.10.57	0	0	80	640	16.10.57
				56.13	6. 7.57		11. 9.57	10,240	0	10.240	20,480	12. 9.57
				57.3	6. 7.57	Incomplete absorption	1.10.57	10	20,480(a.	0	0	2.10.57
					14.10.57	Incomplete absorption	15.10.57	0	0	0	0	16.10.57
				49.9	6. 7.57		11. 9.57	0	0	0	0	12. 9.57

Designation: A = abortus R = Rabbit We = Weybridge 3, 9, 16 = year when freeze dried

DISCUSSION

The results show that in the rabbit lesion, variants of *Br. melitensis* did arise. One of these variants was recovered on culture and found to be aerobic, of low pathogenicity for guinea-pigs, but still predominantly "melitensis" in character. (The lapinized strain R.56.13.Op.) A second variant which did arise in the lesion was recovered from the spleen of a guinea-pig inoculated 8 weeks previously with abscess material, and this showed marked CO_2 dependence, average pathogenicity, and predominantly "abortus" characteristics (the cavianized strain G.57.3.Op.)

Serological examination supported the cultural findings in that monospecific sera showed the lapinized strain to agglutinate with "melitensis" serum and the cavianized strain to agglutinate with "abortus" serum.

Thus the mutation spectrum of *Br. melitensis* is here shown to be wider than previously recognised.

These results have been foreshadowed in remarks made by many workers, notably by Renoux (1952) who stated that the characters used to distinguish the so-called species of *Brucella* merely constitute degrees of common properties, which do not justify giving them the status of a botanical species. There is no doubt that the usefulness of classifying *Brucella* strains is enhanced by the findings reported here. The pathogenic nature, which always will be the most important consideration, is significantly correlated with the biochemical, cultural and serological properties of these organisms. Examination of freshly isolated cultures is, however, a fundamental requirement, and it is felt that freeze-dried material from infected tissues or at least from the primary culture should be the most suitable for diagnostic investigations.

The taxonomic situation is not at all clear as yet, but in the author's opinion only one species can be recognised in the genus *Brucella* (Meyer and Shaw, 1920), namely *Brucella melitensis* (Hughes) Meyer and Shaw.

In consequence *Bacterium abortus* (Schmidt and Weis, 1901) should be named *Br. melitensis* var. *abortus* as proposed by Evans (1917); and the names *Br. melitensis* var. *melitensis* (Evans, 1917), *Br. melitensis* var. *suis* (Hardy, Jordan, Borts and Hardy, 1930) should be recognised as correct.

Evidence to allocate other varieties of *Brucella* organisms to separate species requires careful consideration, as it would appear that the organisms mentioned in recent literature could be typed or classified more correctly in conformity with the first variety mentioned above, e.g.:—

Br. melitensis var. *thomseni* (Renoux 1952).
Br. melitensis var. *lisbonnei* (Renoux 1952).
Br. melitensis var. *intermedia* (Renoux 1952).
Br. melitensis var. *karakul* (v. Drimmelen), 1953.
Br. melitensis var. *ovis* (Buddle 1954).

One important characteristic of *Brucella* that warrants more attention than it has received, is invasiveness, a particularly notorious property of laboratory cultures of *Br. melitensis*. In this connection, investigation of the LD50 dose for guinea-pigs of a standard description, and the spleen clearing time after as standardized dose as possible, additional criteria may be suggested.

ACKNOWLEDGEMENTS

Dr. R. A. Alexander, Director of Veterinary Services, is thanked for permission to publish this report. Dr. A. W. Stableforth kindly supplied the stock cultures. Thanks are also due to Dr. J. R. Thomas for his help with the manuscript. Technical assistance from Messrs. G. du Plessis and P. V. Mulders is warmly appreciated.

REFERENCES

Evans, A. C. (1923) — Further studies on *Bacterium abortus* and related bacteria. A comparison of *Bacterium abortus* with *Bacterium bronchisepticus* and with the organism which causes malta fever. *U.S. Aub. Health Rep.* 38:580—593.

Hansen, K. and Köster, H. (1936) — Nachweis von *Brucella abortus* auf Grund der Alkalifestigkeit. D.T.W. 44:739—742.

Hardy, A. V., Jordan. C. F. Borts, I. H. (December, 1930). Undulant Fever. *National Institute of Health Bulletin*: 158—

Henry, B. S. (1933) — Dissociation in the genus *Brucella Jnl. Inf. Dis.*, 52:374—402.

Huddleson, I. F. (1943) — Brucellosis in man and animals — *The Commonweaith Fund New York*: 50—51.

Jacotot, H. and Vallee, A. (1954) — Quelques consideration sur la brucellose di Lièvre á propos de huit cas identifies a France. *Ann. Inst. Past.*: 87:218—220.

Meyer, K. F., Feusier, M. L. and Shaw, E. B. (1920) — A comparison of the morphologic cultural and biochemical characteristics of *Br. abortus* and *Br. melitensis Jnl. Inf. Dis.*: 27:175—206.

Pickett, M. J., Nelson, E. L., Hoyt, R. E. and Eisenstein, B. E. (1952) — Speciation within the genus Brucella. 1 Dye sensitivity of smooth brucellae: *J. Lab. Clin. Med.*: 40:200—205.

Pickett, M. J., Nelson, E. L. and Liberman, J. D. (1953) — Speciation within the genus Brucella. *Jnl. Bact.*, 66

Renoux, G (1952a) — "Une nouvelle methode de differenciation des varietés de *Brucella*. Action du diethyldithiocarbamate de soude (DEDTC)": *Ann. Inst. Pasteur*: 82:556—62.

Renoux, G. (1952b) — "Une nouvelle "espéce" de brucella: *Br. intermedia*. *Ann. Inst. Pasteur*: 83:814—815.

Renoux, G. and Quatrefrages, H. (1951) — "L'Identification des Brucella par leur activité uréasique" *Ann. Inst. Pasteur.*: 80:182—

Renoux, G. and Carrere, L. (1952) — " De la valeur dis caractéres d'identification des *Brucella* ". *Ann. Inst. Pasteur*: 82-277-288.

Rustigian, R. and Stuart, C. A. (1941) — Decomposition of urea by Proteus. *Proc. Soc. Exptl. Biol. Med.*: 47:108-112.

Renoux, G. (1952) — " La classification des *Brucella*. Remarques á propos de l'identification de 2,598 souchese ". *Ann. Inst. Pasteur.*: 82:289-298.

Schmidt and Weis (1901) — Bacterierne: 266 (cited by Breed et al in Bergey's Manual).

Sterne, M. P. (1952) — A note on the staining of the bacterial capsule. *Onderstepoort Jnl.*: 25:51-52.

Van Drimmelen, G. C. (1953) — *Brucella melitensis* isolated from Karakul sheep of South West Africa. *South African J. Ser.*: 49:299-302.

XVth INTERNATIONAL VETERINARY CONGRESS, STOCKHOLM — 1953

RESOLUTIONS

I.—*Fight against epizootics on an international level.*

" The XVth International Veterinary Congress recognizes the necessity for an energetic campaign against epizootics and supports all efforts to establish an international co-ordination of this fight.

The increasing overlapping of international activities during the past few years constitutes for member-states not only a severe financial burden, but also tends to impair the efficiency of all measures taken in this field.

Hence, the XVth International Veterinary Congress is of the opinion that the tasks resulting from the international fight against epizootics should be organized in the main through the O.I.E. and the F.A.O. within the framework of their mutual agreements.

The Permanent Committee for the International Veterinary Congresses is instructed to co-operate with the international organisations concerned ".

II.—*Revision of the Statutes of the Permanent Committee for the International Veterinary Congresses and of the By-Laws of the International Veterinary Congresses.*

" The XVth International Veterinary Congress instructs the Permanent Committee to prepare for the XVIth International Veterinary Congress in 1957 a draft revision of the statutes of the Permanent Committee and of the Bye-Laws of the International Veterinary Congresses.

The Permanent Committee should consider whether a World Federation of Veterinarians in the form of an International Union is desirable ".

III.—*International standardization of biological products.*

" Recognizing the need of urgent action to establish international standards for biological products for veterinary use, the XVth International Veterinary Congress welcomes the extension of the work of the Committee on Biological Standardization of the World Health Organisation to include such products. It suggests that this Committee be encouraged to extend as soon as possible its work towards the provision of international standards for other suitable veterinary substances, those meriting immediate attention being the **Cl. welchii** (Cl. perfringens) antigens, beta and epsilon, and swine erysipelas antiserum. The XVth International Veterinary Congress also welcomes the work of theO.I.E. on the

study of biological products for use in the control of animal diseases and suggests that the Office be encouraged to continue its activities on this subject ".

IV.—*Establishing suitable post-graduate scholarships in the field of veterinary parasitology.*

" In view of the heavy losses arising from parasitic infestations of livestock and the dearth of trained parasitologists throughout the world, the XVth International Veterinary Congress urges the Permanent Committee to seek the co-operation of O.I.E. and F.A.O., and national and international veterinary bodies to establish suitable post-graduate scholarships in this field ".

V.—*Information on preventive and curative treatment of parasitic diseases and the practical control of these diseases.*

" On the proposition of the Committee on the Control of Parasitic Diseases, the XVth International Veterinary Congress recommends co-operation to the fullest possible extent with O.I.E., F.A.O. and other agencies in determining the distribution of the important parasitic diseases of livestock throughout the world, in making available to the veterinary profession the latest and most authentic information on preventive and curative treatment of these diseases and in encouraging the practical control of parasitic diseases throughout the world ".

VI.—*Distribution of the reports of the Congress.*

" The XVth International Veterinary Congress urges the Organizing Committee of the next Congress to make every effort to see that the reports of the papers to be presented at that Congress are in the hands of all delegates at least one month before the opening date of the Congress ".

VII.—*Veterinary education regarding physiology and pathology of reproduction and lactation.*

" As the prevention and treatment of disturbancees in reproduction and lactation and artificial insemination of domestic animals have developed into specially important branches of veterinary science and practice, the XVth International Veterinary Congress recommends that veterinary schools should ensure that students receive adequate instruction in this branch of veterinary work ".

VIII.—*International Animal Production Organisation.*

1. " In view of the vital contribution which the veterinary profession can make to the important field of animal production, the XVth International Veterinary Congress recommends the formation of a special Animal Production Organisation to deal with Animal Breeding, Animal Nutrition and Animal Husbandry in relation to animal health and animal productivity.

2. This Animal Production Organisation should be affiliated to the International Veterinary Congress Organisation and should have representation on the Permanent Committee ".

IX.—*International exchange of veterinarians.*

" The XVth International Veterinary Congress proposes that the veterinary organisations of the different countries should organise an exchange of veterinarians in different fields of activity for the purpose of study, gaining practical experience and establishing personal contacts ".

X.—*The use of vaccines in the fight against infectious diseases and epizootics.*

" The XVth International Veterinary Congress recommends that, when choosing a process of immunization with a view to combating an infectious disease, preference is given to vaccines of germs or viruses killed or made inactive, so that they are totally inoffensive. Living germs or viruses, attenuated or not, should not be used unless no other immunizing method of sufficient value exists.

In that case, the so-called " living " vaccines shall not be used generally unless a profound experimental study has proved the stable character of the viruses of which the vaccines are composed, and has precisely determined the risks which their use involves. The possesion and the use of these vaccines should be restricted exclusively to veterinarians ".

XI.—*Food hygiene and public health.*

1. " The XVth International Veterinary Congress — in view of the importance of veterinary work for public health and public economy — recommends an increased participation of veterinarians in public health and agricultural administrations, especially for combating zoonoses, for the supervision of victuals and for the study of other questions of current interest for human and animal health.

2. As the value and effect of the supervision of victuals depends on the technical training of the supervising veterinarians as well as on their participation in the framework of the administration, it is desirable that in all countries a special training of professional veterinarians takes place in the field of the manufacture and supervision of victuals of animal origin.

3. As an important part of food poisoning is caused by human permanent excreters of salmonella-bacteria, suitable measures for the removal of germ-carriers from the food trade should be aimed at in all countries.

4. W.H.O., F.A.O., O.I.E. and other international organisations should support individual countries by technical consultation and through the development of international standardized methods of research in the field of zoonoses and food hygiene and in this way facilitate the training of veterinarians for the public health service ".

XII.—*Control of rabies.*

" The XVth International Veterinary Congress recommends that International organisations such as W.H.O., F.A.O. and O.I.E.

should provide all possible technical and material assistance to countries where rabies is enzootic, in an intensified effort to control and eradicate this disease by the application of well-proven sanitary measures combined with mass immunization of dogs with a vaccine of proved potency, reinforced, where necessary, by wild-life reduction programmes ".

COMMENTS BY THE DIRECTOR OF VETERINARY SERVICES

UNION OF SOUTH AFRICA

RESOLUTION No. 1.

Fight Against Epizootics on an International Level.

The Union of South Africa is in full agreement that the fight against the Epizootic Diseases of animals must be organized on an international basis and that for their control and eradication the closest collaboration on an international basis is essential.

The Union of S.A. does not agree that this organization should be established in the main through the O.I.E. and the F.A.O. It should be pointed out that the draft convention for the control of Foot and Mouth disease sponsored by the O.I.E. was of such a nature that the provisions could not be applied on the Continent of Africa.

The Union of S.A. collaborates to the maximum of its potential with C.C.T.E./C.S.A. and through the Organization with I.B.E.D. and its technical advisory committee I.A.C.E.D. Reference to the proceedings of the organizations will indicate the practical support which has been given by the Union of S.A. and this should be viewed in the mirror of the achievements of those organizations.

The Union of S.A. is of the opinion that, when dealing with epizootic diseases of domestic animals in Africa, south of the Sahara that the approach, in the first instance, should be made through C.C.T.A./C.S.A.

RESOLUTION No. 2.

Revision of the Statutes of the Permanent Committee for the International Veterinary Congresses and of the By-Laws of the International Congresses.

At this stage South Africa has no comments to offer on the revision of the statutes.

The National Committee is of the opinion that the time is not right for the formation of a World Federation of Veterinarians.

In view of the financial commitments it is considered that the function and scope of existing International Organizations should be fully clarified before consideration can be given to the formation of a World Federation.

RESOLUTION No. 3.

International Standardization of Biological Productst.

The Union of S.A. has no intention of departing from its present policy of maintaining full control over the manufacture of all Veterinary Biologicals within the Union borders.

The Institute charged with the responsibility by the State for the manufacture of all such biologicals is the Onderstepoort Laboratories, Transvaal, South Africa. The Director of these laboratories being fully conversant with the standards laid down throughout the world, lays down his own minimum standards which certainly are not lower than those in force in other parts of the world and in many instances are superior. Maintenance of these standards is rigidly enforced.

Under the Fertilizers, Farm Feeds, Seeds and Remedies Act, 1947 (Act No. 36 of 1947) registration of any biological imported into, offered for sale, or distributed within the Union is a prior essential. The Director of Veterinary Services acts as the Technical Advisor to the Registrar appointed under this Act and takes any measures he deems fit to ensure that the potency and safety of any biological imported into the Country is not lower than the minimum standards laid down for those produced at Onderstepoort. The State will not hesitate immediately to cancel or withdraw any import permit for a product of which the minimum requirements are not consistently maintained.

The Scientific Advisory Committee of I.B.E.D. is actively engaged in doing everything possible to ensure that in territories in Africa, south of the Sahara a similar standard will be maintained. Reference to the remarkable achievements initiated by I.B.E.D. for the control of Rinderpest with a view to ultimate eradication from the Continent will serve to show the progress which has been made.

RESOLUTION No. 4.

Establishing suitable Post-Graduate Scholarships in the Field of Veterinary Parasitology.

At the present time the Faculty of Veterinary Science of the University of Pretoria, the only Veterinary Faculty in S.A. does not intend establishing Post-Graduate courses in either Parasitology or in any other field of study.

The National Committee fully appreciates the value of trained Helminthologists and Entomologists in the respective taxonomic fields. It feels that the need for experienced systematists in all such fields will remain but is of the opinion that in the field of

control as applied in the Animal Industry the great need is for veterinarians to make a special study of one or other parasitological subject. The Government of the Union of S.A. has made adequate financial arrangements for the allocation of bursaries, scholarships, and post-graduate study either within S.A. or outside its borders to meet its own requirements for trained Veterinary Parasitologists. At the moment there is a shortage of individuals which appears to be in evidence throughout the world today. It is anticipated that this shortage will be overcome in the near future but there is little likelihood that any surplus from S.A. will be available for distribution to other countries

Full details of the arrangements that the Union Government has made for the exchange of Professional and Technical personnel may be obtained from C.C.T.A. It must be emphasised that no formal course of study or tuition is arranged at Onderstepoort but Professional Technicians receive their instruction by taking part in the normal routine, teaching, and research activities in any of the sections at the Institute. A large number of visiting scientists enjoy the technical hospitality of these laboratories and all have indicated their entire satisfaction with the arrangements that have been made to accommodate them and to assist in their studies.

RESOLUTION No. 5.

Information on Preventive and Curative Treatment of Parasitic Diseases and the practical control of these Diseases.

By membership of various International Organizations, by attendance at selected International Congresses, and by a regular study of the world's literature, Officers of the Veterinary Division are kept fully advised as to the progress made in other parts of the world. The Union of S.A. plays an active part in ensuring through C.C.T.A. and its bureaux that all relevant information information is made available to authorities in Africa, south of the Sahara with the least possible delay.

The results of original research work at Onderstepoort are published in the Onderstepoort Journal of Veterinary Science. This is a purely technical publication and has a world-wide distribution.

Within the Union itself use is made of Extension Officers, Field Veterinarians, Publications in the lay press, distribution of information leaflets and pamphlets, and the liberal use of the radio for the distribution of the latest knowledge and achievements. The limiting factor remains the scarcity of trained and experienced personnel to carry out these functions.

RESOLUTION No. 6.

Distribution of the Reports of the Congress.

South Africa is in full agreement that arrangements should be made to ensure that the reports of all papers to be presented

at Congress should be in the hands of all Delegates not less than one month before the opening date of the Congress.

The National Committee wishes to emphasize that in its opinion Congress should be so arranged, or alternately the papers to be presented at Congress should be so limited that there is no overlap on the programme between allied subjects. It is of the opinion that the programme for Congress has been over enlarged to such an extent that delegates are quite unable to attend more than a small percentage of the discussions in which they are particularly interested and to which they might be in a position to make a material contribution.

Since the discussion that follows presentation of a paper frequently is of greater importance than the paper itself, it is felt that adequate time should be made available to ensure that full discussion is not curtailed and that in addition the necessary Secretarial provision is made to ensure that an adequate representation of the discussion should be distributed with the final report of congress.

RESOLUTION No. 7.

Veterinary education regarding physiology and pathology of reproduction and lactation.

The National Committee views with considerable concern the growing tendency to overload the basic course of instruction for veterinary graduates. It is felt that the necessity for a broad academic training should not be lost sight of and that further increase in the course of basic instruction in specialized Veterinary Medicine can only take place by increasing considerably the time necessary for this basic training. It is felt that there are a number of fields in which specialized study is essential but that this study should take the form of specialized post-graduate study either within the country or at suitable institutions in other countries.

It is felt that the prescribed course in Physiology, Meat and Dairy Hygiene, Animal breeding and Genetics for both large and small animals is adequate to meet the needs of the average Veterinarian. The Certificate awarded to each gradudate does not provide for any reference to specialization. This will be found on his record of post-graduate study.

In only one field is a deviation under consideration. At present Gynoecology in all its aspects, forms an integral portion of the University Department of Surgery. It is felt that owing to the enormous expansion of artificial insemination and a realization of the extreme importance of fertility and infertility that a separate independent Department of Animal Gynoecology should be established within the existing framework of the Faculty of Veterinary Science. It is probable that this Division of teaching activities will be brought into operation at the beginning of 1959.

RESOLUTION No. 8.

International Animal Production Organisation.

It is the present opinion of the National Committee that Veterinary Science on the one hand and Animal Husbandry and Genetics (including distribution) are each specialised studies or subjects and that neither should be made subservient to the other. Bearing this in mind it is believed that the best solution is the establishment and maintenance of separate organisations or departments with a common controlling body which will ensure the maximum of mutual co-operation.

It is appreciated that it is not possible to draw a definite line of distinction between the activities of the two departments. For instance, it is impossible to determine where nutrition should be regarded as a function of Animal Husbandry and where nutrition should be regarded as a Veterinary matter concerned with the maintenance of normal health. Therefore, activity of individuals in either organisation or department should not be discouraged and should not be regarded as encroachment upon the sphere of activity of the other.

RESOLUTION No. 9.

International Exchange of Veterinarians.

It is the policy of the Government of the Union of South Africa to encourage to the maximum the exchange of Veterinarians particularly in Africa, south of the Sahara.

The Council of Scientific and Industrial Research has compiled a complete list of the facilities available in South Africa not only in the field of veterinary science but in all scientific fields. This is a very bulky document but probably is available for consultation in the Office of the South African Ambassador in Paris and certainly is available in the offices of C.C.T.A. in London. In addition, the South African Government has made available the sum of £2,500 to be used under certain specified conditions to foster the exchange of veterinarians. Full details of this scheme are obtainable from either the office of the South African Ambassador or the C.C.T.A./C.S.A. Secretariat, London. Up to the present only one officer has availed himself of these facilities, namely Mr. Plowright, Veterinary Research Officer, East African Veterinary Research Organisation, Muguga, Kenya, who visited Onderstepoort in 1957 to study our methods of tissue culture as applied to the study of Bluetongue of sheep and Lumpy skin disease of cattle. In addition he was able to discuss his own problems connected with the study of Rinderpest by tissue culture methods.

There are no senior veterinarians on the staff of Onderstepoort who have not been afforded the privilege of Overseas experience either by attending International Conferences or by following a course of study in Overseas Institutes. Funds have been made available by the Union Government for this purpose.

In 1957, Professor D. Coles was invited to visit Nyassaland to advise the authorities on their poultry industrty.

In 1957, Professor J. H. R. Bisschop was invited to visit Nyasaland to advise and report upon the Cattle Industry. This officer on previous occasions has visited the Sudan, Uganda, Kenya, and all the United Kingdom High Commission Territories for the same purpose.

In 1956, after the diagnosis of Bluetongue in sheep in Portugal had been made and confirmed at Onderstepoort, Dr. Jansen of the Onderstepoort staff visited Portugal with a view to advising the Veterinary Authorities on the control of this disease of sheep.

In 1953, Dr. R. Alexander, at the invitation of the Government of the United States of America visited America to advise on the control of Bluetongue with particular reference to the preparation and distribution of an effective vaccine.

On various occasions Dr. R. du Toit has been invited to visit Southern Rhodesia and South West Africa to advise on Tsetsefly control.

Previously Dr. M. Sterne had visited Turkey to assist and advise on the production of Anthrax vaccine.

A very large number of visitors from outside the Union are accommodated at Onderstepoort every year to study the methods in use and to gain first-hand information on the research being conducted. The duration of these visits varies from a few days to a year or longer. Such visitors have originated from all over the world.

My comment as Director of Veterinary Services for the Union of S.A. is that, at present, the traffic in the exchange of Veterinarianh is overwhelmingly one way, towards Onderstepoort probably because other Governments and Institutes have not made similar provisions for an actual exchange of workers apart from accommodating visitors for comparatively short periods.

RESOLUTION No. 10.

The use of vaccines in the fight against infectious diseases and epizootics.

The responsible veterinary authorities in the Union of S.A. differ completely and emphatically from the expression of opinion at the 15th International Veterinary Congress that preference be given to vaccines composed of germs or viruses killed or made inactive so that they are totally inoffensive.

After many years of experience and probably as the pioneer in the field of the use of living but attenuated virus vaccines for the durable immunity of domestic animals, the opinion is confidently expressed that, not only are suitably selected and controlled living vaccines preferable but that, in many instances, the use of so-called inactivated vaccines is contra-indicated. Without entering into detail it is believed that the use of so-called inactivated Foot and

Mouth disease vaccine is primarily responsible for the lack of control in those countries where its use is permitted.

The following is a list of vaccines of which the effective component is live, which are prepared and distributed from the Onderstepoort laboratories:—

1. Bluetongue.
2. Rift Valley Fever.
3. Wesselsbron virus infection.
4. Horsesickness.
5. Fowlpox.
6. Newcastle disease.
7. Distemper.
8. Rabies (Flury strain).
9. Contagious abortion (strain 19).
   All the above vaccines are issued in freeze-dried form.
10. Heartwater. This is a specially selected strain of the causal organism issued frozen at low temperature on dry ice. The resulting reaction is controlled by Chemotherapy.

The preparation and distribution of all vaccines for domestic animals is controlled by the State. Standards are laid down and the safety, viability and effectiveness of all products are adequately checked before distribution is permitted after registration under the revelant act (Act 36 of 1947). An expiry date after which the particular vaccine may not be used is stamped or printed on every individual container.

Any complaints received in regard to the use of these vaccines is promptly investigated by State Veterinarians.

None of the above vaccines is restricted to use by Veterinarians only.

You asked the question "why is the use of these vaccines not reserved for veterinarians?" My best reply is to pose the question "can any adequate reason be given why the use of these vaccines should be limited to veterinarians?" That question I have asked repeatedly and have never received a satisfactory reply.

RESOLUTION No. 11.

Food Hygiene and Public Health.

1. In South Africa the basic principle is followed that, since food ultimately is destined for use by man, therefore medical officers should be appointed and remain in control of the use and distribution of all such animal products.

Although medical officers may be in charge the Medical and Veterinary professions work in the closest possible collaboration. For example, where the economic position permits it, all animals to be slaughtered are subjected to ante-mortem and post-mortem examination by trained veterinarians. Qualified meat inspectors carry out the meat inspection services but condemnation of any carcase or portion of a carcase is carried out only by a veterinarian.

Apart from the veterinary control in abattoirs, Municipal Authorities and commercial enterprises employ full-time trained veterinarians for the control of animal products to be used for human consumption.

2. Although no fixed post-graduate course is at present given in the Faculty of Veterinary Science of the Pretoria University, Veterinarians engaged upon the control of food for human use are adequately trained. The formation of a Department of Food Technology within the Faculty is under consideration.

3. Trained medical officers are in charge of the routine and regular examination of personnel handling food of animal origin for human consumption with a view to excluding Salmonella infections.

At the present moment particular attention is being paid to the problem of excluding Salmonella infection from liquid eggs.

RESOLUTION No. 12.

Control of Rabies.

For the control of Rabies all the measures recommended at the 15th International Veterinary Congress have been adopted and have been in practice for several years. In spite of the peculiar difficulties encountered in South Africa, we are happy to report that, not only is this disease under control, but in certain areas infection has been eliminated completely. We are satisfied with the appointment of Dr. Kipps and are fully prepared to continue to work under his direction. This point was discussed in a tactful manner collectively with all the members and also individually when I visited the laboratories. Dr. Kipps is entirely satisfied with the co-operation.

ready in a couple of shakes

for prolonged action

It's as simple as that to use Mylipen. Just two or three vigorous shakes of the vial and there you have a free-flowing suspension of procaine penicillin ready for injection. And once it is injected, 1cc. (300,000 units) Mylipen will maintain a therapeutic level of penicillin for 24 hours in most cases. Thus it provides convenient and effective treatment for any infection for which a prolonged acting penicillin preparation is indicated.

MYLIPEN *TRADE MARK*

In vials of ten 1 cc. doses

GLAXO LABORATORIES (S.A.) (PTY.) LTD., P.O. BOX 21, WADEVILLE, TRANSVAAL.

PERMANENT COMMITTEE FOR THE INTERNATIONAL VETERINARY CONGRESSES

Biltstraat 168, Utrecht (Netherlands).

No. 620 March, 1958

Report of the Veterinary Section of XIth Congress of the International Scientific Film Association held in Amsterdam from 21 to 27 September, 1957.

The Committee of the Veterinary Section of the Congress consisted of the following members:

Prof. Dr. L. de Blieck (Netherlands).
Prof. Dr. G. H. B. Teunissen (Netherlands).
Prof. Dr. F. Schoenaers (Belgium).
Prof. Dr. F. Lucam (France).

Screenings of veterinary films took place on September 24 and 25, 1957, and were attended by a great number of veterinarians and other Congress members interested in veterinary films.

These films were to a large extent exhibited during the veterinary sections, viz.:—

1. *Neurological abnormalities in small animals* (*Netherlands*). This film, an abstract of a longer one in the field of neurology, showed a number of disorders mainly in the spinal marrow.
2. *Aural resection* (*Dog*). (*Great Britain*).
3. *Réactions anaphylactiques des vaisseux mésentériques du lapin.* (*Belgium*).
4. *Les greffes artérielles hétérogènes.* (*France*). The part of this film on experimental surgery in the dog was shown.
5. *Artificial insemination in chickens and turkeys.* (Great Britain). A popular science film.
6. *Excision of vaginal wall fibroma.* (*Great Britain*).
7. *Samenübertragung beim Rind. IV. Beurteilung des Samens.* (*W. Germany*).
8. *Geburtshilfe beim Rind.* (*W. Germany*).
9. *A study of the thalamic relay for taste.* (*Sweden*).
10. *East-Coast Fever.* (*Union of South Africa*).
11. *Applied anatomy as related to anterior vena cava bleeding in the hog.* (*U.S.A.*).
12. *Hidatidosis.* (*The Argentine*).
13. *Nagana.* (*Union of South Africa*).

Besides, a few films had been put in the framework of the general programme and were shown to numerous audiences in the evening:

14. *Large-scale cultivation of Foot-and-Mouth Disease Virus.* (*Netherlands*).
15. *Artificial insemination in pigs.* (*Norway*).
16. *Kaiserschnitt beim Rind von der linken Flanke unter hoher Extraduralanästhesie.* (*Austria*).
17. *Die Naht des Zuitzenrisses und der Zuitzenfistel beim Rind.* (*W. Germany*).

The following agricultural films were shown:

1. *Just a trace.* (*Australia*).
2. *Terre moderne.* (*France*).
3. *Where the hills are twice as steep.* (*Australia*).
4. *Au pays des volcans.* (*U.S.S.R.*).

For want of time, a certain number of films could not be exhibited which is regrettable

On the whole screened films were of a high standard and have doubtless awakened or enhanced the interest in the scientific film in many of those in attendance.

The Film Committee of the Permanent Committee for the International Veterinary Congresses which is at the same time the Standing Veterinary Film Committee ot the International Scientific Film Association, begs to thank the film contract persons in the different countries as well as any other collaborators who have made it possible to present some of the best veterinary films to the Congress.

The veterinarians who are interested in human medicine also had an opportunity to see a number of most interesting films in the Medical Secton.

TH8 COMMITTEE OF THE VETERINARY SECTION OF THE CONGRESS.

March, 1958.

COUNCIL MATTERS

THE SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION.
DIE SUID-AFRIKAANSE VETERINÊR-MEDIESE VERENIGING.

THE MINUTES OF THE MEETING OF COUNCIL HELD ON MONDAY, THE 24th OF FEBRUARY, 1958, AT THE UNION HOTEL, PRETORIA.

PRESENT: Dr. P. S. Snyman (President), Drs. A. M. Diesel, M. W. Henning, G. D. Sutton, H. P. Steyn, L. W. v. d. Heever, J. W. Pols, M. C. Lambrechts, A. F. Tarr, R. du Toit, H. H. Curzon, A. C. Kirkpatrick, R. A. Alexander, S. W. J. van Rensburg, C. F. B. Hofmeyr, S. van Heerden (Hon. Secretary).

Dr. P. J. Meara present by invitation.

APOLOGIES for absence were received from Drs. P. J. du Toit, R. Clark and E. M. Robinson.

1. CONFIRMATION OF MINUTES of Meeting held on November 11th, 1957.
   Adoption moved by Dr. R. du Toit, seconded and agreed.

2. MATTERS ARISING FROM THESE MINUTES:

   (a) *Antibiotic contamination in milk.*

   Dr. Meara introduced the matter and enlarged upon the memorandum submitted (Appendix A to agenda of Council meeting of November 11th, 1957).

   He felt that the matter should be dealt with through the offices of the Association, by

   (1) A warning statement should be given on the container of an antibiotic drug for intramammary use, insisting that the milk be discarded for at least 72 hours from the final treatment.

   (2) An intensive programme should be carried out to educate dairy farmers in the importance of the problem.

   Dr. v. d. Heever enquired whether the presence of antibiotics would prevent the milk from souring. If it did so, it could be regarded as a preservative and its presence would then be in conflict with the Foods and Drugs Act.

Dr. Steyn voiced the opinion that antibiotics and hormones should not be registered and should be sold only on prescription. Dr. Alexander said that as a specific act controlled this, nothing could be done about it. Dr. Alexander moved and it was agreed that a letter be directed to the Registrar of Act 36/47 that the Association is perturbed by antibiotic contamination of milk, arising from treatment of mastitic conditions by farmers. It gives rise for concern (a) because of the possibility of sensitising reactions and allergic responses which may follow the consumption of such milk, and (b) because of the disturbing effect on cheese manufacturing operations.

It is suggested that consideration be given to give effect to the suggestion put forward by Dr. Meara.

Dr. Diesel moved that Dr. Meara be asked to ventilate this subject at the next Annual General Meeting. This was seconded by Dr. Henning and agreed to.

3. IMPLEMENTATION OF RECOMMENDATIONS OF SUB-COMMITTEE OF INQUIRY INTO CO-OPERAATIVE EMPLOYMENT OF VETERINARIANS.

The President read the resolution taken at the Annual General Meeting.

Dr. Steyn felt that no objection could be raised against co-operative employment, provided

(a) services were provided without charge to members of the Co-operative only;
(b) the services of the veterinarian are not advertised, and
(c) services are not rendered to non-members except in cases of emergency.

At this juncture the letter from the S.A. Agricultural Union, dated 10th February was read.

It was felt that, provided the "spirit" incorporated in the resolution passed at the Annual General Meeting was interpreted sincerely, no difficulties would arise. The question of prohibition of employment however does not arise and this should be pointed out to the S.A. Agricultural Union.

It was also agreed that we should always obtain a copy of the contract between any of our members and the Co-op. concerned.

A motion that the General Purposes Committee draw up a draft contract in consultation with a lawyer, for the guidance of members, was adopted.

3.(b) LETTER FROM CAPE WEST BRANCH, dated 21st January, read.

It was reiterated that this Association does not approve of the employment of veterinarians by organisations who collect fees for the services rendered by the veterinarians.

Dr. Alexander stated that the veterinarian was responsible for his contract and that if prima facie case is established, the Veterinary Board may deal with the veterinarian — it has nothing to do with the S.P.C.A. or other association (See paragraphs 14(b) and 12(a)(ii) and 12(c) of Code of Ethics.

It was reported that the Johannesburg S.P.C.A. employing full-time veterinarians was continuing to charge for the services rendered by veterinarians employed.

4. MEMBERSHIP:

Applications for membership had been received from the following persons, all of whom held the Veterinary degree of the University of Pretoria. A proposal that these persons be recommended for membership, to the forthcoming Annual General Meeting, was unanimously agreed to: A. Vogelnest, A. M. Day, J. W. Rousseau, B. A. Matson, D. Venter, J. W. van Niekerk, I. G. Horak, C. J. Mare, D. Dixon, S. J. van Rensburg, (Miss) L. van der Merwe, L. W. Langlands, R. Worthington, D. J. Jarvie.

5. FINANCE:

(a) *Maud Bales Scholarship*:

The Hon. Treasurer reported that the Finance Committee had considered the applications and recommend that the scholarship be equally divided between R. R. van der Veen and L. Naude. This recommendation was adopted.

(b) *Life Membership*:

The Hon. Treasurer announced that the following members, having paid annual subscriptions for the prescribed number of years, were now life members: Drs. R. du Toit, W. J. Ryksen, M. Sterne, L. Stonier, G. Watt, J. S. Watt and J. G. Bekker.

It was agreed that the Hon. Secretary advise these members accordingly and convey the congratulations and good wishes of Council.

6. CORRESPONDENCE:

(1) Letter dated 21.1.58 from Dr. C. W. A. Belonje re deduction of expenses for post-graduate study course from taxable income, in respect of medical and dental practitioners read. Dr. Tarr mentioned that £150 per annum could also be deducted for entertainment allowance.

Agreed that the letter and cutting be referred to the Editor, to publish suitable notice in the Journal.

7. GENERAL:

(1) Dr. Steyn enquired whether Distemper vaccine was available directly to the public.

Dr. Alexander replied that this was so and that no sound reasons had been advanced why this should not be done.

SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION, ONDERSTEPOORT

THE MINUTES OF THE SPECIAL MEETING OF COUNCIL HELD ON MONDAY THE 21st OF APRIL, 1958, IN THE MEAT BOARD BUILDING, PRETORIA.

PRESENT:

Dr. P. S. Snyman (President), Drs. A. M. Diesel, H. W. Henning, G. D. Sutton, M. C. Lambrechts, A. C. Kirkpatrick, E. M. Robinson, R. Clark, R. du Toit, L. v. d. Heever, S. van Heerden (Hon. Secretary).

PRESENT BY INVITATION:

Drs. M. de Lange and W. D. Malherbe (being members of the sub-committee).

APOLOGIES FOR ABSENCE:

Received from Drs. R. A. Alexander, P. J. du Toit, S. W. J. van Rensburg, J. W. Pols, A. F. Tarr and C. F. B. Hofmeyr.

1. DRAFT CONSTITUTION — Memorandum and Articles of Association.

Dr. Diesel gave a resumé of the pertinent differences between the draft constitution and that of the S.A. Medical Association.

As a result of a suggestion by Professor Henning, it was moved and agreed that the Finance Committee consider recommending to Council an honorarium for the Editor of the Journal and the Hon. Secretary. This should be done annually.

Several other changes were suggested and agreed upon. These amendments have been effected in the draft, the amended copies of which will be sent to all members.

A suggestion was made that the word "Medical" be dropped from the title of the Association. It was agreed that Dr. Henning make enquiries from language authorities and report back to Council.

OBITUARY

ARTHUR JAMES EWINS, D.Sc., F.R.S.

The death is announced of Dr. Arthur James Ewins, joint discoverer of sulphapyridine (M & B 693) at the age of 75 years.

Born at Norwood, Dr. Ewins was educated at Alleyn's School, Dulwich, and in 1899 joined the staff of the Wellcome Physiological Laboratories, Herne Hill, working under the late Prof. George Barger. He graduated B.Sc. from the Chelsea Polytechnic in 1906 and worked for many years with Sir Henry Dale, joining the Medical Research Committee (War Council) with Dale in 1914, in which year he was awarded his D.Sc. He worked on acetyl-choline and choline esters and other biological and physiological investigations. After joining May and Baker Ltd. in 1917, he built up a flourishing research organization and was eventually appointed a Director of the firm as Director of Research. With his colleague Phillips he discovered sulphapyridine (the first chemotherapeutic agent for the treatment of pneumonia) and sulphathiazole. Another of his discoveries was the aromatic diamidines, curative for trypanosomiasis and leishmaniasis; of these, one of the best known is pentamidine, which is widely used for protection against African sleeping sickness. In 1943 Ewns was elected F.R.S. He retired in 1952. His chief pleasures were working in his garden, reading and motoring.

BOOK REVIEW

TUBERCULOSIS IN ANIMALS AND MAN. A study in Comparative Pathology. John Francis. Published by Cassell and Co., London.

Some ten years ago Francis published a book on Bovine Tuberculosis which was a valuable contribution to our knowledge of the subject at the time. The present volume is an attempt to review the whole field of tuberculosis in animals in general, both domesticated and wild and runs to 357 pages. The first 107 pages are devoted to bovine tuberculosis and deal mainly with the diagnosis and control of the disease.

The main portion of the book is devoted to tuberculosis in animals other than bovine and including birds both domesticated and wild. The author has gone to a great deal of trouble to collect references from many sources and these

alone add greatly to the value of the book. The last chapter in the book deals with a comparison of the pathology and epidemiology of tuberculosis in animals and man which in itself could have formed the basis for a book. It is difficult to make a criticism of the book as it is in a sense a synoptic review of a subject which would require several volumes to deal with in greater detail. From the reviewer's point of view he would have welcomed more information or expression of opinion about the etiology of the limited type of lesion found in the lymphatic glands of the head in pigs, an important problem from the meat inspection point of view. The author must have gone to an enormous amount of trouble to gather all the information he has managed to pack into the available space and all workers on tuberculosis both of man and animals owe him a debt of gratitude for this valuable and up to date contribution to our knowledge of the subject. E.M.R.

TRADE EXHIBITION AT THE VETERINARY CONGRESS

August 26th — 28th, 1958

The following firms have given the following short descriptions of some of the drugs or instruments they will be exhibiting:

GURR SURGICAL INSTRUMENTS (PTY.) LTD.

Gurr Surgical Instruments (Pty.), Ltd., of Johannesburg, are this year showing for the first time an entirely new needle recently developed by their principals S. & R. J. Everett & Co., Ltd.

The needle is to be called the "GURR DIAMOND STAR", is stainless of spring-tempered steel. It has a sharper and harder point, easier penetration, better control, less pain and longer life. The ultra sharp point makes the initial puncture easier in the toughest of hides. It has been found that the DIAMOND SHAPE POINT is sharper, stronger and more durable. The shaft of this needle is bevelled from square to round and this aids control of direction which is a desirable factor in dealing with mobile and sclerotic veins and similar "tricky" injections.

HORNE & PLATOW (PTY.), LTD.

1. New Elinax X/Ray Apparatus with portable mobile stand suitable for radiography of all animals including live stock and small animals.
2. Fuji Research Microscopes with built-in illumination giving magnification up to 1500.

I.C.I. SOUTH AFRICA (PHARMACEUTICALS) LIMITED, will be exhibiting a comprehensive range of their Veterinary products.

"DICTYCIDE" now available in South Africa has proved most effective in the treatment of lungworm disease.

In the I.C.I. Laboratories extensive investigations have been made in the physical properties of various intramammary formulations and their distribution within the udder after injection. This work followed by successful field trials has led to the introduction of two entirely new formulations known as "DISPOLAC" P. and "DISPOLAC" P.S. the *first dispersible formulations* of penicillin and penicillin/dihydrostreptomycin for intramammary injection.

Available to Veterinarians only is the 2 Litre economy pack of "SULPHAMEZATHINE" Sodium Solution 33⅓% distinctively coloured (Blue) and a 50 c.c. packing of "AVLOPROCIL" A.S.

MAYBAKER (S.A.) (PTY.), LTD.

The following products will be featured:

"ANTHISAN"/"PHENERGAN"

Complete antihistamine therapy is offered by "ANTHISAN" brand mepyramine maleate which has a very rapid effect with short duration of

activity and "PHENERGAN" brand promethazine hydrochloride which is long-acting and is a potent antihistamine with sedative properties.

"LARGACTIL"

"LARGACTIL" brand chlorpromazine hydrochloride is indicated in the sedation of small and large animals, the control of vomiting, particularly travel sickness, the management of painful and pruritic states and the enhancement of analgesia. The drug is widely used as a premedicant in anaesthesia and is of value in the treatment of tetanus and heat stroke.

"STRINACIN"

"STRINACIN" is an association of triple sulphonamide and streptomycin granules intended for the treatment of calf scours, piglet enteritis and general diarrhoea in all species of animals.

"PROTEGAN" with penicillin

This well-known intramammary injection is now available in a single-tube presentation in addition to the packing of 20 x 5 c.c. collapsible tubes.

"TRINAMIDE"

Each 0.5 gm. "TRINAMIDE" tablet contains equal parts of sulphamerazine, sulphadiazine and sulphapyridine and provides general sulphonamide therapy for all species of animals.

"DIBROGAN"

"DIBROGAN" cream contains dibromopropamidine isethionate and promethazine and is thus an association of an antihistamine with an antiseptic. It is used for the treatment of wounds and dermatoses of a non-parasitic nature.

"EUTHATAL"

Each c.c. of "EUTHATAL" contains gr. 3 pentobarbitone sodium and the preparation is intended for euthanasia only.

RECKITT & COLMAN (AFRICA) LIMITED.

Reckitt & Colman (Africa) Limited, manufacturers of Dettol Antiseptic, have developed in their laboratories Disinfectant "212" specially for the farm. Safe and effective in unskilled hands and obtainable at a very low cost.

Dettol Antiseptic Cream, an improved version of Dettol Obstetric Cream, is specially formulated for frequent hand disinfection to prevent cross infection and is ideal as a lubricant for all vaginal examinations.

SKF LABORATORIES (PTY.), LTD.

The nitrofuran group of chemicals have proved to be extremely efficient antimicrobials and this year we have the pleasure of presenting a new preparation — "BIFURAN".

Available in the form of a SUPPLEMENT for adding to the mash and as SOLUBLE TABLETS for dissolving in the drinking water, "BIFURAN" presents a distinct advantage over previous coccidiostats in that it not only controls coccidiosis, but also stimulates growth by improving the feed conversion rate and controlling secondary infections. "BIFURAN" is also indicated for necrotic enteritis in pigs and here again the growth stimulating properties of "BIFURAN" do much to combat the debility which accompanies this disease.

Also featured at our stand are "NEFTIN" PREMIX — for fowl typhoid, salmonellosis, hexamitiasis and acute sinovitis and "NEFTIN" TABLETS for calf paratyphoid and scours. "NEFTIN" TABLETS have been proved to be the most efficient and economical cure for calf paratyphoid.

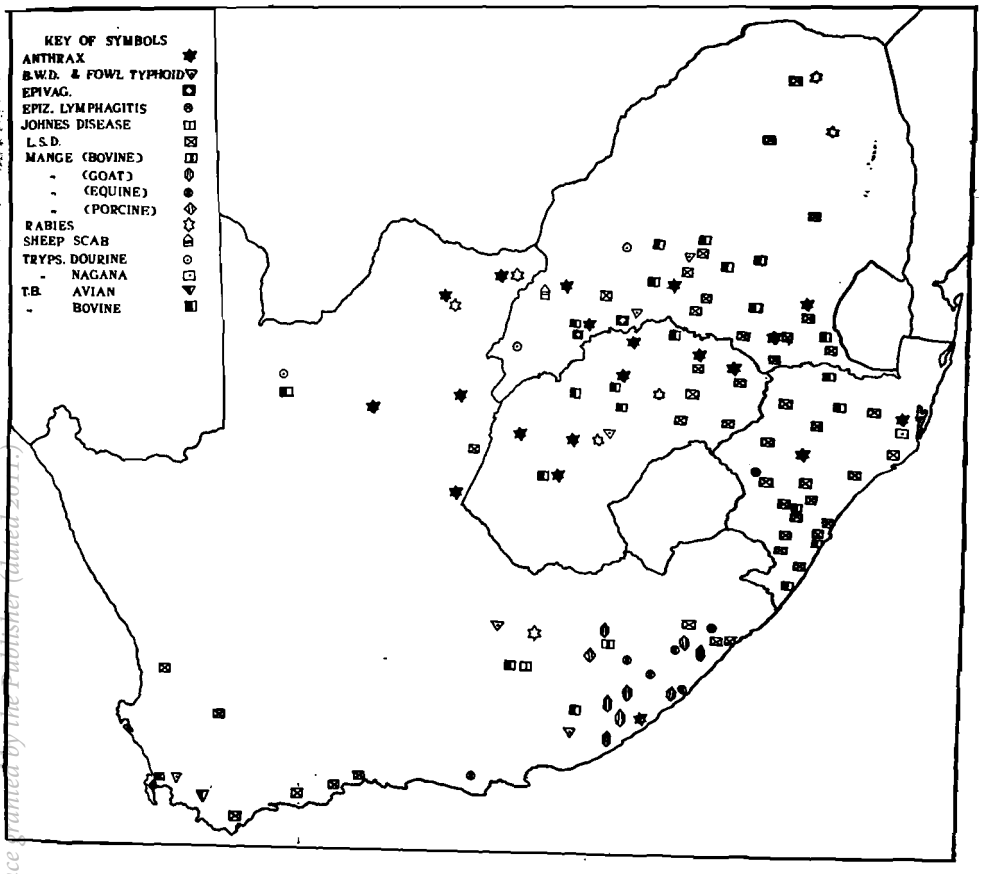
Samples and literature on these products are available at our stand.

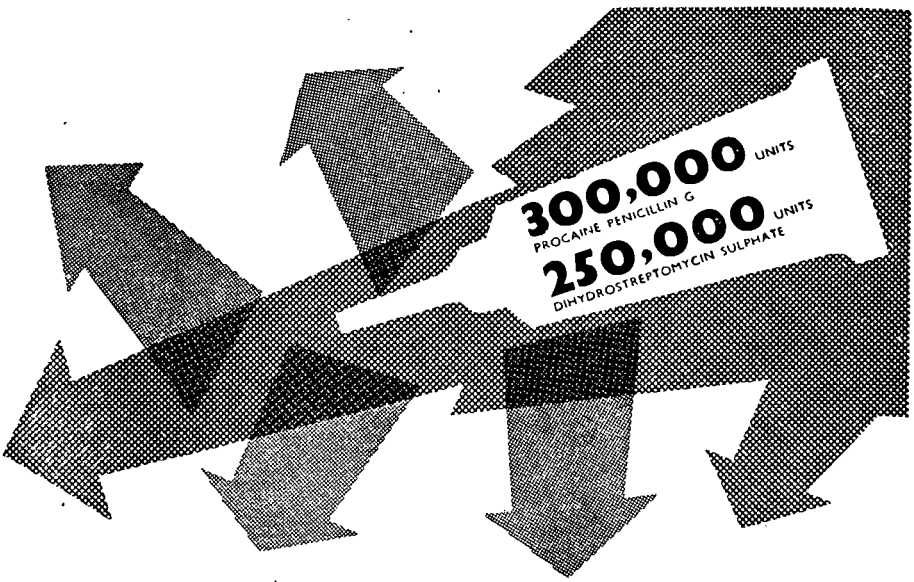
CHAS. F. THACKRAY (S A.) (PTY.), LTD.

Chas. F. Thackray (S.A.) (Pty.), Ltd., will be exhibiting Surgical Instruments and Equipment of interest in the Veterinary field, and a cordial invitation is extended to all members of Congress to visit this Stand. On view will be found a comprehensive range of Thackray Surgical Instruments and Sterilizers, Davis & Geck Catgut and Sutures, Zeal Clinical and Veterinary Thermometers, and Sterling Rubber Gloves.

OUTBREAKS OF SCHEDULED DISEASES IN THE UNION OF SOUTH AFRICA DURING THE PERIOD 1.3.58-31.5.58.

DISEASES	*CAPE*	*NATAL*	*O.F.S.*	*TRANSVAAL*
Anthrax	(3) Barkly West (3) East London (1) Mafeking (1) Postmasburg (2) Vryburg (2) Warrenton	(4) Hlabisa (2) Msinga	(1) Bloemfontein (1) Boshof (2) Brandfort (1) Frankfort (1) Kroonstad (1) Vrede (1) Vredefort	(1) Amersfoort (1) Ermelo (1) Johannesburg (Abattoirs) (1) Klerksdorp (1) Lichtenburg
Bacillary White Diarrhoea			(1) Winburg	
Epididymitis and Vaginitis				(1) Klerksdorp (1) Potchefstroom
Epizootic Lymphangitis	(1) Humansdorp			
Fowl Typhoid	(1) Albany (1) Middelburg (1) Stellenbosch			(2) Pretoria (1) Standerton
Johnes Disease	(1) Cradock			
Lumpy Skin Disease	(1) Bredasdorp (2) Cape Town (1) Ceres (5) Clan William (5) George (1) Kimberley (1) Mossel Bay (3) Ngeleni (3) Nqutu (2) Port St. Johns (3 Riversdale (1) Tsolo	(7) Eshowe (1) Estcourt (2) High Flats (1) Inanda (10) Klip River (2) Lions River (2) Lower Umfolozi (3) Newcastle (2) New Hanover (9) Nongoma (1) Pietermaritzburg (4) Pinetown (7) Richmond (3) Umvoti (4) Umzinto	(1) Bethlehem (1) Frankfort (4) Harrismith (2) Reitz (6) Vrede	(2) Amersfoort (3) Ermelo (9) Heidelberg (1) Kempton Park (1) Lydenburg (1) Louis Trichardt (6) Nigel (2) Pietersburg (2) Piet Retief (2) Pretoria (1) Sibasa (4) Standerton (1) Ventersdorp (8) Volksrust (7) Zoutpansberg
Mange (Bovine)	(1) Glen Grey			
Mange (Goat)	(2) Glen Grey (1) Kentani (1) Kieskamahoek (2) Kingwilliamstown (2) Mqanduli (2) Peddie (1) Stutterheim (1) Umtata			
Mange (Equine)	(1) Kentani (2) Libode (1) Nqamkwe (1) St. Marks (1) Umtata	(1) Estcourt		
Mange (Porcine)	(1) Wynberg (1) Queenstown			
Rabies	(1) Mafeking (2) Maraisburg (1) Vryburg		(1) Lindley (2) Winburg	(1) Letaba (3) Zoutpansberg
Sheep Scab				(2) Lichtenburg
Trypanosomiasis (Dourine)	(1) Gordonia			(1) Rustenburg (1) Schweizer Reneke
Trypanosomiasis (Nagana)		(1) Hlabisa		
Tuberculosis (Avian)	(1) Caledon			
Tuberculosis (Bovine)	(1) Cradock (1) Fort Beaufort (1) Gordonia	(1) Durban (1) Paulpietersburg (2) Pietermaritzburg (2) Port Shepstone (2) Vryheid	(1) Bloemfontein (1) Kroonstad (1) Parys (1) Ventersburg (1) Wesselsbron	(1) Bethal (2) Brits (1) Bronkhorstspruit (2) Klerksdorp (1) Krugersdorp (1) Middelburg (1) Piet Retief (1) Pretoria





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. 'Burcillin' 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.

Recommended in the treatment of : ● MIXED INFECTIONS ● RESISTANT INFECTION ● CASES OF UNKNOWN ÆTIOLOGY

'BURCILLIN' BRAND **P.S.**

Issued in single-dose tubes, in containers of 12

BURROUGHS WELLCOME & CO. (THE WELLCOME FOUNDATION LTD.) **LONDON**

Depot for South Africa :
BURROUGHS WELLCOME & CO. (SOUTH AFRICA) LTD., 16, Kerk Street, JOHANNESBURG

Jl. S.A.V.M.A. 29 (3), 1958

CERTAIN ASPECTS OF PIG PROGENY TESTING

J. H. HOFMEYR

Pretoria

Introduction:

The development and application of modern animal breeding methods and health control measures have exerted a tremendous influence on present-day thought on the systematic improvement of livestock.

From a genetic point of view the assessment of breeding values is a fundamental prerequisite for the systematic improvement of animal production. Once the requirements for a suitable environment, i.e. health, nutrition, housing, management, etc., are met the breeder is left with the problem of assessing the breeding value of each individual animal. The limitations of the most commonly used aids in selection, such as pedigree, individual performance, etc., are well known.

The fact that an animal has one or more meritorious ancestors does not necessarily indicate that his progeny will all possess those qualities. Moreover, general appearance (phenotype) or individual performance is seldom entirely hereditary in nature. Various environmental factors such as nutrition, health, housing, management, etc., may cause large variations in the performance of animals, thereby rendering their own performance records or appearance a rather unsatisfactory measurement or indication of their genotype.

The application of the progeny test, based on the performance of a random sample of a sire's or dam's offspring, is generally recognised as being genetically the soundest method for the evaluation of breeding values — particularly where carcase traits with low heritability are involved. The value of the progeny test is also obvious where sex-limited traits, e.g. milk-production, fecundity, mothering ability, etc., of females are considered.

The progeny test offers the only sound method for the detection of undesirable genes in breeding stock.

With the current emphasis on more efficient production in the pig industry, it is imperative that the genetic improvement of the modern pork and bacon pig should keep pace with both market requirements and progress made in methods of feeding and management. Modern pork and bacon production is in fact a highly specialised enterprise aiming at the production of carcases with fixed dimensional and quality requirements. In order to

produce the ideal with a free margin of profit the producer must ensure that he has healthy and fertile breeding stock with an inherent ability to grow rapidly and utilize feed very efficiently.

Most of the progressive pig producing countries have organized pig progeny testing schemes and these now form an integral part of practical pig breeding.

In practice all organised and officially recognized pig progeny testing is being conducted at specially equipped pig testing centres.

Pig Testing Centres:

Modern pig testing originated in Denmark where it has been practised since 1907.

The procedure at Pig Testing Centres (P.T.C.) is to conduct litter tests under standardised environmental conditions. By means of carefully recorded performance tests in respect of economically important traits, the progeny of boars and sows is studied and compared. Conclusions are based on results obtained with four selected litter mates, special attention being paid to such considerations as rate of growth, feed conversion and carcase quality of progeny of pigs and also to fertility, milk production and mothering ability of parent sows.

This comprehensive study of performance under standard conditions makes it possible to trace, within limits reasonably accurately, genetic differences between pigs. It is also possible for the results to be used for comparisons between breeds, within breeds, between litters and within litters, since all pigs are, within limits, subjected to the same "animal environment", where individual weights, feed consumption (Denmark and South Africa, etc.), etc., are systematically recorded.

The test itself is based on the performance of four piglets (2 gilts and 2 barrows) selected according to a prescribed method. These pigs are subjected to standard methods of treatment (housing, rearing, etc.), slaughtering and carcase evaluation.

Pig-testing provides for both progeny testing of boars and sows and sib-testing of remaining litter mates. In the case of sib-testing the remaining litter mates are not tested themselves. In view of the genetic correlation between sibs and the assumption that the tested mates are a representative sample of the whole litter, the average potential breeding value of the untested mates can be assessed. The practical difference between these two tests apart from their respective advantages and disadvantages are:—

(a) In the case of the progeny test a breeder decides on the basis of the progeny performance whether he should continue breeding from two particular individuals (sire and dam).

(b) In the case of a sib-test a breeder decides, on the basis of the performance of four test pigs from a litter, whether

he should keep the remaining litter mates for breeding purposes.

Preliminary assessment of a boar is based on the average performance under test of three litters by unrelated sows.

Pig-Testing Centres in South Africa:

The three Pig-Testing Centres in the Union have now been in operation for just over two years. These centres are situated at Cedara (Natal), Elsenburg (Western Cape Province) and Pretoria (Transvaal).

A total number of 430 pigs have completed the test up to the present date (30th June, 1958). The support has been satisfactory, particularly in view of the slump in the pig industry during the past 18 months.

Although the centres so far established have a total capacity of only 44 litter groups, the introduction of pig-testing has nevertheless ushered in an important phase in pig breeding in this country. In view of a recent article on the functioning of these centres (Hofmeyr, 1958) it should not be necessary to refer to more than a few of the more important facts, details which link up with the paper submitted by Dr. Loveday.

Pig-testing in South Africa is based largely on the Danish method with the exception of a few adaptations to suit local conditions, e.g. long distances. In order to enable breeders residing far from testing centres to participate in the scheme, provision has been made for accommodating in-pig sows at the testing centres. It is hoped, in fact, that this method may become standard practice within the near future, since it enables closer observation of and control over sows and litters and, therefore, still more comparable tests through the elimination of sources of environmental variance, such as differences between herds in feeding, housing and treatment up to weaning. Comparative figures, based on local testing centre results, have indicated that the average mortality rate from birth to weaning is decidedly lower in the case of centre-farrowed litters, namely 12.0 per cent. as against 21.5 per cent. for farm-farrowed litters.

During the first two years, various operational problems have been encountered, most of which can be regarded as initial teething troubles. There have been and in fact still are, certain disease factors which have been hampering the efforts at the centres to such an extent that the Department of Agriculture has refrained from publishing the results obtained so far.

The disease factors which have had an important bearing on the functioning of the Centres up to the present have been:—

(a) *Scouring*:

The first litters entered the Pig Testing Centres during May, 1956, and passed through the test without any signs of disease. During November, 1956, serious scouring set in, particularly at the Cedara and Pretoria Centres. Scouring

continued, in spite of all veterinary efforts, until the rations were changed in March, 1957. It was concluded that rancidity of the fats in the ration must have been the cause. Slight scours, however, have occurred from time to time at the Pretoria Centre, and it was only towards the end of January, 1958, that Onderstepoort succeeded in diagnosing vibrio spp. infection.

(*b*) *Foot and Mouth Disease*:

Owing to Foot-and-Mouth disease restrictions, the activities of the Pretoria Centre were seriously affected. No litters were permitted to enter this Centre while the restrictions were in force (June, 1957—February, 1958).

(*c*) *Virus piglet pneumonia* (*V.P.P.*):

Acting on veterinary advice (Division of Veterinary Services), it was decided not to admit any pigs to the testing centres coming from a herd where the presence of V.P.P. had been established. This has resulted in the Elsenburg Testing Centre running empty. Arrangements have now been made to resume the testing of pigs from infected herds so as to provide information on the importance of this disease under optimum environmental conditions.

Minor disease factors were 2 cases of agalactia, 1 case of "milk-fever" and 5 cases of paraketosis.

The influence of the health factor on the testing of litters is summarised in the following table based on the data for all pigs completing the test before the 1st July, 1958:—

A.	Number of pigs accepted at the centre for testing	468	
B.	Number of pigs not completing the test due to:		
	(a) Death	16	8.12 per cent.
	*(b) Diagnosed disease	12	
	(c) Disqualification for poor growth	10	
C.	Number of pigs showing any form of scouring	285	
D.	Number of carcases showing T.B. lesions	4—0.93 per cent.	

Remarks:

(1) For various and obvious reasons it would be unfair to compare these figures with those for overseas testing schemes. It is, however, interesting to note that in the case of Denmark (Clausen and Thomsen, 1958) the comparable figure under B (above) has been reduced from 7.0 in 1926-27 to 1.8 per cent. in 1956-57. This was accomplished through improved health control measures such as more hygienic castration of male test piglets, while the improved environmental conditions of three new centres

*These pigs were slaughtered for P.M. purposes — 4 were suspected vibrio infection cases and 8 were suspected V.P.P. cases.

had a marked effect on the number of pigs not completing the test. (The new Centres started operating in 1950-51, and the proportion of pigs not completing the test was reduced from 4.1 per cent. in the previous year to 2.0 per cent. in that year).

(2) The incidence of T.B. is very low, probably owing to the fact that no milk or skim-milk is fed to test pigs in this country. Very few piglets have access to dairy products before weaning, i.e. before entering the centre. The corresponding Danish figure for 1956-57 is only 0.36 per cent. (Pigs are fed soured skim-milk at testing centres in Denmark).

(3) The incidence of V.P.P. amongst test pigs has been very low. It should be mentioned, however, that no special attention, save the usual abattoir inspection, was given to this disease before November, 1957. Since then, 122 test pigs have passed careful examination for V.P.P., and only six cases have been reported. These were all from the same breeder in the Western Cape Province. The average performance of these few pigs was not significantly influenced by the disease. While the effect of virus pneumonia on growth rate and food conversion is still a matter for research in this country, the following figures published by the N.P.B.A. Progeny Testing Research Co. Ltd. (England) in 1957 are of interest in this discussion.

The figures relate to the condition of the lungs of all test pigs slaughtered from 21st June, 1954 to 31st January, 1957.

Condition of lungs.	No. of Pigs	% of Total	Age at slaughter (days)	Daily gain (lbs.)	Food conversion
1. No infection	444	32.69	200.19	1.052	3.560
2. Small pneumonic areas	204	15.02	199.84	1.055	3.616
3. Large pneumonic areas	194	14.29	199.89	1.061	3.574
4. Pneumonic areas plus other complications	516	38.00	199.06	1.061	3.631
TOTAL/AVERAGE	1,358	100.00	199.67	1.057	3,597

These test pigs are kept under close-to-ideal conditions, and it has been suggested that, commercially, the picture must be very different, as the main losses would be due to secondary breakdowns.

According to experience at Selby (N.P.B.A. Testing Centre) the most common breakdown is " thumping " characterised by high body temperature, prostration and laboured breathing. The follow-

ing figures show the relationship between "thumping", growth rate and food conversion:—

Pigs showing:	No. of Pigs	Age at slaughter (days)	Daily gain (lbs.)	Food conversion
1. No "thumping"	225	193.5	1.41	3.38
2. One bout of "thumping"	75	198.6	1.33	3.54
3. More than one bout of "thumping"	49	208.4	1.24	3.86

(4) When pig testing was launched in South Africa it was believed that disease would be a minor factor which would call for the minimum veterinary attention. The necessity for an efficient health control scheme has, however, become very clear during the first two years of the scheme. The only satisfactory method of ensuring that the disease factor is adequately controlled is to subject every participating herd to strict veterinary inspection.

Apart from ensuring reliable results at the testing centres, this would also have the effect of controlling pig diseases throughout the country. Breeding stock is transferred from one herd to another, thereby increasing the possibility of spread of infection. The commercial producers' pigs go straight to the abattoir.

Summary and Conclusions:

(1) To the breeder the most important aspect of pig-testing is that it provides him with invaluable information which is not available under ordinary practical conditions. The results enable him:—

(i) to estimate with reasonable accuracy the breeding value of his boars and sows in respect of a number of traits;

(ii) to estimate with reasonable accuracy the potential breeding value of untested litter mates;

(iii) to compare the performance of his pigs with that of other breeders' at the same centre and, within limits at other centres; the most true comparisons would be those between litters tested simultaneously at the same centre, since in those cases there is no question of influence of possible seasonal or centre variations;

(iv) to assess, within limits, his breeding progress from one pig generation to another.

(2) All pig-testing centres function according to the same basic principles. Allowing for differences in procedure, which can be ascertained within limits, results of the various countries can be compared. Through comparison of results obtained here with those overseas the relative progress and developments of the local pig industry can be gauged.

(3) The relative comparability of testing centre results enables breeders wishing to import breeding stock to base their selection on a study of those results.

(4) Pig Testing Centres serve an important educational purpose. Interest in the results obtained at the centres has already induced several breeders to keep records of farrowing details, mortality, weights, slaughter ages, etc., in their own herds.

By comparing the performance of a test group with that of the balance of the litter on the farm, any shortcomings in his methods of feeding or management are brought home to the breeder.

The Scheme is designed to stress economically important traits and to adhere as closely as possible to practical methods of production. Furthermore, the officials at the testing centres come into contact with breeders to their mutual benefit

(5) Because of its technical and specialised nature pig-testing will have its greatest appeal and be almost restricted to the more progressive and advanced pig breeders. The Scheme in South Africa will have succeeded in an important aim if it can establish a nucleus of recognised, accredited stud herds which have achieved, and would be expected to maintain, their position on the basis of the performance of their pigs at the testing centres.

These herds would be able to supply other stud and commercial breeders with healthy and obove-average quality breeding stock.

(6) One conclusion reached after two years' experience is that although a Pig-Testing Scheme under South African conditions has to cope with difficulties not normally encountered in most other countries, it can be run successfully and to the benefit of the pig industry. Although the starting of the Scheme was welcomed by many leading pig breeders in the country, its possible value is not yet fully appreciated by the industry as a whole.

Pig-testing has stressed the need for a Health Control Scheme for stud breeders in this country.

It has also exposed more than ever before, the unhealthy basis of pedigree registration in this country.

It appears, that probably the most important contribution of the Pig-Testing Scheme to the immediate future of the pig industry is in its educational value. It is felt that the scheme must essentially be regarded in this light at present rather than as a means to startling improvement in the pig industry. Improvement will follow as more stud and commercial breeders appreciate the technical value of pig-testing and its practical application in breeding and selection.

REFERENCES

CLAUSEN, Hj. & THOMSEN, R. N. (1958). — 46. Beretning om sammenlignende forsøg med svin — 1956/57.

HOFMEYR, J. H. (1958) — Pig-Testing Centres can improve your breeding stock. Farming in South Africa. March, 1958.

N.P.B.A. PROGENY TESTING RESEARCH CO. LTD. (1957) — Progeny testing report — Third annual report, Vol. 3.

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Vitamin B1	1.2 mg.
Riboflavine	1.1 mg.
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SWINE HEALTH CONTROL

R. K. LOVEDAY

Pretoria

INTRODUCTION

The stabilisation of post-war economy and the emergence of reduced market prices have compelled the pig industry to direct its attention to more efficient production. Throughout the world research has been intensified into genetic improvement, more effective feeding and management practices and the nature and effects of swine disease. With these developments has come a growing appreciation of the seriously limiting effects of infectious disease on the expansion of the industry.

In South Africa the three Pig Testing Centres established in 1956 have opened the way for stud breeders to gain more accurate information regarding the breeding value of their stock. The results of the first two years work at these Centres has unexpectedly revealed that infectious disease, initially considered to be of minor importance among the Union's pigs, is more extensive and exerts a considerably greater influence on the performance of test pigs than was hitherto suspected. Further investigation has established the widely disseminated existence of virus piglet pneumonia (V.P.P.) among the country's herds. While the adverse economic affects of this disease are clearly recognised overseas no experimental evidence regarding its significance here is yet available.

The foregoing may be regarded as a clear indication of the necessity for undertaking the regular veterinary inspection of stud herds concerned with the Testing Centres, in order to determine and improve the health status of such herds. In this way will be established a nucleus of accredited herds, capable of supplying improved, healthy stock to the industry. Fortunately, such diseases as atrophic rhinitis, transmissible gastro-enteritis, leptospirosis, hog cholera, variola and Brucella suis infection have not been diagnosed in the Union to date, and the regular veterinary inspection of stud herds would ensure their prompt recognition and eradication should any of these diseases ever appear.

The presence of symptomless "carriers" of diseases such as V.P.P., erysipelas and paratyphoid in pig herds renders clinical examination unreliable in assessing their health status. This can only be determined by the prolonged clinical and pathological observation of the herd maintained as a closed unit. This concept forms the basis of health control. A brief consideration of Swedish

methods will serve to illustrate the principles of a health control scheme, which, it is considered, could serve as a model for the Union.

HEALTH CONTROL IN SWEDEN AND OTHER COUNTRIES

Sweden's efforts to improve the health of her pig population may be attributed to the importance of pork in her meat-marketing income, of which it forms some 65 per cent., and to the fact that, prior to 1943, at least 35 per cent. of all pigs born died before attaining market weight.

Beginning on a local, experimental basis in 1941, Sweden's control measures were originally directed toward the eradication of V.P.P., atrophic rhinitis and sarcoptic mange from the breeders' herds. Continued extension of the scheme to other parts of the country has occurred, and, since 1955, only breeders with health-certified herds may use Swedish progeny testing centres. (Swahn, 1955).

The scheme, as described by Swahn (1957), is administered through the local agricultural societies, and employs specially trained veterinarians approved by the Royal Veterinary Board. Its workings may be summarised as follows:—

(a) A contract, in force for at least 2 years, binds the breeder to comply with the regulations and to act on the advice and instructions of the control veterinarian.

(b) The breeder must report all disease outbreaks and submit the carcases of all pigs dying in the herd for laboratory examination. In addition, the lungs and snouts of all stock sent for slaughter are examined for lesions of V.P.P. and atrophic rhinitis.

(c) The control veterinarian examines the herd clinically at regular intervals, advises regarding sanitation, feeding and management and, of course, investigates reported outbreaks.

(d) Where the farm is found to have satisfactory hygienic conditions, management and freedom from the diseases concerned in the scheme, a health certificate is issued. Pigs from certified farms are known as "control" or "premium" pigs and earn a fixed bonus over and above their purchase price. They are marked with the prescribed code letter of the country concerned and the breeder's own control number.

In Britain an "Association for the Advancement of Virus Pneumonia Free Pigs" was formed this year. (3) It has issued standards for herds claiming freedom from V.P.P., based on six-monthly veterinary inspection of herds maintained in strict isolation, and stringent slaughter tests over a period of at least the last 18 months. These standards form a valuable statement of the criteria

of freedom from V.P.P., and the slaughter tests will be referred to under " abattoir inspection " — below.

A high proportion of Australian grade herds, as well as some stud herds, are infected with V.P.P. (4). Successful attempts have been made, in the state of Victoria, to eradicate the disease from several state-owned herds, both to test the methods employed and to provide " clean " stock for sale to farmers. In addition to the usual lung examinations for V.P.P. the large bowel from each slaughter pig was studied for lesions of necrotic enteritis, in order to survey the incidence of this disease and its spread in each herd. Vibrionic dysentery was introduced into one herd with the foundation stock, and led to a high morbidity rate (75%) and the eventual slaughter of the entire herd.

PRACTICAL APPLICATION

Under this heading the methods of applying a health control programme, based on the Swedish model, to South African stud herds will be briefly discussed.

(1) *Herd Inspection.* In the beginning monthly inspections of participating herds are required, in addition to the investigation of disease outbreaks reported. Accurate records and the identification of all stock are essential. Post mortem reports and lung examination results from slaughter pigs need to be be correlated with inventory changes since the previous visit.

Clinical findings are noted and it may be necessary to destroy one or more runt pigs for post mortem confirmation of a clinical suspicion. Specimens of lesions considered suspicious of V.P.P. can be collected in formalin for histological examination. The mucosa of the large bowel should be carefully examined (after washing away of bowel contents) for lesions of necrotic enteritis such as ulcers, erosions, scars or areas of superficial necrosis. These lesions constitute evidence of past or present enteritis of varied aetiology, both known and unknown. While necrotic enteritis has long been associated with paratyphoid, numerous instances have been noted in recent years where Salmonella organisms could not be isolated from such cases. (5) and (6).

(2) *Isolation.* Effective control demands the maintenance of a closed herd, into which only pigs from disease-free sources may be introduced. This excludes the return of stock from shows or sales to the farm unless such animals have been effectively isolated from possibly V.P.P. infected animals while at such show or sale.

Where a breeder maintains a commercial herd in addition to his stud, the two herds may be regulated as one unit provided not more than 30—40 cows are involved. Above this number the unit becomes too large for practical control measures, and the stud herd would require to be kept separately. It is con-

sidered that 30—50 yards would be an adequate separation between two such herds.

(3) *Hygiene.* The spread of such diseases as paratyphoid and spirochaetosis is facilitated by an unsanitary, overcrowded environment. Minimum hygienic conditions, considered essential for the maintenance of health, may be summarised as follows:—

(a) A sufficient water supply to allow of daily cleansing of all styes.
(b) Stye floors of properly sloped concrete in good repair.
(c) Stye drainage into outside channels and not through or into adjoining pens.
(d) Effective disinfection of farrowing pens or outside farrowing arks, and the supply of new, short bedding, prior to re-use.
(e) Scrubbing down of sows with soap and warm water before admittance to the farrowing pen.
(f) Where outdoor farrowing or fattening camps are in use, the provision of sufficient camps to allow of reasonable resting for disinfection purposes.
(g) Fenced-off drainage pits and manure dumps. Proper manure disposal, preferably into Baber traps.
(h) Control of flies, rats and mice on the premises.
(i) No poultry to be allowed in the piggery.

(4) *Husbandry.* The vital role of improved husbandry methods cannot be over-estimated in health maintenance. The control veterinarian will be expected to correct feeding errors and advise on such matters as disinfection, worming, castration, breeding hygiene and the care of pregnant females.

(5) *Abattoir inspection.* Continuous pathological examination of the lungs of slaughter pigs by a veterinarian is the only acceptable test presently known for V.P.P. Lay meat inspectors do not possess sufficient basic pathological knowledge to undertake these inspections.

For slaughter tests approved by the Association for the Advancement of Virus Pneumonia Free Pigs in Britain are cited below, and could very well form a basic for the assessment of lung examination results in this country.

(i) Herds where at least one-third of each litter passes through the fattening house.

Lungs of at least 30 pigs or at least 50% of the quarterly throughput of the fattening house (whichever is the lower) must be examined every 3 months by a veterinary surgeon, and found to be clear of lesions typical of V.P.P., and 95% of them clear of any pneumonia lesions in the anterior lobes. If more than 5% of lungs show pneumonia of the anterior lobes, they must be

examined microscopically and the pneumonia found to be other than V.P.P.

(ii) Herds in which the majority of pigs do not pass through a fattening house.

(a) Weaners must be mixed in groups of at least 3 litters. From each such group lungs of at least 30% must be inspected at slaughter.

(b) Alternatively, lungs of at least 50% of each litter must be examined at slaughter.

In either case, 100% of the lungs examined must be free from lesions of the anterior lobes microscopically resembling V.P.P.

It is noted that after a herd has fulfilled the above requirements for a total period of 3 years the number of lungs examined and the frequency of veterinary inspection may be reduced by half.

(6) *Disease Eradication.* Since certified disease-free foundation stock is not yet available in this country, the eradication of V.P.P. and, perhaps, some other diseases from participating studs will have to be undertaken until this position has been remedied.

(a) *Virus pneumonia.* An eradication method successfully used in Britain by Betts, Whittlestone and Beveridge (1955) and in Australia (4) involves farrowing the sow in sufficient isolation to prevent air-borne transmission of the disease, and using the litter to determine whether or not the sow is infected. Betts et al. consider the separation of test sows or "clean" pigs from possibly infected stock should not be less than six feet, and that such animals should never be housed in the same building as infected pigs. A practical arrangement on the farm, involving the use of every second farrowing pen, will usually provide a distance of eight to ten feet between litters, but care must be taken to prevent transmission of the disease along a common roof. Camps must be double-fenced with eight to ten feet between the two fences.

Litters are examined for coughing, daily if possible, and after forced exercise, from five weeks of age. Antibiotic additions to the creep feed of such litters may suppress coughing without affecting the virus.

Coughing litters are discarded with their dams, and the lungs of a high proportion of the remaining litters are examined at slaughter, as the ultimate test for freedom from V.P.P. A nucleus of "clean" breeding stock is built up until sufficient numbers are available, when the remainder of the herd is slaughtered. Farrowing pens and fattening houses are considered to be non-infectious after being cleaned and spelled for seven days.

Macpherson and Shanks (1955) have suggested the use of third-litter sows in starting an eradication scheme, on the assumption that older sows are more likely to have lost their "carrier" status.

A further method (Done, 1955) for obtaining "clean" stock utilises the technique of antiseptic delivery of piglets and their artificial rearing. Apart from the very high standard of management demanded for the success of this procedure, provision must be made for supplying the colostral immunity lacking in such piglets.

In Australia (4) a modification of this method, involved allowing the piglets contact with the sow for brief periods during the first two days in order to suckle colostrum. Thereafter they were reared on a milk substitute.

(b) *Paratyphoid.* Environmental factors promoting the spread of this disease have already been mentioned. Buxton (1957) is of the opinion that the carrier state in pigs may persist for only a few months under good sanitary conditions. He points out that while S. cholerae-suis is the commonest serotype infecting pigs in some countries, a variety of serotypes, among which S. typhi-murium is one of the commonest, have been isolated in other countries. The necessity for combating possible S. typhi-murium carriers, such as rats and mice, in piggeries has been mentioned.

(c) *Tuberculosis.* Where tuberculosis is revealed by autopsy or abattoir condemnations, the farm must be investigated for human, bovine and avian sources of infection. Unpasteurised milk products should not be fed from untested herds. In addition, the swine herd should be tuberculin tested at three monthly intervals, using avian and mammalian tuberculins, until no further reactors occur.

(d) *Spirochaetosis.* This disease may be eradicated by improving environmental conditions and the isolation or preferably slaughter of clinical cases. Nevertheless, sporadic outbreaks may be expected to re-occur from time to time.

(e) *Sarcoptic mange.* Treatment of the herd with B.H.C. and the evacuation of infected premises for a minimum period of two weeks is uniformly successful in clearing up the disease.

SUMMARY

1. Protection against transmissible disease is as important to the pig breeder as are improved breeding and husbandry practices. Experience gained over the last two years at the Union's three Pig-Testing Centres has focussed attention on the need to place participating stud herds under veterinary supervision, not only to ensure that disease-free pigs are admitted to these Centres,

but also to build up a nucleus of health-certified herds as a means of improving the health of the pig population. Such supervision is calculated to promote the prompt identification and eradication of exotic diseases appearing in the Union.

2. Virus piglet pneumonia is widely disseminated among Union pig herds. This disease has proved to be of considerable economic significance in other pig-producing countries, a number of which are undertaking eradication measures.
3. Sweden has pioneered an efficient health control system, aimed at eradicating virus piglet pneumonia, atrophic rhinitis and sarcoptic mange and rapidly improving the health of the pig population. The Swedish scheme is described, and it is suggested that it be used as a model for a similar programme in the Union.
4. The practical implications of applying such a programme are outlined. The need for accurate records and the maintenance of a closed herd is stressed. Minimum hygienic requirements are specified and the vital role of good husbandry in health promotion mentioned. The continuous pathological examination of the lungs of slaughter pigs is the only acceptable test for the presence of virus piglet pneumonia in a herd. Finally, disease eradication measures are briefly considered as an important part of any control programme in the Union, where no certified sources of disease-free foundation stock yet exist.

REFERENCES

1. Swahn, O. (1955) 23rd Session (1955) R. No. 402. Office International Des Epizooties.
2. Swahn, O. (1957) Canad. J. comp. Med. 21:40.
3. Report (1958) Vet. Rec. 70:322.
4. Pullar, E. M., Veterinary Research Institute, University of Melbourne (1958) Personal communication.
5. B.V.A. Publication No. 14 (1956): "The Husbandry and Diseases of Pigs".
6. United States Department of Agric. Year Book (1956). "Animal Diseases", p. 365.
7. Betts. A. O., Whittlestone, P. and Beveridge, W. I. B. (1955), Vet. Rec. 67:685.
8. Macpherson, R. and Shanks, P. L. (1955), Vet. Rec. 67:533.
9. Done, J. T. (1955), Vet. Rec. 67:623.
10. Buxton, A. (1957), Salmonellosis in Animals: A Review. Commonwealth Agricultural Bureaux.

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SOME GENERAL REMARKS ON THE MANAGEMENT AND DISEASES OF THE SOW AND LITTER

L. ABRAMS

Johannesburg

Apart from the genealogy of pigs, the care and management of the herd sows is one of the most important factors in any successful pig-keeping enterprise. The size of the litter and of the piglets at birth, and their subsequent growth depends almost entirely on the condition of the sow.

Accommodation:

The sows and selected gilts should be kept in suitably fenced paddocks, providing them with adequate shelter from the elements. The shelter should be either in the form of a permanent house with water and feed troughs, or arks which can be moved from paddock to paddock. The paddock should be planted to grass. Kikuyu is very suitable for this purpose as it is hardy and stands up very well to continued rootling, which provides the animals with the exercise necessary to keep them in good condition. Spare paddocks should be available for rotation and worm control.

Bedding should be provided in the houses or arks, and should be removed when soiled. An adequate supply of clean water should always be available.

It is essential, economical, and for the health of the pigs, that green feed be grown. For this purpose lucerne or Russian Comfrey are recommended. The latter is easily grown, hardy, nutritious and highly palatable, giving a large yield of fodder. The greens should preferably be cut and fed to the pigs, rather than be grazed, as the pigs destroy the crops when rootling.

In addition to the green feed sows should be fed about 3 lbs. of concentrates daily. Where no green feed is available the ration of mash should be increased to five to six pounds per day.

The condition of the sow should be brought up gradually so that just prior to farrowing she should be in good, hard condition with no excessive fat. Over-fat sows tend to be very clumsy, resulting in over-laying of the piglets.

A well-fed sow will produce well developed piglets at birth. Her milk supply, provided she comes from a good milking strain, should be adequate for the litter to weigh, with the aid of creep feed, 400 lbs. at eight weeks (i.e. nine to ten pigs per litter).

Service of Sow:

A gilt should be served at between eight and nine months of age, and the adult sow when she comes into oestrus — usually five to seven days after weaning. Should the adult sow be excessively run-down after weaning it is advisable to skip the first oestrus period after weaning. The sow should be brought to the boar on the second day of heat, and after being served once, removed, and then returned to the boar again on the third day for another service, as ovulation of the sow occurs in the latter half of the oestrus period. A serving box should be used in the case of a young gilt being mated to a large boar, or a large sow to a young boar. It is advisable, always, to have an attendant present at serving to prevent any savaging, or, if necessary, to guide the boar. During her heat period, the sow should be isolated.

Anoestrus, although relatively infrequent, responds very well to 750 to 1,000 units of Pregnant Mare Serum given intramuscularly. Oestrus follows within three to five days when the sow can then be served. Failure to conceive is often caused by service at the wrong time, i.e. on the first day only, or due to the use of a sterile boar. Chronic metritis is also a frequent cause of non-conception. If this condition is diagnosed the use of penicillin or terramycin can be resorted to, but generally with little hope of success and the animal should be destroyed. Pseudo-pregnancy is also occasionally encountered and such animals should not be retained in the herd.

Abortion:

It is usually an isolated pig that aborts; any generalised infection invariably causes an abortion.

Brucella suis is a cause of abortion in the United States, but whether this is a cause in the Union has yet to be proven.

Faulty nutrition is the most frequent cause of abortion in the sow. Vitamin A is recognised as being important for the sow's gestation, and a lack of it causes foetal death, abortion and still births. Lack of minerals is also thought to be a cause of abortion. It has been noted that sows grazing in newly-reaped maize and bean fields have aborted, but the actual causative agent has not been identified.

Farrowing:

A week prior to farrowing (service records should be kept), the sow should be brought into a recently washed stye, and there de-wormed with any one of the piperazines. The following day she should be washed down and taken to her farrowing pen, which should be clean and have an adequate supply of clean, dry bedding.

The farrowing pen should consist of a room about 12 ft. x 12 ft., provided with a farrowing rail. Leading off from the room a small camp should be built so that the sow and litter can have access to ground. The ground is essential for the health of the sow's feet. If kept continuously on cement her feet become tender

and painful, making walking an effort. The pain is such that sows have preferred to lie down rather than get up and feed, resulting in a drop of milk production and consequent smaller growth of the litter.

Another type of farrowing pen is one that has a roofed compartment with a small cement yard containing the water and feed troughs. When this type of accommodation is provided the sow and piglets should be allowed out daily for grazing and access to ground.

At farrowing, an attendant should be present. As each piglet is born it should be allowed to move away from its mother, thus severing the umbilical cord, and then placed in a box containing dry bedding. If necessary, heat should be provided for the little pigs, and here they should remain until the whole litter is born. Their noses should be cleaned of any adhering membrane, so as to prevent suffocation.

The after-birth is passed within half to three quarters of an hour after the birth of the last piglet; and sometimes concurrently with the last piglet. At this stage the piglets, which are now dry, are placed close to the udder and allowed to feed.

If the piglets are allowed to wander around after birth they are likely to disturb the sow who should preferably remain supine during the whole farrowing process. With unattended sows the over-laying percentage is high.

The attendant should be patient, and in no way interfere with the sow. He should remain discreetly in the background until any abnormalities in farrowing are observed. His presence is amply justified by the number of piglets he might save from being lain upon.

Providing the bedding and surrounding conditions are clean, no interference is necessary with the umbilicus, and the remnants shrivel up within twenty-four hours and no navel or joint ill results.

Parturition difficulties are extremely rare. Usually one piglet is oversized but one should not be in any hurry to render assistance, as the sow invariably manages on her own. Intervals between piglets being born is usually fifteen to thirty minutes. If, after forty five minutes the next piglet has not emerged and there is a considerable amount of straining, it is then advisable to assist the sow. It is more often than not possible to manipulate the piglet with the fingers, as the vaginal passage is not long. Instruments should be used only as a last resort. Once the obstructing piglet has been removed the remaining piglets are born normally. Pituitrin can be used to stimulate uterine contractions if necessary.

The sow will remain recumbent for three to four hours after farrowing, when she will then require food. The appetite is very poor for at least twenty-four hours after farrowing.

Post Parturient Conditions:

Metritis: occurs twenty-four to forty-eight hours after farrowing and appears to be of bacterial origin. The sow is off her feed,

febrile, is recumbent, dull and listless, and sometimes has an obvious vaginal discharge. She loses her milk supply, and the piglets die of starvation.

Treatment: The use of intramuscular penicillin and terramycin is advocated. If the response to treatment is not rapid, as many piglets as possible should be put to a foster mother, or hand-reared.

Agalactia:

Agalactia is most frequently encountered immediately after farrowing, always resulting in high mortality amongst the piglets. The whole litter is usually lost. The glands appear full, become hard, tense and painful; the pig has a high temperature, remains recumbent, listless and dull. The piglets indicate hunger by repeated attempts at suckling, moving from gland to gland. The piglets die of starvation. Latterly this condition has been encountered in almost epidemic form. Further investigation of this condition is urgently required, as heavy losses occur.

Single cases can be treated with antibiotics immediately the presence of the condition becomes apparent. Here again it is advisable to put the piglets with non-infected foster mothers, or resort to hand-rearing with all its attendant difficulties and disappointments.

A form of non-febrile agalactia is encountered. The udder develops normally prior to farrowing, but no milk is secreted after farrowing. The udder is hard and tense. The piglets, after vain attempts to feed, die off. The cause might be a hormonal-dysfunction.

Mastitis:

More often associated with a single gland which becomes hard, tense and painful. The sow is reluctant to allow suckling and the piglet who has chosen that teat dies from starvation. Mastitis can occur at any stage after farrowing and is found more often in old sows whose udders have been severely mutilated by successive litters.

Treatment: Antibiotics are used fairly successfully. Very often the gland becomes necrotic and sloughs away, it then has to be treated as an open wound. Such an animal should be disposed of after weaning.

Nutritional Requirements of the Lactating Sow:

A pound of sow mash of any of the proprietary brands, containing 19 to 20 per cent. protein, plus minerals, is fed for each piglet of the litter, plus another five to six pounds for an average sow, in addition to any green feed that might be available. Creep feed, preferably in a separate feeding trough out of reach of the sow, should be provided for the piglets at three weeks.

Piglet Mortality:

Still Birth: This is often encountered when the act of farrowing is prolonged, or in very large litters, probably caused by mechanical suffocation.

The litters obtained from some boars have a high percentage of still births which seems to indicate the presence of some lethal factor. Other still births are caused by embryological abnormalities.

Mass mortality in the litter is usually associated with conditions of the sow, such as agalactia, metritis, etc., as described above. Isolated piglet deaths are caused by over-laying during the first few days and the farrowing attendant should be available to prevent this. Mortality is high, through over-laying, in pens without farrowing rails.

An occasional piglet is often found dead, or in a comatose condition as a result of starvation. The piglet, in all probability had attached itself to a gland with little or no milk, and having made its selection remains attached to that gland with resultant death.

The term, "Baby Pig Disease" has been given to illness and death in the first few days, without any clearly defined cause. The writer believes that such piglets die of starvation, as baby pigs are very susceptible to fasting. The piglets have a hypoglycaemia which is the cause of death, but it is probably brought on by starvation.

Piglet Anaemia:

This is an iron deficiency and is seen usually from three to eight weeks after the farrowing. It is associated with litters confined entirely to cement enclosures with no access to earth, and in litters where the piglets have grown rapidly, were sleek and in good condition. When the percentage haemoglobin drops, growth stops and the piglets then develop a "boxy" appearance. The clinical signs are pale mucous membranes, increased respiratory rate and a certain amount of listlessness. Slight diarrhoea is also sometimes observed. A diagnosis of piglet anaemia can be made on the clinical signs, coupled with the history that the animals have had no access to any earth. If possible, a haemoglobin estimate should be made. A post mortem of one of the weakest pigs should be undertaken to confirm diagnosis. The most constant pathological changes are enlargement of the heart, flabbiness of its walls and a general appearance of extreme pallor. Fluid is sometimes present in the pericardial and peritoneal cavities.

Treatment:

(1) Continued intra-muscular injections of iron-dextran solutions, or,
(2) Oral daily administration of Piglet Anaemia paste. Piglets must be encouraged to eat creep feeds.

Prophylaxis:

It is preferable to allow the piglets and the sow access to soil, and it is for that reason that an earth run be attached to the farrowing pen. If this is not possible then the sow and her litter

should be sent out to graze daily in order for the piglets to come in contact with earth.

Iron sulphate and reduced iron, available in preparations in the form of a paste, can be administered two or three times prior to the piglets taking creep feed.

Diarrhoea in Unweaned Pigs:

(1) Diarrhoea commonly occurs in piglets three to four weeks old and is due to an upset in digestion following the intake of solid food for the first time. It is usually not serious and clears up spontaneously as the pigs become accustomed to solid food. There is no marked setback in their growth nor do they refrain from suckling.

(2) Diarrhoea is encountered when fermented mash or swill is fed. It would seem that a toxin is produced during the fermentation process which then subsequently sensitizes the gut for a bacterial infection, producing severe symptoms, characterised by continuous scouring, inappetence, unthriftiness, a staring coat, and loss of weight.

Treatment:

This condition often responds well to terramycin or penicillin administered intramuscularly; or terramycin intramuscularly into the sow for absorption during suckling. The condition can be prevented by feeding a dry or slightly dampened mash to the piglets and avoiding the use of swill during infancy.

(3) A diarrhoea of true bacterial origin occurs where hygiene is particularly bad. The organisms involved are yet to be identified, but B. coli seem to play an important role. However, they are, in the majority of cases, responsive to the antibiotics and sulphonamides.

Pneumonia:

(1) Piglets kept in wet, badly ventilated and unhygienic conditions are very prone to pneumonia. The onset is sudden and death follows rapidly. The acute condition is recognised by a high temperature, rapid, shallow breathing, "tucked-up" appearance and disinclination to move. This condition responds very well to the antibiotics. Unless promptly treated the prognosis is very bad.

Pneumonia caused by Ascaris lumbricoides:

(2) The migrating larval form of ascaris lumbricoides cause tissue damage to the lungs, followed by bacterial invasion of the damaged lung tissue, causing a severe pneumonia. Coughing is always present, respiration is distressed and the infected pigs tend to huddle together in a corner of the stye and die.

Treatment:

The pneumonia can be treated by the use of antibiotics, but the piglets remain runts. Prevention of the infestation, through proper management, is of supreme importance.

Virus Pneumonia:

(3) This is generally a non-acute condition, observed in piglets of all ages. The piglets are unthrifty, cough constantly and weight gains are minimal.

The rearing and isolation of piglets from the infected sow is discussed by Dr. Loveday.

Castration:

This should be done at four weeks when healing is rapid, and the animals are hardly affected. Castrating should only be delayed when young boars are to be selected for breeding purposes. Any castration wound infections respond well to antibiotics, but with adequate anti-septic precautions at the time of castration, and proper hygiene, castration wound infections should be very rare.

Piglets showing scrotal hernias should be destroyed as soon as the condition is noted.

Navel and Joint Ill:

The first indication is that the young pig is not thriving as it should. Examination at this stage may reveal the presence of a navel abscess. Usually it is only after pyaemia has developed and the disease has spread to the joints, causing lameness, that it is recognised. One or several of the joints become swollen and on post mortem there is extensive suppuration of the joints and the tendon sheaths. This disease is usually associated with poor hygienic conditions, and can be prevented by cleanliness of the farrowing pen. It is best to destroy infected animals as their weight gains are never good.

In conclusion, more attention should be given to the study of the bacteriology of pig diseases, as severe losses are caused to the pig industry through lack of sufficient knowledge on the subject. There is a definite need for a porcine bacteriologist and a virologist in our ranks.

DISCUSSION OF PAPERS ON PIG DISEASES AND MANAGEMENT

PROF. HENNING:

Ek dink die drie here het 'n groot diens aan die veenywerheid gedoen deur hierdie onderwerp te berde te bring. Dis 'n saak wat in die verlede baie min aandag van ons professie geniet het. Hier hoor ons die eienaardige feit dat die W.P.-Proefstasie weens 'n besmetlike siekte gesluit moes word. Ek dink die veearts kom nie te danig gunstig uit soiets nie, want dit is ons plig om sulke siektes te beheer en ons het in gebreke gebly. Hier het ons 'n geleentheid waar ons genoodsaak is om varke te teel wat vry is van siekte. Dit is al prakties oorsee gedoen, deur Beveridge en sy medewerkers.

DR. R. B. CUMMING:

The first point that comes out of Dr. Loveday's paper is that the veterinary graduate such as we are producing right now cannot fulfill the conditions necessary to carry out this swine health control scheme. The re-organisation of the course is presently under consideration, and this is an important matter. In the aspects of feeding, management, breeding, genetics, etc., our course does not give our students sufficient information.

Another point, regarding the control of V.P.P., I worked in Britain in 1954-55 with Dr. Tribe on the rearing of day-old piglets, and this method, in my opinion, is by far the easiest way to produce pigs free of V.P.P. People do not realise how easy day-old piglets are to rear. The sow is farrowed in a crate, the piglets are born into receptacles, taken away at birth, and brought back once or twice to suckle colostrum, but that is not altogether essential. Then they are reared on a gruel for the first week, but at the end of a week these piglets are on dry feed and water, under infra-red lamps, and it is extremely easy to rear day-old piglets in that way. In practice I found one can easily rear piglets without teats as they will lap out of a drinking basin from the very first day.

If we have V.P.P. free herds are we likely to have less scours? Are we not likely to short-circuit our scour problem, as has been seen in P.P.L.O. — negative poultry flocks, where we are short-circuiting haemophilus gallinarum infection, cholera and probably visceral gout?

Can Dr. Hofmeyr please explain whether sows taken to Testing Stations are allowed to return to their farms and possibly carry disease back to them?

Another point which arises here is that we have put the cart before the horse. Instead of cleaning up first and testing afterwards, we have started the wrong way around and run into trouble. This must be a warning when we start random sample tests and bull testing stations in this country.

DR. D. OSTERHOFF:

Hoe belangrik hierdie gesondheidskontrole is het ek self in Swede gesien. In 1945-46 het hulle verliese van omtrent 15-20% gehad op die varktoetsstasies, en hierdie persentasie het afgeneem na omtrent 3% nadat hulle in 1952 in Swede hierdie gesondheidskontrol ingebring het. Dit is nie alleenlik die siek diere wat uit die toetse uitval nie, maar waar 2 uit dietoetsgroep van 4 varkies siek word, word die hele groep gekanselleer.

Ek het van dr. Swahn 5,460 ondersoekte longe ontvang van alle diere wat by die verskillende toetsstasies geslag word. Dr. Swahn het al hierdie longe gegradeer. 'n Absolute gesonde long kry die gradering 0 en die gradering gaan op tot 5, as die long baie sterk aangetas is. Sy resultate was as volg vir die 5,460 longe:

Graad 0 (absoluut gesond)	=	15%
Graad 1	=	30%
Graad 2	=	30%
Graad 3	=	20%
Graad 4 en 5	=	5%

Dit is bewys

(a) dat hierdie gevorderde longveranderings die rede vir die vroeë slag van proefdiere is;

(b) dat daar geen verskil is tussen proefdiere wat in verskillende maande gebore is, wat longveranderings betref nie;

(c) dat daar geen verskil is in die verskillende jare nie — alle ondersoeke is deur een man gedoen;

(d) dat manlike diere meer vatbaar is as vroulike diere, en verskille is ook gesien tussen verskillende toetsstasies en ook tussen verskillende varkrasse.

Die erflikheidsfaktor is so gering vir V.P.P. dat 'n mens hier glad nie van enige genetiese effek kan praat nie.

Hoe hoër die gradering van Swahn was, hoe kleiner was die daaglikse gewigstoename van sulke diere.

Dr. Abrams praat van „Hypoglycaemia" deur 'n gebrek aan melk onder varkies, maar Hongaarse en Amerikaanse navorsers het bewys dat dit ook deur 'n hemolitiese geelsug veroorsaak kan word.

DR. I. VAN SCHALKWYK:

In tests with feeds I have found it very difficult to produce scours in piglets with the commonly used feeds. There is one possible exception to this, and this is a byproduct of the alcohol industry, which contains a rather high percentage, about 30% of ash and about 30% of this in turn consists of potassium salts. This product, if used in too great a proportion in the ration, could cause scours in piglets.

Commercial pig feeds sell at somewhere round £20 a ton in this country, and pig meat, at say 1/9 a pound, fetches somewhere round £140 a ton; a conversion of 7 to 1 is equivalent to the price realised on bacon. A conversion of 7 to 1 on a farm is not very high when one considers the amount of feed used to maintain breeding stock and the feeding of pigs which do not reach bacon weight. The profit margin is, therefore, very, very narrow indeed and probably indicates why only some 2½% of all feed manufactured in the country is pig feed, a land whcih only produces 20-30,000 lbs. of pig meat per annum. This indicates how largely the disease factor enters into the economics of pig production.

DR. H. P. STEYN:

Dr. Hofmeyr, wat is die onkoste verbonde aan die toets van varke sover dit die boer betref?

On a large farm where piglets were dying, ostensibly from piglet anaemia, it was later found that the deaths were due to the use of treated wood shavings. This raises the question of to what extent shavings are used by pig breeders and perhaps our Testing Stations.

DR. J. BOSWELL:

Warmth is of very great importance in the raising of piglets, an deven on the highveld, one could consider the farrowing of sows on soil instead of on concrete. Concrete need not be used for farrowing to avoid worms, as there are such effective modern worm remedies. It is important to worm and castrate piglets at about 6 weeks of age, using a safe remedy such as piperazine, rather than waiting till they are weaned. This reduces the strain of weaning and cuts down scours at weaning.

DR. R. ORTLEPP:

Ek het tot vanmôre gedink dat alle varkaandoenings net met wurms te doene het. Ek dink dat wurms oor die geheel 'n baie groter rol speel as die ander siektes. Omdat hulle 'n erosiesiekte is, word daar minder aandag aan hulle gegee, en gevolglik is die wurmtoestand geweldig erg hier in ons land. Ons kommersiële kuddes is gewoonlik erg besmet, en die vernaamste een is die besmetting met spoelwurms. Een van die vernaamste longaandoenings wat u veral onder jong varkies voor speenouderdom kry, word deur die jong stadia van spoelwurms met hul migrasie teweeggebring. Is dit nie moontlik dat daardeur hulle baie meer vatbaar vir viruslongaandoeninge kan word nie? Higiëne moet ook baie verbeter word. Ons is gelukkig dat Trichinella nooit hier gevind is nie, maar moet ons oë daarvoor oophou. Is die hoes nie miskien deur die spoelwurmlarwe in die long veroorsaak nie?

Besmetting met nierwurm is maar tot dusver net eenkeer in die Unie gevind, en dit op 'n plaas in Natal, maar die moontlikheid dat die siekte weer hier kan voorkom is nie uitgesluit nie, en kan die gevolg hê dat karkasse daarmee besmet nie vir menslike gebruik goedgekeur sal word nie.

PROF. K. SCHULZ:

I.v.m. wat die vorige spreker gesê het, moet ek sê dat ons wurmbesmetting uitgeskakel het in verband met viruslongontsteking. Die histologiese veranderinge van VPP is heeltemal anders as dié deur parasiete veroorsaak.

As ons hierdie siekte wil bestry dan gaan ons baie groot moeilikhede hê, en dit is 'n baie moeilike en langdradige besigheid. Dit is maklik om die siekte vas te stel as dit gevorder is, maar

met baie gevorderde gevalle is die geskiedenis dat die diere nie gehoes het nie. Ons het hoes onder baie diere gekry wat wel vir wurms behandel is.

In die begin is dit gevind dat die longveranderinge heeltemal onspesifies is, wat by enige longaandoening aangetref word. Die moeilikheid is dan om te sê of dit dan 'n geval is wat in V.P.P. sal ontwikkel of dit 'n geval is wat nie V.P.P. het nie. Ons sal met 'n skoon kudde moet werk om te sien of diere, wat nie letsels wys nie, draers van die siekte is of nie.

DR. H. KLEEBERG:

I would like to focus attention on the bad management of the supply of vitamins and minerals. The best educated farmer has the healthiest pigs. In two years practice in Germany, where about 50% of practice is with pigs, I have had very good results with feeding of minerals, trace elements and vitamins. I have injected 24-hour-old piglets with vitamin mixtures and iron.

I do not think tuberculosis is a big problem in pigs and feel that tuberculin testing for them is both cumbersome and unreliable. Not all tuberculosis-like lesions in the head lymph glands of pigs are due to tuberculosis; we have found nearly 30% of these lesions to be due to Corynebact equi, cocci, etc. The disease does not spread readily in pigs and generalisation is uncommon. As it is only possible to identify tuberculosis of the head glands culturally it is necessary to condemn all heads found to show such lesions on the abattoir floor. In contrast to Europe, some 30% of infected glands were found to be infected with the human strain in this country, and eradication of the disease in pigs will, therefore, depend more on the eradication of human tuberculosis than of bovine.

DR. HOFMEYR said that sows are no longer accepted at Testing Stations until the participating herds have been cleaned up. Pigs at Testing Stations are regularly treated for worms.

Farmers only have to pay the postage on their applications to have pigs tested at the Testing Stations and there are no other costs. His test pigs are purchased for £3 each from the farmer.

DR. LOVEDAY mentioned that there is a strong suspicion that some of these epidemics of acute mastitis may possibly be venereally transmitted, the sow developing metritis post-partum and thereafter a secondary acute mastitis.

Hypoglycaemia is caused by any condition causing starvation in the piglet, whether is be due to some condition in the piglet itself, or any condition causing agalactia in the sow, e.g. metritis, mastitis, etc. Such piglets rapidly become sluggish and eventually comatose, and are very liable to be overlaid. It is, therefore, important to administer glucose to the litter when treating the sow for agalactia (2 c.c. of 50% glucose-saline per piglet subcutaneously). Piglets over one week old are much more refractory

to the development of hypoglycaemia. In investigating losses from overlaying it is therefore important to remember that the primary cause of the trouble must be sought, i.e. the condition causing the piglet to starve. Adequate warmth will delay the onset of hypoglycaemia.

There are numerous substances used in the treatment of timber against borers, and the substance concerned in the mortality mentioned by Dr. Steyn is still being investigated.

Ascaris infection causes considerably more lung damage to develop from V.P.P. than in V.P.P. infected pigs not harbouring Ascaris. Pigs artificially infected with Ascaris have not always shown coughing and where coughing has been shown it has usually lasted only about 4-7 days.

Where tuberculosis has been found in a herd I feel it is necessary to undertake tuberculin testing before such a herd could be certified as free of disease.

Finally, while this health control scheme has been primarily evolved for pedigree herds, I do feel that the application of these principles to large commercial herds by the practitioners attending such herds would be of immeasurable economic benefit to these commercial producers.

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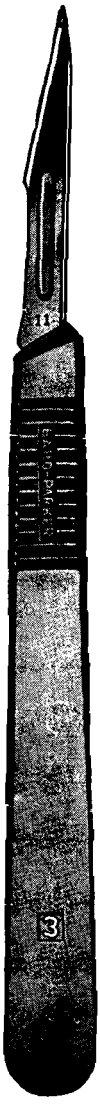

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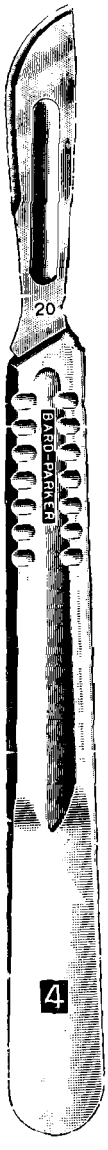

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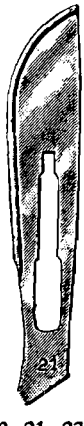

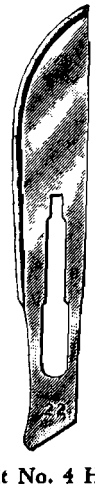

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INFECTIOUS INFERTILITY IN SHEEP

S. W. J. VAN RENSBURG, K. M. VAN HEERDEN,
D. J. LE ROUX and A. J. SNYDERS
and K. M. VAN HEERDEN

INTRODUCTION

Although many different types of infection are known to be associated with abortion in ewes, the ovine species has, until recently, been regarded as being particularly free from coital or venereal infections. Epididymitis, however, has for some years been incriminated as one of the main causes of sterility in rams in all the foremost sheep raising countries of the world.

Gunn, Saunders and Granger (1942) first recorded the prevalence of epididymitis in rams in Australia, and Moule (1950) stated that in tropical Queensland it was responsible for 67.6 per cent. of disease of the reproductive tract of rams. Symons (1953) in reporting on the examination of stud rams in South Australia recorded the presence of anatomical abnormalities, mainly epididymitis, in up to 62 per cent. of rams.

McFarlane and co-workers (1952) stated that in New Zealand widespread abortion in ewes, neonatal mortality in lambs and epididymitis in rams appear to be associated.

McGowan and Schultz (1956) recorded a specific epididymitis in rams in California, which affected 27 per cent. of 5,000 rams, and which they pointed out should be differentiated from epididymitis caused by *Corynebacterium ovis*.

In discussing pseudo-tuberculosis in sheep Belonje (1951) drew attention to the high incidence of epididymitis in rams, presumably caused by *Corynebacterium ovis*, in South Africa. Van Rensburg (1953) pointed out that *C. ovis* is probably not the only cause of epididymitis, and that the available evidence suggests the presence of another organism as well.

While most of the research work done elsewhere has thus far been concentrated on the male, the authors have also undertaken a study of the effect of this disease on the fertility of the ewe, and proof had been obtained both experimentally and in the field, that lesions are produced in the female genital tract when a susceptible ewe is served by an infected ram. Van Rensburg (1955) showed that a muco-purulent cervico-vaginitis is set up in ewes by intra-vaginal injection of cultures of *C. ovis* and by service from rams with epididymitis and secreting *C. ovis* in their semen.

He indicated the possibility of coitus being one of the methods whereby generalised infection with this organism takes place in breeding animals. On the basis of work done subsequently he (1957) described the condition as "contagious epididymitis and vaginitis in sheep", bearing some resemblance to epi-vag in bovines.

Objects

The present investigation embraces a study of:—

1. The aetiological factors concerned.
2. The transmission of the causal organisms.
3. Diagnostic methods.
4. Pathogenesis in rams and ewes.
5. Epidemiology.
6. Treatment and control.

Procedure

The work and results reported in this paper cannot be regarded as complete and conclusive, and the investigations are still in progress. The great economic importance of an infectious genital disease affecting the one species of animal which is a more prolific revenue earner for this country than any other class of livestock or agricultural product, has prompted the authors to furnish this interim report, in order to acquaint their colleagues, particularly in the sheep farming areas, with all the known facts, and especially the methods of diagnosis and control.

The problem has been studied since 1949 when 40 rams with epididymitis were sent from Grootfontein College of Agriculture to Onderstepoort, where they were subjected to bacteriological and pathological examinations. This research has, however, been stepped up considerably in the past three years, and involves field as well as laboratory studies.

The collection of semen in all cases is done by electrical stimulation according to the method described by van Rensburg and de Vos (1957). Rams are held in lateral recumbency; wool and hair around the prepuce are clipped, and the area cleansed with a detergent solution. The preputial opening is wiped carefully with a plug of cotton wool on forceps and soaked in normal saline. This is important in order to prevent admixture of leucocytes and contaminating organisms with the semen, which may complicate the diagnosis. Injuries and wounds of the prepuce may also cause bacterial and cellular contamination of the semen.

Aetiology

On account of the frequent occurrence of Preisz-Nocard lesions in the epididymis and other parts of the genital tract of rams, and the isolation of *Corynebacterium ovis* from such lesions, this organism was until 1953 regarded as the main cause of the disease in South Africa.

The relatively limited distribution of epididymitis, when viewed in the light of the ubiquitous occurrence of *C. ovis* gave rise to doubts as to the sole culpability of this organism. This suspicion was increased when Buddle and Boyes (1953) in New Zealand reported the recovery from the semen and genital lesions of an organism which they regarded as a variant of *Brucella melitensis*. They classified this organism in the Brucella genus on a basis of cell morphology, colonial morphology, cultural characters, biochemical properties, sensitivity to antibiotics and sulphonamides in vitro, pathogenicity for laboratory animals, and its association with genital disease in the natural host.

Watts (1955) stated that the responsible agent for epididymitis in South Australia was apparently the same as that described by Buddle and Boyes.

Buddle (1956) proposed that, since the New Zealand and Australian ovine strains have been shown to be sufficiently stable and distinguishable from other established groups of the Brucella genus in a number of independently variable characteristics, they be assigned to a new species, *Brucella ovis*.

In Southern Africa, Sonnenschein and Karsten (1939) reported the isolation of *Brucella melitensis* from cattle, sheep and goats in South West Africa, but Pullinger (1939) was unable to confirm this from cultures submitted by them to Onderstepoort, and regarded the organisms as rough variants.

Van Drimmelen (1953) cultured brucella organisms from the milk of two Karakul ewes from Gobabis, that had aborted. He could not assign them to any of the recognised species of the genus Brucella, but suggested a new species, *Brucella ovis*, and finally proposed the designation *Brucella melitensis* var. *karakul*.

None of these South African workers associated the organisms isolated by them at that time with epididymitis in rams.

While examining semen smears in the Murraysburg district at the end of 1956 one of the authors (K. M. v. H.) found a Merino ram with no clinical evidence of epididymitis but showing brucella-like organisms in the semen. This animal (3188) was sent to Onderstepoort, where the presence of these organisms in his semen was confirmed. A drop of his semen was placed on the glans penis and inside the prepuce of a 6-month-old clean ram lamb (2814). This produced a unilateral epididymitis, and brucella type organisms were found by both cultural and microscopic examination of his semen. Subsequent work by Snyders (1957) proved conclusively that, on a basis of cultural characters and serological reaction, this organism is very closely related to, if not identical with *Brucella ovis* of Australia and New Zealand.

Transmission and Susceptibility

Australian and New Zealand workers have shown that *Brucella ovis* is transmitted by coitus and that ram to ram transmission can take place by direct contact. They have further transmitted it by

intravenous inoculation and by the intratesticular and intrapreputial routes.

Following the isolation and cultivation of Brucella ovis from ram 2814, infection has been produced experimentally by applying to the glans penis of two clean rams in each of three groups:—

i. A drop of semen from 2814.

ii. Cultures of the organism isolated from the semen of 2814.

iiii. Cultures of Strain A.272 of *Brucella ovis* obtained from Australia.

In all six of the recipients the presence of *Brucella ovis* in the semen was established both microscopically and culturally within 3 to 10 weeks, and in 5 of the 6 rams clinical evidence of epididymitis appeared in from 6 to 14 weeks after infection.

Two other rams were subsequently infected in a similar manner with semen from two of the six experimental animals, and *Brucella ovis* was recovered from the semen of each 11 days after infection.

On 9.6.58 one of the six infected rams (1922) was placed together with a clean young ram (4013) with 22 young ewes that had never been mated previously. Oestrous ewes were served by both rams from the next day on. Ten days later epithelial cells and free brucella type organisms were observed in the semen of 4013, and after another five days his semen contained numerous polymorphonuclear leucocytes with intracytoplasmic brucella organisms in many of the cells.

On 3.3.58 an oestrous ewe (2181) was inseminated with semen from one of the six experimentally infected rams (2001). At the next oestrous period vaginal mucus from her was applied to the glans penis of a clean ram (4098). Twenty days later his semen contained many polymorphonuclears, and after another 11 days brucella organisms were also present.

All the breeds of sheep that have come under our observation, namely, Merinos, Karakuls, Persians and Dorpers appear to be equally susceptible. The apparent higher incidence of the disease in Karakuls and mutton breeds is probably not due to a greater degree of resistance on the part of the Merino as to the fact that Merino flocks are more self-contained than other breeds, and therefore not so exposed to infection.

Diagnosis

The diagnosis of infection in rams can be made by cultural examination of semen, serological tests, microscopic examination of semen smears, and clinical examination of the genital organs.

Of these the complement fixation test carried out on the sera of rams is the method of choice. The technique for this has been described in detail by Clapp (1955).

Since cultural and serological tests can only be performed in the laboratory, the field worker has to resort to microscopic examina-

tion of semen and clinical examination of the genitalia for making a diagnosis on the spot.

Corynebacterium ovis is Gram positive and can therefore be detected by staining semen smears by Gram's method.

Brucella ovis is a small bacillus or cocco-bacillus, Gram negative, Hansen positive and acid-fast with the modified Ziehl-Neelsen technique.

In all our work, both in the field and in the laboratory, duplicate smears are made from the semen of each ram, one being stained by Gram's method and the other with the modified Ziehl-Neelsen one. The latter method is as follows:—

Smears are air-dried and lightly fixed over a flame; stain with dilute carbol-fuchsin (1:10) for 10 minutes;

4% acetic acid — until the colour ceases to come away;

Counterstain with dilute methylene blue (0.5%) — 1 minute;

Wash and air dry.

Comparing the microscopic examination of semen smears stained in this manner with cultural examination Edgar, Inkester and MacDiarmid (1956) found that in no case were organisms cultured from samples which were negative on smear examination, and, conversely, from all those samples positive by smear examination, the organism was grown.

Semen smears are stained by this technique as soon as possible after they have been made. If staining and examination are delayed for some days, the organism stains very faintly or not at all, and infection can thus be missed. The brucella organisms retain the fuchsin, and appear as small red bacilli or cocco-bacilli, usually as intracytoplasmic clumps and as loose extra cellular organisms.

Normal healthy semen should not contain blood or epithelial cells, and provided the ejaculate was taken with due hygienic precautions, the presence of polymorphonuclear and/or epithelial cells in any number must be viewed with suspicion, since this is suggestive of the pre-phagocytic or early stage of infection, before the causal organisms themselves can be detected.

Brucella ovis invariably appears to be present in the semen long before clinical symptoms of infection are evident, and microscopic examination is therefore a far more reliable diagnostic method than clinical palpation. The latter should, however, not be neglected on that account, since the organisms are generally not present in the advanced stages of epididymitis.

Pathogenesis

EWES: As stated previously, it has already been shown that a vagino-cervicitis is produced by the intravaginal injection of *Corynebacterium ovis* cultures. More recent work has established that a similar syndrome is set up by *Brucella ovis*.

Post coital examination of ewes with a speculum reveals marked

hyperaemia of the anterior vaginal and posterior cervical mucosa within a few hours after service by an infected ram. This is usually accompanied by the secretion of a variable amount of muco-pus, which after a day or two may become dry and caseous.

The anterior vaginitis is not as severe or persistent as that which characterises epi-vag or vibriosis in bovines. It generally subsides after a day or two, and in ewes that do not conceive it may reappear at the next oestrus. In ewes that conceived and lambed normally it has been observed to recur after parturition.

Since the genitalia of ewes are not accessible to rectal palpation, one cannot readily determine the extent to which the remainder of the female genital tract becomes involved. This can only be ascertained accurately by post mortem examination, and all the evidence obtained thus far indicates that there is not the same tendency for lesions to occur in the deeper genitalia as in the venereal diseases of bovines.

Last year, however, two of the authors examined the genital organs of 66 ewes after slaughter at the Upington abattoir. These animals came from what is regarded as the worst infected district in the Union. Thirty-one were pregnant. In the remaining 35 they found 2 showing endometritis, 1 oophoritis, 3 salpingitis and 3 evidence of resorption of the foetus — a total of 9 out of 35 (25.7%). Comparison of these findings with those obtained at other abattoirs shows that the incidence of pathological changes in the female genitalia is above the normal in that district. This can reasonably be assumed to be associated with the wide prevalence of infectious infertility in that area.

The disease is responsible for a marked depression of the fertility level in some affected flocks, as is shown by the following examples:—

Flock A: 400 ewes produced 73 lambs (18.2%).
,, B: 1,100 ewes produced 123 lambs (11.1%).
,, C: 2,000 ewes produced 800 lambs (40%).

The owner of the latter Karakul flock reported that the previous season, prior to the introduction of infected rams, he obtained 3,000 lambs from his 2,000 ewes.

Determination of the precise role which the ewe plays in the impairment of fertility is not possible, since the epididymitis in rams is a contributory factor, but the records of owners who practise artificial breeding indicate that the ram is not the sole cause of the poor fertility.

In ewes that do conceive the organisms invade the placenta, with abortion in some as a sequel. According to MacFarlane and co-workers (1952) the placenta of aborted foetuses shows characteristic lesions. There is a gelatinous oedema of the chorio-allantois. The cotyledons have a slight firmness and show an alteration in colour from deep red to pink or even yellowish white, and in advanced cases they may become partially detached. Inter-cotyledonary areas show small plaque-like thickenings, yellow white in colour

and of a firm consistency. These tend to coalesce into large raised yellowish-white areas resembling chamois leather.

Our field observations suggest that during the first season following the introduction of infection the abortion rate may be high, but in flocks in which it has been prevalent for some years ewes apparently develop immunity, and abortion is then not such a big problem as infertility.

RAMS: There is considerable variation in the time taken for the clinical symptoms to appear in the male. In all breeds some individual rams have a very high resistance, and may serve infected ewes for years without developing the lesions characteristic of this infection, yet they may be transmitting it all the time.

Some of the experimental animals whose semen is being examined weekly have now been secreting *Brucella ovis* continuously for over six months without revealing any abnormality of the testes on palpation. Six weeks after infection is the earliest stage at which we have detected clinical evidence of the disease. This can usually be observed first in the tail of the epididymis, and is unilateral in the majority of cases during the early stages. In some it starts as an acute epididymitis, but more frequently it is chronic from the onset. In others there is a transient mild epididymitis, which subsides after a week or two, and may disappear completely, but frequently recurs some weeks later.

The head of the epididymis is the second favourite site for lesions, the body being only rarely involved. In old chronic cases, however, the whole epididymis may be affected, and this organ is then frequently larger than the testis itself, the latter undergoing some degree of atrophy.

In the early stages the epididymitis is of a chronic indurative non-purulent type. In South Africa, however, the great majority of old standing cases are characterised by abscessation. The abscesses are encapsulated, the well developed fibrous capsule containing yellowish-green semi-fluid or caseous pus. These lesions are not confined to the epididymis, but may occur as well defined circumscribed swellings in any part of the scrotum or on the cord. The condition is often associated with chronic peri-orchitis with adhesions between the parietal and visceral layers of the tunica.

The abscesses are of the typical Preisz-Nocard type, and *Corynebacterium ovis* can be recovered from most of them, except in old advanced cases. *Brucella ovis* cannot usually be found in the lesions or in the semen at this stage.

The specific role played by each of these two organisms in the causation of the disease is still being studied, but the observations made thus far indicate that they may act in close collaboration. There appears to be either a concurrent infection with the two agents and consequent synergistic action, or, as seems more probable on the available evidence, a primary infection with *Brucella ovis* sets up a non-purulent epididymitis which " softens up " the tissues, thus rendering them vulnerable to a secondary invasion by *Coryne-*

bacterium ovis and production of the Preisz-Nocard type of abscessation.

Epidemiology

During the past two years one of the authors (K. M. v. H.) has been conducting an extensive survey in all the main sheep farming districts in the Cape Province. The object of this was to obtain all possible information on the field aspect of this disease as well as of other types of ovine infertility, and to obtain suitable material for laboratory research.

The investigation included a clinical examination of as many rams as were presented on the farms visited, supported by a microscopic examination of as many semen samples as possible.

The results are summarised in the following table:—

Area	Number of rams examined	Number of semen samples examined	Number of infected rams
Western Province	112	14	4 (3.6%)
Eastern Province	276	5	6 (2.2%)
Midlands	1,047	50	74 (7%)
Karoo	1,288	113	148 (11.5)%
North-West Cape	1,066	216	222 (20.8%)
Total	3,789	398	454 (11.9%)

A diagnosis of epididymitis was made on the clinical findings, or when brucella-like organisms or corynebacteria were found in the semen of rams which showed no palpable lesions. Noteworthy is the absence of these organisms in the semen of rams in all those flocks in which the fertility was normal, and where there was no reason to suspect breeding trouble.

For better evaluation of the results the Cape Province has been divided into the five areas given in the table. By far the highest incidence was found in the North-West Cape and Karoo regions, which comprise roughly that portion lying north-west of the main railway line from Kimberley to Cape Town, with the exception of the winter rainfall area of the Western Province.

In the Karoo is included the district of Luckhoff in the Southern Free State, where infection was found in the three flocks that were examined.

The Eastern Province is roughly that portion lying east of the Bloemfontein-Port Elizabeth main line, and extending as far as Stutterheim. It is significant that the six cases found in this area were all on one farm in the Tarkastad district. The owner ascribes it to the introduction of infected sheep from the North West, that he accepted for grazing during a severe drought many years ago.

The results do not give a very accurate indication of the extent of infectious infertility, because during the year or two preceding this survey most of the farmers, especially in the worst affected area, have been eliminating clinically affected rams from their flocks, and have been applying antibiotic treatment on a big scale.

Although the remainder of the Union has not been surveyed to the same extent as the Cape, it seems certain that the infection is not so widespread in the other three provinces. Investigation of complaints of poor fertility and abortion among isolated flocks in the latter three provinces has, however, revealed that they are not free from the disease. Where foci of infection have been found in them, there was usually a history of the introduction of breeding animals from the Cape.

Treatment and Control

Buddle (1954) showed that rams can be effectively immunised against *Brucella ovis* with a simultaneous inoculation of *Brucella abortus* Strain 19 and an adjuvant vaccine incorporating ether-killed ovine brucella organisms in a saline-oil emulsion.

Subsequently trials by Buddle (1958) provided convincing evidence of the superior immunological efficiency of the double inoculation as compared with the adjuvant vaccine used alone. No clarification can be given at this stage of the mechanism by which S.19 contributes to the immunological effect.

Vaccination studies with ewes have so far not provided results as conclusive as those obtained with rams.

The results, however, justify optimism with regard to the future control of *Brucella ovis* by inoculation. Further, if the hypothesis advanced above, regarding the dependence of *C. ovis* on the presence of *Br. ovis* for its pathogenicity to the sex organs of rams proves to be correct, one visualises the possibility of also increasing resistance to Preisz-Nocard infection of the male genitalia by vaccination against *Brucella ovis*.

Pending the outcome of the experimental work on preventive inoculation, which is now in progress, methods of control must, for the present, be confined to eliminating the use of infected rams, and increasing fertility by antibiotic treatment.

Before commencement of the breeding season all rams should be subjected to the complement-fixation test, or palpation of the genitalia and microscopic examination of duplicate semen smears stained by Gram and the modified Ziehl-Neelsen methods. Rams showing evidence of infection must be eliminated.

The same tests should also be applied to rams newly introduced, particularly if the flock is known to be free from breeding trouble.

Where elimination of infected rams will be uneconomic, the conception rate can be improved by giving each ram a 3-4 day course of antibiotic treatment, preferably penicillin and streptomycin prior to joining, and also at about three weekly intervals during the breeding season.

Where artificial breeding is carried out it has been shown that the conception rate can be significantly increased and abortion reduced by injection into the cervix an hour or two after insemination, of 50,000 units each of penicillin and streptomycin in 10 ml. sterile water.

Summary

(1) A preliminary report is given on the work being done in South Africa on epididymitis in rams and vaginitis and abortion in ewes.

(2) The two principal aetiological factors determined thus far are *Brucella ovis,* which is identical with the organism described in Australia and New Zealand, and Corynebacterium ovis.

(3) The theory is advanced that the prevalence of Preisz-Nocard lesions in the genitalia or rams in parts of South Africa is due to synergism between these two agents.

(4) The diagnostic methods employed are cultural examination, serological tests, microscopic examination of semen smears stained by Gram and the modified Ziehl-Neelsen techniques, and by clinical examination.

(5) The results of transmission experiments are given. .

(6) The symptoms produced in ewes and rame are described.

(7) A survey has shown that the disease is widely prevalent in the North-Western Cape, and that foci of infection also exist in the other three provinces.

(8) Methods of treatment and control are discussed.

Acknowledgement

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REFERENCES

Belonje, C. W. A. (1951): Jl. S.A. Vet. Med. Assn., 22:165-173.

Buddle, M. B. & Boyes, Betty W. (1953): Austr. Vet. Jl., 29:144-153.

Buddle, M. B. (1954): N.Z. Vet. Jl., 2:99-109.
,, (1956): Jl. Hyg., 54:351.
,, (1958): N.Z. Vet. Jl., 6:41-46.

Clapp, K. H. (1955): Austr. Vet. Jl., 31:27-28.

Edgar, D. G., Inkester, I. J. and MacDiarmid, Heather J. (1956): N.Z. Vet. Jl., 4:20-24.

Gunn, R. M. G., Saunders, R. N. and Granger, W. (1942): Bull. C.S.I.R.A., No. 148.

McFarlane, D., Salisbury, R. M., Osborne, H. G. and Jebson, J. L. (1952): Austr. Vet. Jl., 28:221-226.

McGowan, B. and Shultz, G. (1956): Corn. Vet., 46:277-281.

Moule, G. R. (1950): Austr. Vet. Jl., 26:26-37.

Pullinger, E. J. (1939): Cited by van Drimmelen.

Snyders, A. J. (1957): Unpublished data.

Sonnenschein and Karsten (1939): Cited by van Drimmelen.

Symons, L. E. A. (1953): Rept. Conf. Austr. Dept. Agr.

Van Drimmelen, G. C. (1953): S.A. Jl. Sc., May 1953: 299-302.

Van Rensburg, S. W. J. (1953): S.A. Wool Board Ann. Rept.: 24-27.
,, ,, (1955): Idem. 19-20.
,, ,, (1957): "Breeding Problems and Artificial Insemination": Libagric, Pretoria: 156-160.

Van Rensburg, S. W. J. and de Vos, W. H. (1957): Jl. S.A. Vet. Med. Assn., 28:1-3.

Watts, P. S. (1955): Austr. Vet. Jl., 31:1-6.

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Ear case T-33-4-1956

COCKER—Male—3 years of age

History: Inflammation of ear with odour and extensive head shaking.
Symptoms: Inflammation of external ear canal, typical pseudomonas odour, small laceration in external canal.
Diagnosis: TRAUMATIC OTITIS.
Treatment: Ear cleaned with chlorinated oil solution. METIMYD with NEOMYCIN applied twice daily for 10 days.
Results: Complete healing.

Eye case T-21-4-1956

COLLIE—Female—6 years of age

History: Corneal ulcer measuring 1/16" x 1", following traumatic injury.
Symptoms: Light sensitivity, discharge, irritation.
Diagnosis: CORNEAL ULCER.
Treatment: METIMYD OINTMENT with NEOMYCIN applied twice daily for 12 days. On first and third days 5 cc. of foreign protein were given.
Results: Complete repair of ulcer with slight scar formation.

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GERMAN SHEPHERD—Female—2 years of age

History: Dry eczema of two months duration.
Symptoms: Dermatitis and alopecia involving left labial commissure and left external ear flap. Severe pruritus of involved areas.
Diagnosis: DRY ECZEMA.
Previous Treatment: Sodium caprylate solution and sulfa ointments.
Treatment: METIMYD OINTMENT with NEOMYCIN applied twice daily for one week.
Results: Pruritus ceased after the first application of METIMYD. Within one week all symptoms of dermatitis had disappeared.

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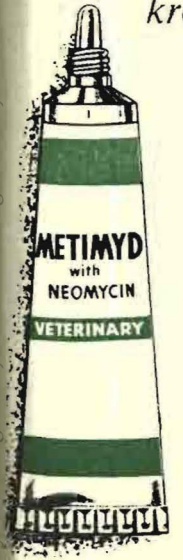
Edeem

Allergie

Nie-spesifieke ekseem

Akute en kroniese otitis externa



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A PIT TO FACILITATE OPERATIONS ON LARGE ANIMALS

D. H. G. IRWIN
Dept. of Surgery, Onderstepoort

Operating tables suitable for large animals are expensive and are found only in veterinary schools and perhaps the largest private clinics. In the vast majority of practices the veterinarian and his assistants are obliged to kneel, squat or adopt other awkward positions when large animals are operated upon under general anaesthesia.

In the author's previous practice on a farm where it was necessary to do several caesarean sections on sows at various times, there was a convenient terrace about 3 feet high. The sows were anaesthetized and then moved to the edge of it. The author stood at the foot of the terrace and operated in comfort. On other farms a similar arrangement was possible for a teat operation (under local anaesthesia, with the cow standing), and

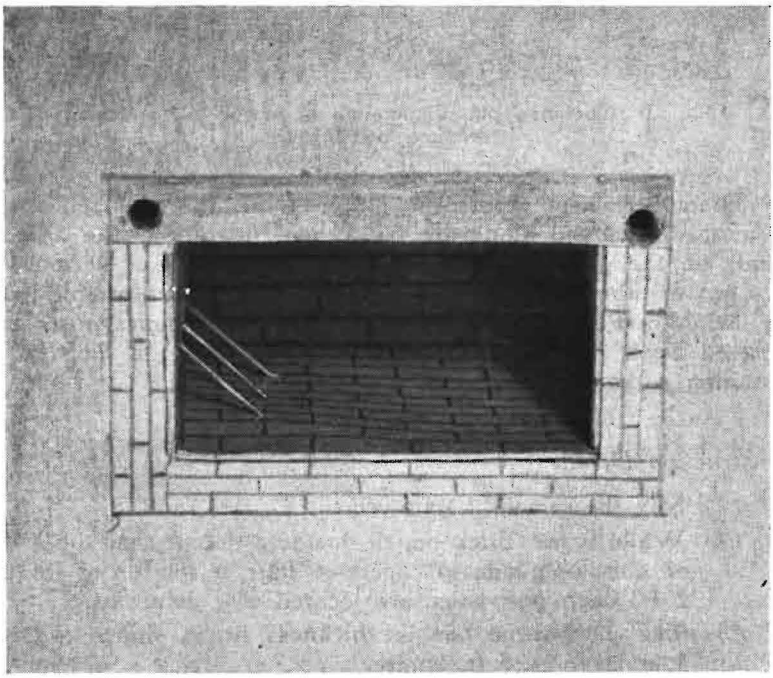


Fig. 1: Operating pit. Photograph of model. Note ladder rungs and postholes.

a claw amputation. After these experiences the idea of an operating pit was conceived, and a plan was drawn for its construction. It was to have been located on the premises of the author's clinic.

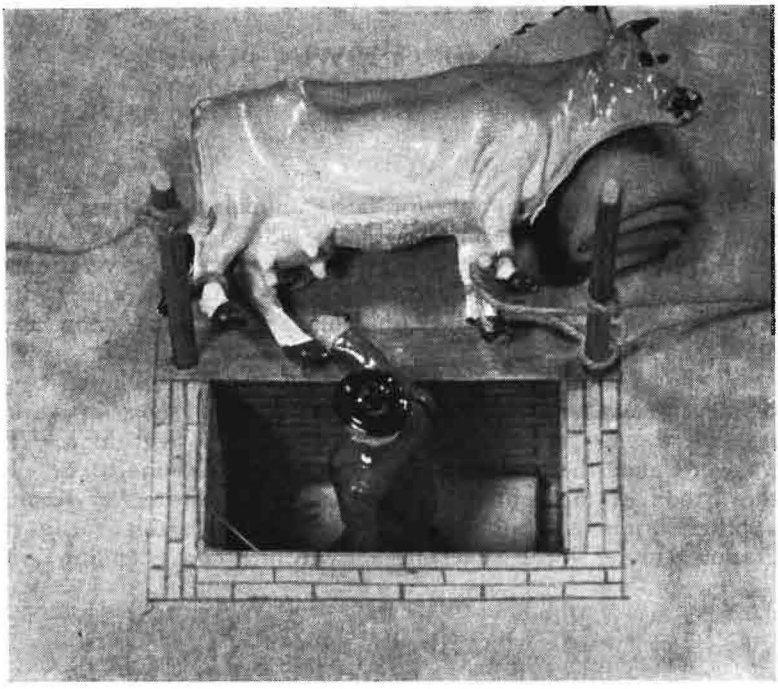
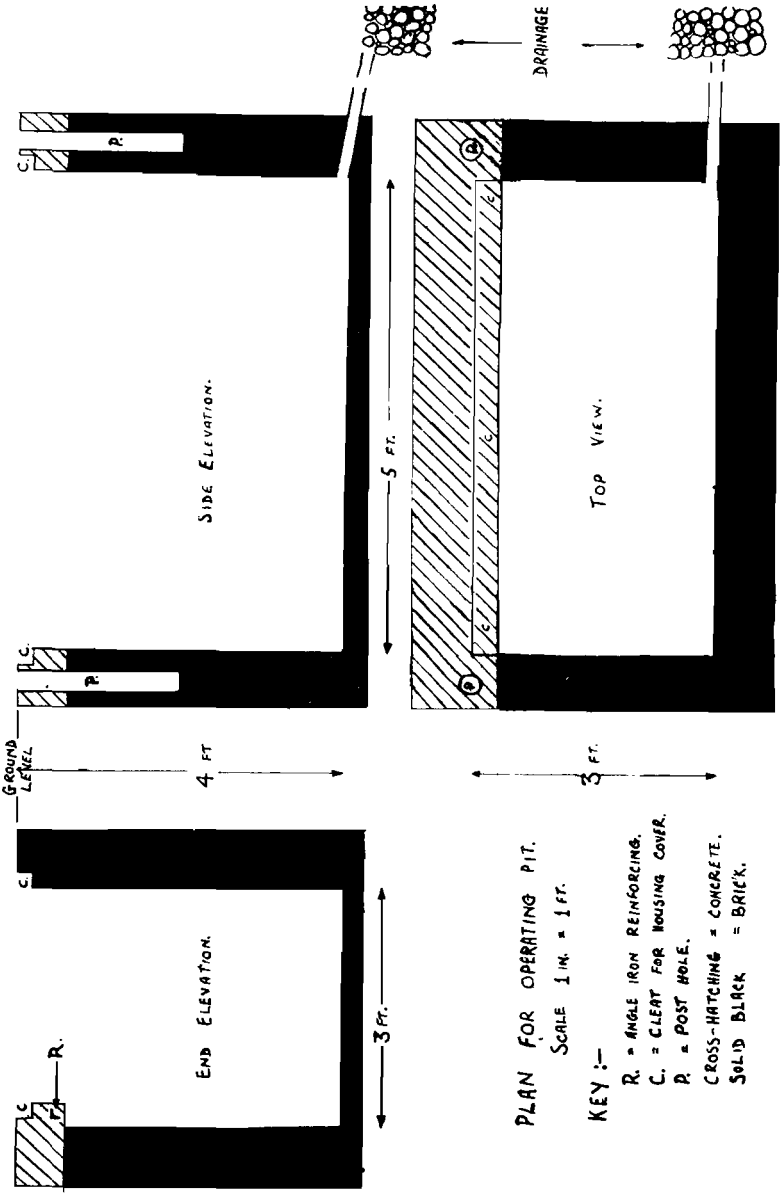


Fig. 2: Operating pit. Photograph of model. Cow secured. demonstration in pit.

Beams are kept across the pit until the anaesthetized animal is suitably arranged alongside. For hoof operations the operator stands on the pit bottom, and for operations such as herniotomy, on a box or other suitable elevation to maintain a comfortable working height. Post-holes are plugged with a dummy-post, until replaced by a post for use in securing or raising a limb or for arranging a drip, etc.

Construction Details:

(1) Mix the cement 1 part cement 4 parts sand.
(2) Walls 9 ins. brick on all 4 sides; except that top 6 ins. of one long side is concrete: here a reinforced lip and 2 ft. deep post-holes are located, see diagrams.
(3) The pit bottom, single thickness brick, slopes ½ in. to 1 in. over its 5 ft. length.
(4) The drain is from 1—2 cubic yards in size and is covered by galvanized iron before replacing the soil.



ACKNOWLEDGEMENTS

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ENCEPHALITOZOON CUNICULI INFECTION OF LABORATORY RABBITS AND MICE IN SOUTH AFRICA

H. MALHERBE and V. MUNDAY

Laboratories of the Poliomyelitis Research Foundation, South African Institute for Medical Research, Johannesburg

The protozoon-like micro-organism causing endemic encephalomyelitis in rabbits was first described in 1922 by Wright and Craighead.[1] It was independently noted in 1923 by Levaditi, Nicolau and Schoen[2] who named it *Encephalitozoon cuniculi*. Spontaneous infection of mice was also reported by Levaditi, Nicolau and Schoen[3] and by Cowdry and Nicholson;[4] while Perrin[5] observed the organism in the brains of rats and one guinea-pig.

Encephalitozoon cuniculi is regarded by most writers as a protozoon: it is rod-shaped, straight or slightly curved, with blunt rounded ends; measures 2 to 2.5 microns in length and 0.8 to 1.2 microns in width;[6] and stains irregularly, usually showing one or two pale areas. Differentiation from *Toxoplasma gondii* has been discussed by Perrin[7] and by Lillie.[8] Encephalitozoon is Gram-positive, and stains blue-red by the method of Wright and Craigheid[9] and blue-black or dark purple with Goodpasture's stain.[10] Toxoplasma is larger and usually crescentic with pointed ends; it is Gram-negative, and appears blue with the stain of Wright and Craighead and red-brown with Goodpasture's stain. Attempts to grow encephalitozoon on artificial media have been unsuccessful.

The infection is chronic, and may pass undetected or produce motor paralysis. Swaying of the head from side to side in animals at rest has been noted by Goodpasture.[11] Lesions occur chiefly in the brain and kidneys, but may be found in other viscera. In the kidney focal infiltrations by round cells are seen, chiefly in relation to tubules in the medulla. The organism itself is less frequently observed in kidney than in brain, but may be seen in epithelial cells or free in the lumens of tubules. Central nervous system lesions occur in both brain and spinal cord. The meninges may show all-round infiltration, and foci of necrosis surrounded by glial cells and lymphocytes or plasma cells are irregularly distributed in the grey and white matter, usually near vessels which show cuffing with round cells. Polymorphonuclear leucocytes are almost invariably absent. The organisms may be detected in the necrotic centres of foci, or they may be found in aggregates within tissue spaces at a distance from the lesions, with little or no cellular reaction around them.

During the recent investigation[10] of a neurotropic virus isolated from the vervet monkey *Cercopithecus aethiops pygerythrus,* which resembles the B virus of Sabin and Wright,[13] intradermal inoculation of rabbits was followed by motor paralysis. Sections of brain and cord showed focal encephalomyelitis, the presence of virus in the central nervous system being confirmed by tissue culture methods. In sections of the spinal cord of one rabbit a group of several hundreds of rod-shaped organisms in a tissue space of 40 microns in diameter was noted, not associated with any cellular reaction. Haematoxylin and eosin stained them a pale grey, and with Gram's stain they appeared light purple.

In view of the statement by Sabin and Wright that their study of B virus in rabbits had been complicated by the presence of *Encephalitozoon cuniculi,* it was decided to ascertain whether this organism, believed to have not previously been reported in South Africa, could be responsible for the lesions observed. Fifty-one rabbits, obtained from the breeding colony of the Serum Laboratories of the South African Institute for Medical Research, were examined; 36 having been used for poliomyelitis vaccine safety tests with negative results, and 15 being uninoculated animals. All were adult rabbits in apparent good health. In most instances only tissues from cerebral cortex and kidney were taken; fixation was carried out in 10 per cent. formal saline or Bouin's fluid, and the sections were stained with haematoxylin and eosin. In certain cases showing lesions, stains selective for the organism were used on further sections.

Typical round-cell infiltrations in brain or kidney were noted in 43 of these animals. Table 1 summarizes the results, and it

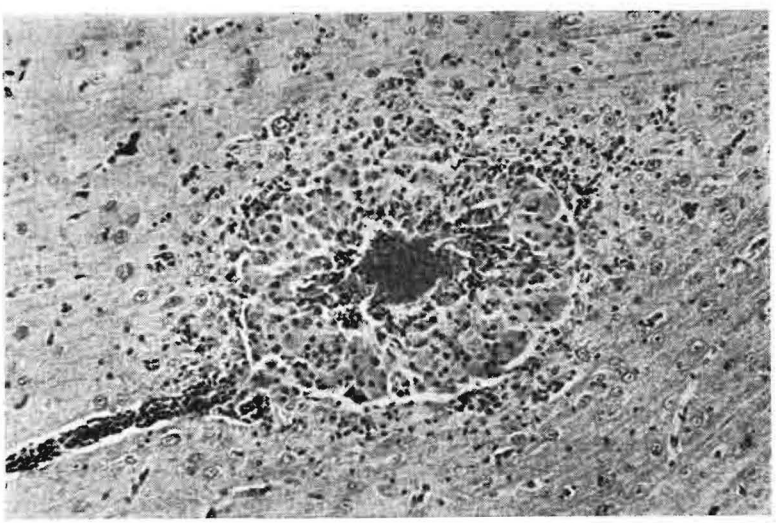

FIGURE 1.

FOCAL LESION IN BRAIN OF RABBIT, STAINED WITH HAEMATOXYLIN AND EOSIN. x 192.

will be seen that no essential difference exists between the rabbits used for safety tests and those sacrificed within an hour of being taken from the breeding pens. Figure 1 shows the nature of the lesions encountered in the brain. Sections from sixteen of the safety test animals and twelve of the stock rabbits showing lesions were further examined by means of the selective stains, and organisms morphologically and tinctorially similar to *Encephalitozoon cuniculi* were demonstrable in 11 of the former group and in seven of the latter, being observed in the kidney in four instances and in the brain in 15. Stained with haematoxylin and eosin, the organisms appeared light grey, and were not readily detected unless present in large aggregates. By the method of Wright and Craighead they stained blue-red, and were light purple with Gram's stain. They were most satisfactorily demonstrated by means of Goodpasture's stain, the dark rods contrasting well with the light yellow background. In the sections of brain they were seen either scattered in the necrotic centres of focal lesions (Figure 2) or closely packed in aggregates not associated with any cellular reaction (Figure 3). It was noted that encephalitozoa were not invariably seen in sections cut from block of tissue known to contain them, by reason of the small size both of the aggregates and of the necrotic centres of lesions. Cellular infiltration, being more extensive, was readily shown in most sections. It is thus clear that selective staining of multiple sections may be necessary to confirm the presence of *Encephalitozoon cuniculi* in histological preparations.

Samples of brain tissue from the 15 uninoculated rabbits were pooled, crushed and suspended in 20 ml of phosphate buffer solution without added antibiotics on the day that they were taken. The

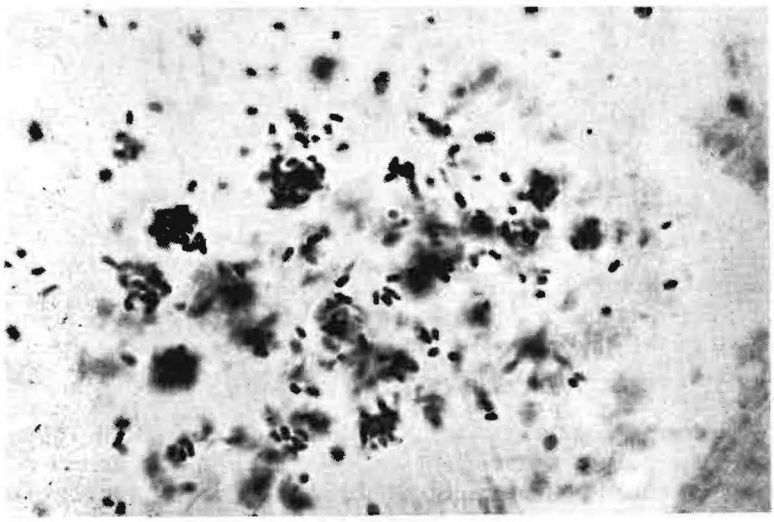

FIGURE 2.

E. CUNICULI IN THE NECROTIC CENTRE OF A BRAIN LESION. GRAM'S STAIN. x 1200.

suspension was centrifuged at 1,000 r.p.m. for one minute to sediment the grosser particles, and 0.2 ml of the supernatant fluid was inoculated on to each of two slopes of the following artificial media: blood agar, dextrose agar, Littman's ox-gall agar, and actidione agar. One of each of these cultures was kept under aerobic conditions, while the other was held under 10 per cent. carbon dioxide in air. In addition, two thioglycollate broth cultures were inoculated. With the exception of one of the dextrose agar slopes which contained a single rapidly-spreading fungal colony, none of these cultures showed any growth after two weeks' incubabation at 37°C followed by a further two weeks at room temperature.

Monkey kidney tissue cultures grown in a medium which did not contain antibiotics were inoculated with the same material, and after 10 days' incubation at 37°C they appeared normal, and no organisms could be detected in stained preparations of these cultures. In view of the fact that *Toxoplasma gondii* grows well

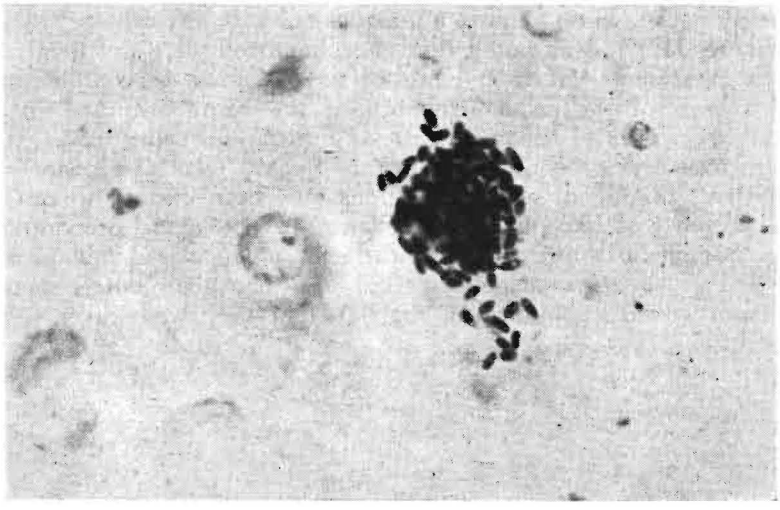

FIGURE 3.

AGGREGATE OF E. CUNICULI IN BRAIN TISSUE. GOODPASTURE'S STIN. x 1500.

in tissue cultures of monkey kidney even in the presence of penicillin and streptomycin, it is considered that this protozoon was not present in the inoculum. Rabbit kidney cultures were not inoculated with the brain suspension, but this line of investigation will be pursued.

Recently, organisms morphologically and tinctorially identical with Encephalitozoon cuniculi were observed in two albino mouse brains examined histologically in these Laboratories. Since the mice could have come from any of three breeding colonies on attempt was made to establish which of the strains was infected. Twenty young adult mice in apparent health were taken from each colony and sacrificed without delay. From each brain one section stained

with haematoxylin and eosin and one section stained by Goodpasture's method were examined. Lesions or organisms were not seen, except in one mouse derived from a strain received in 1955 from Australia. This brain showed a focal encephalitis with round cell infiltration, and several aggregates of organisms not associated with cellular reaction were present. The identity of the organism as Encephalitozoon cuniculi was confirmed by selective staining. Since there is a communicating door between the rooms accommodating this and another strain of mice, and the attendants are common to both groups, it is possible that infection is not confined to the Australian strain. The mice are not in contact with rabbits, consequently the infection is probably endemic.

There is no evidence that *Encephalitozoon cuniculi* is pathogenic for man, but its presence in laboratory animals should be borne in mind when neurotoxins or neurotropic viruses are being tested in rodents. Lepine and Sautter[14] have noted resistance to the virus of *Lymphogranuloma venereum* in mice infected with encephalitozoon; and the similarity between lesions caused by this parasite and those resulting from viral infections may lead to confusing experimental results. It is therefore essential to be aware of the problem, and a means of eliminating the infection in laboratory animals should be sought.

TABLE 1

RABBITS EXAMINED HISTOLOGICALLY FOR E. **CUNICULI**

	Total	Lesions in brain	Lesions in kidney	No lesions
Safety test rabbits	36	24	27	5
Uninoculated rabbits	15	11	12	3
Total	51	35 (68.6%)	39 (76.5%)	8 (15.7%)

SUMMARY

The occurrence of Encephalitozoon cuniculi in laboratory rabbits and mice in South Africa is reported.

43 of 51 rabbits from one breeding colony showed typical lesions of brain or kidney, and brain lesions were observed in one out of 60 uninoculated white mice. Organisms morphologically and tinctorially identical with Encephalitozoon cuniculi were seen in sections of both rabbit and mouse tissues.

Infection with this parasite should be borne in mind when rodents are inoculated with material thought to contain neurotropic agents.

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REFERENCES

1. Wright, J. H. and Craighead, E. M. (1922): J. Exp. Med., **36**, 135.
2. Levaditi, C., Nicolau, S. and Schoen, R. (1923): C.R. Acad. Sci. (Paris), **177**, 985.
3. Levaditi, C., Nicolau, S. and Schoen, R. (1924): Ann. Inst. Pasteur, **38**, 651.
4. Cowdry, E. V. and Nicholson, F. M. (1924): J. Amer. Med. Ass., **82**, 545.
5. Perrin, T. L. (1943): Arch. Path., **36**, 559.
6. Perrin, T. L. (1943): Arch. Path., **36**, 568.
7. Lillie, R. D. (1947): J. Lab. Clin. Med., **32**, 76.
8. Lillie, R. D. (1954): Histopathologic Technic and Practical Histochemistry. New York, The Blakiston Company Inc., page 378.
9. Goodpasture, E. W. (1924): J. Infect. Dis., **34**, 428.
10. Malherbe, H. and Harwin, R. To be published.
11. Sabin, A. B. and Wright, A. (1934): J. Exp. Med., **59**, 115.
12. Lepine, P. and Sautter, V. (1949): Ann. Inst. Pasteur, **77**, 770.

A REVIEW OF SOME COMMON SPINAL CONDITIONS IN SMALL ANIMAL PRACTICE

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In small animal practice the clinician is constantly called upon to diagnose and treat a variety of conditions which affect the spinal column and its associated structures in both the dog and cat. In the larger domestic animals similar conditions may be encountered but, since the treatment of such cases poses many obvious difficulties, they have received considerably less attention than those affecting small animals; the latter offer a greater scope for investigation when economic factors, hospitalisation facilities and prolonged treatment or nursing may have to be taken into account.

Veterinary literature deals fairly comprehensively with the subject and almost exclusively the observations have been made on the small domestic animals. In this field there would seem to be a closer similarity between the conditions in the human subject and the small domestic animal than the horse or bovine subject; in canine practice the clinician has tended to lean heavily on the detailed studies of similar conditions in man.

In considering spinal conditions in their widest interpretation three systems are intimately concerned, viz., skeletal, muscular and nervous and involvement of one is almost invariably associated with the others either primarily or secondarily as the condition progresses.

Among the various factors which may give rise to conditions affecting the spine are:—

(i) Congenital deformities of bony structures.

(ii) Trauma which may involve skeletal, muscular and nervous systems.

(iii) Nerve involvement and destruction following specific neurotropic diseases, tumour growth and senile degeneration.

(iv) Complex neuro-muscular-skeletal involvement of the spine which is frequently associated with rheumatic-osteo-arthritic changes.

While all four types of conditions with many variations are reasonably well recognised, only the fourth group which by reason of its complex and polysymptomatic nature offers a challenge in diagnosis and treatment to many clinicians, will be discussed. Included in this group are bony changes involving the vertebrae,

compression damage to the spinal cord proper or nerve roots, changes in the positioning and structure of the intervertebral discs, paraplegic states and arthritis or rheumatic conditions which may affect the vertebral column or its surrounding musculature.

In small animal practice the aforementioned conditions are common and the increasing use of radiography has undoubtedly played its part in establishing more accurate diagnoses but it is only within the past 30 years that prominence has been given to the effects of intervertebral disc lesions. In this respect veterinary science has closely followed developments in human medicine for although the herniated disc in man was described clinically by Goldthwait(1) and Middleton and Teacher(2) in 1911, the implications of these clinical observations apparently passed unnoticed for almost 20 years and it was only in 1929 that Dandy(3) and later Mixter and Ayer(4) emphasised the importance of these lesions.

Probably the first critical description in veterinary literature of spinal conditions was that of Brook(5) (1936) although unpublished personal observations were made in 1935. Schnelle(6) (1938), Hoerlein(7) (1953), Dickson(8), Hearn(9) and others have since reported on various spinal conditions. Moreover, in recent years increasing use has been made of improved techniques in myelography in the study of disc herniation in particular and Douglas(10) demonstrated the value of such myelography in the differential diagnosis of some spinal conditions.

Aetiology:

The origin of a number of so-called neuro-musculo-skeletal conditions remains obscure but inflammatory processes which involve the spinal joints and the periosteum of the bones rank high among possible causes. In turn, secondary changes in bone composition with the deposition of osteophytes and calcium salts may follow such inflammatory processes. While no conclusive evidence is available it is probable that conditions such as anchylosing spondylitis, calcification of intervertebral discs and chronic ossifying spinal pachymeningitis arise as the result of some previous inflammation at the site.

In a proportion of cases trauma and stress on the long back in some breeds is a predisposing cause but, in many instances, the condition appears to arise spontaneously without previous history of inflammation or injury. Weather changes and alterations in atmospheric humidity appear to play some part in causation especially where frank arthritic-rheumatic conditions are concerned.

Again, recent evidence by Bush et al(11) (1956), suggests that the intervertebral disc possesses some hydrophilic properties which may be influenced by humidity changes resulting in the development of internal pressures within the disc itself. When conditions favourable to the foregoing exist, the disc tends to absorb fluid and the developing pressure within the nucleus pulposus may be sufficient to produce rupture of the annular ring. Substance is given to this theory by the frequency with which the

incidence of paraplegic cases appears to increase in some animals during seasonal changes.

Loss of tissue elasticity and vitality especially of spinal joint structures are common changes which occur in ageing animals. Senile degenerative changes must therefore be considered as aetiological factors in spinal osteo-arthritic conditions but, age, per se, cannot always be implicated.

Peripheral neuritis and torticollis due to compression of cervical nerve roots may be encountered in comparatively young animals (1—2 years) and herniation of the intervertebral disc may occur as early as two years when tissue elasticity could be expected to be unimpaired and degenerative changes to be minimal. The frank osteo-arthritic conditions especially of the coxo-femoral joint are invariably senile changes but instances have occurred when generalized rheumatoid-arthritic symptoms have been seen in dogs as early as $2\frac{1}{2}$ years which cases have been ascribed to unknown toxic factors.

Again, vitamin deficiency of the B group has been cited as an aetiological factor in many of the musculo-skeletal conditions and is probably one of the main contributory factors in wry neck or the muscular rheumatism syndrome where radiography reveals no sign of bony changes. The main aetiological factors may, therefore, be summarized thus:—

1. Trauma affecting the vertebral column.
2. Skeletal osteostrophy.
3. Degenerative changes in the bone-cartilaginous elements of the vertebral column.
4. Metabolic changes leading to osteophytic deposits.
5. Inflammatory processes in the spinal column.
6. Gross vitamin deficiencies.

Breed Susceptibility:

While many of the aforementioned conditions may be met with in any breed of dog, it is significant that spinal arthritis, calcification and herniation of intervertebral discs, anchylosis and spondylitis appear to have the greater incidence among dogs with disproportionately long back in relation to the rest of the frame. Breeds such as the Dachshund, Pekinese, Sealyham, Scots' Terrier and Spaniel are commonly recognised as being prone to spinal conditions. Torticollis or wry neck is seen in Toy breeds while arthritis of the sacro-iliac and coxo-femoral joints appears to affect the Airedale, Irish Terrier and Alsatian.

Symptoms:

Cervical Conditions: These include torticollis or wry neck and peripheral neuritis both of which conditions may be associated with bony changes affecting the cervical vertebrae and their intervertebral discs with consequent pressure on nerve roots. In the main, however, the conditions appear to resemble muscular rheumatism characterised by marked hyperaesthesia of the skin surrounding

the neck and great tenderness of the muscles stretching from the ing of the atlas to the point of the shoulder.

Palpation evinces flinching and the pain may be such that the animal cries hysterically although no focal point may be found nor is there any muscular swelling. Fear of pain is particularly noticeable in some cases; the animal remains in fixed positions unwilling to move and adopts an almost characteristic attitude by attempting to tuck the head and neck into the thorax between the shoulders.

Systemic disturbances are rare and the conditions are invariably afebrile although appetite may frequently be impaired due to pain and fear. Both torticollis and cervical peripheral neuritis can occur in the course of a pseudocyesis or false pregnancy and may follow a recurrent seasonal pattern.

Differential Diagnosis:

Foreign bodies such as needles and sharp bones may penetrate the pharynx or oesophagus and become embedded in the musculature of the neck where they give rise to extreme pain on movement. Abscess formation at the site accompanied by rise of temperature and swelling are diagnostic features. X-ray examination is an essential aid in establishing the cause of the condition although in most cases of torticollis due to neuritis or myositis no apparent abnormalities may be seen.

Thoraco-Lumbo-Sacral Conditions:

Although most of the musculo-skeletal condtions in this region have many symptoms in common there are a number of differences.

Spondylitis: The onset may be slow and the first symptom may be intermittent bouts of pain accompanied by arching or stiffness of the back. The focus of pain may be localized depending on the vertebrae intimately concerned; generally the lumbar vertebrae appear to be more commonly affected and hyperaesthesia of the back and abdomen is noted. A temporary partial paresis may follow the calcification of the intervertebral disc.

In a number of instances, however, there is no displacement of the calcified disc and the cause of the condition may pass unnoticed for months until X-rays reveal complete absence of the disc or its fusion into the two vertebrae. When fusion is incomplete a characteristic "click" unaccompanied by pain is often heard when the animal is rocked on its legs.

Spinal Arthritis: Inflammatory changes involving the vertebral joints may occur in any region of the column but show a tendency to affect the lumbo-sacral area and coxofemoral joints. A proportion of cases are acute in origin accompanied by intense pain, hyperaesthesia, arching of the back, inco-ordination of gait and partial or complete paraplegia which may, in turn, produce bladder and bowel incontinence. In cases which show symptoms of "acute abdomen" there is an initial febrile stage which subsides within 24—48 hours.

Many, however, show a gradual onset without febrile disturbances. Pain on palpation of the affected area shows great variation in intensity and may be intermittent with a tendency to wear off after movement. In the initial stages there may be little interference with gait and little arching of the back. The condition may persist for 5—7 days without deterioration and then clear spontaneously but frequently it may become progressively severe leading to posterior paralysis.

Prolapsed Intervertebral Disc: Apart from outright trauma, it is possible that herniation, slipping or rupture of the disc rarely occurs without a preceding or simultaneous inflammation of joint structures. It must be stated, however, that many cases appear to arise spontaneously without showing any prodromal symptoms of pain, arching of the back, stiffness or difficulty in walking and are presented with a sudden flaccid paralysis.

Herniation may occur at any level but, in most breeds, the prolapse or rupture involves the lumbar region. In the typical case a characteristic chain of symptoms is exhibited. The onset may be sudden or may follow 24—48 hours of spinal arthritis accompanied by stiffness in the back. The animal resents handling and palpation of the back and hindquarters produces intense fear and pain. The abdomen is tense and respirations are markedly increased. In the early stages the animal arches the back or walks with difficulty and frequently collapses on one or both hind legs. There is rarely any temperature rise and the appetite may be unimpaired although a proportion of cases refuses to eat, probably due to pain or retention of urine. Voluntary control of the bladder and bowel ceases but involuntary emptying of both frequently occurs during examination.

This stage may last for 24—72 hours during which the sensory nerves appear to be unaffected while the motor nerves show progressive involvement leading to paraplegia accompanied by a retention or incontinence of bowel and bladder. As the paralysis becomes complete the spinal and abdominal muscles become flaccid and the animal can be handled and palpated without evincing pain.

The site of the disc involvement may sometimes be demonstrated clinically but the degree of herniation cannot be gauged except by the subjective symptoms displayed. In a number of cases pressure on the spinal cord affects both hind and fore limbs producing increasing respiratory distress and pulmonary congestion. Again, the resulting retention may predispose to a haemorrhagic cystitis and uraemic symptoms may ensue.

Differential Diagnosis: Without recourse to radiography it is impossible to arrive at a precise diagnosis of a number of spinal conditions. In recent years the use of contrast media in myelography has been advocated to aid differential diagnosis but Douglas considers the technique to be dangerous in dogs and prefers ordinary X-ray photography.

While changes in the structure and density of the intervertebral

disc are reasonably easily demonstrated by X-rays, herniation or rupture may not always be visible, in which case careful examination of the intervertebral space is called for. Chronic arthritic changes accompanied by deposits are generally clearly seen but must be read in conjunction with clinical findings.

Treatment:

The complex nature of various spinal conditions rules out any specific form of treatment. Briefly, it should be approached from the following angles:—

(1) Relief of pain.
(2) Reduction of inflammatory processes.
(3) Restoration of impaired function.
(4) Maintenance of muscle tone.
(5) Prevention of secondary infection.

Aspirin and salicyclic acid are still extremely useful drugs and muscle relaxants of the mephenesin group may be employed. Inflammatory conditions respond to cortisone preparations and acute arthritic processes have been successfully treated by phenylbutazone. Analgaesics combined with full doses of vitamin B complex are frequently employed to treat the polyneuritic symptoms while posterior paraplegia must be treated symptomatically, attention being paid to the prevention of secondary urinary or pulmonary involvement.

SUMMARY

A review of some spinal conditions in small animals is given with special reference to the possible aetiology and symptoms of herniated intervertebral disc.

REFERENCES

1. Goldthwait (1911) — The lumbosacral articulation . . . lumbago, sciatica and paraplegia. — Boston Med. Surg. J. **164**, 365, 1911.
2. Middleton and Teacher (1911) — Injury of spinal cord due to ruptured intervertebral disc. — Glasgow Med. J., 76 (1911).
3. Dandy (1929) — Loose intervertebral disc — Arch. Surg. 19 (1929).
   „ (1941) — Concealed Intervertebral discs — J. Amer. Assoc., 177 (1941).
   „ (1942) — Recent advances in diagnosis and treatment of ruptured intervertebral discs — Ann. Surg., 115 (1942).
   „ (1942) — Serious complications of ruptured intervertebral disc — J. Amer. Med. Assoc, 119 (1942).
4. Mixter and Ayer (1935) — Herniation of disc into Spinal Canal — New Engl. J. Med., 213 (1935).
5. Brook (1936) — Experimental and Clinical Studies of the Spine of dogs — Baltimore, J. (1936).
6. Schnelle (1938) — "The Canine Spine" — N. Amer. Vet., 19 (1938).
7. Hoerlein (1953) — Diagnosis of prolapsed intervertebral disc — Amer. Vet. J. Res. (1953).
8. Dickson (1955) — Treatment of Spinal Arthritis — "Pennant", 10 (1955).
9. Hearn (1957) — Prognosis and Treatment of Paraplegia in Dogs — "Pennant", 19 (1957).
10. Douglas (1955) — Myelography to Demonstrate disc protrusion — Vet. Rec. 4008 (1955).
11. Bush et Al (1956) — Fluid content of the Intervertebral Disc — Brit. Med. J., 4984 (1956).

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UTERINE FIBROMATA IN A COW

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RESUMÉ

The difficulties associated with diagnosis in a case of multiple uterine fibromata in the cow are described.

Neoplasia of the uterus in the cow is rare; the neoplasms most often seen — and then seldom — are lipomata. The case under discussion is of interest because, inter alia, of the diagnostic difficulties encountered.

Subject: A full-grown Grade Jersey cow.

Anamnesis: The owner complained that the animal was sterile. When first examined by two senior students, the conclusion was come to that a small mummified foetus was present.

Examination: The author did not agree as the uterus was the size of a pregnancy of about $3\frac{1}{2}$ months, contained fluid, and bodies like cotyledons could be palpated in the uterine wall. On the side of the slightly larger uterine cornu the middle uterine artery was somewhat bigger than on the other side. Purulent material was present in the vagina, but the cervix was closed.

Diagnosis: The quality of the uterine wall was harder than in the usual gravid uterus. The middle uterine arteries were also relatively small, although the larger one was on the side of the larger horn. The intra-uterine fluid felt somewhat less watery than normal. Structures like cotyledons were present, although they felt perhaps a little harder than usual. The only diagnosis that appeared to fit in was that of pregnancy, although there were unusual features. It was decided to send the cow away to be returned in a month.

On re-examination the " cotyledons " were found slightly enlarged, but the rest of the uterus and the blood vessels virtually the same. A few colleagues, asked to examine the cow, gave varied tentative opinions, but none felt that he could commit himself.

An exploratory laporatomy was decided upon.

The operation: After the customary preoperative preparation, the cow was given chloral hydrate intravenously at the rate of Gm. 4.5 per 50 Kilos. In order to control salivation she received mgm 30.0 atropin intramuscularly. Anaesthesia was completed and then maintained by the intravenous administration of Sagatal (Maybaker) as needed.

The surgical approach had to be selected from six operative sites (three on each side of the body), viz.:

(a) the vertical flank site;
(b) from the udder forward lateral to the superficial abdominal (or mammary) vein, and
(c) the approach from the udder forward between the last mentioned vein and the linea alba.

The uterus was fairly small and the surgical wound had to give access to the caudal parts of the uterus in case the condition found required it. It was therefore decided to employ the site lateral to the mammary vein on the right side.

An incision was made from the udder to a point about 10.0 cm. cranially.

When the peritoneum was incised, the omentum was visible. The hand was introduced and slid caudally until the edge of the omentum could be felt. This was pushed forward and a horn of the uterus then slid out of the abdominal wound.

On palpation the size of the uterus coincided with that of a 3½ months' pregnancy. The contents were fluid (later found to be pus) and in several places in the corpus and the cornua there were hard tumours, subsequently found by Dr. D. J. Smit of the Dept. of Pathology, from a biopsy speciment, to be fibromata.

The peritoneum and muscles were then closed in two layers with chronic catgut and the skin with silk. Two umbilical tape tension sutures were also inserted.

Healing took place uneventfully except for stitch abscesses at the tension sutures.

Discussion: As, judging from the quality of the uterine wall, the prognosis with regard to subsequent fertility was regarded as hopeless, and as the tumour could have been malignant, it was decided not to attempt panhysterectomy, as the animal was in good condition and there was a chance that the owner could command a good price for her. Extensive surgery would have prolonged recovery and resulted in loss of condition.

The problems associated with diagnosis are extremely interesting as pregnancy was very closely simulated.

It is suggested that the closely simulated pregnancy was in fact due to an early pregnancy with resorption of the foetus, when infection supervened.

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MUMMIFIED EXTRA-UTERINE FOETUS IN A BITCH

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RESUMÉ

A case in a Fox Terrier bitch is described of a mummified foetus in the abdominal cavity as a sequel to a tear in the uterus at least six months before.

Parturient rupture of the uterus with escape of a foetus into the abdomen is an accident which is usually followed by dire consequences. The present case is notable because it proved to be an exception.

Subject: The paient was in her fourth year — a Fox Terrier bitch in good general condition.

Anamnesis: She had her first litter of four pups at the age of about 18 months. Veterinary attention was necessary and obstetrical forceps had to be employed. After that she had a litter every six months until the age of nearly four years — five litters in all — the second to the last consisting of three, four one and four pups respectively. Parturition was, according to the owner, difficult in every case, but active assistance was unnecessary after the first litter until the last birth, during which the owner had to pull on the pups to assist delivery. They were also a few days premature.

Examination: The bitch was presented at the Faculty Hospital (Out-Patients Dept.) three days after the last pup was born. She had a moderate attack of pharyngitis. A fairly large, firm body was palpated in the abdomen. It was movable and pressure on it did not cause pain.

Diagnosis: The student examining the case thought that it was a retained foetus as it certainly resembled it in shape.

It was pointed out that the characteristic soft feel of the uterus was absent. The swelling therefore was extra-uterine. At the same time it was too hard for a foetus recently escaped from the uterus. It was decided merely to label this body as a tumour (in the wide sense) with a possibility of its being a scirrhous

carcinoma, as the very hard unresilient consistency of the body was exactly that of such a neoplasm.

Laparotomy was advised and agreed to.

The operation: This "tumour" was delivered outside the abdomen through a mid-line infra-umbilical incision. It was found to be completely imprisoned by the "policeman of the abdomen" — the omentum — with some adhesion to the mesentery of the jejunum, which was separated very easily with slight haemorrhage, while the vessels in the omentum surrounding the "tumour" were systematically divided between sutures until it was completely released. It proved to be a mummified foetus, all soft tissues having gone. The uterus was then examined and an old transverse scar at the junction of cornu and corpus was found on the left side.

Discussion: It was obvious that the uterus had ruptured at the very latest six months before, but as the only time that intra-uterine instruments were used was at the first birth, it could have happened two years before. In any case, as spontaneous rupture of the uterus can take place during a difficult birth without the use of oxytocics or obstetrical instruments, the accident could have occurred at any of the first four parturitions.

It is fairly certain that the placenta must have accompanied the foetus. It was contrary to expectation to have found that total absence of uterine adhesions and only a comparatively slight attachment to the mesentery occurred, especially when the reaction that must have accompanied absorption of placenta and soft foetal tissuies is considered.

The rôle played by the extensive and ubiquitous omentum should not be underestimated in the prevention of adhesion to viscera. In spite of this and in consideration of the shock producing tear of the womb as well as the deleterious effects caused by the absorption of products of autolysis, few if any surgeons would have given any but the gravest prognosis in the absence of urgent surgical interference.

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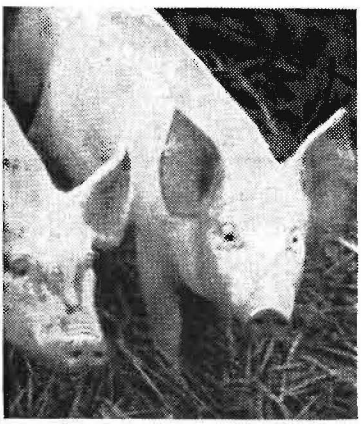

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RUPTURE OF THE BLADDER IN THE NEW-BORN FOAL AND ITS SURGICAL CORRECTION

J. L. du PLESSIS

Colesberg

During the last decade quite a number of laparotomies in the horse have been recorded in the literature. In this paper the author attempts to show that the new-born thoroughbred foal is in fact a relatively safe subject for laparotomy under field conditions. Furthermore, successful attempts at relieving the condition of ruptured bladder in the foal support his belief that in cases where there is no other way of saving the animal's life than surgical intervention, the veterinarian should indulge whole-heartedly and with determination in operative procedures. It is usually a matter of nothing to lose and everything to gain. The satisfaction derived from such a successful, last-resort operation is indeed valuable encouragement to the young practitioner.

In some 200 foalings, rupture of the bladder of the foal has been encountered five times. In all cases the foals were colts.

The condition of rupture of the bladder is relatively rare in the new-born foal. During four years' practice with approximately 200 foaling mares the condition was encountered five times. In the author's experience it occurs exclusively in colt foals.

Symptoms: The first symptoms usually appear from 24 to 36 hours after birth. There are signs of listlessness and the foal suckles half-heartedly. These symptoms become more prominent as the case progresses. Sub-acute colic, varying in intensity from case to case, is usually seen. The temperature is normal in the early stages but may fall below normal as uraemia set in. From time to time the foal attempts unsuccessfully to micturate. The penis is protruded a few inches but no urine is passed. No urine can be drawn from the bladder by catheter. In advanced cases ascites develops progressively. An aseptic needle puncture postero-lateral to the umbilicus to the left of the median plane, produces a jet of urine and confirms the diagnosis.

As far as differential diagnosis is concerned, the only other condition that should be considered is impaction of the colon with retained meconium. Exploration of the rectum with the middle finger serves to eliminate this condition. Furthermore, the posture of the straining foal in the case of retained meconium differs markedly from that in the case of rupture of the bladder. In the latter condition, the hind legs are pushed out backwards, the back and

loins are hollowed and the head lifted. When straining to void meconium, the four legs are held close together, the back arched and the tail lifted.

The prognosis is usually favourable, even in advanced cases. A successful operation was performed on a foal which was five days old and which was in advanced uraemia after showing symptoms for over three days.

The cause of the condition is uncertain. It is suggested that the rupture occurs during the act of birth, when the foetus is expelled with a full bladder.

Operation: General anaesthesia with Sagatal or Nembutal is employed successfully. From 12 to 15 c.c. usually produces sufficient depth of anaesthesia. The needle with stilette is kept in position in the jugular, in case of possible circulatory failure. If this occurs Aminophyllin Theophylline serves as a remarkably dependable stimulant. In a weakened subject 10 c.c. Aminophyllin is mixed with 12 c.c. of anaesthetic.

The foal is held in a dorso-lateral position on its left side on a table of convenient height. The mare is held as close to the foal as possible to avoid undue excitement.

The site is clipped, cleaned and disinfected in the usual manner and draped with a sterile cloth. The incision is started 1—2 inches in front of the pubis, 1 inch lateral to the prepuce and carried forward for $3\frac{1}{2}$ to 4 inches. After the skin, the aponeuroses of the external and internal oblique muscles and the rectus abdominis are incised together as they are with difficulty separable at this site. Haemorrhage is usually negligible. The peritoneum is cut with scissors and the edges of the wound held open with forceps. When the peritoneum is pierced a stream of urine gushes out. This is the crucial point in the operation because of the significant loss of body heat through the large amount of escaping urine. At this stage the circulatory state of the foal should be carefully observed. The escape of the urine can be governed according to the condition of the patient. The bladder is then examined. The rupture is usually on the dorso-lateral part of the body of the bladder. It is usually clear-cut and from half to one inch long and can be readily recognised. In one case no clear-cut rupture could be found but an area about an inch and a half in diameter next to the point where the round ligament joints the bladder, was visibly inflamed and along an indistinct half-inch line the fibres of the serous coat of the bladder were divided. It was assumed that this was the site of the incomplete rupture. A single row of Lembert sutures along the indistinct line proved to be sufficient.

The bladder is gripped with forceps half an inch away from each commissure of the rupture and pulled into the lips of the wound. No. 3/0 chromic catgut on an atraumatic needle is used to close the rupture. Starting a quarter of an inch away from the one commissure of the rupture and ending a quarter inch beyond the other, a continuous Lembert type suture is employed to approximate the edges of the rupture, taking care never to penetrate the

wall of the bladder. An additional Connell suture is used to ensure proper involution of the edges of the rupture.

At this stage three separate pints of normal saline at blood-heat are in readiness. With a sterile $\frac{3}{8}$-inch rubber tube two pints of saline are infused through the wound, being distributed extensively as possible between the loops of the intestine. After draining as much of this saline as possible, the remaining pint with two million units of crystalline penicillin dissolved in it, is infused in a similar way and left in. The peritoneum and muscular layers are stitched separately with No. 0 chromic catgut, using an ordinary continuous through-and-through stitch. The skin is closed with interrupted mattress silk sutures. The wound is dusted with a sulphanilamide mixture wound powder.

A plastic 12 in. catheter is inserted through the urethra and held in position by two superficial skin sutures through the edge of the prepuce. The catheter is removed after 24 hours.

One million units of penicillin are given intramuscularly for the next three days and the stitches removed on the tenth day. Healing is usually by first intention. In none of the cases was there any evidence of peritonitis. Within a half to one and a half hours after completion of the operation the foal usually rises and immediately starts suckling.

Jl. S.A.V.M.A. 29 (3), 1958

A CONTRIBUTION TO THE DIFFERENTIAL DIAGNOSIS OF TRAUMATIC PERICARDITIS IN CATTLE

C. F. B. HOFMEYR

Department of Surgery
Onderstepoort

RESUMÉ

A brief review is given of a few cases showing close resemblance to traumatic pericarditis — two of which were curable.

As a condition, whose differential diagnosis has some similarity to that of traumatic pericarditis and which is a precursor of the latter, namely, traumatic reticulitis, has been fully described fairly recently [Hofmeyr (1957)], the present contribution will concern itself with a few informative cases only.

Traumatic pericarditis has a grave prognosis, yet some, though not all conditions resembling it, are amenable to treatment.

Here follows a description of cases:—

Case 1: *Subject*: Aged Friesland Bull.

Anamnesis: Steady loss of condition and increasing lassitude and anorexia occurred over an extended period of time.

Examination: The animal was recumbent and refused to rise. His condition was poor and his temperature normal. Hyperpnoea with grunting was present. The pulse was weak and the heart rate over 100 p.m. Pronounced oedema of the dewlap and brisket was evident as was marked ascites. Auscultation showed lung fields fairly clear with some moist rales. Heart sounds were muffled with a systolic murmur. Percussion indicated bilateral hydrothorax and an enlarged cardiac dullness. The liver was much decreased in size. Rectal examination was negative except for confirming the ascites.

Diagnosis: Extensive and long standing abdominal visceral abscessation, with a hopeless prognosis.

Discussion: Clearly the findings of primary importance were cardiac dilatation with especially right A-V insufficiency and shrunken liver. The hepatic smallness could be due to atrophy the result of long standing malnutrition or inanition, or due to a specific poison such as amidopyrine.

The condition of the bull was not bad enough to warrant the former conclusion, while the latter could be safely excluded as preparations containing amidopyrine are used in man and dog but very seldom in cattle.

The alternative explanation of the small liver was cirrhosis — fairly common in cattle. This, again, could have been brought about by liver fluke or by chronic toxaemia from a large abscess. The myocardial degeneration could be explained in terms of specific poisoning (e.g. from Pachystigma pygmaea) or to chronic toxaemia.

The latter, being the common factor in both main pathological conditions, was most likely the right one. As no large space occupying lesion could be demonstrated on examination of the thorax, it was reasonable to expect the abscess in the abdomen, especially as surface examination showed no evidence of it.

The bull died a few days after examination. There was a large abscess between liver and diaphragm. Myocardial degeneration and right A-V insufficiency were present as well as extreme hepatic cirrhosis.

Case 2: *Subject*: A full-grown pedigreed and very valuable Jersey cow.

Anamnesis: The owner reported indefinite signs of illness a few weeks prior to examination by a veterinarian who diagnosed the case as typical traumatic pericarditis. As she was due to calve in about a month's time, the author was requested to do a pericardiotomy in an attempt to prolong her life until full term.

Examination: The temperature was normal, breathing somewhat laboured, accompanied by soft grunting, and the pulse was small and the rate well over 100 p.m. There was an extensive oedema of the dewlap and sternum, extending to the region of the umbilicus. On pinching the withers there was some slight reluctance to curve the spine ventrally. Superficial and deep palpation of the reticulum produced no discomfort. Auscultation revealed a clear lung field on the right and of all the left lung except an area between the heart and diaphragm where respiratory sounds were absent. The heart, although rapid and weak showed no unusual sounds. Percussion of the chest showed a consolidation between heart and diaphragm.

Diagnosis: Post cardiac pulmonary abscess not due to a foreign body.

Treatment: In view of the value of the animal and of the uncertainty in diagnosis, the author suggested a laparotomy at the site of rumenotomy. By introducing the hand between reticulum and diaphragm the presence of a foreign body would be felt and the abscess in the lung would be palpable through the diaphragm.

The owner agreed and the diagnosis was confirmed. It was explained to the owner that the use of antibiotics in the treatment of abscesses was, as a rule, futile, but that it occasionally happened that, where an organism is particularly sensitive, the antibiotic may induce a cold abscess to form. The treatment indicated here

was, obviously, thoracotomy with drainage of the abscess. If pulmonary and costal pleura were not adherent, however, spread of the infection in the pleural cavity and empyema were possible.

The owner elected to try the first treatment, which, if unsuccessful would be followed by the second.

Six mega units of penicillin was administered daily for nearly a fortnight. There was a very gradual improvement and eventual full clinical recovery.

Discussion: Filling of the pericardium with fluid causes great interference with the venous return from the cranial vena cava and has relatively little effect on the caudal vena cava. This causes an oedema of the dewlap and the cranial part of the brisket — the drainage area of the cranial vena cava — while oedema of the abdomen is absent unless there is a special condition present causing interference with the emptying of the caudal vena cava.

The pattern of the oedema in this case, as was immediately apparent, differed from that of traumatic pericarditis. The failure to demonstrate pain over the reticulum further weakened the suggestion of a foreign body. The absence of an enlarged cardiac percussion area finally eliminated the original diagnosis. It is clear that if an abscess compressed the caudal vena cava only, oedema of the dewlap would have been absent and swelling of the dependent parts drained by this vessel would have been in evidence.

The post cardiac consolidation suggested an abscess. The right ventricle lies latero-anterior, close to the sternum and is easily compressible compared with the left ventricle. Any pressure on the heart from the side of the diaphragm would thus compress the right ventricle against the sternum, seriously interfering with the venous return of both the major veins by causing failure of the right atrium to empty and lead to oedema from dewlap to abdomen.

Case 3: *Subject*: A Friesland calf rising one year.

Anamnesis: It was admitted to hospital with the diagnosis of traumatic pericarditis.

Examination: The temperature was normal and the pulse in neighbourhood of 140 p.m. Breathing was fast and accompanied by grunting. There was a pronounced jugular pulse and oedema of the dewlap. On auscultation the heart sounds were muffled. The left lung showed coarse râles and the right lung, in addition, some friction sounds, which could be interpreted as bronchial as they were not typical. Percussion showed some enlargement of the cardiac dullness, a fairly low fluid line in the left chest and a higher one in the right. No pain responses could be produced by pinching the withers or doing a deep palpation over the reticulum.

Diagnosis: A tentative diagnosis of right pleural empyema was made. This was confirmed by pus being demonstrated on needle puncture.

A right thoracotomy was performed, standing and under local anaesthesia, the distal 12—15 cm. of the 6th rib being resected. After draining more than 5 litres of pus the thoracic cavity was

flushed out with sterile normal saline then closed up leaving a rubber drain in place. The grunting improved rapidly and the heart rate showed appreciable improvement from day to day. At the same time the oedema of the dewlap regressed. By flushing out the chest daily with warm normal saline first and then with penicillin solution, recovery eventually took place. It is noteworthy, that whenever more than a few hundred ml of saline was infused into the right hemi-thorax, signs of distress and grunting became evident.

Professor G. C. van Drimmelen, Dept. of Bacteriology, kindly isolated the causal organism from the pus and found Bacillus pyocyaneus in pure culture.

Discussion: The right lung sounds indicated pleuritis, but as the calf had been dosed before and as foreign body bronchitis can on auscultation resemble pleuritis, this clinical finding had to be evaluated carefully, and was not necessarily in conflict with traumatic pericarditis. The oedema of the dewlap also was indicative of the latter diagnosis. Yet it was clear that there was no pain in the reticular area.

On theoretical grounds it was felt that a larger accumulation of fluid in the right chest could compress the right auricle and the cranial vena cava, so as to cause venous stasis and oedema of the dewlap. A still large amount of fluid will compress the caudal vena cava, as it is situated more dorsally than the other vessel. In the latter case oedema will, of course, show on the abdomen.

Hydropericardium hydrothorax would be a natural result of the conditions stated. A diagnosis, then, of right pleural empyema explained all the symptoms much more exactly than one of pericarditis. As the right pleural cavity was manually explored at operation, the possibility of a foreign body causing the infection was finally eliminated.

General Remarks: It has been attempted to show that a variety of conditions may be the cause of the most obvious symptom of traumatic pericarditis, viz. oedema of the dewlap and yet it is generally believed that this symptom is almost pathognomonic. The only clinical finding that has always, in the author's experience been due to foreign body pericarditis is gas in the heart sac revealing itself by a clear metallic tinkle. Even here pneumopericard *can* conceivably occur from other causes. The list of conditions responsible for swelling of the dewlap, is of course, not exhausted. Besides local causes there is acute cardiac decompensation complete with grunting, to mention only one condition that can embarrass and confuse the clinician. Yet it is heartening to find sometimes that a case, the prognosis of which at first sight appears hopeless, on being very carefully examined with an open mind, is suffering from a condition that is curable.

REFERENCES

HOFMEYR, C. F. B. (1957): The Diagnosis and Differential Diagnosis of Traumatic Reticulitis in the Cow — Jnl. A.V.M.A., 130(4), p.p. 183-186.

INTER-AFRICAN ADVISORY COMMITTEE ON EPIZOOTIC DISEASES

The Fifth Annual Session of this Committee of the Commission for Technical Co-operation in Africa (C.C.T.A.) was held at Luanda in Angola on July 21st—22nd, 1958, and was attended by representatives of Belgium, France, Portugal, the Rhodesian Federation, the Union of South Africa and the United Kingdom and the two new Member Governments of the Commission, viz. Ghana and Liberia. W.H.O., F.A.O. and O.I.E. sent observers, as also Nigeria, Bechuanaland and the United States of America.

The Union of South Africa was represented by Dr. R. A. Alexander, Director of Veterinary Services and Dr. B. C. Jansen, Senior Research Officer.

The subjects discussed ranged over many of the most important animal diseases of Africa and reports were received from several laboratories on items of interesting current research not yet published.

The final texts were approved of inter-African agreements for the control of foot-and-mouth disease and rinderpest.

The Meeting was followed by a two-day Symposium on Animal Trypanosomiasis. Communications were received on the present situation in every country in Africa South of the Sahara, in which the disease exists and discussion centred round methods of survey of tsetse incidence, new methods of suppression of fly-density and the criteria for appraisal of the trypanocidal value of new drugs.

Several delegates paid a visit to Nova Lisboa by air to visit the Veterinary Research Laboratories of Portuguese West Africa. These modern buildings are extensive and exceedingly well equipped and compare very favourably with any other veterinary research institute in Africa.

The Meetings were convened by the Inter-African Bureau for Epizootic Diseases, Muguga, Kenya. At a Meeting of the Council of Management of the Bureau held at this time also, the Council was informed that the U.K. Government had agreed to provide new enlarged premises for the Bureau at Muguga.

TRAINING COURSE ON BRUCELLOSIS

Following a recommendation by the Inter-African Advisory Committee on Epizootic Diseases, that increased attention should be given to Brucellosis in domestic animals in Africa South of the Sahara, a training course on laboratory and field technique devised to enable participants to conduct surveys on a uniform basis was

undertaken by the Commission for Technical Co-operation in Africa, the World Health Organisation and the Food and Agricultural Organisation.

The Course was held at Elisabethville in the Belgian Congo from June 16—25th, 1958, and was attended by 27 Veterinary and Medical Officers from 12 different countries, who received lectures and laboratory instruction from Dr. Kaplan (W.H.O.), Dr. Stableforth (U.K.), Dr. Renoux (Tunis) and Dr. van Drimmelin (Union of South Africa). All members of the W.H.O./F.A.O. Expert Committee on Brucellosis.

The organisation of the Course was in the hands of the Inter-African Bureau for Epizootic Diseases, Muguga, Kenya.

THIRD WORLD CONGRESS ON FERTILITY AND STERILITY

AMSTERDAM, JUNE 7 TO 9, 1959

ANNOUNCEMENT

The *Third World Congress on Fertility and Sterility,* sponsored by the International Fertility Association, will be held in *Amsterdam,* Holland, from June 7 to 13, 1959.

The general outlines of the sections of the programme will be as follows:—

1. Female sterility (Physiology of reproduction, pathology, endocrinology, clinical problems, treatment).
2. Male sterility (Physiology of reproduction, pathology, endocrinology, clinical problems, treatment).
3. Basic research and/or animal reproduction.
4. Psycho-sexual problems.

Although any original report on some phase of fertility and infertility, either clinical or in the field of the basic sciences, will be considered, definite priority will be given to those papers concerning the following subjects:

1. *Embryonic death* (Etiology, pathogenesis, placental structures in its relation to the condition of the foetus, functional problems and diagnosis of the embryonic and foetal death, and habitual abortion).

2. *Hormonal factors and vitamins in fertility and sterility* (Ovulation and sterility, induction of ovulation, influence of thyroid, steroids, etc., on ovulation, influence and physic-pathological significance of vitamins, hormones and spermatogenesis, vitamins and spermatogenesis).

3. *Relative value of the techniques for study of the endocrine functions in human sterility* (Study of the estrogen function, study

of the luteal function, study of the adeno-hypophysis function, testicular biopsy value, study " in vitro " of the fertilization of mammalian and human ovums, use of radio-isotope designers in the study of the sexual function).

4. *Biochemistry of spermatogenesis.*

5. *Psycho-sexual problems in sterility.*

Official languages: English, French, German, Spanish (with simultaneous translation).

Registration fee: full member U.S. $40.—

accompanying family-members: U.S. $15.—
after January 1st, 1959, the registration fee for full members will be U.S. $50.—.

Titles for papers should be sent not later than June, 1958, to both Dr. Alfonso Alvarez-Bravo, Avenida Horacio 1506, Mexico City 5, D.F., Mexico, chairman, and Prof. Dr. B. S. ten Berge, Academisch Ziekenhuis, Groningen, Holland, executive member of the Programme Committee.

For further information and registration apply to Dr. L. I. Swaab, Hon. Secretary Third World Congress on Fertility and Sterility, Sint Agnietenstraat 4, Amsterdam-C. or to the nearest Wagons Lits/Cook office.

TRADE EXHIBIT AT THE CONGRESS

PFIZER

The new (red coloured) Terramycin Animal Formula Soluble Powder, when used parenterally, opens to veterinarians a whole new field of economic treatment of low-value animals particularly in cases of Heartwater and Gallsickness. Whilst this material is non-sterile (hence its lower price) and its parenteral use is therefore not entirely without some hazard, it is generally agreed that this is far outweighed by the immense economic advantages of saving an animal at a comparatively low cost. Sheep and goats can now inexpensively be treated for or immunized against heartwater.

At the same time Terramycin Intramuscular continues to be the dosage form of choice for valuable animals (and when sentimental value is involved) in cases when the exceptional, time-tested, broad-spectrum control conferred by Terramycin is indicated in primary or secondary infections.

Pride of place, therefore, on the Pfizer stand continues to go to the Terramycin dosage forms which are in sufficient variety to meet all needs of economy, administration and dispensing.

Also featured is Deltacortril Intramuscular — Veterinary, which has proved to be invaluable in a wide variety of conditions where stress is a factor in both large and small animals. Alongside are two more recent Pfizer introductions for the armamentaria of South African Veterinarians. Combiotic Aqueous Suspension — in the convenient fifty-dose vial — is indicated in mixed infections which call for the marked synergistic effect of combined Penicillin and Streptomycin therapy.

Blo-trol is an unusually effective surface tension decreasing agent which brings rapid relief in frothy bloat of ruminants.

When you visit the Pfizer stand be sure to get your Terramycin tube-squeezer from the Pfizer representative. It makes the administration of Terramycin Animal Formula for Mastitis a simple, single-handed matter.

PRESS ANNOUNCEMENT

" VERSICAINE "

Maybaker (S.A.) (Pty.) Limited, announce the introduction of " VERSICAINE " brand lignocaine hydrochloride solution, which will be found suitable to secure nerve block prior to dehorning procedures in cattle and for paravertebral anaesthesia. " VERSICAINE " is more potent, quicker and longer-acting than procaine hydrochloride and side-effects and local irritation are uncommon. " VERSICAINE " is presented in 50 c.c. multi-dose bottles.

Retail price 11/9 each, subject to usual trade discounts. Obtainable from all wholesalers.

COUNCIL MATTERS

THE SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION

Minutes of the Council Meeting held at 2 p.m. on 16th June, 1958, at the Meat Board Building, Pretoria.

PRESENT: Drs. P. S. Snyman (President), H. P. Steyn, G. D. Sutton, R. du Toit, R. Clark, A. C. Kirkpatrick, S. W. J. van Rensburg, E. M. Robinson, A. F. Tarr, H. H. Curson, J. W. Pols, M. W. Henning, S. van Heerden.
Drs. R. A. Alexander and C. F. B. Hofmeyr were present for part of the deliberations.

APOLOGIES were received from Drs. P. R. Viljoen, M. C. Lambrechts and L. v. d. Heever.

I. MATTERS ARISING FROM THE MINUTES.

(a) The full-time employment of veterinarians by S.P.C.A.'s elicited further discussion. The position in Johannesburg was raised by Dr. Steyn. On a proposal by Dr. Clark it was agreed that the General Purposes Committee should obtain legal opinion on:

1. Whether it is permissible for societies registered as welfare societies to charge fees for services rendered.
2. Whether the courts would uphold a ruling by the Veterinary Board that, where a veterinarian is concerned with such practice, it constituted "Farming out" and unethical practice.
3. Whether Council will be within its rights in advising members not to apply for, nor accept such appointments.

After consideration of such counsel, the General Purposes Committee will draft communications to be directed to the Johannesburg S.P.C.A. —of which a copy would be sent to the Federal Council of the S.P.C.A.'s. Similar letters also to be sent to the People's Dispensary for Sick Animals, Johannesburg, and to the Animal Welfare Society.

It was agreed that Dr. Diesel be co-opted to assist in the deliberations of the General Purpose Committee in this matter.

(b) The President reported that the new Minister for Agriculture had not been approached to open the Congress because of information received from the office of the Secretary for Agriculture. Mr. J. G. Grobler, President of the South African Agicultural Union had been approached and had agreed to open the Congress. — Noted.

(c) ANNUAL GENERAL MEETING, 1958.

The Convenor of the Congress Committee, Dr. H. P. Steyn reported on the work done thus far.

Dr.Steyn enquired whether the Professional Provident Society could be invited to send a speaker to address members during the Congress. Agreed that this be arranged for Thursday the 28th August.

It was agreed that specific members be asked to open the discussions on the papers presented.

Dr. Alexander thought that the time had arrived that we should consider hiring or buying our own recording machine. This would facilitate the making of a record of the discussions at the Congress. — Noted.

Dr. Alexander moved that the formal dinner be omitted from the programme. Dr. Steyn seconded. — Agreed.

II. MEMBERSHIP.

(1) New Members: Drs. C. H. B. Marlow, L. Black and G. C. Steyn were proposed by Dr. Clark, seconded by Dr. R. du Toit. Agreed that the names of these candidates be submitted to the Annual General Meeting.

III. FINANCE.

The Hon. Treasurer, Dr. Sutton, laid the report of the Auditors, together with the subsidiary documents before Council for consideration. Salient features were mentioned.

(i) It was agreed that the expenditure of £124.0.0 odd, in excess of the approved amount of £200 per annum for the Journal, be approved.

(ii) The subscription to the Journal be increased from 15/- to 20/- per annum as from the beginning of the year 1959.

(iii) Articles published in the Journal should be condensed.

The Editorial Committee should vet the articles more critically and by referring articles back to authors ensure that superfluous substance be eliminated.

The Finance Committee recommended that the whole of he Prize Reserve Fund, which at present stood at £1,576.11.6 be transferred to the Benevolent Fund.

A motion by Dr. Alexander, seconded by Dr. Curson, that Dr. Thomas first be consulted before this was done, was adopted.

IV. GENERAL.

(i) Dr. Alexander announced that as from 1st August, any registered veterinarian would obtain 12½ per cent. discount on ALL vaccines obtained from Onderstepoort. The present system of deposit accounts would be abandoned. Dr. Alexander also advised that veterinarians would not be able to sell vaccines so bought, but would have to use them themselves.

As from 1st August, vaccines would also be sold to Co-operative Societies and other concerns trading in veterinary requisites. Veterinarians re-selling vaccines to farmers would require general dealers' licences and this would constitute action of which the Veterinary Board might take cognisance.

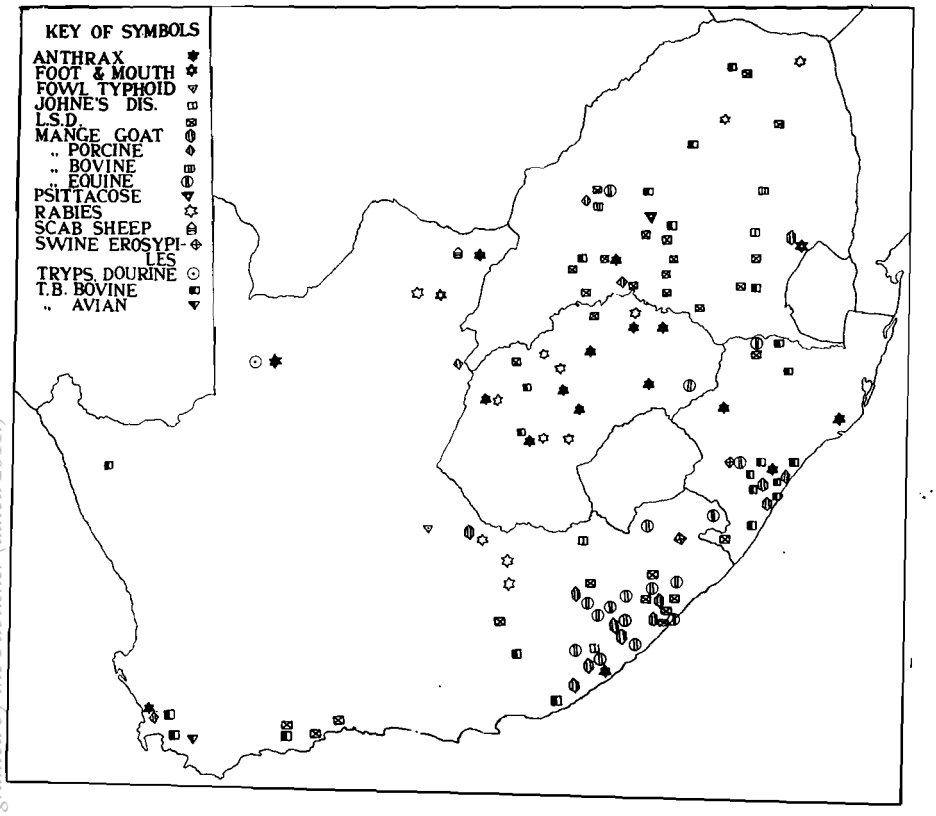
(ii) Dr. Alexander advised that he desired a discussion at the next meeting of Council on "The Relationship between the State Veterinarian and Private Practitioner". This was agreed to.

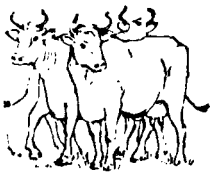
(iii) Dr. Steyn read a circular letter from the Professional Provident Society relative to a conference to be held to consider the question of taxation relief on pension fund contributions by self-employed persons.

It was agreed that Dr. Steyn attend this conference as the representative of Council, and report back to Council.

OUTBREAKS OF SCHEDULED DISEASES IN THE UNION OF SOUTH AFRICA DURING THE PERIOD 1.3.58-31.5.58.

DISEASES	*CAPE*	*NATAL*	*O.F.S.*	*TRANSVAAL*
Anthrax	(2) East London (1) Bellville (1) Gordonia (1) Mafeking	(5) L. Umfolosi (1) Klipriver (1) Ndwedwe	(2) Frankfort (2) Heilbron (1) Winburg (3) Bloemfontein (1) Bethlehem (1) Kroonstad (1) Theunissen (1) Boshof	(1) Randfontein
Foot and Mouth Disease	(1) Vryburg			(1) Barberton
Fowl Typhoid	(1) De Aar			
Johne's Disease	(1) Stutterheim			(1) Belfast
Lumpy Skin Disease	(9) George (2) Mosselbay (1) Harding (1) Riversdale (3) Ngqeleni (1) Cradock (1) Elliotdale (1) Mqanduli (1) Tsolo (2) Umtata (1) Indwe (1) Lady Grey	(1) Utrecht	(1) Hoopstad (1) Vredefort	(1) Vanderbijlpark (3) Ermelo (1) Letaba (1) Carolina (1) Randfontein (2) Bronkhorst-spruit (1) Delmas (1) Rustenburg (5) Heidelberg (1) Vereeniging (1) Nigel (1) Potchefstroom (2) Zoutpansberg (1) Ventersdorp (1) Standerton (1) Pretoria
Mange (Goat)	(1) Elliotdale (1) Peddie (4) Glen Grey (1) King Williams Town) Colesberg (3) Butterworth (2) Nqamakwe (1) Manduli	(1) Inanda (1) Camperdown (1) Umlazi		(1) Barberton
Mange (Porcine)	(1) Bellville (3) Warrenton			(1) Klerksdorp (2) Rustenburg
Mange (Bovine)				(1) Lydenburg (1) Rustenburg
Mange (Equine)	(3) Keiskamahoek (2) Libode (2) Nqamakwe (2) Tsomo (5) St. Marks (2) Mt. Fletcher (1) Umzimkulu (3) King Williams Town (1) Elliotdale (1) Engcobo (2) Kentani (1) Glen Gray (2) Umtata	(3) Lionsriver (1) Utrecht	(1) Harrismith	(1) Rustenburg
Psittacose				(1) Pretoria
Rabies	(1) Vryburg (1) Maraisburg (1) Colesberg (1) Steynsburg		(2) Boshof (1) Heilbron (1) Wesselsbron (1) Thabanchu (1) Welkom (1) Bloemfontein	(1) Pietersburg (1) Sibasa
Scab Sheep	(3) Mafeking			
Swine Erosypiles	(1) Kokstad	(1) Lionsriver		
Trypanosomiasis (Dourine)	(2) Gordonia			
Tuberculosis (Bovine)	(1) Riversdale (1) Somerset West (1) Springbok (1) Paarl (1) Bedford (1) Bathurst	(2) Pietermaritzburg (1) Camperdown (2) Durban (1) Inanda (1) Lower Tugela (4) Umzinto (1) Vryheid (2) Paulpietersburg	(1) Bulfontein (1) Bloemfontein	(2) Bronkhorst-spruit (1) Ermelo (1) Soutpansberg (1) Potgietersrust (1) Warmbad (1) Ventersdorp
Tuberculosis (Avian)	(1) Caledon	(1) New Hannover		





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Clinical Reports
Successful trials have been carried out in Australia and United Kingdom. *Austr. vet. J.* 1954, 30:209. *Vet. Rec.* 1955, 67:74.

Chloromycetin TINCTURE 10%

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An effective antihistamine, Benadryl* Parenteral often gives relief from allergic states within a few minutes following intravenous injection. With intramuscular injection or oral treatment with Benadryl Capsules, response is slightly slower. Conditions in which Benadryl is highly effective include — Bloat · Serum Sickness. Erythema. Acute moist eczema. Allergic dermatitis. Pruritis.

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Jl. S.A.V.M.A. 29 (4), 1958

THE QUALITATIVE DETERMINATION OF CASTOR BEAN (*Ricinus communis*) OIL CAKE MEAL IN ANIMAL FEEDS

B. C. JANSEN
and
J. F. W. GROSSKOPF

Onderstepoort

Incidents have occurred during recent years where castor oil cake meal, being mistaken for sunflower oil cake meal, was included in mixed animal feeds, mainly dairy meals. In the instances where this type of mixture was fed, large numbers of dairy cows were affected with the following symptoms: severe gastro-intestinal irritation, diarrhoea and colic. Inability to rise and coma preceded death.

Losses of valuable animals that can be attributed to feeds procured from dealers usually result in claims for compensation; hence the need for a reliable test to either exclude or detect the suspected toxic element.

The toxic principle of the castor plant *Ricinus communis* is a toxalbumen, ricin, which is present in a high concentration in the seeds. Since it is water soluble and insoluble in oils the ricin remains in the oil cake meal when the oil is expressed.

Considerable difficulty is experienced in detecting castor oil cake meal in a feed by visual inspection especially when the agglutination tests (ricin has blood-agglutinating properties) do not afford the required degree of specificity. In this article the detection of ricin by a serological method with absolute specificity is reported.

Materials and Methods:

Immune serum was produced in rabbits by the intravenous injection of a 0.05 per cent. solution of RICIN (MERCK) in physiological saline. Each rabbit received eight injections of 1 ml. each spaced at four days' intervals and was exsanguinated four days after the last injection. The serum was collected and stored in a refrigerator at 4°C after the addition of merthiolate to a final concentration of 1:5,000.

The method employed for the performance of the test is based on Wilson and Pringle's adaptation of the agar-plate precipitin test of Auchterlony. This gel precipitin test is a laboratory tool for the demonstration of the combining power of an antigen with its specific antibody. The antigen and antibody are allowed to

diffuse towards each other through a layer of agar and, when the reagents are present in proper concentrations, their diffusion into the agar results in the appearance of a precipitate line. The morphology of the lines formed permits detection of the identity or non-identity of any two antigens or antibodies by comparison. This point will be clearly illustrated below.

A 0.5 per cent. Davis New Zealand agar solution in 0.8 per cent. saline was prepared. After adjustment of the pH to 7.0 the solution was filtered while hot. The basins in the agar plates were of the same dimensions as and similarly spaced to those used by the above authors. A standard antigen consisting of a 2.5 per cent. solution of RICIN (MERCK) was used. After the basins in the agar plates were filled with the different reagents the dish covers were replaced and the plates incubated at a constant temperature of 30°C. No addition of reagents was made during the development of the lines. To prevent evaporation of the reagents and desiccation of the agar the dishes containing the plates were sealed in a glass jar containing a layer of 0.8 per cent. NaCl solution in its bottom. The test was read after 72 hours.

The extraction of the ricin from the material under test was done as follows: One part by weight of the finely ground material was shaken up well with a volume of 0.8 per cent. NaCl solution equivalent to four times the number of weight units of dry material e.g. 1 gram of meal plus 4 ml. of saline. After the addition of 1:1,000 toluene as preservative the flask was placed in an incubator at 37°C for 24 hours and shaken hourly except during the night. Subsequent to extraction the mixture was filtered through S and S No. 589 Black Ribbon filter paper and the filtrate was reduced to one quarter of its volume. This was effected by suspending the filtrate in Visking cellophane sausage casing in front of a running fan.

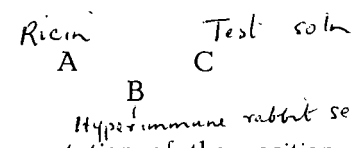
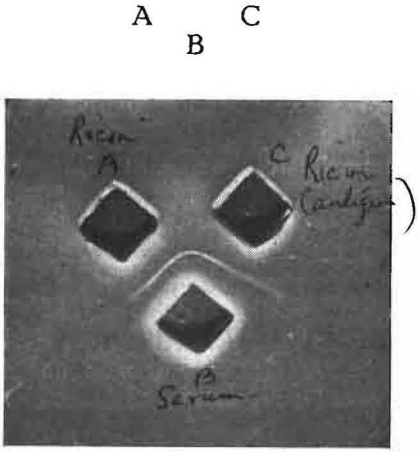


Fig. I. Schematic representation of the position of the basins in the agar plate.

Referring to fig. I, basin A was always filled with the standard antigen solution and basin B with hyperimmune rabbit serum. A single distinct precipitin line formed in the intervening section of agar without fail and the concentrations of these two reagents were such that the line formed midway between the two basins. Basin C was used for the test solution which was put up in its original concentration and at dilutions of 1:2 and 1:4 in three respective plates. When the test solution contained ricin a single precipitin line coalescing with the one between A and B formed between the basins B and C in either one or more of the three plates in which basin C contained the different concentrations of the extract.



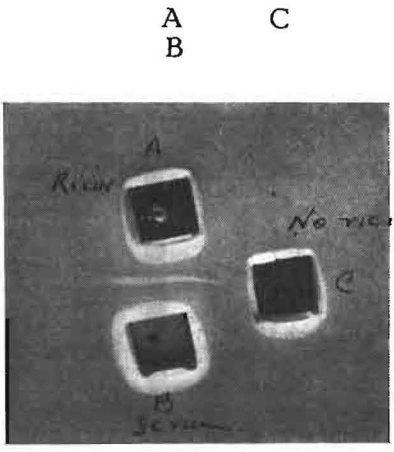


Fig. II.

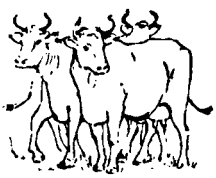
Solution in C containing Ricin. Solution in C free from Ricin.

PRODUCT	Result
Meal mixture without castor oil cake meal	Neg.
Meal mixture with 0.5% ,, ,, ,, ...	Pos.
,, ,, ,, 1.0% ,, ,, ,, ...	,,
,, ,, ,, 2.0% ,, ,, ,, ...	,,
,, ,, ,, 4.0% ,, ,, ,, ...	,,

From the above results it is evident that the gel-precipitin test can be a useful diagnostic aid in the field of toxicology in addition to its wide application in immunology.

REFERENCES

Wilson, M. W., and Pringle, B. H. (1954). Experimental studies of the Agar plate Precipitin Test of Auchterlony. Journal of Immunology 73: 232.



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A SURVEY OF BLOOD TRANSFUSION IN VETERINARY MEDICINE

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The history of blood transfusion, though interesting and important, will not be covered.

The broad field of blood transfusion in animals may be conveniently divided into the following sub-headings: Indications, the donor, collection, direct transfusion, the blood bank, infusion of blood, dosage, haemolysis, anti-coagulants, blood groups, transfusion reactions and cross-matching.

Indications:

In *dehydration* following on diarrhoea and vomiting, simple electrolyte solutions are indicated, unless there has been much protein loss in inflammatory exudate. In the latter case, and in the stage of collapse due to dehydrating conditions, infusion of plasma or serum is indicated.

Electrolyte solutions used in *shock* conditions are helpful, and may avert death. Their use, however, may be accompanied by the development of generalised oedema, albeit harmless. Large volumes must be used because of seepage from an over-porous vascular bed. Infusion of colloidal solutions is better, as correction of the plasma colloidal osmotic pressure will enable the blood-vascular system to retain the infusion fluid. Artificial colloidal solutions, so-called plasma extenders, are valuable in shock treatment. Plasma extenders should possess a pH range of 7-7.4, non-antigenic properties, colloidal particles the size of albumen molecules, a long shelf-like, and have a reasonable price. A 9-10% gelatine solution possesses these qualities, but standardisation between various batches of gelatine is difficult. Recently introduced higher polysaccharides are widely used, but plastic colloidal solutions should be avoided, on account of blockage of the reticulo-endothelial system.

The best infusion in shock is however plasma or serum — it takes twice as long to raise the blood protein of the shocked patient when whole blood is used, and the infused red cells are an unnecessary encumbrance to the recipient. The use of whole blood in shock should be restricted to cases due to haemorrhage.

Since the following conditions are accompanied by shock, infusion of plasma or serum is indicated in their treatment — burns, traumata, intoxication with some exotoxins (Cl. Welchii

Type D), simple organic poisons (oxalates and pot. cyanide) — a physiological product (histamine) and conditions equivalent to bowel obturation. (Holman).

The *pathology of shock* tends to make it progressive, at least in cases where the patient's defensive response is weak, and where treatment is unsatisfactory. The exudate lost by the blood vascular system in cases of burns and traumata is similar to plasma. The loss of fluid causes a drop in blood pressure, the extravascular plasma proteins raise the interstitial and lower the blood osmotic pressures, which encourage further loss of fluid. The blood becomes viscid, and the slow movement of the corpuscles through the capillaries damages them, whilst the attendant lowered blood blood oxygen tension also affects the capillaries. This damage to the capillaries upsets their semi-permeability causing excessive loss of fluid and protein constituents from the blood, even at sites remote from the original lesion. This pattern is sometimes aggravated by the body defensive reaction; in haemorrhagic and traumatic shock vaso-constriction occurs, as a defensive reactionary method; also the capillary damage described above is often aggravated by this reaction. Freeman (1933) thus advises against using epinephrine in these conditions — in anaphylaxis however, vasodilation occurs, and then epinephrine is useful. Adrenal cortex hormones influence, inter alia, capillary permeability, and are useful for treating shock.

What changes take place in the body, making a condition of shock irreversible? Markowitz (1954) considers anaerobic bacterial activity in the liver to be perhaps the most important in the dog. This suggestion is based on two facts. First, that dogs subjected to a course of antibiotics are more resistant to developing irreversible shock than controls, and secondly, that when dogs' livers are viviperfused with arterial blood the dogs are likewise more shock-resistant. From this it would appear that antibiotics are indicated in conjunction with blood transfusion in treating shock in the dog, so that even if the oxygen tension drops below the critical level for anaerobe inhibition, antibiotics will prevent unrestrained bacterial activity, which would cause severe liver degeneration.

A lowered red cell count may necessitate blood transfusion. in dogs, the loss of 39 c.c. of blood /Kg. body weight by haemorrhage leads to irreversible shock unless immediate transfusion is carried out. In general, the quicker the fall in blood volume or red cells, the more urgent is the new blood transfusion. The body is able to compensate to a greater extent when the loss is gradual.

Haemolysis in many protozoal diseases is often spectacular. Canine babesiosis accounts for some 12% of cases in mixed practice in the Transvaal (Thomas & Every, 1950); reports of the efficacy of blood transfusion in this condition are surprisingly absent from the literature. The red cell count may fall from nine to three mil./cmm. in equine babesiosis, Henning (1949) reports a 75%

drop in erythrocyte count in bovine babesiosis. In anaplasmosis the r.b.c. count may fall from 7 to 2.5 mil./cmm. Koger (1941) speaks highly of the benefit from transfusion of whole blood in anaplasmosis.

Icterus neonatorum often occurs in the horse; it has been reported in the mule, piglet, and has been produced artificially in the piglet and in puppies. Replacement transfusion is the best curative treatment; it should be practised in foals when the erythrocyte count falls below 4 mil./cmm.

Severe anaemia occurs in ovine haemonchosis and canine ankylostomiasis; Bild (1953) describes the efficiency of blood transfusion in the latter. Secondary anaemias, as occur in many acute and chronic infectious diseases, in neoplastic diseases, chronic nephritis, hepatic cirrhosis, gastro-intestinal diseases and chronic poisoning with lead, arsenic and phosphorus are also indications for blood transfusion. Pernicious anaemia does not occur in animals but sprue-like macrocytic anaemias, responding to vitamin B_{12} have been described. Much interesting work has been done on marrow transfusion in cases of bone marrow disease, e.g. following radiation exposure.

Milks (1949) suggests replacement transfusion in carbon monoxide poisoning.

The average longevity of erythrocytes in the dog is 124 days. Leucocytes infused into leucopenic cats lasted around 16 hours.

Serum and plasma infusions are indicated *in cachexia* from a nutritional standpoint. *Antibodies* in serum and plasma are useful in viral and bacterial diseases. Calves deprived of colostral antibodies should have dams' serum or plasma orally (in the first 24 hours, or parenterally.

Blood transfusion is useful in various cases of *delayed clotting*. Platelets in freshly drawn blood will shorten clotting time in equine purpura haemorrhagica. The lowered prothrombin levels in the blood in sweet clover disease can be raised dramatically by transfusing defibrinated blood, freshly collected from a normal animal. Dicumarin can also be counteracted by the use of vitamin K, and is a useful treatment for sweet clover disease. Field, Rickard and Hutt (1946) have described a family of dogs showing haemophilia, apparently a thromboplastic substance is lacking in this disease, which would suggest blood transfusion as a treatment.

The British Pharmacopoeia lists the products derived from whole human blood as follows (their indications are given in parenthesis) — concentrated red blood corpuscles (various anaemias), liquid and dried plasma, liquid and dried serum (shock and burns), fibrinogen (locally in tissue grafts and systematically in haemophilia), fibrin foam (locally in conjunction with thrombin as a haemostatic). To these may be added, to complete the summary, albumin (for nutritional and fluid dynamic reasons), and globulin (the antibody bearing fraction, for infections).

Donors:

Canine donors should be two or more years old, and can safely donate 2-3% of their body weight in blood, but 4.5% may prove fatal. Dogs kept in clinics as permanent donors must be fed a high protein and haematinic diet; the practice is questionable on humanitarian grounds, and from the fact that a single operation may require the weekly harvest of three large donors (Hays and Dorsey, 1953). Dogs submitted for euthanasia are often sufficiently healthy to donate blood, and most owners permit this when the harvesting procedure is explained. Dogs destroyed by veterinarians on behalf of welfare or municipal organisations make a satisfactory source of supply. The writer had several clients volunteer the use of their pets for periodic donations. Donors must be healthy.

In bovine work try always to use a donor on the same farm. Apart from possibly transmitting bacterial or protozoal diseases, sufficient antibodies may be transfused to cause a positive tuberculin reaction in an otherwise negative reactor. Adult cattle and horses can safely donate four litres of blood — when eight litres are drawn from a 1,000 lb. horse, it begins sweating and shows weakness (Jansen). The same amount may be drawn off four days later, but an extended lay-off should then follow.

Collection:

Strict asepsis is essential.

Contamination is lessened by using a "closed circuit" — obtained by joining the bleeding needle to the collecting vial by tubing. Trouble from clotting is reduced by heparinizing donors, using silicone lined apparatus, rinsing apparatus with anticoagulant, using a large bore needle, and short connecting tubing, and by using evacuated collecting vials. The latter are available commercially, or prepared by sealing whilst still hot after sterilizing; by use of a plunger pump, an enema bulb or by utilizing the negative pressure of a milking machine.

General anaesthesia of canine donors may be deep, light or unnecessary. Barbiturates are most often used, being virtually cleared from the blood stream in five minutes, by which time the left chest wall is prepared for aseptic heart puncture. A skin incision or use of a short thick guide needle will assist asepsis, and prevent needle blockage with a skin plug.

The needle is inserted medial to the tip of the olecranon, i.e. the site of greatest palpable intensity of the beating ventricle. The needle is thrust into the left ventricle with a jab, with the bevel opening towards the bicuspid valve. The jugular vein is also a satisfactory site for bleeding dogs.

Sheep may be bled from the jugular vein quite readily — some however prefer the intracardial technique, because the site (fourth intercostal space) is more easily cleansed and they considered the jugular vein small and difficult to steady.

The external jugular is tapped for bleeding the horse and cow — define the vein by using a bleeding rope, and bend the

head away from the operator to provide a convexity at the puncture site. Local anaesthesia and perhaps skin incision over the vein are advisable. A large needle or canula preferably with the i.v. part fenestrated will give a rapid flow and preclude coagulation.

Parturition coveralls should be worn.

Schalm (1956) describes bovine blood collection in the slaughter-house. The neck of a stunned animal is swabbed with 70% alcohol, and incised. The first gush of blood is allowed to escape, and then clean buckets containing anticoagulant are filled. Transfer immediately to half or one gallon jars, and add 1 mil. i.u. crystalline penicillin and 1 gm. streptomycin to each gallon. This may be stored at 4—6°C. up to four or five days.

Carle and Dewhirst (1942) describe blood collection in pigs, and Baker (1951) describes bleeding mink and ferrets.

DIRECT TRANSFUSION — has been less efficient in the writer's hands than the indirect technique. Direct transfusion in large animals is described. A Shikles syringe and glass surfaced rubber tubing are used (wide bore polythene tubing suggests itself as an alternative for the latter). Direct transfusion is technically more difficult, but no more helpful than citrated blood.

Any veterinarian with a refrigerator can run a blood bank. Collecting blood before an emergency transfusion may cause a fatal delay. Blood is stored routinely up to 21 days in human and small animal medicine; bovine blood has been banked 5—7 days. After storing whole blood 48 or more hours the plasma may be aspirated by closed circuit technique (this is usually done at the limit of storage time), and stored for two years at 42—44°F., or indefinitely in the frozen state.

Labels on stored blood in the bank should be of distinctive colour for each species and should show collection and expiry dates, volumes of blood, diluent, the collector's name and a note warning that haemolysed blood should be discarded. Once banked, blood must be kept cold — not more than half an hour should be allowed for cross-matching and transport once it is out of the cooler. If a transfusion is stopped or delayed for one hour, the blood must be discarded. Plastic bags will possibly replace bottles to holding blood.

INFUSION OF BLOOD:

Invert the blood container gently to suspend the cells evenly, but avoid warming chilled blood; use it cold. Blood may be administered by various routes—

Orally — to supply the very young with antibodies.

Subcutaneously — suitable for cachexia and other chronic conditions.

Intravenously — the most common route.

Intraperitoneally — no untoward reaction, red cells are absorbed intact. It may save cutting down onto a vein, and transfusion reactions are minimized, but a rise in blood pressure

is delayed too long to allay shock — it is especially useful in children.

Intra-arterially — compared to the i.v. administration, it is more difficult, but the blood pressure is raised faster and with less blood, the coronary bed is more rapidly perfused, urine flow starts sooner, and large volumes may be administered safely. Use the femoral artery of dogs.

Intramedullarily — from here, material injected reaches the heart in 10 seconds — it is satisfactory in young animals. A canula is introduced into the trochanteric fossa after perforating the bone with a Skipman pin and Kirchner chuck. Absorption is around 1 drop/sec., and the method is well tolerated.

Kingma's (1950) continuous fluid infusion technique may be used — Roberts and Dye (1951) and Wion (1951) have shown how this may be modified for large animal infusions.

For replacement transfusion, necessary in icterus neonatorum, blood may first be infused, and the animal then bled; a simultaneous two vessel exsanguination transfusion technique may be used, or Cronin's special four-way tap may be used.

One veterinarian can manipulate the tap and, with successive pumping movements of a 20 c.c. syringe, inject donor's blood, aspirate patient's blood, eject patient's blood to waste and reload with donor's blood.

By means of a carefully controlled two vessel exchange technique, Philipsborn et al (1956) changed the blood of a puppy twice in five minutes.

DOSAGE OR VOLUME TRANSFUSED:

This may be based upon the haemoglobin value, which should be raised to 75% of the normal. *Example* : Blood volume of dogs is around 40 c.c./lb. A 40 lb. dog with an hb. value of 6.5 gm/100 c.c. blood (i.e. 50% normal) would need

$$40 \times 40 \times \frac{25}{100} = 400 \text{ c.c.}$$

Haemoglobin values are readily determined.

Accurate measurement of haemorrhage during operations will determine blood dosage.

When the hb. criterion is inappropriate, transfuse blood serum or plasma to effect — i.e., until the extremities become warm, the pulse full, the mucous membranes coloured and when superficial veins rapidly refill after being milked out (Archibald).

Bild suggests a maximum of 8 c.c. blood per pound in one transfusion, at the rate of 60 drops/min., although 2,500 c.c. blood was transfused into a dog during one operation. Another " heroic " transfusion was given to a woman, when 35 pints of blood were administered during a 6½ hour operation. The usual efficient dose in cattle is around one gallon of blood per 500 lbs. body weight (Christensen) at the rate of 100 c.c. per minute. In icteric foals

the average volume exchanged is about 2 litres or up to 5 litres over about 1½—3 hours.

HAEMOLYSIS:

Haemolysed blood is unsuitable for transfusion. It may be caused by excessive shaking, temperature changes, hypotonic solutions, and such chemicals as soaps and alcohol. Bacterial contamination causes haemolysis, although coliform organisms can thrive at the storage temperature without causing haemolysis.

ANTICOAGULANTS:

Sodium citrate is the usual anticoagulant — 1 part of a 2.5% solution to 9 parts blood, is used. Dextrose inhibits haemolysis in stored blood, and to prevent this caramelizing during sterilizing, citric acid is added. These together with sod. cit. are called ACD, with the following formula:

Sod. cit.	*citric acid*	*dextrose*	*Water for injection*
1.6 gm.	0.56 gm.	1.5 gm.	75 c.c.

this quantity will keep 500 c.c. of blood for three weeks under refrigeration (B.V.C.). Sodium citrate is rapidly oxidised in vivo, and Archibald considers it clinically safe. Others consider it hazardous. Soluble calcium salts and procaine injected intravenously elsewhere avert possible myocardial irritability. Citrated transfusions injected intra-arterially do not embarrass the myocardium as the citrate is oxidised in the peripheral circulation.

BLOOD GROUPS:

For transfusions in dogs blood groups are considered of negligible moment by some and rarely of importance but of considerable importance by others. Five groups are described, A-through E, with A being of considerable agglutinative importance.

In horses and cattle isohaemagglutinins are of no practical importance. On balance it appears that for clinical purposes animals do not possess groups akin to the classical A, B and O groups of man, but rather Rh-like groups. In other words a first transfusion without previously cross-matching is not dangerous. About 10 days after a first transfusion of incompatible blood further transfusion may cause transfusion reaction.

SYMPTOMS OF TRANSFUSION REACTIONS:

These are mainly due to agglutination of donors' cells, their intensity depends upon the rate at which this occurs. Agglutinated cells may cause emboli whereupon symptoms will vary with the site of arrest. If the donor's cells (Haemolysis follows quickly) are agglutinated within one hour, symptoms are haemoglobinaemia, haemoglobinuria, fever, emesis, incontinence, tremors, hives and transient prostration (Young et al). If this occurs, cease transfusion immediately, since anaphylactic or haemolytic shock may follow (Archibald). Horses manifest uneasiness and defaecation,

and pulse and respiration rise to 80—100 and 40 per minute respectively. Excessive haemorrhage may follow incompatible transfusion.

By adding a 10% solution of sodium salicylate to blood before transfusion, Herman was able to prevent transfusion reactions of incompatible blood in dogs and horses, and even prevent reaction in heterologous transfusions. Adding an antihistaminic substance to blood will also reduce or eliminate transfusion reactions (Ferris et al), 1952.

CROSS-MATCHING:

Hollis (1952) suggests that testing the donor's red cells against the recipient's serum is sufficient safeguard. Young et al (1952) describe a laboratory technique; in this packed cells of donor and recipient are added to the other's serum, in the proportion of 1:20. Agglutination and/or haemolysis indicate incompatibility. In the field, add one drop of donor's blood to 3 c.c. N-Saline: mix one drop of this with one drop of recipient's serum on a slide. Significant agglutinins are absent if clumping is not observed. In the presence of Dextran, rouleau formation may occur, and make typing interpretation difficult.

Baker, G. A., and Gorham, J. R. (1951). "A Technique for Bleeding Ferrets and Mink." Cornell Vet., Vol. 41, p. 235.

Bild, C. E. (1953). "Blood Transfusion in Dogs." Vet. Med., 48, 413-416.

Carle, B. N., and Dewhirst, W. H. "A method for Bleeding Swine." J.A.V.M.A., 101, 495-496.

Field, R. A., Rickard, C. G. and Hutt, F. B. (1946). Cornell Vet., 36, 285.

Freeman, N. E. (1933). "Decrease in blood volume after prolonged Hyperactivity of Sympathetic Nervous Syst." Am. Jn. Physio., ciii, 185.

Hayes, F. A. and Dorsey, N. S. (1953). "Radical Amputation of scapula and limb." Vet. Med., 48, 387-388.

Hollis, R. H. (1952). Fluids, Blood and Plasma Therapy in Veterinary Medicine. N. Am. Vet., 33, 317-323.

Kingma, F. J. (1950). "A Technique for the slow infusion of Fluids." J.A.V.M.A., 117, p. 403.

Koger, R. B. (1941) Whole blood in Treat of Anaplasmosis." Vet. Med., 36. 316-318.

Markowitz, J., Archibald, J. and Downie, H. G. (1954). "Experimental Surgery." 3rd Ed. The Williams and Wilkins Co.

Milks, H. J. (1949). Practical Vet. Pharm., Mat. Med. & Theurapeutics Bailliere, Tindall and Cox.

Philipsborn, H., Miller, A. and Traisman, H. S. (1956). "The effect of Simulated Exchange Transfusions in Puppies." Illinois Jnl. Pediat., 49, 67-74.

Roberts, S. J. and Dye, J. A. (1951). "The treatment of Acetonaemia in cattle by Continuous Intravenous Inj. of Glucose." Corn. Vet., 41 (1951), 3-10.

Schalm, O. W. (1946). "Diseases of Cattle," Fifty-seven Authors. American Veterinary Publications, Evaston, Illinois, 380.

Thomas, A. D. and Every, R. (1950). Jnl. S.A.V.M.A., 21, 35.

Young, L. E., O'Brien, W. A., Swisher, S. N., Miller, G., Yuile; C. L. (1952). "Blood Groups in Dogs." Their significance to the Veterinarian. Am. Jnl. V. Res., 13, 207-213.

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'N PRAKTIESE SUKSESVOLLE TEGNIEK VIR DIE TRANSFUSIE VAN BLOED BY BEESTE

Dr. P. J. SCHUTTE
Pretoria

Met hierdie voordrag wil ek aan u 'n praktiese tegniek verduidelik wat ek met suksesvolle resultate gebruik by die transfusie van bloed by beeste. Met geringe veranderinge kan dit ook by die ander huisdiere toegepas word in gevalle waar die toediening van bloed dikwels die verskil tussen lewe en dood beteken.

Daar is verskeie indikasies vir 'n bloedtransfusie, bv. anemie as gevolg van anaplasmose en piroplasmose, anemie as gevolg van 'n idiopatiese algemene hemorragiese diatese. Verder kan dit toegepas word in gevalle van algemene verswakking as gevolg van toksiese toestande soos metritis of gastro-enteritis of as gevolg van ernstige bloedverlies.

Die hele prosedure is maklik en gou om uit te voer — dit duur ongeveer 'n uur tot 'n uur en 'n kwart vir die skenk en ontvangs van een en 'n half gelling bloed en die resultate is uitstekend. Ongeveer vyf-en-sewentig persent van gevalle waar die dood volgens my mening sou ingetree het, het geleef nadat hierdie diere bloed ontvang het. In geen geval kon die dood toegeskryf word aan 'n reaksie tussen moontlik bestaande verskillende bloedgroepe of aan skok as gevolg van onttrekking van so 'n hoeveelheid bloed van 'n skenker of aan die toediening daarvan aan 'n ontvanger nie. In 'n reeks van twaalf transfusies was daar drie noodlottige gevalle. Die dood was te wyte aan:—

'n Septiese metritis gelyktydig met anaplasmose: Een geval.
Embolisme of apopleksie: Een geval.
Maag- en derm-impaksie: Een geval.

Nieteenstaande hierdie laasgenoemde geval blyk dit dat die toediening van bloed aansienlik bydra tot die herstel van peristaltiese bewegings. Dit vergemaklik die behandeling vvan 'n verstopte en atoniese maagdermkanaal in gevalle van anaplasmose.

Dit is belangrik om daarop te let dat in gevalle waar 'n bloedtransfusie aangewese is, die dier se hart gewoonlik baie swak is. In een uiterste geval het 'n bul beswyk as gevolg van die bedwang wat toegepas was nog voordat die transfusie begin het. Die dood was waarskynlik te wyte aan te hoë eise wat aan die gedegenereerde hartspier gestel was. Dien dus in swak diere 'n analeptikum toe voordat u met die transfusie begin. Goeie resultate word behaal met een van die volgende:—

(a) 90 mgm, Methedrine, (B.W.) i.m. of
(b) 3—4 cc adrenalien 1—1000 i.v. of s.k.

Ter voorbereiding vir 'n transfusie word drie bottels wat elk 10 onse stolwerende oplossing bevat vir 20 minute gesteriliseer onder 'n druk van twintig pond per vierkante duim, d.w.s. by 'n temperatuur van tweehonderd nege-en-vyftig grade Fahrenheit. Elke bottel het 'n kapasiteit van tagtig onse, d.w.s. 'n halwe gelling en dit moet verkieslik voorsien wees van 'n nou opening van 0.8 dm. 'n Groot opening kan moontlik die transfusie-apparaat wat daarvoor geplaas moet word laat skeur.

Verhoed dat die bottels bars as gevolg van 'n skielike verandering van temperatuur deur sorg te dra dat die sterilisator koud is wanneer die bottels daarin geplaas word en dat dit na sterilisasie toegelaat word om sonder die vrylating van stoom vanself af te koel tot by kamertemperatuur. Steriliseer rubberproppe of ebonietskroefproppe saam met die bottels en plaas dit in posisie voordat laasgenoemde uit die sterilisator verwyder word.

Die stolwerende middel bestaan uit:—

Natrium sitraat ʒIV.
Natrium Chloried grs. XXXIJ.
Aq ad ℥VIIJ.

Dan word die nodige instrumente in 'n sterilisasie drommetjie geplaas en vir dieselfde tyd en onder dieselfde temperatuur gesteriliseer. Die instrumente wat gebruik word is die volgende:—

(a) Opereermes.
(b) Tien cc. spuit met dun buigbare naald 3½ dm. lank.
(c) Trokar en kanule nagenoeg ¼ dm. in deursnit en 3½ dm. lank. (Dit is die grootste lid van die „Universal Trocar" bestaande uit vier lede van verskillende groottes).
(d) Twee „Mayo Cloth Forceps."
(e) Naaldhouer.
(f) Twee krom snynaalde met Dermalon.
(g) Watte.
(h) Skêr.
(i) „Simplex" transfusie-apparaat.

In laasgenoemde se buis word 'n glasbuisie ¼ dm. x 3 dm. ingevoeg en die metaal verbinding vir die gebruiklike naald verwyder. Die „Simplex" transfusie-apparaat moet toegedraai wees in 'n doek anders sal dit weens die hoë temperatuur aan die metaal van die sterilisasiedrom vaskleef.

Hierdie drommetjie met steriele instrumente asook die drie gesteriliseerde bloedbottels word nou gebêre tot dit benodig word.

Die sterilisator wat gebruik word is van die drukkoker-tipe, dog ontwerp en vervaardig spesiaal vir sterilisasie-doeleindes. Dit is verkrygbaar van enige handelaar in mediese instrumente en heet: „The All American Portable Pressure Sterilizer."

Die kapitale uitgawe vir bogenoemde apparaat is as volg:—

Sterilisator	£13	10	0
Elektriese kookplaat	5	17	6
Sterilisasie-drommetjie	3	15	0
Operreermes		8	6
„Mayo Forceps"	1	12	6
Spuit en naald		15	6
Trocar en Kanule	2	2	0
Naaldhouer	1	10	0
Snynaald en Dermalon		1	0
Skêr	1	1	0
„Simplex" transfusie-apparaat		7	6
Totaal	£32	0	6

Neem egter in ag dat een transfusie per veertien dae gedoen word, wat uiters konserwatief gereken is, dan beteken dit vyf-en-twintig transfusies per jaar.

Onthou verder dat al hierdie instrumente vir ander doeleindes gebruik word en u sal met my saamstem dat dit nie alleen finansieel voordelig is nie maar ook die reputasie van die veearts en sy praktyk bevorder.

Wanneer 'n bloedtransfusie aangewese is, word verkieslik 'n mak skenker benodig. Bedwing laasgenoemde d.m.v. 'n neustang en lig hiermee die kop op en draai dit effens na links wanneer die tapping van die regterkant af gaan plaasvind of omgekeerd. Trek 'n riem voor die skouers om die nek vas en skeer met 'n krom skêr 'n area 3 dm. x 4 dm. oor die boonste derde van die nou prominente V. jugularis. Was dit met seep en water en ontsmet dit met alkohol. Infiltreer die onderhuidse weefsel in die area met 10—20 cc. 2% Prokaïen-oplossing sonder adrenalien. Behalwe die verdowende effek van die Prokaïen word die spiervesels in die wand van die V. jugularis verlam sodat vasokonstriksie as gevolg van die steek van die trokar nie die prosedure bemoeilik nie. Maak na tien minute 'n een-duim-lange velsnit oor, en in dieselfde rigting as die aar. Plaas die trokar se punt in die wond en hou dit met 'n hoek van 20—30" van die vel. Druk dit nou in 'n distale rigting in die aar in. Wanneer die trokar verwyder word bly die kanule agter en 'n straal bloed vloei daardeur.

Skud elke bottel voordat en terwyl dit gevul word sodat die stolwerende oplossing die binneste wande van die glas benat en met die bloed meng. Sodoende sal die bloed verhoed word om te stol. Die bottels word tot aan die opening gevul deur bloed te laat inloop totdat dit skuim klaar uitgeloop het en helder bloed by die bottel se opening verskyn. Beëindig die tapping deur eers die riem te laat skiet, die kanule te verwyder en die velrande met die vingers teenmekaar te druk sodat die binneste oppervlaktes van die vel teenmekaar is. Wend dan die „Mayo Cloth Forceps" in die posisie aan. Wanneer die twee klemme na 'n paar minute

versigtig verwyder word kan 'n paar steke ingesit word indien die wond bloei. Indien primêre bloeding nie plaasvind nie is die kanse van wederkerende en/of sekondêre bloeding gering. Bestrooi die wond met D.D.T.-poeier teneinde vlieë weg te hou en laat die dier los.

Die belangrikste nâ-effekte wat 'n skenker mag ondervind is dorstigheid en 'n wankelende tred as gevolg van die skielike onttrekking van hierdie volume bloed, dog dit duur selde langer as 'n paar minute en is van geen noemenswaardige praktiese belang nie. Behandeling teen skok was selfs nie nodig wanneer 'n betreklike klein Jersey-koei een en 'n half gelling bloed geskenk het nie. Verder ondervind skenkers geen of baie min daling in melkproduksie.

Bedwing die ontvanger nou op dieselfde manier as die skenker, met die verskil dat die transfusie makliker van die linkerkant van die dier af plaasvind dan van die regterkant af en dus sal die kop na bo en regs gebring moet word. Indien die dier lê word die nek gebuig deur die kop effens na agter te trek. Trek die riem styf om die nek en skeer, ontsmet en infiltreer die area op dieselfde wyse as by die skenker.

Plaas nou die „Simplex" transfusie-apparaat in posisie oor die bottel-opening en laat alle lug uit die stelsel deur die bottel om te keer en 'n hoeveelheid bloed te laat uitvloei. Sluit die buis en hou die bottel en buis in die posisie.

Span die vel met die duim en vingers van die linkerhand en maak 'n snit oor die aar. Druk die trokar en kanule in 'n proksimale rigting in die aar in en laat die riem skiet wanneer die bloed uitvloei. Verbind die buis met die kanule en laat die bloed invloei. As alternatief kan van 'n dik naald gebruik gemaak word. Sodoende word die velsnit uitgeskakel en die spoed van toediening beperk.

Sluit die buis wanneer die bloedhoogte die opening van die bottel bereik. Verwyder die leë bottel en terwyl die vol bottel enigsins skeef gehou word, word die transfusie-apparaat oor die bottel se nek in posisie geplaas. Keer die bottel onderstebo en open die buis. Op hierdie wyse word die bottels maklik, met die geringste tydverlies en met die uitskakeling van lugembolisme omgeruil.

Indien nodig word bykomende terapeutiese middels soos bv. Gonacrine, dimidiumbromied, yster-, vitamien- en lewerinspuitings op hierdie stadium in die transfusie-buis gespuit. Sodoende bereik dit dan die bloedstroom.

Verwyder ten laaste die kanule en sluit en behandel die wond op dieselfde wyse as by die skenker.

Ter afsluiting kan die volgende gevalle gemeld word as voorbeelde van die sukses wat deur die toediening van bloed behaal is:—

(1) Een en 'n half gelling bloed was geskenk aan 'n koei wat gely het aan piroplasmose. Sy kon weens swakheid nie meer opstaan nie en het 'n subnormale liggaamstemperatuur en geweldige anemie en geelsug gehad. Een uur nadat sy bloed ontvang het

het sy opgestaan, kort daarna begin vreet en daarvandaan geleidelik herstel totdat sy heeltemal normaal was.

(2) 'n Bees met gevorderde anaplasmose was absoluut gedehidreer, sy kon nie opstaan en het vir 'n paar dae niks gevreet nie. Sy het 'n subnormale liggaamstemperatuur, geweldige anemie, geelsug en atonie en verstopping van die maagdermkanaal getoon. Sy het een en 'n half gelling bloed ontvang, direk daarna gemis, kort daarna opgestaan en 'n toenemende mate van herstel getoon tot sy volle gesondheid bereik het.

(3) 'n Geval van anemie as gevolg van hemorragiese diatese van onbekende oorsprong was so swak dat met die hanteer van die dier ter voorbereiding vir die transfusie algehele kollaps plaasgevind het. Die korneale refleks was alreeds afwesig dog met die intraveneuse toediening van adrenalien tesame met een gelling bloed het sy sodanig herstel dat sy binne twee uur water gedrink en meel gevreet het. Sy is egter 'n paar uur later skielik dood vermoedelik as gevolg van embolisme of apopleksie.

Met ander minder ernstige gevalle is soortgelyke dramatiese resultate behaal. By al hierdie gevalle het die toediening van geskikte tonika aptyt aangewakker, bloedvorming gestimuleer en herstel bevorder.

DISCUSSION

Dr. D. H. G. Irwin's comments on his paper

I was often at a loss about theoretical information when doing blood transfusion in practice, and when I arrived at Onderstepoort, spent some weeks off and on in the library and directed this reading along the lines of blood transfusion.

For purposes of discussion I have created about eight sub-headings. One could easily talk interestingly for an hour on each of these. I will mention one or two points out of each sub-heading only (which do not appear on the roneod forms) omitting the actual transfusion which will be covered by Dr. Schutte.

History: Blood transfusion was used especially after 1620 when Harvey described the blood circulation. Blood transfusion was used when warriors had lost blood in battle. One such warrior died after his 3rd transfusion with sheep blood — obviously as we now know, from hetero-haemagglutination.

Indications: Widest field occurs in shock. Markowitz has shown that when dogs' livers are viviperfused with arterial blood, they are more resistant to irreversible shock than are controls.

Also Frank Seligman & Fine have shown that premedication with antibiotics causes increased resistance to development of irreversible shock.

These facts are explained thus:

(a) Anaerobes present normally in dogs' livers are prevented from multiplying by
    (a) increased 0_2 tension or
    (b) antibiotics.

Donors: In bovines. Use donor from the same farm lest diseases are introduced from elsewhere.

Blood from a T.B. reactor may cause an intradermal reaction in an otherwise T.B. negative recipient. (Dr. Jansen, Onderstepoort op. cit.) Protozoal diseases must be anticipated in recipients.

Collection: Sheep and Dog. Intracardial puncture is rewarding for collection under anaesthesia. Barbiturates are cleared from the blood of an anaesthetized animal within about 5 minutes.

Blood Bank: In most practices in slack moments blood may be collected for the blood bank. Blood is cheap and versatile. It keeps for 3 weeks and thereafter serum may be aspirated. Serum aspiration is satisfactory any time after 48 hours.

Labels: Care is necessary; use distinctive colour for each species.

Dose: A mathematical formula exists, suitable for anaemias.

Assume: (i) In dogs 13 gm% haemoglobin is normal; (ii) 40 c.c. per lb. dogs' weight. Raise Hb. value to 25% of normal. A 10 lb. dog will normally have 1,600 c.c. blood; if his Hb. is 25% of normal the formula is:

$$\frac{40 \times 40}{2} = \frac{1{,}600}{2} = 800 \text{ c.c. blood.}$$

Dose for cattle is about $\frac{1}{2}$ gallon of blood per 500 lbs.

In humans the average dose is about 1 pint.

In one case 35 pints of blood were infused into a woman over $6\frac{1}{4}$ hours.

Dosage scales of blood and serum are thus only a guide, and circumstances determine the amount.

Infusion Routes:

i.v. intravenous used most often.

i. art. intravenous route precludes Bainbridge reflex, and myocardial embarrassment from the Na citrate ions, allowing rapid infusion.

i.p. intravenous route. The author inadvertently injected blood into the rectum (using the rt. flank approach). This route has much to commend it.

Subcutaneous antibody content, cachexias, anaemias. Intramedullarily. Drips may be run for long periods without resentment from the dog. Rate is about 1 drop per second.

Anticoagulants: Na citrate used most often. Dextrose (to prevent haemolysis) and citric acid (to prevent dextrose caramelizing).

Groups: By some their importance is over emphasized, and by others disregarded too blatantly. In general, a first transfusion is not dangerous, in fact, many blood banks in North America routinely disregard groups in small animals. Young et al are at variance. Incompatible blood may, in the absence of immediate transfusion reaction, cause antibody formation during the week following transfusion, resulting in slow agglutination and/or haemolysis. Thus an animal may respond to transfusion, only to backslide after about a week or ten days.

QUESTIONS INVITED.

Dr. Schutte: Net die praktiese toepassing sal bespreek word. Die indikasies is wel bekend. My ondervinding is grotendeels by beeste met rooiwater en galsiekte. Bloed is die enigste hulpmiddel in gevorderde gevalle; dis selfs 'n doeltreffende geneesmiddel. Voorbeeld van gevorderde gevalle van galsiekte is genoem, en die wonderlike resultate wat bloed teweeggebring het, is voorgelê.

Die oortapping self: Dit is baie maklik. Merk op die belangrikheid van asepsis.

Geen moeilikheid in verband met bloedgroepe is raakgeloop nie.

Die cardiovascular stelsel moet deur die toediening van 'n analepticum beskut word. Voorbeeld is genoem. Gebruik nog voor die tyd; adrenaline of effedrien is hulpsaam. Olieagtige preparate is verkieslik bo oplossings.

Ten slotte, die byvoeging van glikose tot die transfusie vloeistof; die rooibloedselle word op die manier met hulle metabolisme gehelp.

Dr. Malherbe: Comment:

$$\frac{40}{100} \times \text{body weight in lbs. is the number of c.c. of blood}$$

required to raise Hb. 1%.

Request: Fluid replacement is a complicated subject and I would like you to spend 5 minutes giving us some information.

Dr. Uys: Ek word herinner aan 'n geval van anaplasmose. Die dier was swak maar nie baie siek nie. 3 gelling bloed was by die slagpale versamel in sitraat en toegedien. Goeie verbetering was vir twee dae gehandhaaf, gevolg deur verswakking. 'n Tweede transfusie was toegedien maar nadat 1 pint ingespuit was, het die koei skielik doodgegaan. Die vena jugularis het groot uitgestaan soos by 'n geval van gevorderde perikarditis vreemde liggaam.

Kan dr. Schutte dit verklaar asb.

Dr. Osterhoff: First school of thought says indiscriminate transfusions can be done.

A second school holds that the G. faktor kan gevaarlik wees.

Again, a third, in Europe, e.g. the Hannover School, "Bloed transfusie mag glad nie gedoen word nie." Hulle raai serum aan wat gemeng is en van omtrent 10 verskillende beeste afkomstig is.

Kan die spreker asb. oor die stigting van 'n plasma bank i.p.v. 'n bloedbank gesels.

Dr. Ryksen: A disagreement is apparent. Some practical information is thus desirable. Over the last 10 years we have done some hundred blood transfusions. Our results have been very variable. We now, therefore, do a test r.b.c. of donor with serum of recipient in all cases. Often there is no reaction, but you may find the occasional beast which is very hard to match: e.g. a Friesland bull at an Agricultural School. It took from 8 a.m. — 4 p.m. before a satisfactory donor was found. Have had bad results with hasty transfusions, e.g., I killed a beautiful Shorthorn cow by infusing 1 gallon of blood in approximately 2 hours; became cyanosed and died.

Sometimes haemolysis is present 24 hours after transfusion although at the time it seemed to benefit. Thus we must be very careful, especially on subsequent transfusions. Even when cross-matching is done transfusions may give variable results.

Dr. Kleeberg: In Giessen we were taught not to do blood transfusions without a test. Tests were often not satisfactory, therefore we used plasma. Serum is beneficial and we used centrifuges carrying 100 c.c. or 200 c.c. bottles which handled 1,000 c.c. blood at once, after incubating for ½ hour at 37°C., loosen clot and place in a refrigerator for 10-15 minutes at 2,500 revolutions per minute. This is 40-50% serum from blood — pour off and use.

Reply to Dr. Malherbe:

Dr. Irwin: One can use solutions with small molecules, e.g. dextrose and electrolytes, to good advantage. In shock these fluids cause a harmless oedema. Solutions designed to combat alkalinity and acidity have a valuable place in many conditions. Reference to Meier, 1958, *Mod. Vet. Prac.*, 39, 44.

Metabolic diseases are not considered here — e.g. milk-fever, grass-tetany, etc.

To Dr. Osterhoff:

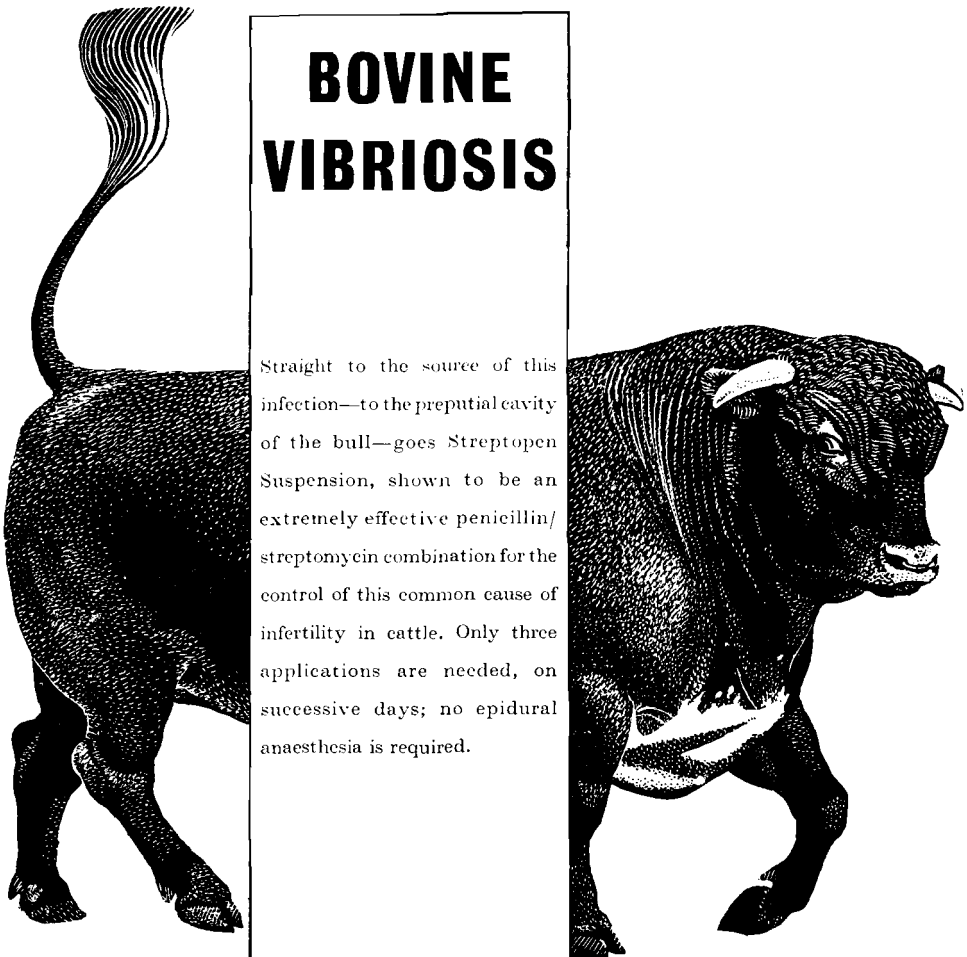
Plasma versus blood. If red cells are not specifically needed, by all means use plasma or serum. They contain useful proteins (cachexia, shock), antibodies (bacterial and viral conditions). One can raise the colloidal o.p. twice as fast by using plasma than when using blood.

Pooled plasma from several animals is best.

To Dr. Malherbe:

Gelatine is still a useful fluid therapy. Its standardization is difficult. Plastic materials in solution, with molecular size comparable to albumin and globulins have been used, but bloc the r.e. system.

NEW for the control of



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FILMVERTONING EN VERDUIDELIKING IN VERBAND MET B.H.C. VERGIFTIGING AS GEVOLG VAN EMULSIES WAT BREEK

P. M. BEKKER
Afdeling Veeartsenydiens, Onderstepoort

Die algemene verkeerde idee bestaan dat die nuwere dipstowwe geheel-en-al skadeloos is en dat dit nie nodig is om op die korrekte gebruik daarvan ag te slaan nie. Arseen dipstof word as gevaarlik beskou en meesal met respek behandel, maar die nuwere dipstowwe waarvan B.H.C. slegs een is, is net so gevaarlik indien nie gevaarliker nie as die emulsie breek.

Indien die konsentreerde B.H.C. dipstof van 'n goeie gehalte is, slegs die bestes word vir registrasie aanvaar en tot die mark toegelaat, en dit op die korrekte wyse soos op die gebruiksaanwysings aangedui, gebruik word, dan is dit werklik skadeloos selfs by relatief hoë konsentrasies.

Gewoonlik is hoë konsentrasie in dipbakke 'n uitsondering, sodat die aspek buite rekening gelaat kan word, maar omdat die bloubosluis in die meeste gedeeltes van Suid-Afrika aan B.H.C. bestand geraak het, raak die boer vroeër of later teleurgesteld met die dipstof in die dipbak. Die neiging is dan om 'n ander dipstof by te voeg sonder om te weet of ag te slaan op die gevaar wat die gebruik van mengsels inhou.

Baie gevalle van vergiftiging van die aard is aan ons bekend maar ek wil net vier tipes noem.

1. In die Ladysmith gebied is 'n B.H.C. benatbare poeier gebruik en later is 'n B.H.C. emulsie bygevoeg. Alhoewel die konsentrasie slegs 120 d.p.m. gamma B.H.C. was, het vrektes nogtans onder kalwers voorgekom.

2. In die omgewing van Pretoria het vrektes selfs onder groot diere voorgekom waar 'n soortgelyke mengsel as onder (1) gebruik is. Hier was die konsentrasie hoog, sowat 500 d.p.m. en veral kalwers maar ook groot beeste het gevrek. 'n Monster van die heel boonste laag het geblyk 'n baie hoër konsentrasie as die goed gemengde dip te hê.

3. In die omgewing van Gravelotte is 'n B.H.C. emulsie vars opgemaak en wel op korrekte sterkte en het sowat 20% van die ongeveer 300 beeste as gevolg van die dipping gevrek. Dit het later geblyk dat net die spesifieke groep dipstof wat daar gebruik is moeilikheid veroorsaak het en vrektes ten gevolge gehad het. Selfs met varsvulling het die watermengbare olie nie ordentlik geëmulsifeer nie. Hier het presies die teenoorgestelde as in geval No. 2 gebeur. Die konsentraat wat uitgeskei het, het afgesak.

4. In die Potgietersrus gebied het vrektes voorgekom waar twee toxaphene emulsies van twee verskillende firmas gemeng is en ook is bekend dat mengsels van B.H.C. emulsies moeilikheid veroorsaak het sowel as mengsels van toxaphene en B.H.C. emulsies.

Die vraag ontstaan waarom breek die emulsies want dit is nie net as gevolg van benatbare poeiers nie, maar ook waar twee vloeibare dipstowwe saam gebruik word. Die meganisme vir die vorming van 'n goeie emulsie is baie sensitief en enige bykomende stowwe kan die balans versteur en breking ten gevolge hê.

As breking ontstaan dan beteken dit dat die fynverdeelde deeltjies wat homogeen met die water gemeng is nou begin om saam te smelt om sodoende groter deeltjies te vorm. Hierdie verskynsel kan onder die mikroskoop waargeneem word. Hierdie, miskien nog baie klein deeltjies, wat uit emulsie is, word dan deur die vel absorbeer en veroorsaak senusimptome. Gewoonlik begin die dier rondtrap, asof vlieë hom pla, sy bek kwyl, hy word onrustig, lyk verwilderd, draai in die rondte, en slaan neer met stuiptrekkings. Gewoonlik staan die dier na 'n rukkie op, kom heeltemal normaal voor en begin selfs te vreet totdat dit weer 'n aanval kry.

Die vraag ontstaan hoe die dier behandel moet word wat vergiftiging op die wyse opgedoen het. Allereers moet die dier met seep en water deeglik gewas word om die gebreekte emulsie te verwyder en tegelykertyd 'n kalmeermiddel, soos barbiturate, ens., in te spuit.

Die simptome wat ontstaan is so tipies dat dit in die meeste gevalle nie nodig is om dipmonsters vir bevestiging van breking van die emulsie in te stuur om dit te bevestig nie, maar indien wel dan moet monsters as volg geneem word:—

(a) Van die oppervlak (feitlik afgeroom word).

(b) Sê 18 dm. onder die oppervlak, alles sonder om te roer.

(c) Nadat die dipstof deeglik geroer is.

Die natuurlike vraag ontstaan, wat dan gemeng mag word en hoe om te weet wat toelaatbaar is. Hierdie vraag kan slegs na die uitvoering van proewe beantwoord word. Baie gegewens is reeds bekend en proewe word uitgevoer om vas te stel watter dipstowwe gemeng kan word.

As 'n goeie reël moet die prinsiep gevolg word dat mengsels nie gebruik mag word nie, behalwe as die gebruiksaanwysings dit voorskryf.

Summary

Attention is drawn to the fact that the new organic insecticides can be dangerous to animals if emulsions break.

Types of mixtures where breaking occurs are quoted, viz.:

(a) Wettable powders; and

(b) Mixtures of two Toxaphene or two B.H.C. or a B.H.C. and Toxaphene emulsion.

The symptoms shown by animals after B.H.C. poisoning has occurred, are discussed and the treatment indicated as well as the procedure to prevent the breaking of emulsions by not using mixtures unless indicated on the directions for use.

Opsomming

Aandag word gevestig op die feit dat die nuwere organiese insekte-middels gevaarlik vir diere kan wees as die emulsies breek

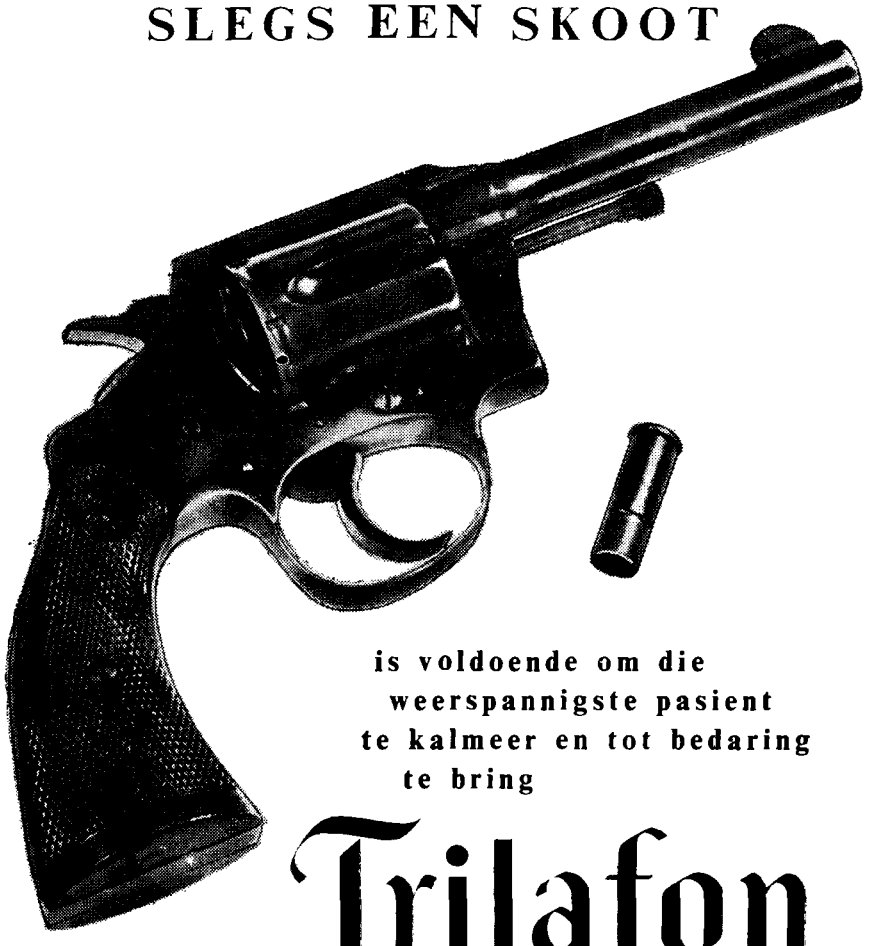
Tipes van mengsels waar breking voorkom word genoem, nl.:

(a) Benatbare poeiers en emulsies.

(b) Mengsels van twee Toxaphene of twee B.H.C. of 'n B.H.C. en 'n Toxaphene emulsie.

Die simptome wat die diere toon na vergiftiging word bespreek, die behandeling aangedui en die weg wat gevolg moet word om vergiftiging te voorkom, voorgeskryf, nl. om geen mengsels te gebruik nie tensy dit in die gebruiksaanwysings aangedui word.

SLEGS EEN SKOOT



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- **'n voor-narkose-versterkmiddel**

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Jl. S.A.V.M.A. 29 (4), 1958

THE REARING OF DAIRY CALVES UNDER SOUTH AFRICAN CONDITIONS

M. W. HENNING,
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Owing to the abnormally high price of fresh fluid milk the rearing of dairy calves as replacements has become a serious economic problem in all parts of the world. In South Africa many producers are obliged to abandon rearing their own calves and have to rely on bought replacements for maintaining a stable milk supply. Many of the cows are not bred again and are generally disposed of at the end of the lactation period, not infrequently to the butcher. In other cases cows that are suitable for breeding purposes, and that should be utilized for maintaining and improving the standard of the herd, are bred to a scrub bull for the sole purpose of extending their lactation period for another season. The calves thus produced are generally of such a poor grade that they are, in any case, unsuitable for rearing, and inevitably find their way to the slaughter-house. This unhappy state of affairs not only leads to a serious wastage of the dairy stock potential, but it also favours the introduction and dissemination of breeding and other stock diseases into clean herds.

On many farms where calves are reared the methods of husbandry, care and feeding employed leave so much to be desired that calfhood diseases have become rampant, and the death-rate in calves has reached alarming proportions.

According to Henning (1956) and Harwin (1957) barely one calf is reared annually from every three adult females in South Africa. Although a proper survey of the actual causes of these poor production figures has not yet been undertaken the available information indicates that a low rate of fertility of breeding stock and an abnormally high calfhood mortality are mainly responsible. Lambrechts (1950) has reported a death-rate of 22 per cent. among the calves born in Northern Natal, and Thomas (1956) one of 40 per cent. in the Northern Transvaal.

The depressing effect of this state of affairs is reflected by the population figures reported by Henning (1956). According to this report (Table 1) the cattle population of South Africa has remained static from 1939 to 1954, whereas it has increased by 21 per cent. in Great Britain and by 11 per cent. in the Netherlands. This cannot be ascribed to excessive slaughtering of livestock as 29 per cent. of the total cattle population in Britain was

slaughtered in 1954, as compared with only 10 per cent. in South Africa. According to Henning (1956) the unfavourable position of the cattle industry of this country, as compared with that of Britain and the Netherlands, must be ascribed to a large extent to the deficient veterinary services rendered to the South African farmer (Table 3).

The Netherlands with an area of 11,000 square miles has fifteen research, academic and diagnostic institutions, Great Britain, with a size of plus minus 90,000 square miles, has 84, whereas South Africa with nearly 500,000 square miles in extent is served by only three. The number of veterinarians employed in these institutions were 113, 487 and 39 respectively.

It will be seen in Table 2 that there is one veterinarian available for the care of 2,900 cattle in Britain, one for 2,500 in the Netherlands, one for 1,700 in Denmark and one for 35,000 cattle in the Union of South Africa. If the sheep population of nearly 40 million is also accounted for the position in South Africa becomes relatively much more unfavourable.

During the course of a study of paratyphoid, coccidiosis and other calfhood diseases the author realized that the husbandry, the housing and the feeding of the calf all have an important

TABLE I.

COMPARATIVE CATTLE POPULATION FIGURES IN BRITAIN, THE NETHERLANDS, DENMARK AND SOUTH AFRICA

(from Henning, 1956).

	Great Britain.	Nether-lands.	Denmark.	South Africa.
Number of cattle in 1939	8,900,000			11,953,000
,, ,, ,, 1950		2,723,000	3,178,000	
,, ,, ,, 1954	10,718,000	3,025,000		11,705,000
Increase	+1,818,000	+302,000		—248,000
Percentage increase	21	11		0
Number of breeding stock, 2 years and older	5,350,000	2,000,000	2,030,000	5,800,000
Number of calves under 12 months old	3,400,000	1,350,000	1,360,000	2,100,000
Percentage of calves	63	67	67	36
Number of cattle slaughtered in 1954	3,100,000 (1,000,000)	1,200,000 (7,000,000)	1,137,000 (6,3000)	1200,000 (100,000)[1]
Percentage of cattle population slaughtered	29	40	36	10
Number of milk cows in 1954	3,107,000	1,540,000	1,500,000	1,500,000
Average milk yield per cow in gallons during 1954	700	827	810	233
Number of cattle in TB. attested herds	5,300,000	3,025,000	3,178,000	25,591
Percentage	50	100	100	0.22

[1] Number of calves slaughtered, which is included in the total.

TABLE II.

VETERINARIANS AND VETERINARY INSTITUTIONS IN GREAT BRITAIN, THE NETHERLANDS AND SOUTH AFRICA IN 1954.
(From Henning, 1956).

	Great Britain	Netherlands	Denmark	South Africa
Total number of Veterinarians	3,876	1,200	1,860	350
Veterinarians in Private Practice	2,811	—	1,030	189
Research, diagnostic and academic institutions	84	15	5	3
Number of Veterinarians employed at these Institutions	487	113	74	39
Full-time State Veterinarians	583	89	44	44
Veterinarians part-time in State employment	1,900	—	—	0
Number of Veterinary students registered — 1955	1,128	384	414	95
Number of Veterinary student graduates in 1955	210	75	52	13
Number of cattle per Veterinarian	2,900	2,500	1,700	35,000

influence on the pathogenesis. The investigation reported here was, therefore, designed to observe the effect of certain types of feeding as well as the environmental conditions on the health and growth-rate of the calf. This entailed, inter alia, the formulation of milk substitutes capable of satisfactorily replacing fresh fluid milk, a study of the effect of the type of housing on the health of the calf and a study of the incidence of disease in the calves reared under the conditions of the experiment. Moreover, as the dairy industry was desirous of creating a regular market for its surplus dairy by-products, the author largely concentrated on the utilization, under South African conditions, of milk replacement mixtures containing skim milk powder, whey and casein. It was realized that the formulation and general use of milk substitutes prepared from these products would benefit the breeder, the dairyman as well as the manufacturer.

During the last three or four decades many research workers have attempted to replace fluid milk as a feed for baby calves. In their search for a suitable milk-substitute it was natural for them to concentrate on the value of such milk by-products as skim milk powder, butter milk powder, whey powder and casein. But, as even these dairy by-products are sometimes uneconomical when used predominantly in the formulation of milk-replacement, the value of cheaper animal and vegetable producted was also explored. The digestive system of the calf, however, is not adapted to many of the ingredients employed so that digestive derangement frequently supervened. Many workers, therefore, attempted to find a suitable balance between these ingredients and milk and dairy products.

The universal interest in calfhood feeding, the care and management and housing of the calf, and calfhood diseases is reflected by the extensive literature that has accumulated on the subject in recent years. But, as it will be superfluous for the author to discuss this bibliography in a report of this nature the reader is referred to Savage and McCay (1942), Morrison (1954), Henning (1956, 1958) and other workers for details.

It should be pointed out, however, that nearly all the work done on calf-rearing elsewhere has been carried out under conditions that cannot be readily applied to South Africa. An attempt has, therefore, been made to explore and modify the various procedures already employed in order to find those that are most suitable for this country.

Most observers believe that it is essential for the calf to receive a certain amount of whole milk for at least the first 30 days after birth. But the minimum amount that would satisfy his requirements under all circumstances has not yet been determined. In common with Maynard and Norris (1923) many workers advise the feeding of a full ration of whole milk for 30 days followed by a gradual introduction of a milk-substitute, gruel, or a calf-starter in the place of milk. Others have reared calves successfully on considerably less milk, supplemented by a replacement mixture, or a calf-starter, or both (Eckles and Gullickson, 1924; Mead, Regan and Bartlett, 1924; Bender and Perry, 1929; Jones, Brandt and Wilson, 1931; Frens and Dammers, 1949; Grashuis, 1953; Preston, 1956; Drouliscos, Verbeek and Armstrong, 1957).

When it was **not** possible to feed a full ration of whole milk for thirty days the best results were obtained when the available supply of milk was given in small amounts daily or twice daily for the whole period of thirty days in conjunction with the milk replacement fed (Jones, Brandt and Wilson, 1931). Preston (1956) reported that calves could be successfully reared on barely 130 pounds of whole milk fed over a period of four weeks, supplemented by milk-replacement, or calf-starter and hay. Drouliscos et al (1957) claim good results with even a smaller amount of milk, also given in conjunction with a calf meal. Those calves which were completely deprived of whole milk after the colostrum period were prone to suffer from digestive upsets which interefered with their rate of growth.

Most workers agree that in any venture designed to rear calves on a limited amount of milk every effort should be made to induce them to consume sufficient calf-starter and hay in order to provide them with the energy normally derived from milk, always bearing in mind the possibility of inducing digestive derangement. Norton and Eaton (1946) state that the palatibility of a calf-meal can be improved by the incorporation of molasses and good quality hay in the feed — in their hands as much as 8 per cent. molasses added to the calf-starter did not have an abnormal laxative effect. Preston (1956) and Drouliscos et al (1957), on the other hand,

believe that hunger is the best incentive for stimulating the consumption of calf-starter. They, therefore, advise starving the calf for some time before the starter is given.

The author must explain that this investigation was commenced at the Experimental Farm of the University of Pretoria only after provision had been made for suitable housing. In the course of this study he was obliged to transfer the experiments to Onderstepoort where suitable housing facilities could not be provided. The result was that a great deal of valuable information was lost.

Nevertheless, the circumstances under which the experiment was carried out provided him with an opportunity of making observations on young calves housed under environmental conditions resembling those prevailing on many South African farms.

A long, narrow, north-facing, wood and iron shed open on three sides and partly open on the fourth side was made available for the experiments. It was previously used for sheep and was divided into a number of small individual pens by wooden slats and wire netting. The floors and drainage furrows, made of concrete, were uneven, allowing the accumulation of manure and urine in the pens. As no feeding racks or mangers were provided the calves were fed out of boxes on the floor which allowed a great deal of the feed to land on the floor, where it was often exposed to contamination before it could be picked up by the calves.

The housing provided gave very little protection and the calves were badly exposed to extremes of temperature, cold draughts and cold south-easterly winds. During winter the north-facing shed became very warm during the day and extremely cold during the night and early morning. At the Meterological Station a difference of as much as 27°C. was sometimes recorded between the maximum and minimum temperatures during a period of 24 hours.

As the heat-regulating mechanism of the new-born, including the baby calf, is believed not to function effectively yet, the calf generally takes some time to adjust itself to the impact of sudden changes in its environmental temperature. No doubt the unfavourable environmental conditions together with the type of feeding exposed the calves to severe stress which lowered their resistance and predisposed them to infection, thus accounting for the high incidence of disease in most of the groups under observation (Table VIII).

Grade Friesland calves were used in the experiment. The calves were bought from dairies; but were first allowed to remain with their dams for 48 hours and were generally introduced into the experiment at the age of five to seven days.

All the calves were inoculated with virulent heartwater blood soon after their arrival. In order to prevent a serious clinical response prophylactic treatment with tetracyline was carried out on the twelfth day. If a reaction occurred in spite of the prophylaxis, treatment was repeated. Most of the calves responded readily

to the treatment. It was not possible to obtain the desired quota of calves at the same time so that calves had to be bought as they became available and added to the different groups. Nor was it possible always to obtain calves of the same age so that animals of different ages had to be employed in the same experiments. Very few of the calves used, however, were more than 8 days old when they were introduced into the experiment. Although an effort was made to limit the weight of the calves within the range of 75 to 95 pounds, some of them weighed either more or less. Calves under 70 pounds weight at birth were regarded as unsuitable for the experiment.

In a previous study (unpublished) carried out under suitable housing conditions the author found that calves reared on milk-replacement composed mainly of skim milk powder (Table III No. 1) plus calf-nuts (Table IV) and lucerne hay showed barely any digestive upsets, and grew apparently normally. At 16 weeks of age they compared favourably with calves fed on skim milk, and even with those receiving a full ration of whole milk.

In order to reduce the cost, the replacement mixtures II and III (Table III) were substituted for mixture I in this study.

TABLE III.

THE COMPOSITION OF THE THREE MILK REPLACEMENT MIXTURES I, II AND III.

	Mixture No. I.	Mixture No. II.	Mixture No. III.
Skim milk powder	80	—	—
Whey powder	6	6	32
Butter milk powder	—	80	—
Casein powder	—	—	32
Kaffircorn Meal	10	10	33
Food Yeast	2	2	2
Mineral Salts	1	1	—
Calcium carbonate	1	1	1

Protein content ∓ 31 per cent.

TABLE IV.

Yellow Mealie meal	30.00
Kaffircorn meal	20.00
Pollard	15.00
Wheaten bran	7.00
Peanut-Cake meal	10.00
Lucerne-leaf meal	2.00
White fish meal	5.00
Casein powder	3.00
Buttermilk powder	3.00
Molasses	2.00
Calcium carbonate	1.00
Dicalcium phosphate	1.25
Sodium chloride	0.75

Protein content ∓ 20 per cent.

Fluid replacement was made by suspending one pound of powder in nine pounds of boiling water and cooling the liquid to body-heat before it was fed. All the calves received colostrum and mother's milk up to about seven days. Commencing on the eighth day the transition from whole milk to milk replacement was gradual and all the calves received a small amount of whole milk during the first 21 days, a total of 60 pounds being given from the 8th to the 21st day. The ration of fluid replacement per day was approximately 10 per cent. of the body weight of the calf, and was fed in two equal feeds per day. One gram of vitamin A powder (Roche) was added once a week to the ration until the calves partook of hay. But as the calves were exposed to enough sunlight, Vitamin D supplementation was not regarded as necessary. The Vitamin B complex in the form of food yeast was, however, incorporated in the mixture.

From the 70th to the 77th day the replacement was gradually reduced, and all the calves were weaned on the 77th day. Some of them were then discharged from the feeding experiment, so that growth-rates are available only for those that remained in the test for at least 16 weeks.

The individual weights of the calves entering the experiment and the individual gains in live weight up to 16 weeks are given in Tables V and VI. The different treatments received by the various groups and the average live weight gains are recorded in Table VI.

The incidence of disease and death in the various groups is presented in Table VIII.

From the first day onwards all the calves were allowed free access to good quality lucerne hay. They soon started nibbling at the hay and within a fortnight most of them were already ruminating. At two weeks the calves were encouraged to eat some calf-nuts by placing a small handful at the bottom of the bucket immediately after a milk feed. The amount of nuts was gradually increased until most of the calves were consuming as much as two or three pounds a day at eleven weeks.

The calves in groups A, B, C, D, E, F, G and H were kept under poor housing conditions and the husbandry was poor, but the conditions provided for groups I and J were regarded as very good.

From the time of their introduction into the experiment up to the weaning at eleven weeks the calves in group I and J had each received an average of approximately 60 pounds of whole milk, 750 pounds of fluid milk replacement, 70 pounds of calf-nuts and 200 pounds of hay. At 16 weeks the average amount of calf-nuts fed was 143 pounds and hay 334 pounds. On account of the conditions under which the calves in the other groups were kept it was not possible to keep a proper record of the feed consumption.

TABLE V.

INDIVIDUAL WEIGHTS OF CALVES ENTERING EXPERIMENT AND GAINS UP TO 16 WEEKS.

A		B		C		D		E		F		G		H		I		J	
I	G	I	G	I	G	I	G	I	G	I	G	I	G	I	G	I	G	I	G
72	170	97	125	95	130	82	101	90	78	80	80	103	116	80	79	88	159	80	115
78	164	104	125	82	147	89	86	86	69	83	85	92	126	88	124	98	146	97	125
101	166	87	121	87	63	91	115	86	76			92	65	86	72	73	133	93	133
78	66	76	78	73	69	82	114	96	67			82	98	107	76	90	167	91	126
97	126	68	76	79	98	92	95	92	75			74	83	94	83	85	170	84	153
90	95	71	73			86	98	105	102			75	116	108	140				
89	76	76	115			73	127	98	124			95	75	96	131				
83	79							105	75			96	77	89	85				
91	64							104	98			81	105	98	124				
								99	121			95	103	110	117				
								76	84			90	118	92	56				
								85	79			99	174	75	75				
								81	76			87	116	85	123				
												81	113	80	105				
												84	110	81	105				
												85	96	95	138				
												93	114	103	95				
												90	119	79	86				
												94	134	85	100				
														99	129				
86.5	111.8	82.7	101.9	83.2	101.4	85	105.1	92.5	86.5	81.5	82.5	88.8	108.3	91.5	101.8	86.8	155	89	130.4

I = Initial weight in pounds.
G = Gain in weight at 16 weeks.

The last line gives the average for each column.

TABLE VI.

LIVE WEIGHT GAINS UP TO 16 WEEKS FOR GROUPS OF CALVES RECEIVING DIFFERENT TREATMENTS.

Group.	Number of Calves.	TREATMENT.		Average Liveweight gains in lbs. in 16 weeks	Average gain per day.
		Type of Replacement used.	Type of housing and husbandry.		
A	9	Mixture No. II (Table III) no antibiotic	Poor	111.8	1.0
B	7	Mixture No. II (Table III) plus antibiotic for 3 days	Poor	101.9	0.91
C	5	Mixture No. I (Table III) for five weeks then Mixture No. II for 6 weeks	Poor	101.4	0.905
D	7	Ditto plus antibiotic for 3 days	Poor	105.1	0.94
E	13	Mixture No. III (Table III)	Poor	86.5	0.77
F	2	Ditto plus antibiotic for 3 days	Poor	82.5	0.74
G	19	Mixture No. I (Table III) for 5 weeks then Mixture No. II for 6 weeks; Furazolidone for 5 days	Poor	108.3	0.97
H	20	Mixture No. I (Table III) for 5 weeks then Mixture No. III for 6 weeks; Furazolidone for 5 days	Poor	101.8	0.91
I	5	Mixture I (Table III) for 5 weeks then Mixture No. II for 6 weeks; Furazolidone for 5 days	Good	155	1.38
J	5	Mixture No. 1 (Table III) for 5 weeks, then Mixture No. III for 6 weeks; Furazolidone for 5 days	Good	130.4	1.16
Ragsdale's (1934)	Standard.				1.22

TABLE VII.

SIGNIFICANT DIFFERENCES IN LIVE WEIGHT GAINS IN 16 WEEKS BETWEEN GROUPS OF CALVES RECEIVING DIFFERENT TREATMENTS.

Significant Comparisons(1)	Differences in live weight gains in 16 weeks in pounds	Minimum differences significant at P = 0.05(3)
A vs E (9, 13)(2)	25.3	21.9
I vs A (20, 9)	43.2	28.2
I vs B (5, 7)	53.1	29.6
I vs C (5, 5)	53.6	30.0
I vs D (5, 7)	49.9	29.6
I vs E (5, 13)	68.5	26.6
I vs F (5, 2)	72.5	42.3
I vs G (5, 19)	46.7	25.4
I vs H (5, 20)	53.2	25.3
G vs E (19, 13)	21.8	18.2
J vs E (19, 13)	43.9	26.6
J vs F (5, 2)	47.9	42.3
J vs H (5, 20)	28.6	25.3

(1) Larger gains indicated by first letter in comparison.
(2) Numbers of experimental animals in contrasted groups.
(3) Adjusted for unequal numbers in groups.

The significant differences given in Table VII were calculated by means of an analysis of variance applied to the live weight gains and the minimum differences significant at P = 0.05 were adjusted for unequal numbers of animals in the groups.

An analysis of variance applied to the live weights of animals entering the experiment showed that there were no significant differences in live weight between the groups.

Discussion of Results: From Table VIII it must be evident that the incidence of disease and the death-rate in all the groups, excepting I and J, was very high. Nearly every calfhood disease made its appearance and an abnormally large number of calves (26.5 per cent.) entering the experiment died before the age of 16 weeks was reached.

Although statistically not proven there is some indication that the conditions under which the calves were kept, particularly the housing and the husbandry, have had an influence on the incidence of disease and the death-rate (Table VIII), and on the rate of growth (Table V and VI). Not in any one of the groups from A to H (inclusive), where the housing conditions and husbandry were poor did the average daily live weight gain per calf approach the growth-standard of Ragsdale (1934). It is only in groups I and J where provision was made for proper housing and husbandry that the growth-rate approached or exceeded the standard of Ragsdale.

The results of the experiment clearly show that scours in one or other form is the main hazard to calf-rearing, and that cases of scours are frequently associated with pneumonia, or vice versa.

TABLE VIII.

INCIDENCE OF DISEASE AND DEATH IN THE VARIOUS GROUPS.

GROUPS.	A	B	C	D	E	F	G	H	I & J	Total	No. of Deaths
Number of Calves	13	8	12	11	17	16	28	27	10	142	
Scours all forms	13	8	12	5	15	16	25	16	8	118	
a. Mild non-specific	3	—	7	2	5	3	2	4	6	32	
b. Severe non-specific	4	—	4	2(1)	3	9(1)	16	6	—	48	2
c. Paratyphoid	2(1)	—	1(1)	1	1(1)	—	3(1)	3(1)	—	11	5
d. Coccidiosis	4	6	—	—	2	4	5	5	2	28	—
e. Atypical lumpy-skin	—	—	—	—	—	—	2(2)	3(3)	—	5	5
Lumpy-skin	—	—	—	—	—	—	2(2)	2(2)	—	—	4
Pneumonia	3(3)	2(1)	5	1(1)	2(1)	4(3)	6(1)	6	—	29	10
Diphtheria	—	—	1	—	—	—	1(1)	1(1)	—	3	2
Bloat	1	—	—	—	—	1(1)	1(1)	—	—	3	2
Tuberculosis	—	—	1(1)	—	—	—	—	—	—	1	1
Ophthalmia	—	—	—	—	—	—	9	11	—	16	—
Heartwater	—	1	2	6(1)	3	1	3(1)	—	—	16	2
Haemolytic icterus	1(1)	—	3(2)	3(2)	—	—	—	—	—	7	5
Anaplasmosis	—	—	1	—	1	—	—	—	—	2	—
Tapeworm	—	—	—	—	—	1	—	—	—	1	—
Umbilical abscess	—	—	—	—	—	—	—	—	1	1	—
Total deaths	5	1	4	5	2	5	9	7	—	—	38
Percentage mortality	—										26.5
Average daily gain in weight of surviving calves up to 16 weeks	1.0	0.91	0.905	0.94	0.77	0.74	0.97	0.91	1.27		

Numbers in brackets indicate deaths.

A "Goodness of fit" analysis of the deaths occurring in each group (Table VIII) during the duration of the experiment showed that the frequence of occurrence of deaths in each group was within the limits of the test of homogeneity.

TABLE VII.

SIGNIFICANT DIFFERENCES IN LIVE WEIGHT GAINS IN 16 WEEKS BETWEEN GROUPS OF CALVES RECEIVING DIFFERENT TREATMENTS.

Significant Comparisons (1)	Differences in live weight gains in 16 weeks in pounds	Minimum differences significant at P = 0.05 (3)
A vs E (9, 13) (2)	25.3	21.9
I vs A (20, 9)	43.2	28.2
I vs B (5, 7)	53.1	29.6
I vs C (5, 5)	53.6	30.0
I vs D (5, 7)	49.9	29.6
I vs E (5, 13)	68.5	26.6
I vs F (5, 2)	72.5	42.3
I vs G (5, 19)	46.7	25.4
I vs H (5, 20)	53.2	25.3
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The significant differences given in Table VII were calculated by means of an analysis of variance applied to the live weight gains and the minimum differences significant at P = 0.05 were adjusted for unequal numbers of animals in the groups.

An analysis of variance applied to the live weights of animals entering the experiment showed that there were no significant differences in live weight between the groups.

Discussion of Results: From Table VIII it must be evident that the incidence of disease and the death-rate in all the groups, excepting I and J, was very high. Nearly every calfhood disease made its appearance and an abnormally large number of calves (26.5 per cent.) entering the experiment died before the age of 16 weeks was reached.

Although statistically not proven there is some indication that the conditions under which the calves were kept, particularly the housing and the husbandry, have had an influence on the incidence of disease and the death-rate (Table VIII), and on the rate of growth (Table V and VI). Not in any one of the groups from A to H (inclusive), where the housing conditions and husbandry were poor did the average daily live weight gain per calf approach the growth-standard of Ragsdale (1934). It is only in groups I and J where provision was made for proper housing and husbandry that the growth-rate approached or exceeded the standard of Ragsdale.

The results of the experiment clearly show that scours in one or other form is the main hazard to calf-rearing, and that cases of scours are frequently associated with pneumonia, or vice versa.

TABLE VIII.

INCIDENCE OF DISEASE AND DEATH IN THE VARIOUS GROUPS.

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b. Severe non-specific	4	—	4	2(1)	3	9(1)	16	6	—	48	2
c. Paratyphoid	2(1)	—	1(1)	1	1(1)	—	3(1)	3(1)	—	11	5
d. Coccidiosis	4	6	—	—	2	4	5	5	2	28	—
e. Atypical lumpy-skin	—	—	—	—	—	—	2(2)	3(3)	—	5	5
Lumpy-skin	—	—	—	—	—	—	2(2)	2(2)	—	—	4
Pneumonia	3(3)	2(1)	5	1(1)	2(1)	4(3)	6(1)	6	—	29	10
Diphtheria	—	—	1	—	—	—	1(1)	1(1)	—	3	2
Bloat	1	—	—	—	—	1(1)	1(1)	—	—	3	2
Tuberculosis	—	—	1(1)	—	—	—	—	—	—	1	1
Ophthalmia	—	—	—	—	—	—	9	11	—	16	—
Heartwater	—	1	2	6(1)	3	1	3(1)	—	—	16	2
Haemolytic icterus	1(1)	—	3(2)	3(2)	—	—	—	—	—	7	5
Anaplasmosis	—	—	1	—	1	—	—	—	—	2	—
Tapeworm	—	—	—	—	—	1	—	—	—	1	—
Umbilical abscess	—	—	—	—	—	—	—	—	1	1	—
Total deaths	5	1	4	5	2	5	9	7	—	—	38
Percentage mortality	—										26.5
Average daily gain in weight of surviving calves up to 16 weeks	1.0	0.91	0.905	0.94	0.77	0.74	0.97	0.91	1.27		

Numbers in brackets indicate deaths.

A "Goodness of fit" analysis of the deaths occurring in each group (Table VIII) during the duration of the experiment showed that the frequence of occurrence of deaths in each group was within the limits of the test of homogeneity.

It is difficult to explain the high incidence of coccidiosis and paratyphoid. Although the housing conditions under which groups A to H were stabled were poor, the calves were nevertheless kept separately in individual pens that had not been previously used for cattle. The clinical symptoms manifested usually appeared during a transition from one feed to another.

The question therefore, arises where and when did the calves become infected with coccidiosis, paratyphoid and the other calf-hood diseases. The pens used had not housed calves previously and cannot be regarded as probable sources of infection. It is wellknown that adult cattle, including nursing cows, can act as carriers of these diseases and that stables are often contaminated with infected discharges. It is not unlikely, therefore, that the calves had obtained the infection either from their dams or from the stables before their introduction into the experiment and that they were carrying it on their bodies in an inapparent form. Only when they were subsequently exposed to severe stresse, e.g. during sudden changes of the environmental conditions and the feeding, their resistance was lowered to such an extent that the way was opened for the latent micro-organisms to invade the tissues and set up clinical symptoms.

A recent observation by Bigalke (1956) lends support to this hypothesis. During a study of an outbreak of coccidiosis in a group of young impala, it was revealed that these animals were introduced onto the farm where no other game animals were kept. They were retained separately in feeding enclosures completely out of contact with any other stock. It is suggested that the impala were actually inapparent carriers of coccidiosis and that the conditions under which they were housed favoured the invasion of their tissues by the parasites, leading to the production of clinical symptoms.

The cases of coccidiosis were kept separately in individual pens which were cleaned out as well as possible every day. One gram of di-iodohydroxyquinoline (Zooquin, Embequin, Maybaker) was administered daily per calf for three days. Although some of the calves exhibited severe clinical symptoms every one recovered.

Of the eleven cases of paratyphoid, five died — all before a diagnosis could be made and treatment instituted. The six cases which recovered were recognized early and furazolidone treatment (Henning, 1954) could be carried out in time. Three different *Salmonella* types were incriminatad as the cause of paratyphoid in the calves kept in this study. Nine of them were due to *S.dublin*.

Seven cases of haemolytic icterus occurred. Of these five died and a chemical analysis of the liver revealed abnormally high copper levels. As the clinical symptoms and pathological anatomy were not inconsistent with those of copper poisoning, and as copper was incorporated in the mineral mixture used, it was thought to be the cause of the disturbance.

The occurrence of lumpy-skin disease in some of the calves is of interest. Three of the calves bought from a dairy where sporadic cases of lumpy-skin disease had occurred developed clinical symptoms of the disease from 6 to 14 days after their introduction into the experiment.

All of them manifested an acute diarrhoea and all died. Five other calves developed a similar type of diarrhoea from which they died. An atypical form of lumpy-skin disease was believed to be the cause of death in these animals.

SUMMARY

An effort was made to rear dairy calves on milk-replacements under South African conditions. The calves, 142 in number, were divided into ten different groups, each of which received a different treatment. Groups A to H were kept under poor housing conditions and the husbandry was poor. These conditions resembled those prevailing on many South African farms. Groups I and J were kept under conditions which are believed to be good. The average daily live weight gains of the calves in Groups A to H up to 16 weeks varied from 0.74 to 1.0 pound. On the other hand the average gain for Group I was 1.36 pounds and for Group J 1.16 pounds per day which compares favourably with Ragsdale standard of 1.22 pounds per day.

The incidence of calfhood disease and the death-rate were extremely high in all the groups, excepting I and J. Nearly all the common calfhood diseases made their appearance. Thirty-eight of the calves died, giving a percentage mortality of 26.5, but as all the deaths were confined to Groups A to H and none occurred in Groups I and J, the actual death-rate was even higher, viz. 28.9 per cent.

Scours and pneumonia were the chief causes of illness. Twelve calves died from various forms of scours and ten from pneumonia.

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REFERENCES

Bender, C. B. and Perry, E. J. (1929). The New Jersey dry-fed calf mixture. *New Jersey Agric. Coll. Ext. Bull.* 73 (1929); p.p. 14.

Bigalke, R. (1957). Personal communication.

Drouliscos, N. J., Verbeek, W. A. Armstrong, C. W. B. (1957). Goedkoop Hanskalwers. Rewolusionêre stelsel ontwerp. *Landbou Weekblad*, Okt. 15; 21-23.

Eckles, C. H. and Gullickson, T. W. (1924). Raising the calf when whole milk is sold. *University Minn. Bull.*, 215.

Frens, A. M. en Dammers, I. J. (1949). Kalvermeel. Oriënteerde praktyk-proeven over het opfokken van kalveren met so weinig mogelyk volle melk of melkproducten. *Bedryf voor Veevoeder. Ministerie van Landbouw, Vissery en Voedselvoorsiening, Directie van de Landbou*, Landbou 6, 's Gravenhage.

Grashuis, J. (1953). *De opfok van kalveren in de melkveehoudery.* Koninklyke Nederlandse Zuivelbond. Instituut voor Moderne Voeding „de Schothorst" Commissie van Beheer, C.L.O. Mengvoeders (C.L.O. Controle).

Harwin, G. O. (1957). Die Unie verkwis sy kalwerpotensieel — Slagter se mes die vernaamste rede. *Boerdery in S. Afrika,* Aug., 6-11.

Henning, M. W. (1954). On the chemotheraphy of calf paratyphoid. *J.S.A.V.M.,* 25(4).

Henning, M. W. (1956). *Animal Diseases in South Africa,* C.N.A., Johannesburg.

Henning, M. W. (1956). Die Suid-Afrikaanse Veenywerheid op die kruispaaie. *J.S.A.V.M.A.,* 27(3); 187-195.

Henning, M. W. (1958). *Die Kalf. Sy versorging, voeding en siektes.* Voortrekkerpers, Johannesburg.

Jones, I. R., Brandt, P. M. and Wilson, F. D. (1931). Raising calves on dry meals. *Agr. Exp. Sta. Bull.,* 290; p.p. 30. Oregon State College, Corvallis.

Maynard, L. A. and Norris, S. C. (1923). A system of rearing dairy calves with limited use of milk. *J. Dairy Sc.,* 6:483.

Mead, S. W., Regan, W. A. and Bartlett, J. W. (1924). A study of the factors affecting the growth of dairy heifers. *J. Dairy Science,* 7:440-459.

Morrison, F. B. (1954). *Feeds and Feeding. A Handbook for the student and the Stockman.* Published by the Morrison Pub. Co., Ithaca, New York.

Norton, C. L. and Eaton, H. D. (1946). Dry calf starters for dairy calves. *Cornell Agr. Exp. Stn. Bull.,* 835; p.p 31.

Preston, T. R. (1956). Dry feeding of calves. *Agriculture,* 62:462-466.

Ragsdale, A. C. (1934). Growth standards for dairy calves. *Mo. Agr. Expt. Stn. Bull.,* 336, 1934.

Savage, E. S., McCay, C. M. (1942). The nutrition of calves, a review. *J. Dairy Sc.,* 25:595-643.

Thomas, H. B. (1956). Personal Communication.

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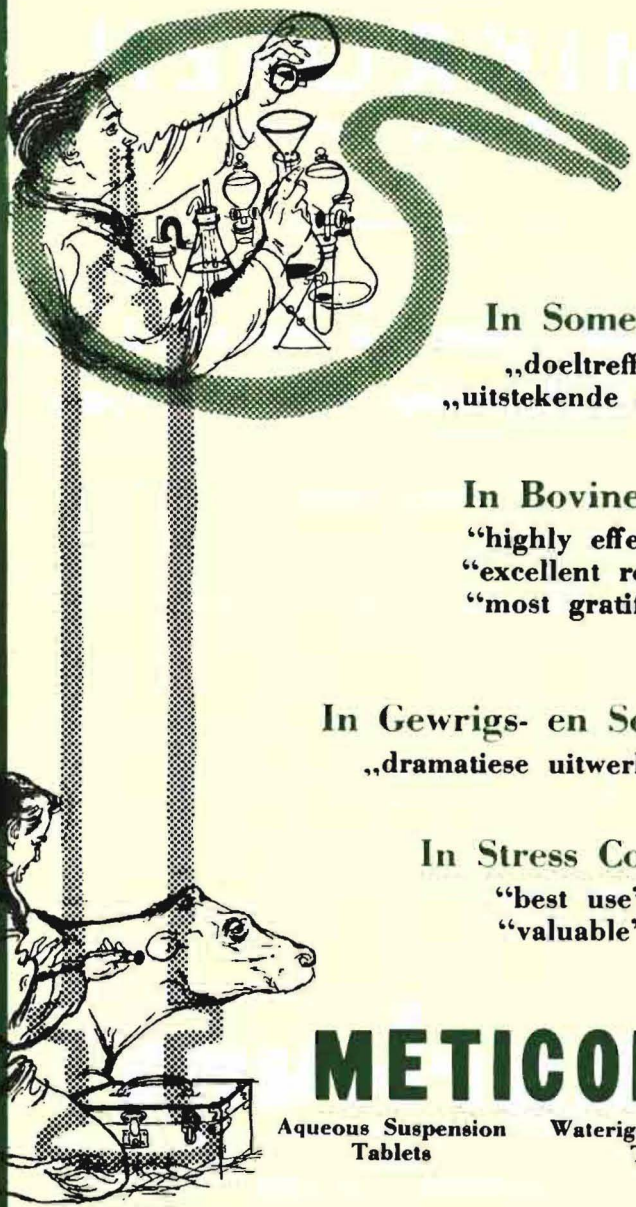

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SARCOSTEMMA VIMINALE POISONING IN SHEEP AND AND CATTLE

J. R. PHILIP
Salisbury

J. J. JACKSON
Enkeldoorn
South Rhodesia

D. K. SHONE
Salisbury

Sarcostemma viminale R. Br. is a succulent shrub with a copious milky latex. It is often found scrambling over granite outcrops or climbing over bushes and trees. The branches are leafless, about the thickness of a finger with opposite branching. The flowers are white and sweet scented. The Afrikaans name is melktou or spantoumelkbos and the Shona name dombonyoka.

Steyn (1949) established the toxicity of specimens of the plant originating from the Namaqualand and Uitenhage districts of the Cape Province, and he also showed that 10 ounces of the fresh material would kill a sheep within 12 hours. In earlier work Steyn (1934) had found that 1,100 grams of plant material from the Kei Road area of the Cape Province failed to kill a sheep.

S. viminale occurs over a large portion of Southern Rhodesia and is especially prevalent in the low veld areas. It was suspected as being responsible for the death of four cattle in the Enkeldoorn district. All four animals were found lying dead within a radius of 200 yards of a S. viminale plant which had climbed over a tree, and the latter having fallen, had made the plant available to cattle.

Post-mortem examinations on the four animals were carried out and identifiable portions of S. viminale were found in the ruminal contents. A general cyanosis and congestion of the carcases were noted together with sub epi- and endocardial petechiae as well as haemorrhages under the capsule of the spleen, hyperaemia of the rumen and omasum and degeneration of the liver. A considerable quantity of ruminal fluid had been discharged from the mouth and nostrils. The surrounding ground showed signs of disturbance from convulsive movements by the animals.

Fresh material of the S. viminale plant was obtained and 514 grams of the freshly-ground material were dosed by stomach tube to a sheep weighing approximately 65 pounds. When next observed five hours later the sheep was staggering, grinding its teeth and the head was pulled in towards the sternum. Muscular tremors over the body were observed and the respiration was markedly accelerated. The rumen was distended but not tense. Ten minutes later the sheep was recumbent and the forelegs and head were being periodically extended. Galloping movements of both fore and hindlegs intervened and continued for a further ten minutes

until death supervened, five and a half hours after the material was administered. Consciousness was retained throughout.

A full post-mortem examination was undertaken and the only lesions of note were a general cyanosis, congestion of the blood vessels and petechial haemorrhages in the omentum.

The symptoms observed, closely resembled the acute form described by Steyn (1949), who also described a chronic form where paralysis followed the convulsive symptoms if death did not take place.

S. viminale is often used by natives as an emetic for dogs. A twig approximately four inches long is crushed and the latex is poured into milk or other food and given to the dog.

SUMMARY

The toxicity of S. viminale from the Enkeldoorn area of Southern Rhodesia was established by the death of a sheep within six hours of being dosed with 514 grams of fresh ground-up material. The clinical symptoms observed and the lesions noted at the post-mortem examination are described.

The lesions noted at the post-mortem examination of four cattle whose deaths were attributed to the consumption of this plant are described.

ACKNOWLEDGEMENTS

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REFERENCES

Steyn, D. G. (1934). The Toxicology of Plants in South Africa. Cape Town; Central News Agency.

Steyn, D. G. (1949). Vergiftiging van Mens en Dier. Pretoria, Van Schaik.

Jl. S.A.V.M.A. 29 (4), 1958

MENINGO-ENCEPHALITIS TUBERCULOSA IN A BOVINE

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Onderstepoort

During December, 1956, a stock inspector sent in a brain specimen to Onderstepoort for examination. This has been taken from a one-year-old Friesland heifer grazing on the farm Elandsfontein in the Pretoria district. Prior to its destruction the animal had shown obvious nervous symptoms for a period of at least four weeks. In the beginning the animal walked with extended and raised head and often took up a similar position while standing. The eyes were affected, the vision being markedly impaired. This was manifested by an unsteady and ataxic gait. On one occasion the calf caught its head in the fork of a tree. The nervous symptoms became progressively worse. Later the animal became unthrifty, lost its appetite and subsequently fell off in condition. Sometimes there was grinding of the teeth. On several occasions a transient improvement had been observed. Eventually, however, the heifer became unconscious and had to be slaughtered. Unfortunately, no autopsy was performed, the brain only being removed.

The origin of the infection could not be determined. The calf's mother died shortly afterwards as a result of a snake bite. The tuberculin test of the remaining 11 head of cattle on the farm revealed 3 reactors. One of these was slaughtered but no tuberculous lesions were found.

The pathology of tuberculosis of the central nervous system presents great variations, which are ascribed to the virulence of the causal organism, the age of the tuberculous processes in the pia, and probably mainly to the reactionary state of the body. Histologically three main types, namely caseous and infiltrative tuberculosis and tubercle formation in the form of miliary nodules or a conglomeration of them have been described.

The present case would fit more readily into the category of caseous meningitis but differed from it in several respects. The meninges were considerably thickened and had a variegated appearance. The brain surface was distinctly granular, dull greyish or reddish-yellow miliary nodules being diffusely spread over the medulla oblongata, the cerebellum and especially the left cerebral hemisphere. A number of these foci coalesced to form nodular masses of variable sizes and shapes (Meningitis tuberculosa circumscripta).

Interspersed between these were areas with a sero-fibrinous exudate in evidence. The vicinity of the hippocampus and the

choroid plexus were also affected to some extent. The lesions were characterised by caseation and variable central calcification. They were more pronounced in the folds of the pia-arachnoid that dipped into the cerebral sulci than on the gyri, their surface being either roughened or depressed. On section, in the periphery of the cortex, foci of a dull yellowish colour (necrosis), of softening, of oedema and of focal congestion were noted. The tuberculous affection was, therefore, not confined to the meninges alone but in certain areas it encroached onto the brain substance to a variable extent.

The histological changes were also very variable. They were not of a uniform type, since transitional forms occurred. The meninges, the cortex of the brain tissue and the blood vessels were principally involved. The meninges were considerably thickened, especially in the depth of the sulci, where the loose texture favoured a relative unrestricted expansion of the tuberculous lesions. These were characterised by a number of confluent caseous nodules having a tendency to form central calcification.

The nodular structure was indicated by a narrow irregularly formed connective tissue (collagen) capsule and was accentuated by a centrally placed blood vessel in the less advanced lesions. The tissue contiguous to these blood vessel walls was distinctly cellular and was clearly marked off from the enclosing, caseous material in which numerous necrobiotic nuclei were distributed. The cellular nature of the lesion was thereby clearly indicated, and one may accept that the caseation was not superimposed on a granulating tissue. A lymphocytic zone, varying in width, separated the caseating masses from the underlying brain tissue. This cellular exudate involved the meninges adjacent to these areas and spread along the septa and blood vessels into the depth of the brain substance, giving rise to the non-specific "cuffing" of the blood vessels. At the periphery of several caseous nodules there were small foci, closely resembling typical tubercles (resorption tubercles). They consisted of proliferating radially arranged epithelioid cells in various stages of disintegration. Multinucleated giant cells were seen in various places either singly or in definite aggregations. Acid-fast bacilli were fairly frequent in the caseous masses, and in the vicinity of epithelioid cells and in the cytoplasm of giant cells, occasionally in the lumens of blood vessels and not at all in the lymphocytic exudate. There were foci with a meningeal exudate rich in fibrin and the meningitis was probably most fulminating in these areas. Occasionally the affected blood vessels wall ruptured and the tuberculous tissue was seen to enter the lumen.

One of the most striking changes was that observed in the vascular system, both arteries and veins being affected. Arteritis (peri-, end- or pan-arteritis) was a prominent feature of the meningeal affection and the pial veins traversing the exudate showed an intense phlebitis. Only vessels traversing the exudate were found to be altered; the grosser the exudate the more profound

was the arteritis (particularly in the depth of the sulci). Arteries passing through sulci where there was no exudate, were unaffected.

The most constant finding in affected arteries was a marked swelling of the adventitia, due chiefly to proliferation of adventitial cells and the infiltration of lymphocytes and mononuclear phagocytes to a lesser extent. The lesions in the intima varied considerably. The intima cells appeared normal or proliferated, swelled or desquamated, or to be totally absent. The majority of blood vessels walls were considerably thickened, due to a fibrocellular intimal endarteritis. This consisted of a subendothelial proliferation of fibroblasts with formation of reticulin and sparse collagen but no elastic fibres. This change was very striking, since in the normal artery the intima cells remain in close contact with the elastic membrane. In vessels in which the intima cells were degenerating, thrombosis might be in evidence. The media was mainly unaffected. In cases where the vessels were enclosed in a large caseous focus, it was involved in the generalized massive necrosis affecting the other coats and the lumen. Hyaline degeneration of the media was associated with intimal fibrin deposition. This type of lesion and advanced intimal cellular infiltration of the smaller arteries were the main causes of vascular obstruction.

However, the tuberculous lesions were not confined to the meninges alone and the pia was not clearly defined everywhere. In such cases the underlying brain tissue was involved to a variable extent, as clearly indicated in the illustrations 1 and 2. These changes are generally ascribed to pressure or to toxins, but they probably were mainly associated with the ischaemia following the occlusion of the meningeal blood vessels.

The brain lesions were manifested by degeneration of ganglion cells and nerve fibres, pronounced proliferation of microglia cells and in places, of blood vessels, marked focal congestion, fairly extensive oedema even involving the medulla, focal collequative necrosis, necrotic foci filled with numerous macrophages (Schaumzellen) and "cuffing" of blood vessels to a variable degree. A number of these changes are by no means specific, since they are seen in a variety of central nervous conditions (traumatic or viral affections).

Bacteriological findings: Numerous short acid-fast rods were demonstrable in smears made from the nodules and the material scraped from the surface of the brain. The cultures on Löwenstein-Jensen medium showed a luxuriant growth of Mycobacteria after four weeks. The guinea-pigs injected with a suspension of the original material showed generalised tuberculosis at autopsy after seven weeks. On a basis of the cultural characteristics and the pathogenicity of the organisms, tuberculosis of the Mycob. avian type could be excluded. Although the human type of M. tuberculosis very seldom provokes lesions in cattle, four rabbits were injected. Two of the rabbits received 0.01 mgm of bacteria intravenously and two 10 mgm subcutaneously. All rabbits died after

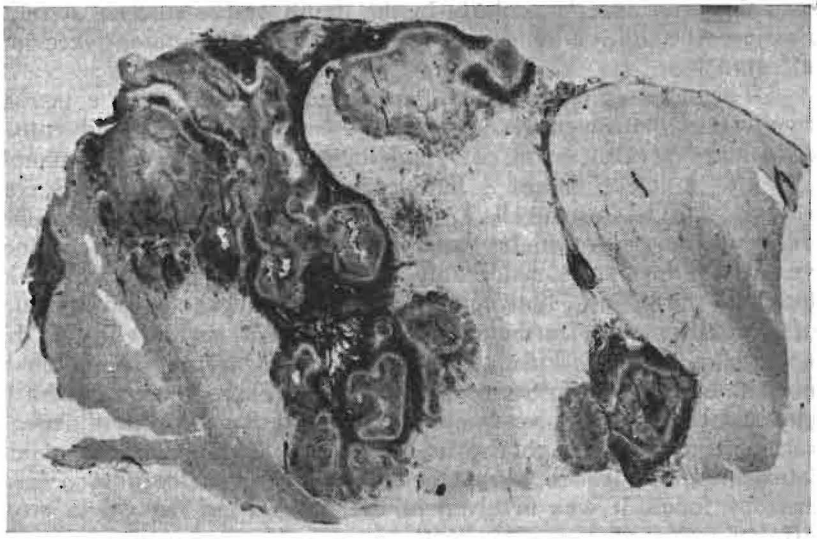

FIG. 1: *Section of the cerebrum. Note the extent to which the sulci between the convolutions are distended by the tuberculous affection and the variation in the degree of the lesions involving the convolutions. The meningeal changes are characterised by pronounced caseation with a variable amount of central calcification and a lymphocytic cell infiltration.*

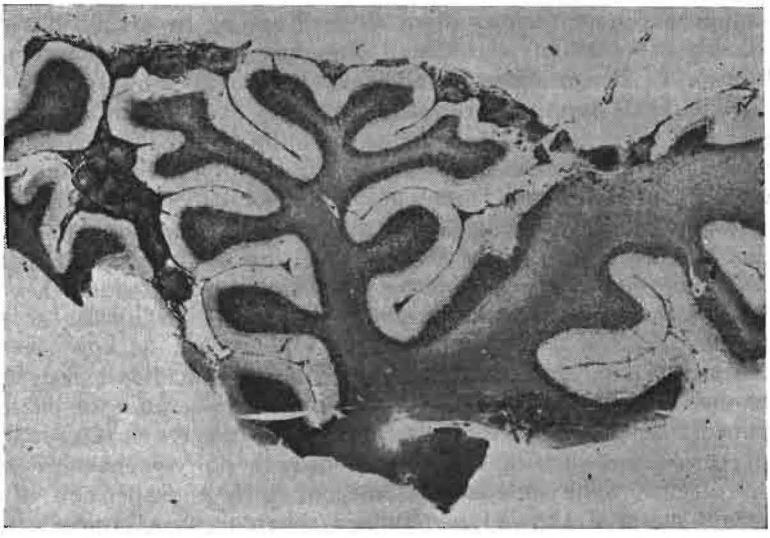

FIG. 2: *Section of the cerebellum. It will be noted that the tuberculous meningeal affection is more pronounced in the depth of the sulci than that on the external surface of the convolutions. The lesions of the brain tissue are considerably less marked than those of the cerebrum.*

two to five weeks, were emaciated at autopsy and multiple tubercular foci involved their lungs, spleens and kidneys.

Tuberculosis of the central nervous system is mainly seen in an advanced stage of the disease, i.e. severe pulmonary affections, extensive involvement of the serous membranes, and generalisation.

A short review of the literature will give an idea of the frequency of tuberculosis of the brain in cattle. Wetzstein (1907) found 1.4 per cent. of animals with lesions of the brain among 28,000 tubercular carcases at an abattoir in Switzerland. Hjortlund (1912) reported on the examination of 405,000 carcases at the Copenhagen abattoir. 130,000 showed tubercular lesions with 557 involving the central nervous system. He often found tuberculosis of the spinal canal. Rienaecker (1951) found 4 per cent. of brain tuberculosis among 1,585 tubercular carcases and Walter (1951) found 2.5 per cent. affected with meningitis or meningo-encephalitis among 1,363 tubercular carcases. At the Leipzig abattoir Hermus (1953) examined 10,483 slaughter cattle — 45.9 per cent. were tuberculous of which 0.8 per cent. showed brain tuberculosis. The percentage of brain tuberculosis in animals with generalised infection amounted to 4.1 per cent. Among 3,795 with tuberculosis in one organ there was no case where the brain was affected.

Taking these statistics into account, it is surprising that, to the knowledge of the authors, no case of tuberculous meningo-encephalitis in bovines has been recorded in the Union of South Africa so far. It must be accepted that brain tuberculosis in a more common occurrence than is generally believed. It would be advisable to examine the central nervous system in all cases of advanced and generalised tuberculosis in cattle encountered during post-mortem examination or meat inspection.

LITERATURE

Craig, J. F. and Davies, G. O. (1941). *Vet. Jnl.*, 97:61.
Hermus, G. (1953). *Mtsh. Vet. Med.*, 12:252.
Hjortlund, G. (1912). *Dtsch. Tierärst. Wschr.*, 20:648.
Rienaecker (1951). *Mtsh. Vet. Med.*, 14:269.
Jeuchner, K. (1950). *Schweiz. Arch. Tierheilk.*, 92:23.
Wetzstein, G. (1907). *Vet. Med. Diss., Zürich.*

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The authors wish to thank Dr. T. Naude, State Veterinarian, Pretoria, who tested the herd, for the information about the symptoms shown by the animal.

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Acting on the authority given it by the 1958 Annual General Meeting, the Board has successfully concluded negotiations for a Group Life Assurance Scheme and also a Hospitalisation Scheme. The following are very brief summaries of these schemes, both of which come into operation on the 1st November, 1958, and are open to all members of the Society.

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ship of the Society is reached, subject to certain rules of the scheme. The sum assured is in each case related to the number of shares or units of membership held, the member having a choice of subscribing for £20 or multiples thereof to a maximum of £100 for every share held. The maximum sum assured for a member holding the maximum of 50 shares is therefore £5,000. The present premium rate at 1s. 3d. per cent per month is equivalent to £7.10.0 per £1,000 per annum or a mere £37.10.0 per annum for £5,000. The Scheme allows for allocation of any profits to the Society and the Board has power to distribute such profits. For certain purposes such as study loans and partnerships, benefits under the scheme may be ceded to the Society, which will consider providing guarantees on behalf of the member.

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Both these optional additional benefits offer remarkable value to members, be they very young or already nearing retirement age and existing members should take immediate steps to secure their participation. Those who are not yet members of the Society should not delay in availing themselves of the very wide measure of security afforded by membership; enquiries should be addressed to the Secretary, P.O. Box 6268, Johannesburg.

HARTWATERIMMUNISASIE VAN ELANDE (*TAUROTRACHUS ORYX ORYX*, PALLAS)

J. F. W. GROSSKOPF
Onderstepoort, Pretoria

Die vatbaarheid van al ons inheemse wildsbokke vir hartwater is nog nie bekend nie. Die meeste boksoorte kom voor in die Transvaalse en Natalse bosveld waar hartwater algemeen voorkom en die bokke dus òf immuun teen òf onvatbaar vir die siekte moet wees om te kan voortbestaan. Wildsbokke word egter nou en dan deur wildliefhebbers van hartwatervry-areas geneem na gebiede waar hartwater wel voorkom. Dit is bekend dat Springbokke (*Antidorcas marsupialis marsupialis*, Zimmerman) vatbaar is en ook vrek aan die siekte (Spreull, 1922; Neitz, 1944), terwyl Blesbokke (*Damaliscus albifrons*, Burchell) wel besmet kan word met *Rickettsia ruminantium* maar dat hulle slegs simptome ontwikkel as hulle ontmilt is (Neitz, 1933, 1935, 1937). Die swart wildebees (*Connochaetes gnu*, Zimmerman) is ook vatbaar vir die parasiet maar word nie merkbaar aangetas nie (Neitz, 1935).

Gedurende Desember 1955 is agt jong elande, waarvan die ouderdomme tussen drie en sestien maande gewissel het, van Tsumeb, S.W.A., 'n hartwatervry-area, na die Potgietersrust-distrik geneem waar hartwater algemeen voorkom. Daar kon nêrens vasgestel word of die eland wel vatbaar is vir hartwater of nie en aangesien die bokke baie mak was en volgens regulasie tog vir dertig dae in 'n kraal onder kwarantyn gehou moes word, is besluit om 'n poging aan te wend om hulle teen hartwater te immuniseer.

Vars hartwaterbesmette skaapbloed is op Onderstepoort verkry en by atmosferiese temperatuur na die plaas vervoer. Vier ure na kolleksie van die bloed was al die elande daarmee ingespuit. Elke bok is 10 ml. stadig binneaars toegedien. Skok as gevolg van die inspuiting het by drie van die bokke in 'n ligte mate voorgekom.

Vanaf die vyfde dag na inspuiting is die rektale temperature van die elande twaalfuurliks geneem. Die temperature het binne normale perke gevarieer tot die twaalfde dag, waarna geringe wisselende temperatuurstygings op verskillende dae by die verskillende bokke voorgekom het. 'n Voorbeeld word weergegee in Fig. I. Geen behandeling is toegepas nie. Na die sewentiende dag was al die elande se temperature weer normaal en het so gebly tot die twee-en-twintigste dag toe die neem daarvan gestaak is. Ongelukkig is geen bloedoorspuitings op vatbare diere gedoen nie en daar is dus geen definitiewe bewys dat die elande wel besmet geraak het nie.

Die elande loop nou sedert Januarie 1956 op erg besmette Hartwaterveld en bontbosluise (*Amblyomma hebraeum*) is met verskillende geleenthede op hulle waargeneem. Tot dusver (September 1958) het nog nie een van die elande kliniese hartwater opgedoen nie en daar kan dus aangeneem word dat elande sonder vrees van hartwatervry-streke na hartwater-besmette veld oorgeplaas kan word.

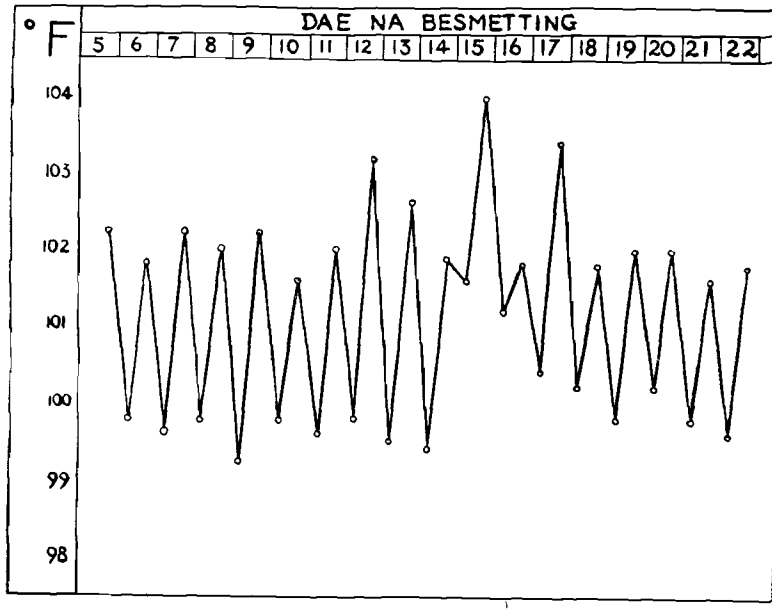

FIG. 1: *Die duidelikste temperatuurreaksie wat by 'n eland verkry is.*

VERWYSINGS

1. Neitz, W. O. (1933). The blesbuck (*Damaliscus albifrons*) as a carrier of heartwater and bluetongue. *J S.A.V.M.A.*, 4:26.
2. Neitz, W. O. (1935). The blesbuck (*Damaliscus albifrons*) and the black wildebeeste (*Connochaetes gnu*) as carriers of heartwater. *Ond. J. Vet. Sc. An. Ind.*, 5:35.
3. Neitz, W. O. (1937). The transmission of heartwater to and from the blesbuck (*Damaliscus albifrons*) by means of the bont tick (*Amblyomma hebraeum*). *Ond. Jul. Vet. Sc. An. Ind.*, 9:37.
4. Neitz, W. O. (1944). The susceptibility of the springbuck (*Antidorcas marsupialis*) to Heartwater. *Ond. Jul. Vet. Sc. An. Ind.*, 20:25.
5. Spreull, J. (1922). Heartwater. *Agric. Jl. U. of S.A.*, 4:236.

ENGLISH SUMMARY

Eight young eland, originating from a heartwater-free area, were each injected with 10 ml. of heartwater-infected sheep blood. Slight temperature rises occurred between the 12th and 17th day after infection but no other symptoms were noticed. These antelopes have since grazed on infected heartwater veld for nearly three years without contracting the disease. It is, therefore, thought to be quite safe to transfer these antelopes from heartwater-infected areas.

BOOK REVIEW

GENETIC RESISTANCE TO DISEASE IN DOMESTIC ANIMALS, by F. B. Hutt, Professor of Animal Genetics, Cornell University. Comstock Publishing Associates. 198 pages.

Every true biologist knows that if he is to be healthy, wealthy and wise, it is not a bad idea to choose his parents carefully. But this is usually the extent of his interest in genetics.

Sooner or later somebody had to stir up enthusiasm and write this book and it is fortunate that Hutt did the job. His lighthearted and impish treatment of the subject not only makes for easy and pleasant reading, even at the end of a long and tiring day, but oddly enough serves to heighten its significance.

The underlying idea is to make veterinarians think, and think, and realise their grave responsibility towards animal breeders, that they have for so long been inclined to shirk. In this, the author succeeds admirably.

In fairness to the veterinarians, however, it should be said in mitigation that for years they have been preoccupied with the conquest of the major infectious diseases, and only recently been free to turn their thoughts to the great problems associated with nutrition, management and breeding. Without their successes, there would have been few animals for the geneticists to work on. For even the author's beloved zebus, after presumably thousands of years of exposure to rinderpest, lungsickness and foot-and-mouth disease, not to mention trypanosomiasis, heartwater and East Coast Fever, are still about as susceptible as most exotic cattle, allegations to the contrary notwithstanding. And natural selection has done precious little to save the indigenous poultry of the western and northern shores of the Indian Ocean from wave upon wave of Newcastle disease.

Nevertheless, the veterinarians have admittedly paid far too little attention to fostering genetic resistance to disease, and only the few reactionaries left will take umbrage at Hutt's good-natured sallies and fail to thank him (naturally, by buying the book!) for his stout efforts on their behalf.

J. W. D. A. Coles.

COUNCIL MATTERS

MINUTES OF COUNCIL MEETING HELD ON MONDAY THE 25th AUGUST, 1958, AT THE MEAT BOARD BUILDING, PRETORIA.

PRESENT: Dr. P. S. Snyman (President), Drs. A. M. Diesel, H. P. Steyn, S. W. J. van Rensburg, R. du Toit, J. W. Pols, E. M. Robinson, R. Clark, A. F. Tarr, M. W. Henning, C. F. B. Hofmeyr, L. W. van den Heever, R. A. Alexander, G. D. Sutton (Hon. Treasurer) and S. van Heerden (Hon. Secretary).

PRESENT BY INVITATION: Drs. W. J. Wheeler, J. Zwarenstein, R. D. Osrin, A. A. L. Albertyn, C. H. Flight, A. J. Louw, J. L. Dickson, R. K. Loveday.

APOLOGY for absence received from Dr. P. J. du Toit.

1. CONFIRMATION OF MINUTES of Meeting held on 16th June, 1958.
2. MATTERS ARISING from these Minutes:
   (a) Dr. van den Heever enquired regarding the word "Medical" in the Association's title. Professor Henning reported that "veterinary medical" had already been in use since 4000 B.C. and also used in most veterinary faculties in the world. Council agreed not to recommend a change in the name of the Association.

   (b) The President requested further information regarding this matter. Dr. Steyn outlined the progress made. Legal opinion had been obtained and considered by the General Purposes Committee, which would circulate its report, together with the opinion, to Council members. It appeared that "farming out" was occurring, which constituted unethical conduct on the part of the veterinarian concerned. He felt that before any action was taken a general warning should be issued by the Veterinary Board.

   (c) *Letter from Dr. Lawrence,* was read by Secretary. The President proposed that the Rhodesian Association be congratulated on its resuscitation, and be asked whether it published its own journal.

   (d) *Membership.* Applications had been received from the following persons, all of whom, except Dr. R. J. Thomas (M.R.C.V.S.) held the B.V. Sc. degree of the University of Pretoria It was unanimously agreed to recommend these persons for membership to the forthcoming Annual General Meeting.

      E. J. Redelinghuis, F. J. St. J. van der Riet, H. J. Venter, R. J. H. Howell, W. G. Barnard, S. K. Bakker and R. J. Thomas.

   (e) *Finance.* The Hon. Treasurer announced that the following members, having paid annual subscriptions for the prescribed number of years were now Life Members: Drs. W. B. Allchurch, J. G. Bekker, P. L. le Roux, I. P. Marais, W. J. Ryksen, D. G. Steyn, L. Stonier, M. Sterne, N. F. Viljoen, G. Watt and J. S. Watt. It was agreed that the Hon. Secretary advise these members accordingly and convey the congratulations and good wishes of Council.

   (f) *Generals*
      (i) Dr. Alexander stated that private practitioners are not entitled to sell vaccines to the general public, but only to their own clients.

Sale to the public would require the holding of a general dealer's licence, which no registered veterinarian may hold. Dr. Albertyn requested the retention of the deposit account system, but Dr. Alexander explained that the Treasury had disallowed this.

(ii) Dr. Steyn referred a request from the Professional Provident Society to Council for its comments and suggestions regarding the proposed scheme to try and obtain Income Tax rebate on monies paid to a central pension fund. It was decided that Dr. Steyn be thanked by Council for his work on this matter and that Council's full approval be given tohim to continue.

3. COUNCIL ELECTIONS, 1958-1959: The election of the following to Council was announced:

President: Dr. H. P. Steyn.
Vice-President: Dr. R. du Toit.
Hon. Secretary: Dr. S. van Heerden.
Hon. Treasurer: Dr. G. D. Sutton.
Members 1958-60: Drs. P. S. Snyman, M. de Lange, A. F. Tarr, M. C. Lambrechts.

Dr. R. du Toit ceases to be a member of Council on his election as Vice-President and Dr. L. v. d. Heever was elected to take his place for the remainder of his term of office for 1957-59.

The President congratulated Dr. Steyn on his election to the Presidency and also thanked the Hon. Treasurer and Hon. Secretary for their valued services during the past year. He also stated that it appeared to him that perhaps the time had arrived to consider the appointment of a full-time Secretary.

4. *Election of S.A.V.M.A Representatives on the Veterinary Board*:

The President announced the election of Drs. H. P. Steyn and S. W. J. van Rensburg as the Association's representatives on the Veterinary Board.

Dr. Alexander, commenting on a letter from the Secretary for Agriculture, advised that Dr. Diesel had withdrawn his resignation from the Board.

The Secretary was instructed to convey Council's thanks to Dr. Diesel for reconsidering his decision in this matter.

5. *Motion by Dr. Alexander*: " The relationship between state veterinarians and private practitioners ".

Dr. Alexander stated that in spite of numerous complaints to the Director of Veterinary Services and the Chairman of the Veterinary Board by private practitioners, about alleged interference by state veterinarians, it had been found that in no single instance had any interference been found to have occurred, and he would welcome an expression of opinion by Council on this matter, for the guidance of the Director of Veterinary Services and the Chairman of the Veterinary Board.

Dr. Alexander also cited cases of unethical conduct by private practitioners. A member's letter of complaint was read. In the ensuing discussion attention was drawn to the difficulty encountered in deciding such matters where only one side of a case was being heard and that such complaints were due chiefly to ignorance and a fear of financial encroachment.

On the motion of Dr. Steyn, seconded by Dr. Tarr, it was agreed to ask the Director of Veterinary Services to refer such complaints to the new Disciplinary Committee of Council (to be elected at the next Council Meeting) for consideration and submission of a report.

6. *Reports of Standing Committees*:

(a) *General Purposes Committee*: It was noted with pleasure that Congress papers in galley-proof form had been made available to members this year, and that a circular letter to new graduates had been drafted. This was considered and approved.

(b) *Editorial Committee*: Dr. Robinson drew attention to the high printing costs of the Journal and stated that articles should be kept as brief as possible.

(c) *Library Committee*: Dr. Clark reported that the common room of the old hostel had been fitted as a Library and that the University was providing the sum of £250 p.a. for the purchase of books.

Private individuals may present technical and non-technical books to this Library. The University would undertake to bind the journals received in exchange for the S.A.V.M.A. Journal, provided that these exchange journals were presented to it. On the motion of Dr. R. du Toit, seconded by Dr. Tarr, Council consented to the presentation of these journals to the University.

7. *Matters arising from Branch Annual General Meetings*:

(a) Concern was expressed by private practitioners at the sale of vaccines by pharmacists who were already in some ways in competition. Council decided practitioners are only entitled to sell vaccines to their own clients.

(b) Public Health Group. Information was requested on the appointment of veterinarians to undertake the ante and post mortem inspection of meat. Dr. Alexander stated that support was forthcoming for the appointment of veterinarians to do this work.

(c) Orange Free State, Basutoland and Northern Cape Branch.

(i) Dr. A. J. Louw introduced his branch's resolution that a full-time Secretary and Public Relations Officer be appointed and outlined the numerous duties such an official could usefully perform. During the discussion it was pointed out that the Association's affairs are becoming too complex to be dealt with by a part-time Secretary in his spare time. Also that the Association could not afford such an official unless the annual subscription was increased.

(ii) The branch enquired regarding the implementation of the Report of the Commission of Enquiry into Medical Research. Dr. Alexander explained that the C.S.I.R. had implemented part of the Report in advance and that the report had not yet been approved of by the Governor-General-in-Council.

(f) Cape Western Branch: Requested that the Annual Congress be held in July, during the school holidays. This matter had been fully investigated on previous occasions and Council agreed that no change of time appeared to be possible.

(g) S.W.A. Branch: Council was advised that due to the Foot and Mouth outbreak it had not been possible for the branch to hold an Annual General Meeting this year nor to send a delegate o the Council Meeting.

8. CORRESPONDENCE:

(i) A letter from a member had been received requesting Council's opinion on the question of castrating horses without an anaesthetic.

It was resolved that Messrs. Steyn and Diesel would present a resolution on behalf of Council, to the Annual General Meeting on this matter.

(ii) Circular letters from the Secretariat of the International Veterinary Congress were red and noted. It was also noted that the Committee of the International Veterinary Congress intended to change the name to World Veterinary Association Congress. — No comments.

(iii) A circular letter advising details of the 3rd World Congress on Fertility and Sterility was noted and passed to the Editor for publication in the Journal.

9. GENERAL:

(1) Dr. Alexander reported that he had obtained permission for Dr. Lambrechts to attend the British Veterinary Association Congress in the Isle of Man as an official delegate. Dr. Alexander was thanked for his efforts in this connection. Agreed to ask Dr. Lambrechts to represent the S.A.V.M.A. at this Congress, — the B.V.A. to be advised accordingly.

(2) Dr. van Rensburg laid before the meeting and discussed a draft of a certificate, for suggested use when herds are to be examined and certified by veterinarians. After discussion it was agreed to refer the draft to:

(a) the Fees Committee to consider and recommend suitable and equitable fees, and

(b) the Committee which had drawn up the other veterinary certificates, for consideration and redrafting, if necessary,

and both these Committees to report back to Council. — Agreed.

The Meeting closed at 6 p.m. with a vote of thanks to the Chair.

FOURTH INTERNATIONAL CONGRESS OF ANIMAL REPRODUCTION

(Physiology, Pathology and Artificial Insemination)

The Organizing Committee in the Netherlands announces that after consultation with the members of the Executive Committee it has been decided that the Fourth International Congress on Animal Reproduction will not be held in 1960 but in 1961.

The main reason for this postponement is that by doing so a logical sequence will be reached to the International Husbandry Association Congress to be held in Hamburg, also in 1961.

The Congress on Animal Reproduction will meet in The Hague from June 5—10, 1961.

Further details to follow.

ERRATA

The following Errata occurred in the Paper on: Encephalitozoon Cuniculi, J.S.A.V.M.A., September, 1958:—

Page 241 line 13 by Perrin[6] and by Lillie[7]
line 15 Craighead[8]; Goodpasture's stain[8]
line 22 Goodpasture[9]
line 29 round-cell.
Page 242 line 3 Wright,[11]
Fig. 1 legend x 128
Page 243 Fig. 2 legend x 825
line 20 Blocks
Page 244 Fig. 3 legend GOODPASTURE'S STAIN. x 1030
line 25 an attempt
Page 245 line 16 Sautter[12]

NOTE.—Magnifications in legends to figures have been corrected for reduction during reproduction. See request made in July.

OPENING CEREMONY OF THE CONGRESS AT ONDERSTEPOORT, AUGUST 26th, 1958.
Dr. R. A. Alexander (Director of Veterinary Services); Dr. P. S. Snyman (President, S.A.V.M.A.); Mr. J. H. Grobler (President S.A. Agricultural Union); Dr. J. S. van Heerden (Hon. Secretary, S.A.V.M.A.); Dr. P. J. du Toit; Dr. H. Graf (Dean of the Veterinary Faculty).

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SUBJECT INDEX