VOLUME XXII. NUMBER 1.

MARCH, 1951.

THE JOURNAL

OF

THE SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION.

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(Forman, C. R. (1946) *J. Amer. Vet. Med. Ass.*, **109**, 126
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LECTURE ON THE BREEDING OF FOWLS *

J. D. W. A. COLES

Introduction

This lecture is the outcome, to a large extent, of our experiences at Onderstepoort during the past 15 years. To appreciate it properly, we must hark back to the early thirties and consider what was happening then. Accurate knowledge of poultry pathology and husbandry was at a premium the world over. Everywhere the mortality rate was rising and this not unnaturally led to violent assertions in the popular poultry press that the poor little hen was being asked to do too much and was breaking up under the strain. Opinions were being advanced as facts, and it was confidently predicted that fertility, hatchability, productivity and viability would all sink to new low levels in a comparatively short space of time. Many breeders, perhaps despairing of ever improving production in their own flocks, were quick to concede that it was folly even to make the attempt.

For a time there was a danger that the defeatists would succeed in convincing their fellow-poultrymen of the desirability, if not the necessity, of "going back to nature" and being content with what would be regarded as very mediocre feats of laying by breeders of vision and determination.

Fortunately, the pessimists did not prevail. In the United States in particular, research workers added enormously to our knowledge of avian nutrition and showed how much proper feeding could contribute to the promotion of health and laying. Others brought about the almost total elimination of infectious diseases from well-managed poultry plants. Still others, the breeders of different countries, were left to close the gaps not filled by the nutritionists and epizootologists — and it is with this work that this lecture is mainly concerned.

The Diseases that Kill Fowls

There is comparatively little excuse nowadays for losses attributable to the deficiency diseases. Our knowledge may by no means be complete, but we do understand enough to enable us to feed fowls an apparently adequate diet.

By the use of vaccines and biological tests and by the adoption of proper systems of management, we can preclude practically all losses

* Actually several lectures were given to the Veterinary Science students at Onderstepoort, but for the sake of convenience they have been merged into one.

from infections such as tuberculosis, fowl pox, infectious coryza, Newcastle disease, fowl typhoid, bacillary white diarrhœa, ægyptianellosis, spirochætosis and cholera. The whole flock must be officially certified free of B.W.D. and typhoid.

It is a sad reflection on a poultryman to have external parasites such as lice, red mites and fowl ticks on his plant. Worms can be countered by using the ground properly. Coccidiosis, like the poor, is with us always, but losses need not exceed 2 or 3% even when no drugs at all are given.

Where the trapping of hens is practised, their feet and vents can be examined at the time of release from the nests and so trouble due to bumblefoot and vent picking can be almost entirely circumvented.

What, then, do properly kept fowls die of? Unquestionably, the most important killer is cancer, and it is not so very unusual for over 40% of a flock to succumb to it in a single year. On our plant the figure for the first two years, 1937 and 1938, was not less than 43% — and that at a time when 200-eggers were few and far between.

Under the term cancer, we include the carcinomas, sarcomas, gliomas, embryonal nephromas, erythroleucosis, myeloid and lymphoid leucosis and the hæmangiogenous endotheliomas, which are relatively common tumours particularly of the skin. Neurolymphomatosis and osteopetrosis are, however, excluded because we are far from being convinced that they are neoplastic conditions.

Nephritis perhaps follows cancer on the list and, while our ignorance of this sporadic condition persists, we can expect little progress to be made in combating it.

Inflammations of the oviduct may be somewhat troublesome, especially in second and third season hens, and here again we are still obliged to admit defeat. Almost the same remarks apply to degeneration and rupture of the liver. Naturally, there are many other conditions that claim occasional victims, but as yet they are of insufficient economic importance to disturb us.

We all know how expensive and impracticable, not to say futile, it would be to try to treat cancer in fowls on the lines of cancer in man. And we all know how successful have been the efforts to breed strains of mice highly resistant or highly susceptible to various types of neoplasms. It was only natural that poultry breeders should have been influenced by these most encouraging experiments on mice, when seeking a way out of their own peculiar dilemma. And this notwithstanding that they were fully aware that fowls, unlike mice, could not tolerate much inbreeding. We will revert to this all-important question a little later.

The Objectives of a Poultry Breeder

Deep down in the heart of even the most ardent protagonist of the overworked poor little hen is the realisation that sentiment cannot replace eggs, if the bills of the poultry farm are to be paid. And not

only eggs are demanded; when the hen has finished laying, she has still to grace a dinner table. All this implies that we have to breed not only for eggs but for viability and high fertility and high hatchability and, generally speaking, absence of broodiness. Appearances are important, too, if breed characteristics are to be maintained and even improved.

At this juncture we are forced to allude to the conflict between the show-bench enthusiasts and the commercial breeders. The former, usually the more vociferous, are concerned primarily with morphology and go into raptures over magnificent looking birds that conform to standards set by the showmen themselves — and revised every five to ten years! The so-called commercial men, on the other hand, often affect to be interested not in blue ribands but full egg baskets.

We think that the bickering is most unfortunate and that the extremists in both camps are wrong. A sense of proportion is wanted. The vast majority of poultrymen are in the business to make a living and so demand healthy birds capable of producing an abundance of eggs and meat. There is no reason, however, why the birds should not be uniform in type and meet all sensible æsthetic requirements. As sensible is the crucial word, arguments will continue, but sooner or later a fair degree of unanimity will no doubt be reached.

At this stage we should give some indication of how we prefer to attain our ends. Do we wish to inbreed closely, for instance, hoping thereby to produce quickly some outstanding birds, even at the cost of a large number of their relatives being worthless culls? Or do we desire to raise the general standard of the flock, surely if not always spectacularly in the early stages, until our goal has been reached? Rightly or wrongly we chose the second course and have been very well satisfied with the results. In 1943, for instance, we housed 880 pullets and this figure rose to 1,100 by 1948; during this period the hen-housed average for 365 days increased from 173 to 203 eggs.

The Closed Flock and its Implications

The ideal way to breed fowls is to maintain sufficient numbers in closed flocks, so that in generation after generation there is no necessity of introducing new blood, which almost invariably means new cocks. Every time an extraneous bird is brought in, it really means making a fresh start, as far as any serious breeding programme is concerned.

What does a decision to maintain a closed flock of fowls imply? There must be at least ten breeding pens, each occupied by a cock and six or seven hens. We ourselves have 15 pens and would rather have 20 than 10. Unless there are sufficient pens, the cocks will ultimately become too closely related to the hens to which they are mated. We like to have eight to ten daughters in a flock house to judge the value of a hen from all points of view, including her ability to transmit resistance to cancer, even though four or five are sufficient for statistical purposes where egg production alone is concerned. So we should set all the eggs laid in the breeding pens over a period of at least six weeks. In other words, a minimum of 500 pullets must

be leg-banded and quartered in the flock houses annually. No less than 150 of their young brothers must be retained in the cockerel camps, from which to select 50 to 60 males for the flock houses. After the first season, a few of these 50 odd cocks will qualify to head some of the breeding pens. Cockerels are usually kept from the fifth and sixth weekly hatches, as the best layers may not have resumed production after the moult in time for their eggs to be included in the earlier hatches. If these instructions are observed, there will be in the flock houses about 50 daughters of each sire, and this is a most adequate number by which to judge a male; 20 to 25 will suffice if we take cognisance only of the eggs that are laid.

These, then, are the bare essentials, and if two breeds are kept everything must be duplicated. Incidentally only a most efficient man can handle two breeds; three are simply out of the question.

All this time we have been talking about breeders of fowls, not mere multipliers of them, and so it will not be superfluous to emphasize that breeding entails much book-keeping, and trapnesting at least from Monday to Friday of every week throughout the year. Indeed, book-keeping constitutes 90% of breeding, inspection of the birds 5%, and inspiration the rest.

The Breeding Season

Because the hens do not finish moulting earlier in South Africa, we remove the first pedigreed chicks from the incubator at Onderstepoort about the end of the first week in August — actually on the Friday after the first Monday. Thereafter hatches are taken off at weekly intervals for six or seven, occasionally eight, weeks. If this practice is followed, ten breeding pens each containing an average of six really good hens will give us about 600 to 700 pullets in the flock houses.

In this connection let us state at once that 88% of the pullets hatched should live and be suitable for the flock houses, just as 88% of the birds quartered in the flock houses should, after a year in these houses, still be satisfactory for the butcher or for retention for a second laying season. Moreover, during the hatching season at least 75% of all the eggs laid in the flock houses should be suitable for incubation and at least 75% of all eggs set should hatch. Even though all the selected breeding cocks and hens are over 600 days old, 90 to 95% of their eggs may be incubated and fully 75% should produce chickens.

Lest any misunderstanding should exist, it must be stressed that chicks intended for purchase by the public must obviously be the progeny of birds other than those in the ten or more special breeding pens. Although they are from eggs laid from May to October, mainly by pullets, the chickens for sale should be far superior to those produced on a farm where no scientific breeding plan is in operation.

Necessary Records

It will now be our task to say exactly how the records are to be kept and evaluated, and how the breeding pens have to be assembled.

For the sake of argument we will begin in November, 1945, with 570 pedigreed, wing-banded White Leghorn pullets that were hatched in August and September. They are developing on open range. Five flock houses, each of 400 square feet, have been set aside for them and into every house will go 110 pullets and eight cockerels (in the case of a heavy breed, these figures would be 100 and 10 respectively).

The first 110 pullets to redden up will be ready to occupy a house about December 20. All the pullets will be housed by the end of March, 1946. Fifteen or 20 poor specimens will be held back, perhaps for human consumption.

As the pullets are being installed in the flock houses they are given leg-bands and have their eye colour and wing-bands recorded. A Laying Card is then made out for every pullet and the 110 (or 100) cards for the birds in any one house are kept in a folio by themselves.

Let us assume that the leg-bands are numbered 6·1 to 6·550. The first folio will contain the Laying Cards of 6·1 to 6·110, the second 6·111 to 6·220 and so on. Incidentally, it is desirable to have the leg-bands marked in such a way that the first figure corresponds to the first laying year of the pullet; thus the initial figure on all the leg-bands of pullets coming into production at the end of 1947 or early 1948 would be 8, and in the case of birds commencing to lay at the end of 1949 or the beginning of 1950 it would be 0. It may be necessary, if suitable bands are unobtainable, for a letter of the alphabet to replace the initial figure.

Laying Cards

A specimen is shown and is that of 6·394. Her pedigree is given in the top left-hand corner and 1694(4), 708(2) and 953(2) are the males. A cock is known by his wing-band only and the figure in brackets after the number is the same as the initial figure on his sisters' leg-bands. The females in the pedigree are designated by their leg-band numbers.

Since all 6· birds were hatched in 1945, their Laying Cards will be numbered 46/something; 6·512 would be marked 46/512, and so on.

A differently numbered wing-band is put on every chick when it is removed from the pedigree bag and more will be said about this later.

The age when the first egg is laid is given in days; early maturing pullets are favoured. Only when there is something abnormal about shell quality or egg shape is the fact noted. The dam's Breeding Card was marked 45/22 because she was used as a breeder in 1945 and because she was the second bird in the fourth breeding pen, the first three pens containing 7, 6 and 7 hens respectively, a total of 20.

Hen 6·394 laid 264 eggs during the first 365 days of production. But she laid another 26 eggs before going into her first annual moult and so her figure for the biological year was 290. All other things being equal, we prefer a hen that goes on laying for four to eight weeks after completing her first year.

In 1947 when her Breeding Card was 47/59, 6·394 was mated to cock 465(3) and was placed in pen 10.

When 6·394 was four and a half months old, she was not only leg-banded on entering the flock house, but had the colour of her eyes recorded. Both eyes are not necessarily the same. A No. 5 eye is perfect in colour. A No. 4 is almost as good and such a bird could be used in the best breeding pens. A No. 3 eye is definitely light, and a No. 0 eye might characterise a bad case of epidemic blindness. These numbers are, of course, purely arbitrary, but are nevertheless most useful.

A few words about eye colour will not come amiss. Some breeders make an absolute fetish of it. So long as the eyeballs and pupils are normal and equal in size and shape, and so long as the pupil responds properly to various degrees of light, it does not matter if the iris is a shade lighter than usual. In the case of the White Leghorn, any suspicion of green or grey is most unwelcome.

The egg weights are recorded in ounces, and nine consecutive weights, if available, are entered in the spaces provided. These suffice to enable us to form an excellent idea of the eggs laid by any hen. During the weighing, it is easy to detect and record abnormalities in shell quality and shape. In South Africa the weighing is done in August and September, because nearly every bird is laying then and very few will be missed. The number of the pullet (for only the eggs of pullets are weighed) is written in ordinary and not indelible pencil on the egg, when the bird is released from the trapnest, and then the weight is recorded in lieu of a cross on the Monthly Egg Card, an example of which is shown.

Hen 6·394 commenced laying on 23.1.46. Production in January, 1947, was recorded as 16/5; this meant that 16 eggs were laid during the first 22 days of the month to complete the year, and five during the last nine.

Hen 6·394 ended her career by dying of salpingitis (inflammation of the oviduct) on 13.12.47. She might as well have died of some other disease or been culled or killed for table purposes. If a bird is disposed of because of sickness, it must be entered as having died.

We had nothing to mention under the heading Remarks, but if she had been found laying on the floor in February or had had fowl pox in April or had gone broody in October or had injured herself at some time or other, the incident would have been recorded.

It is easy to assess the breeding value of 4·7480, the dam of 6·394, by assembling the Laying Cards of 6·394 and all her sisters. The numbers of the sisters will naturally be found on the Breeding Card of 4·7480. Likewise the breeding value of the sire 1694(4) can be ascertained by perusing the Laying Cards of all his daughters.

Monthly Egg Cards

An example is given. If the egg production of 55 to 60 birds can be recorded on every card, only two will be required for every

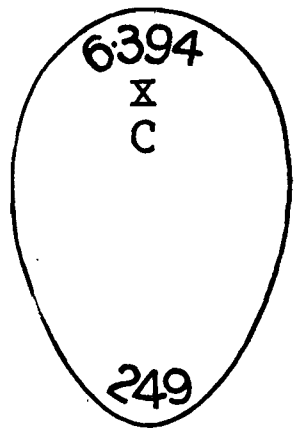
flock house. They are pinned up near the nests. When the eggs are not being weighed, they are represented only by crosses. It is seldom necessary to weigh the eggs over a period of more than 15 days. The double line after every five days makes it easier to find the appropriate square when recording production.

Hen 6·225 laid 12 eggs, but was broody during the month; 6·226 laid eggs with poor shells; 6·227 produced four eggs and then died on August 17; 6·230 was lame for a few days as a result of an injured leg; 6·231 was seen laying on the floor. All the above facts must be recorded on the Laying Cards, as already stated. Hen 6·234 died some months before and so her number is omitted.

Breeding Cards

When it has been decided early in June what hens are to go into the various breeding pens, the Breeding Cards are made out and kept together in a folio. All those used in 1947 were marked 47/something. The hen with the lowest leg-band number in pen 1 was 47/1 and the hen with the highest number in the last pen, No. 10, was 47/63. As 6·394 was the hen with the lowest number but one in pen 10, which contained six hens, she had the number 47/59. The other details at the top of the card need no explanation, if the Laying Card of 6·394 is consulted.

When eggs are collected for pedigree breeding purposes, they should be marked as shown. At the rounded end must appear the numbers of the hen and pen and the initial of the person trapping the



bird. At the pointed end, which, unlike the rounded end, is not damaged during hatching, the serial number is written just before the egg is put into the incubator. The question of the setting of the eggs will be discussed in detail later. There were five eggs in the first hatch, four in the second, five in the third, and so on. Eggs 251 in the first hatch and 259 in the fifth were infertile, and 259 in the seventh contained a dead embryo, and 250 of the third pipped but the chicken

failed to hatch. Egg 254 of the fourth hatch yielded nothing, because the chick was in an abnormal position within the shell; actually, it had its head at the pointed end.

A normally placed chicken has its head in the rounded end with the beak under the right wing and directed towards the air space, and its legs are held against the abdomen with the feet folded and pointing towards the head. Abnormal positions are the following:— I. Head between the thighs. II. Head in the pointed end. III. Head turned to the left. IV. Head rotated away from the air cell. V. Feet over the head. VI. Beak over the right wing.

There were no malformed chicks, i.e. monsters. A hen producing a monster, or too many eggs containing chicks in the wrong positions, would not be used again for breeding purposes. However, it is very seldom that a hen must be discarded because of too many malpositions.

As the chickens are taken from the pedigree bags or baskets, they are wing-banded and the bands are inspected after one and two weeks to make sure that the ends of the wings are free. Those pullets that live and are good enough for egg production are leg-banded when put into the flock houses. The ultimate fate of every bird is recorded and the cause of death is noted wherever possible. It is even shown on the Breeding Card that 6·394 herself died of salpingitis.

Setting and Incubating Eggs

About the end of the first week in July, after the hens and cocks have been in the breeding pens for roughly a month, a start is made with the collection of eggs for the incubators. For the first hatch they are usually collected for ten days, thereafter for seven. The eggs are set weekly. It is best to store the eggs at a temperature of about 60°F, the eggs from each pen being kept in a box by themselves. It is not necessary to turn them.

On the wall above the table in the incubator room is a chart showing the hens and cocks in the various pens. Such a chart is shown in a condensed form.

Pen	1	2	3, 4, 5, 6, 7, 8	9	10
Cock	443(6)	972(5)		721(6)	465(3)
Hens	4·7882 7902 5·8210 6·17 32 121 165	6·21 76 92 97 103 501 505	In these six pens are 36 hens, giving 63 hens in the 10 breeding pens.	5·8310 8325 8407 6·372 399 472 485	4·7480 6·394 400 438 497 503

In pen 1 are hens of three ages and the oldest group is always put first on the list.

On the table is placed the sorting board, which has nine to twelve rows of eight holes. Each row of holes is assigned to one hen, and so all the eggs of any one pen can be put out and given their serial numbers at the same time.

Let us deal with pen 1. The eggs of 4·7882 will occupy some or all of the holes in the first row and those of 6·165 will be put in the seventh row. The hole nearest the operator is the first to be filled in every row. When all the eggs from one pen have been sorted out, they are inspected. No single hen lays all kinds of eggs. If one is glossy, all are glossy. All are more or less of the same size, and the shell texture and markings vary little from egg to egg. If one egg is tinted or brownish in colour, all will be of a similar shade. So if a small, tinted egg with a glossy shell is found in a row of large, white eggs with dull shells, it will be apparent that a mistake has been made and the odd egg must be discarded.

At the end of this inspection, the serial numbers are written on the pointed ends of the eggs and recorded on the Breeding Cards. The first egg of the first hen in the first pen is number 1. If the first hen has laid five eggs, the first egg of the second hen will be marked 6; and so on until the last egg of the last hen in the last pen has been marked, possibly with the number 297 if there are 63 hens in the pens. In every hatch we begin over again with serial number 1 and so the numbers on the eggs of any one hen are always more or less the same for the different hatches; refer to the Breeding Card shown for confirmation of this.

Only sound eggs free of cracks are set and only when an exception can be justified may an egg weigh less than 2 ozs. It is preferable to brush or scrape soiled eggs instead of washing them. After all the eggs have been inspected and marked they are packed in the incubator trays.

If the sale for infertiles is good, the eggs may be candled after a week. Otherwise, they are candled only on the eighteenth day, when the sound eggs of each hen are again separated on the sorting board and put by themselves into a pedigree basket or bag, so that all the chicks removed from a basket or bag on the twenty-second day are the progeny of one hen. The baskets are made of wire and usually hold three to six eggs; they are relatively expensive and take a lot of room in the incubator trays. The bags are made of mosquito netting and the different sizes also hold three to six eggs and they are cheap and occupy comparatively little space in the trays. The bags are washed and sterilized after every hatch and the new ones have to be big enough to allow for shrinkage. The eggs are put in the bags and baskets on the eighteenth day, because no further turning is then necessary.

After the good eggs have been returned to the incubator, all the defective ones should be broken open, and it should be recorded on

the Breeding Cards whether they were infertile or contained dead chicks or monsters.

On the twenty-second day the trays are taken out one by one and the bags or baskets of chicks are covered with a light-weight blanket to keep them warm. The bags are opened in strict rotation, beginning with that containing the eggs of the first hen in the first pen. The serial numbers on the broken shells are checked against those on the Breeding Card, to make sure that no eggs have been put into the wrong baskets and that all eggs are properly accounted for. If there is a mistake that makes any material difference, it is incumbent to discard the chicks in the bag concerned. If all is in order, the chicks are wing-banded and put in a box half covered with a piece of flannelette and with soft hay on the bottom. When this box is full and contains about 30 chicks, they are transferred to the brooder. After the last chicken of the last hen in the last pen has been banded, the unhatched eggs are opened and dead chicks, monsters, malpositions and pipping are recorded on the Breeding Cards. If a chick hatches but suffers from a deformity, it is best not to band it, but to destroy it and record the fact. It is permissible to assist chicks out of eggs, particularly large ones which often give trouble, but the operation will be successful only if the membranes are dry.

To avoid duplication of wing-band numbers, the number of the first chick in the second hatch should follow the number of the last in the first hatch and so on.

In due course most of the pullets will be leg-banded and the bands are put upside down on the left legs to facilitate the reading of the numbers when the birds are released from the nests. The attendant clears the nests seven or eight times a day. No matter whether a bird has been leg-banded and so given a Laying Card, all deaths and sales of males and females must be noted on the dams' Breeding Cards.

Artificial Insemination

There is unfortunately not much lucid thinking on this matter. A cock can cope with eight to 12 hens, depending on the breed, and sire 200 to 300 chickens in a season. It is possible to multiply this number by five to ten, by artificially inseminating the hens, but there is a very real danger of keeping too many chicks from too few cocks and so being forced at a later date to employ males that are too closely related to the females. Moreover, from bitter experience we have learnt that less than 5% of cocks actually selected to head the special breeding pens are really sufficiently outstanding to be used for artificial insemination purposes. During 15 years we ourselves have unearthed only three of these superb creatures. We consider that where fowls are concerned, the whole question of artificial insemination may conveniently be forgotten unless, of course, we particularly desire to counter the effects of preferential mating or an injury to a healthy bird.

Changing Cocks in Breeding Pens

Because many infertiles, for instance, have been found among

the eggs in the first hatch from one pen, the breeder may be tempted to replace the cock. Perhaps the cock has even died. If it is intended to keep accurate records, and any others are valueless, no chicks should be credited to the new male, that are hatched from eggs laid during the three weeks after removal of the first sire. As the breeding season lasts only about eight weeks, it is seldom that a worth-while change can be effected.

Moreover, it is fallacious to think that all a hen's eggs will be useless, simply because those in the first hatch are infertile. Extraordinary things happen, and it is not uncommon to find one or two hens laying infertile eggs during the third or fourth weeks, for example, while all their other eggs are perfect. Because of all these circumstances and the fact that it is generally necessary to set even the first eggs laid after the moult, it is obvious that changing cocks is not very practicable and there is also no possibility of running a trial hatch about a month before the breeding season proper commences.

Candidates for Breeding Pens

The characteristics demanded will vary with the breed and the quality of the birds available. If a breeder requires 100 hens for his pens, he will naturally choose his best 100, and these may be infinitely better or considerably worse than the 100 picked by the man next door for filling his particular pens. Finally, if the breeder is well versed in avian pathology, he will automatically select his birds more stringently than the farmer who has no such knowledge.

The females put in any one pen must be closely related — full sisters if possible, and at least the daughters of a single cock.

We ourselves, of course, are concerned with Single-Comb White Leghorns, and the following points have to be taken into consideration:—

(1) In appearance and weight the hen must conform very closely to the standards laid down for the breed. A desirable weight is 4½ to 5 pounds, and certainly not less than 4 pounds.

(2) Crossed beaks, stubs, side sprigs, willow shanks and markedly dented or crooked keels definitely disqualify birds, and so will eyes rated less than 4.

(3) Rumplessness is an unpardonable defect; due to this abnormality the hen carries her tail down like a guinea-fowl.

(4) A roach back or a wry tail or a bad squirrel tail or even a slightly pendulous crop is not tolerated.

(5) When all other things are equal, discard a hen with excessively developed spurs.

(6) A hen is rejected if she has ever been broody.

(7) In the first 365 days of production at least 240 eggs should be laid, and these should weigh 2 ozs. or more when the full size has been reached, and the quality and shape of the shell must be up to standard. Some breeders may find it difficult to insist

on a production of only 200 eggs, but a figure lower than this is unacceptable.

(8) If mated previously, fertility and hatchability must have been satisfactory and no significant monsters produced.

(9) Neither the hen's dam nor sire, nor any of her brothers, sisters, sons and daughters must have developed osteopetrosis or neurolymphomatosis or leucosis or any other malignant form of cancer such as a sarcoma, a carcinoma, a glioma and an endothelioma. We have already dwelt on this question of cancer. Its significance simply cannot be over-emphasized.

Fortunately, at least 90% of birds doomed to succumb to the various types of cancer, die before the age of 600 days and so, if we mate only males and females older than this, we can expect to breed from the more resistant fowls. Experience in the United States of America and in South Africa has shown that by adopting this simple expedient of breeding from mature birds, a farmer can ultimately lower his annual cancer losses from about 40% to 6 or 7% of his total adult stock. We ourselves have gone further, as just indicated, and refuse to breed even from the survivors of tainted families, no matter how old they may be and, as a result of this very rigid selection, have reduced the annual loss from all forms of malignancy to 5% during the first 600 days of life. We are not very optimistic about lowering this figure, for despite all the precautions taken in choosing hens for the breeding pens about 20% still have tumours spoiling their progeny.

The path of the breeder is never easy. Notwithstanding all obstacles to progress, however, 15% of our pullets leg-banded at four to seven months ultimately qualify for inclusion in our breeding pens; an equal number lay 240 eggs or more but are discarded for various reasons.

In the case of the cock we pay attention to the following points:—

(1) In weight and appearance he must conform closely to the accepted standards of perfection.

(2) The remarks that apply to the hen are just as applicable to the cock, when it comes to crossed beaks, stubs, side sprigs, willow shanks, eye colour, rumplessness, roach back, wry tail, squirrel tail, pendulous crop, dented and crooked keels, fertility, hatchability, monsters and osteopetrosis.

(3) Neither his dam nor sire, nor any or his brothers and sisters should have suffered from any malignant condition or neurolymphomatosis. Two or three cases occurring in his offspring may be overlooked.

(4) The index of his sisters' production during 365 days must be at least 200 eggs. To arrive at this figure we divide the total number of eggs laid by his sisters, by the number of sisters leg-banded and put in the flock houses. If a sister dies of coccidiosis during the first month in the flock house, and this not infrequently happens where Eimeria maxima is a problem,

or dies as a result of an accident like breaking a leg, both she and her production are left out of our calculations. We admit that this is a very arbitrary way of judging a cock, and we know that the index of a male hatched in one year may differ by even 25 eggs from that of a full brother hatched in a subsequent year. But in the absence of anything substantially better, the index serves a useful purpose. It is seldom that a cock is chosen unless the figures for at least eight sisters are available and so the mothers of our sires are equal to United States Record of Merit Honour Roll dams.

It may seem easy to find a cock fulfilling these exacting requirements, but in practice it is most difficult. Not more than 5% of the day-old cockerels retained as possible future breeders will make the grade at the age of 600 days. More often than not the percentage is only two or three and it is exasperating to find how many certain show-bench winners have skeletons in the family cupboards.

Evaluation of the Records

In December the first pullets begin to redden up and flock houses have to be found for them. The necessary space is obtained by consulting the Laying Cards and culling the most worthless of the first and second season birds, and those in the breeding pens that have no prospect of being used again. The poor-looking males are also scrapped. This culling goes on until the last of the pullets have been housed by the end of March.

In January all the attractive-looking cocks from the flock houses and breeding pens are put out to grass in fairly large camps and remain there until the select few are chosen in June to head the new breeding pens. Those that are passed over are then sold for breeding or slaughter purposes. We prefer to run cockerels with the second season hens that are retained in the flock houses for general chick production, so that our choice of males for the breeding pens in the following year will be as wide as possible. There is no point in keeping males in the flock houses that have already failed to quality for the breeding pens.

Early in June we go through the records of the previous year's breeding hens and retain those birds that have produced at least 400 eggs in the first two laying seasons and that still look well. Naturally, the fertility and hatchability of their eggs must have been satisfactory and no important hereditary malformation or osteopetrosis or neurolymphomatosis or malignant condition must have stigmatised their progeny.

This done, we consider the Laying Cards of the first season birds and make a list of all those hens that have laid over 200 eggs during the pullet year. Egg size is denoted by the letters L (usually over 2 ozs.), N (usually 2 ozs.), and S (usually under 2 ozs.). If there is any special defect such as light eyes or weak shells, or if the bird has obviously been a floor layer, the fact is mentioned.

Here are representative entries in the list:—

Leg-band.	*Egg-production.*	*Wing-band.*	*Sire.*	*Dam.*
6·2	269L	111	1694(4)	4·7321
× 6·6	245L	7	1706(4)	4·7424
6·7	255L	167	1658(4)	4·7741
× 6·8	251L	108	1694(4)	2·3580
6·9	255S	221	465(3)	3·4933
× 6·10	263L	49	1276(4)	4·7242
× 6·15	282N	172	1614(4)	4·7101
6·18	240N Floor	140	1375(4)	4·7628
6·19	241L	297	639(3)	4·7688
× 6·21	274S Eyes	46	1276(4)	4·7242
6·27	265L	57	1276(4)	4·7577

Having drawn up this list, we page over the Breeding Cards of the dams and put a cross next to the leg-band number of any hen, if a brother or sister or the mother or father has developed osteopetrosis or neurolymphomatosis or a malignant condition. Hen 6·21 not only came from a so-called cancer family, but had light eyes; to make matters worse she laid small eggs. Hen 6·18 obviously produced more than 240 eggs and in the final analysis should be judged accordingly.

With most undesirables eliminated, virtually by a stroke of the pen, we proceed to sort the remaining birds out into their families. An example follows.

Sire 1694(4)

Dam.	*Progeny.*					
4·7321	*6·2	269L				
	*6·152	252L				
	6·473	238L				
	6·477	202N				
	6·485	207N				
4·7480	6·38	213N	6·319	223L		
	6·39	220S	*6·394	264L		
	6·47	222L	*6·400	284L	♂1448(6)	Index of 224 eggs
	6·66	239L	6·402	213N		
	6·73	225L	*6·438	293L		
	6·216	202N	*6·497	267L		
			*6·503	286L		
4·7484	*6·55	284N				
	*6·143	240N				
	*6·396	273N				
4·7694	*6·305	263L				
	*6·308	254N				
	6·321	213L	♂1456(6)			
	*6·434	258L	♂1459(6)		Index of 201·2 eggs.	
	6·444	262S	♂1460(6)			
	*6·504	247L				
4·7707	6·441	238L				
	6·506	246L				

Another dam was 2·3580 and two of her daughters died of lymphoid leucosis and one of carinosis; yet another was 4·7556 and of her chicks four developed gliomas, one a sarcoma and one a lymphocytoma.

Cock 1694(4) was thus mated to seven hens and no cancers or osteopetrosis or neurolymphomatosis appeared in the offspring of five. On the whole, cock 1694(4) gave excellent results, particularly when mated to 4·7480. When the available good-looking sons of 1694(4) were sorted out, it was found that 1448(6) was a son of 4·7480, and 1456(6), 1459(6) and 1460(6) were all the sons of 4·7694. The index of a cock is, as already stated, based on the performances of all his sisters and not only on the best; 4·7480, for instance, had six daughters besides the 13 fine ones shown.

Obviously, the first thought we had was to make up a breeding pen composed solely of the daughters of 4·7480 and those marked with asterisks were chosen. We were not very impressed with the daughters of 4·7707 and so, in assembling a second breeding pen, we confined ourselves to the daughters of 4·7321, 4·7484 and 4·7694, the selected ones again being indicated by asterisks. As 4·7480 was still alive and eligible, she was included in the new pen with her daughters.

By going through the progeny of every pen, we are thus able to select the occupants of the new pens. It is chastening to realise that all the males and females produced in at least a third of the breeding pens will themselves never grace such a pen!

We thus assemble possible breeding pens on paper, making full use of the best of the hens that have just completed their first laying year, and those members of previous breeding pens still fit for duty. If we need ten pens containing a total of 65 birds and have succeeded in working out 11 with 74, some trimming will be necessary, and for this no hard and fast rules can be laid down. We may be reduced to choosing between a slightly crooked keel and a small spur.

When we have decided finally on the females we consider the cocks and, generally speaking, we prefer those that have already been very successful to untried newcomers. Let us suppose we need ten males. If we already have four well-tried and most satisfactory old ones, we will require only six additional birds. So we go through the list of the available new cocks and pick what we think are the best six and, in doing this, we must bear in mind that it is often risky to select a number of brothers, because we may have to breed too closely later on.

The ten chosen sires are next allocated to the ten pens. The cock should be as distantly related to the hens as possible; if they are of the same age it will suffice if they have not more than one grandparent in common.

The final operation is to handle every breeding bird for the second or third time, just to make certain that no stubs or other defects have been overlooked.

It takes fowls a little while to settle down together, and although

some fertile eggs may be expected after four or five days, it is best to start collecting for the incubators only after a month.

Random Observations and Reiterations

In this lecture some attempt has been made to offer a comprehensive solution, based on long practical experience, to the urgent problem of breeding fowls that pay. Candidly, we have not aimed at producing a few freak hens capable of laying almost an egg a day. Our object rather has always been to ascertain how veterinarians and intelligent poultrymen can maintain closed flocks, in which the general standards of performance and bodily appearance may be raised steadily year by year, to exceptionally high and profitable levels. This has meant tackling not only the question of egg production, but those of fertility, hatchability, viability, body size and all the desirable morphological features of the breed in which we happen to have been interested. When we recall that egg size alone is an expression of no less than a combination of genetic factors, the difficulty of our task becomes only too apparent.

We realise that the day will probably never dawn when a perfect flock of fowls will be raised, that will reproduce themselves in perfect fashion. And, in any case, if there should ever be the slightest danger of achieving what now seems to be so utterly beyond our reach, will not the breeders themselves take care of the desperate situation by calling another quinquennial conference to revise the existing standards?

We have tried in this lecture to show, as it were, how an offensive can be pursued simultaneously on all important fronts, for it is pointless winning the battle in one sector while being routed in another. It is, for instance, futile to develop remarkably healthy fowls that cannot lay.

It must be admitted that our disappointments outweigh the occasions for rejoicing but breeders, like all other indomitable spirits, sustain themselves largely by forgetting the tragic episodes in life and remembering only the happiest. We will recall the fine performances of 4·7480 and her 19 beautiful daughters long after we have erased from our memories the dismal efforts and imperfections of her sister 4·7556 which, when mated to the same cock, produced such miserable pullets that four ultimately developed gliomas, one a sarcoma and one lymphoid leucosis.

Even though we exercise all the care in the world in selecting and mating our hens and cocks, the somewhat appalling fact remains that two-thirds of the unions are failures, when viewed against the background of high standards that we have set. The scope for improvement is almost immeasurable. It is the gratifying miracle of the other third that justifies our efforts and buttresses our will to persist.

Little need be said about the folly and gullibility of people who are induced to lavish money on acquiring a pen or two of breeding birds, in the forlorn hope of establishing without further effort enduring strains of merit. Of the ignorant, stupid or dishonest

breeders who dupe them in this wise, it will be charitable to say even less. For the laying capacity of a hen and her worth as a breeder cannot be accurately forecast — indeed the odds are decidedly adverse — and an alliance with one cock may succeed while that with another may fail. At the best of times breeding is just an uphill struggle, punctuated by occasional victories.

It would be interesting to learn how many poultrymen, saddled with inferior birds, have materially improved their flocks by buying a few expensive and untried cocks and hens, no matter how dazzling their pedigrees. In the long run it will indisputably be much cheaper and better to replace the disappointing stock with superior fowls bought as day-old chicks from a reputable breeder, who is conversant with all the pitfalls of his calling. Even a farmer, who already has a good flock, should buy two or three hundred excellent chicks or sexed cockerels when the time comes to introduce new blood. Not only will he avoid the risk of introducing some disease, which is inseparable from the practice of purchasing cocks, but for the same monetary outlay he will be able to buy many more males and so exert a greater influence on his flock. The almost insuperable difficulty of most prospective buyers is, of course, to find truly reputable breeders with sufficient chicks to meet the demand.

It is with pleasure that we thank Mr. Theo. Marais for preparing the photographs, and Mr. C. H. Driessen for tending the experimental flock for so many years with such great care.

LAYING CARD

708(2) 2·3857 } 1694(4)
953(2) 2·3580 } 4·7480
} 6·394

LAYING CARD	46/394
HEN	6·394
WING-BAND	1044
HATCHED	27.8.45
DATE 1st EGG	23.1.46
AGE 1st EGG	149

SHELL QUALITY..... √ ..... EGG SHAPE..... √ ..... DAM'S BR. CARD 45/22

EGG PRODUCTION: (1) CALENDAR YEAR 264. (2) BIOLOGICAL YEAR 290.

Mating	*Breeding Card*	*Cock*	*Pen*
19 47	47/59	465(3)	10
19			
19			

	L	R
EYE COLOUR	5	5

EGG WEIGHTS

2	2¼	2⅛
2⅛	2¼	2⅛
2	2	2⅛

Year.	Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Totals
1946	6	18	27	25	22	21	22	24	19	23	22	19	248
1947	16/5	14	7	0	0	2	18	23	22	19	7	0	133
													GRAND TOTAL 381

DISPOSAL: ✠ 13.12.47 Salpingitis.
REMARKS:

✠ — died

BREEDING CARD

708(2) 2·3857 } 1694(4)
953(2) 2·3580 } 4·7480
} 6·394

✠ 13.12.47 Salpingitis.

BREEDING CARD 47/59
HEN 6·394
WING-BAND 1044
PEN 10
COCK 465(3)
LAYING CARD 46/394

Serial No.	Inf.	Dead in Shell	Pipped	Mal pos.	Mal form	Hatch Date	Sex	Wing-band	Leg-band	Disposal
249						11.8.47	♂	190		sold
250							♂	191		sold
251	✓									
(1)252							♀	192	8.27	21.12.49 culled
253							♀	193	8.35	27.1.50 culled
242						18.8.47	♂	384	8.141	23.12.48 culled
243							♂	385		sold
(2)244							♀	386	8.119	✠11.11.50 salpingitis
245							♀	387	8.122	27.1.50 culled
247						25.8.47		597		✠ 2.9.47
248							♂	598		sold
(3)249							♀	599	8.228	✠22.1.50, hepatitis
250			✓							
251							♂	600		sold
250						1.9.47	♀	801	8.350	21.12.49 culled
251							♂	802		sold
(4)252							♀	803	8.229	✠ 28.1.48 nephritis
253							♂	804		sold
254				II						
259	✓					8.9.47				
260							♀	998	8.413	22.12.48 culled
(5)261							♂	999		✠12.3.51 mastoiditis
262							♀	1000	8.465	18.1.51 culled.
261						15.9.47	♂	1203		✠4.11.47 persecution
262							♀	1204	8.501	10.2.49 culled
(6)263							♂	1205		sold
264							♂	1206		✠10.11.47 coccidiosis
265							♀	1207		✠12.12.47 accident
258						22.9.47	♂	1401		sold
259		✓								
(7)260							♀	1402	8.489	18.1.51 culled
261							♂	1403		sold
262							♀	1404	8.525	22.12.48 culled
Totals 33	2	1	1	1				29	13	

♂ — male ♀ — female ✠ — died

MONTHLY EGG CARD

MONTH: August, 1946. HOUSE: 3.

Hen	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
6·221		×	×		×	×	×			×	1⅞	2	2		1⅞	1⅞		2	2	1⅞		2	2	2	1⅞		×	×		×	×	22
222		×	×	×	×	×		×	×	×		2⅛	2	2	2⅛	2		2¼	2	2	2⅛		2	2	2⅛	×		×	×	×		24
223	×	×		×	×	×	×			×	2	2		1⅞	2	2	2		2	1⅞	2		2	2		×	×	×	×		×	23
224			×	×				×	×	×			2		1⅞	2				2¼		2	2				×	×		×	×	15
225	×	×		×			Broody											2		2¼	2⅛	2			2⅛		×	×	×	×		12
226		Shell		×	×	×			×		2¼	2⅛	2¼		2⅛	2	2⅛		2	2	2⅛	2		2	2¼	×	×		×	×	×	21
227		×	×	×			×										✠															4
228	×	×		×	×	×	×	×	×		2⅛	2¼	2⅛	2	2⅛		2	2⅛	2¼	2		2	2½	2	2		×	×	×	×		25
229		×	×		×	×		×	×		2	1⅞	1⅞	2		2	1⅞	2		2	2		1⅞	2		×	×		×	×	×	22
230	×	×	×		×	×	×			×		Lame					Injured										×		×	×		10
231		Floor				×				×			2		2					1⅞			2	2						×		8
232	×	×		×	×	×	×		×	×	2	2		2	2	2	2⅛		2¼	2	2		2	2	2		×	×	×		×	24
233	×	×	×	×		×	×	×	×	×	2	2		2⅛	2	2	2	2		2¼	2	2	2⅛		2	×	×	×		×	×	26
235	×	×	×		×	×		×	×	×		2	2⅛	2		2⅛	2⅛	2	2		2	2		2	2	×		×	×	×		23

Space should be provided on this card for recording the production of at least 55 hens.

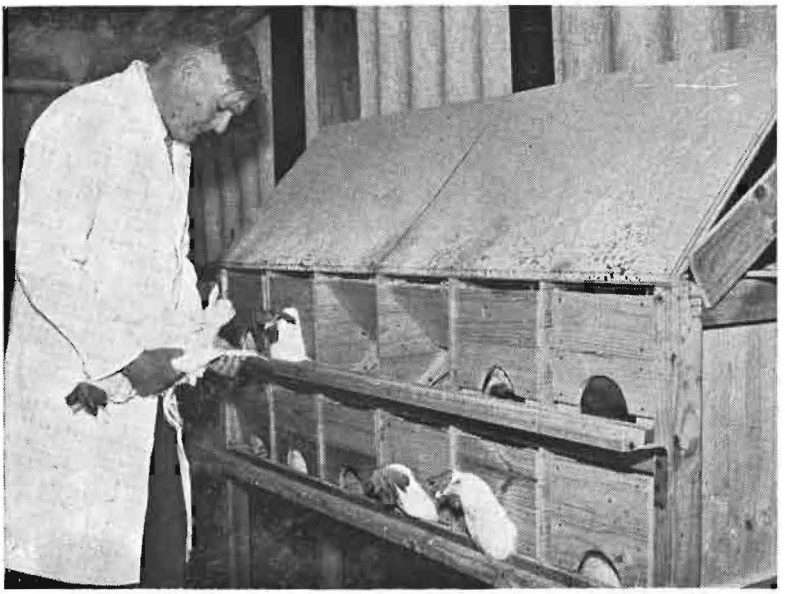


Fig. 1. — Releasing hen from trap-nest. Hold the left thigh between the right thumb and fingers. The number on the leg-band is being read and the band is upside down on the left leg.

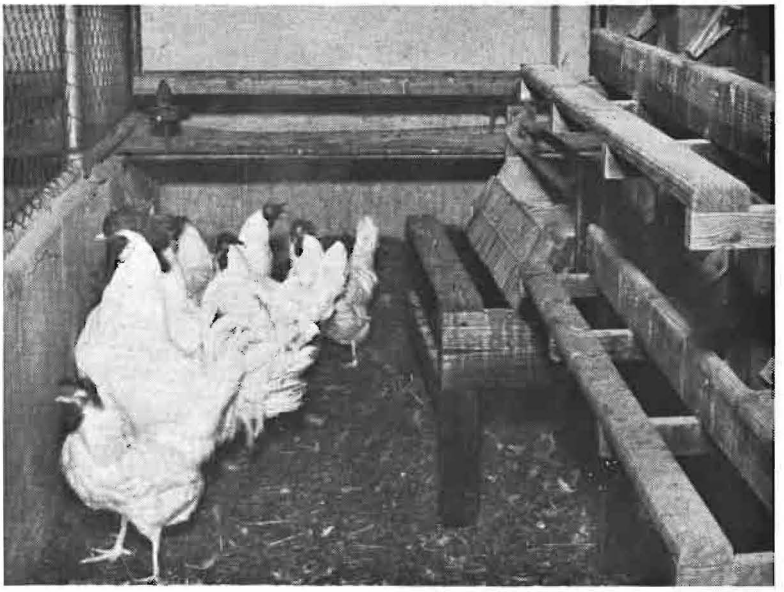


Fig. 2. — A cock and his hens in a breeding pen. The pen is 5 ft. wide, 16ft. deep, 7 ft. high at the back and 8 ft. high in front. The low side walls are 2 ft. high and support the dropping board. There are 2 perches, each 54 in. long, and 6 nests, 3 being on top of the others. The mash hopper is 3 ft. long.

Fig. 3. — Epidemic blindness. The iris of one or both eyes is greyish-green instead of orange or bay and the pupil is small and irregular in outline and does not respond to changes in light. Such a bird would not be used for breeding purposes, and its brothers and sisters should also be discarded if not excellent in all other respects. It must be viewed almost as seriously as neurolymphomatosis.

Fig. 4. — Neurolymphomatosis. Apart from the lameness the bird is usually bright and eats well.

Fig. 5. —Osteopetrosis. The long bones, particularly of the legs and wings, are hard and enlarged to a variable extent.

Fig. 6.— Osteopetrosis. A very severe case in a cockerel.

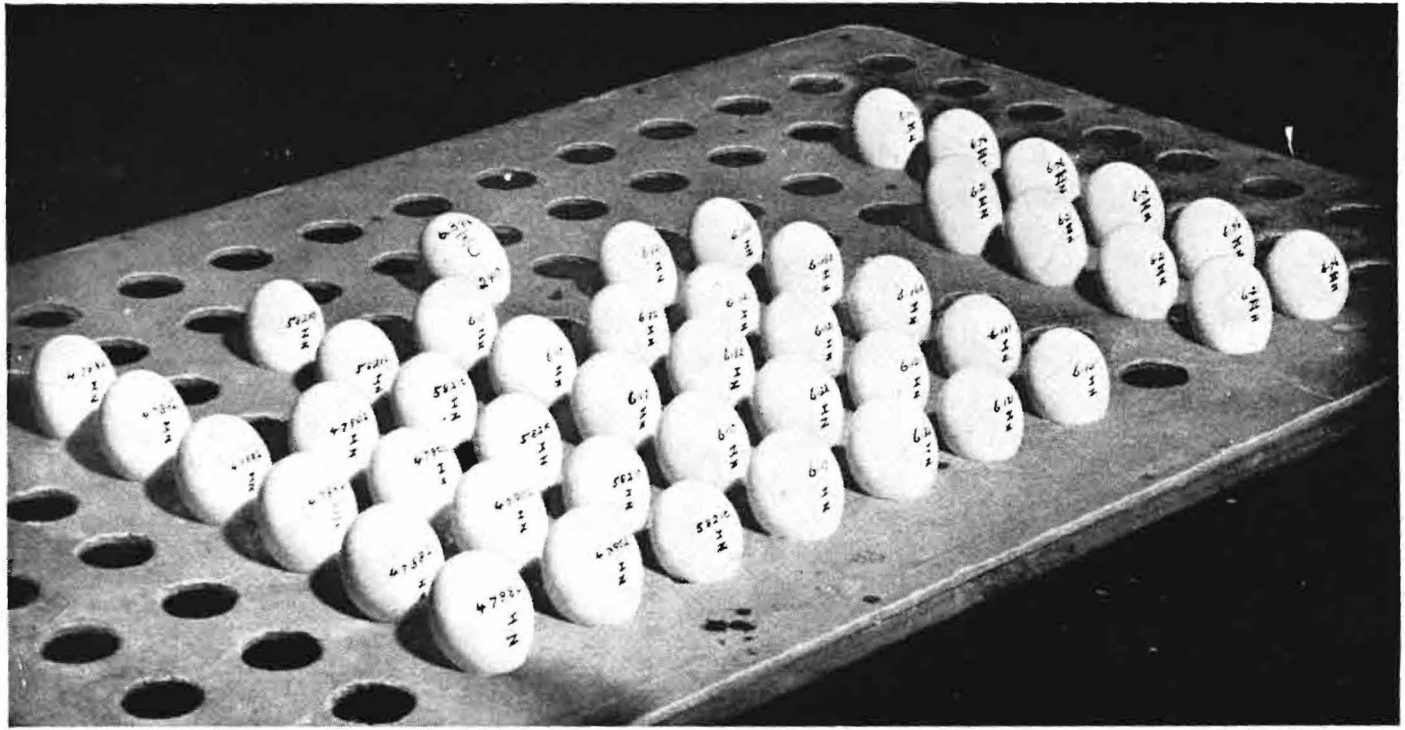


Fig. 7. — Eggs on the sorting board. Observe the smaller eggs laid by 5.8210 and 6.121. In the centre background is an egg laid by 6.394 in pen X; it is lying on its side so that the serial number 249 can be seen.

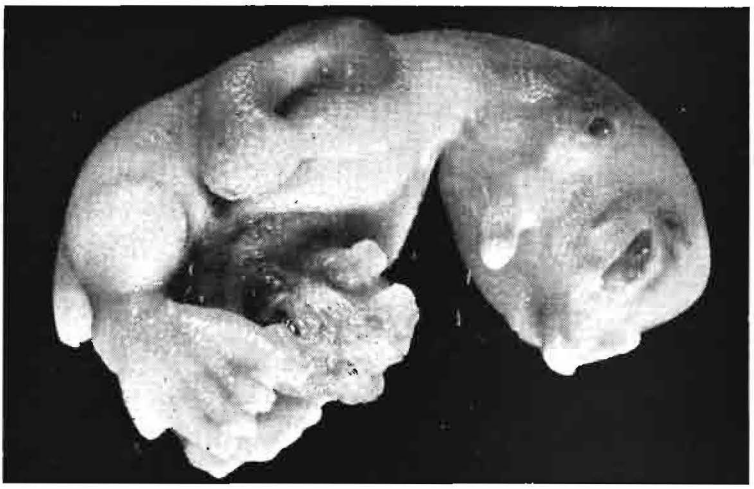


Fig. 8. — A monster that occurs not infrequently in eggs laid by Single Comb White Leghorns. It is bare and cherry pink in colour. Usually there are too many digits and the extremities are webbed like the foot of a duck. The entrails lie without the body. There is a wide gap between the upper and lower beaks. The monsters are usually still alive on the eighteenth day, but never hatch. Both mother and father contribute to the formation of the monster and so should not be used again for breeding purposes. The normal brothers of such monsters should likewise be discarded, and so should their sisters unless of superior merit in all other respects.

Fig. 9. —Pedigree baskets and bags, with eggs in some. There must be plenty of room between the eggs, at least half of the area being free. The long basket is divided into 5 compartments by 4 slides.

Fig. 10. — An incubator tray full of chicks in their bags on the twenty-second day. A light blanket is put over the chicks to keep them warm. Four chicks and the broken shells have been turned out of one bag, preparatory to wing-banding.

Fig. 11. — The above 4 chicks after wing-banding. The bands are put through the wing webs.

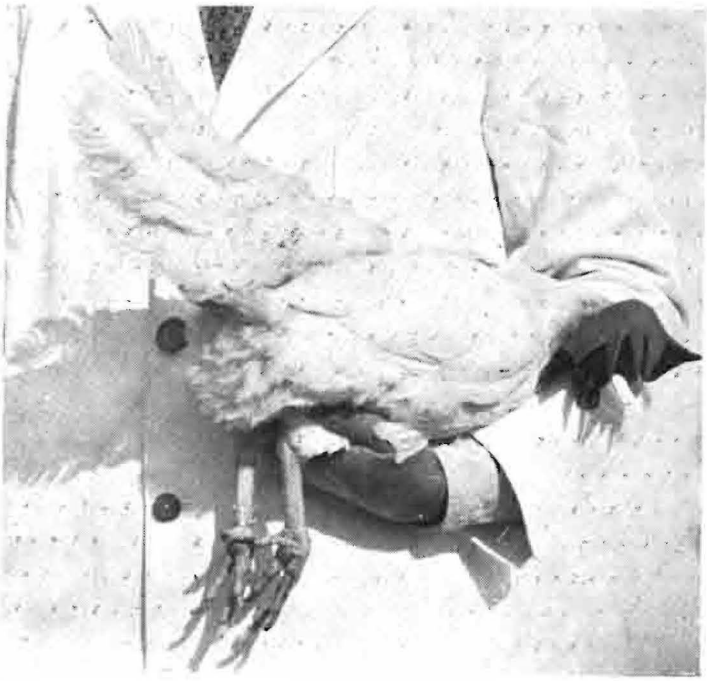


Fig. 12. — How to hold a bird correctly. The index finger of the left hand is between the legs.

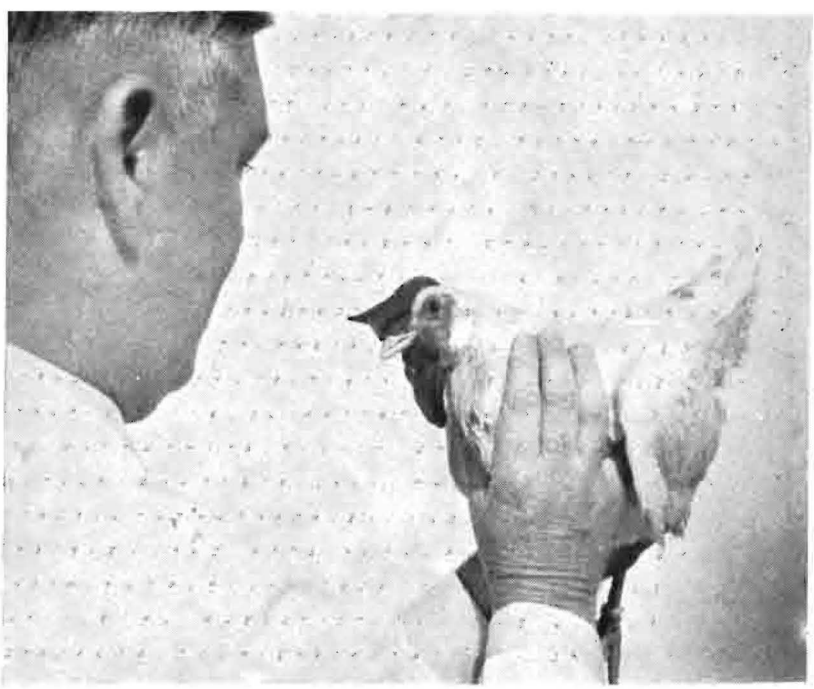


Fig. 13. — How to hold a fowl when examining the head. The index finger of the left hand is between the legs.

Fig. 14. — Judging the width of the back. The right thumb is between the right wing and the hen's body. The right hand is slid back to the tail, to ascertain the width in different parts.

Fig. 15. — Measuring the depth of the body. The right thumb is slid along the centre of the back and the second finger along the keel. The body of a good layer must be broad and deep.

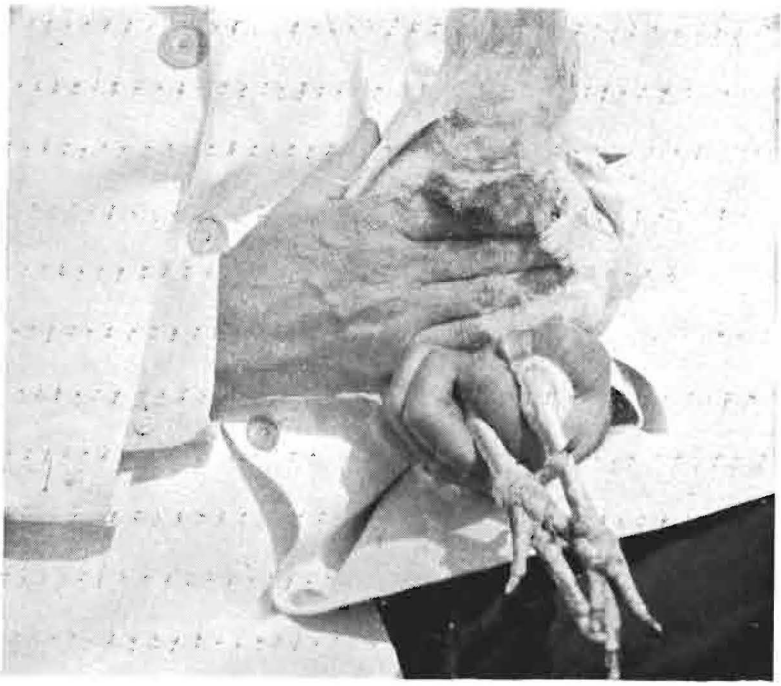


Fig. 16. — Measuring the distance between the keel and pubic bones. The gap should admit 4 fingers in the case of the laying bird and 2 in the case of the non-producing hen.

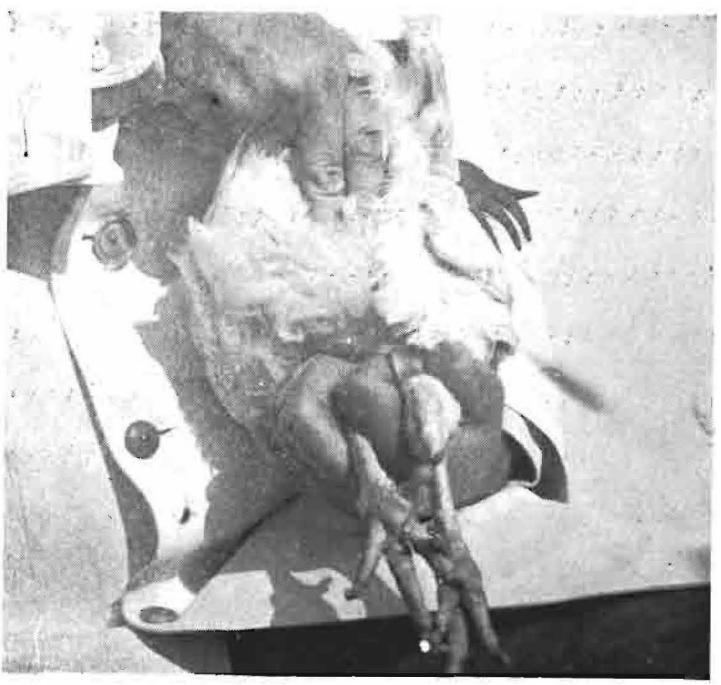


Fig. 17. — Measuring the distance between the pubic bones — 2 fingers if the bird is laying, and 1 if not.

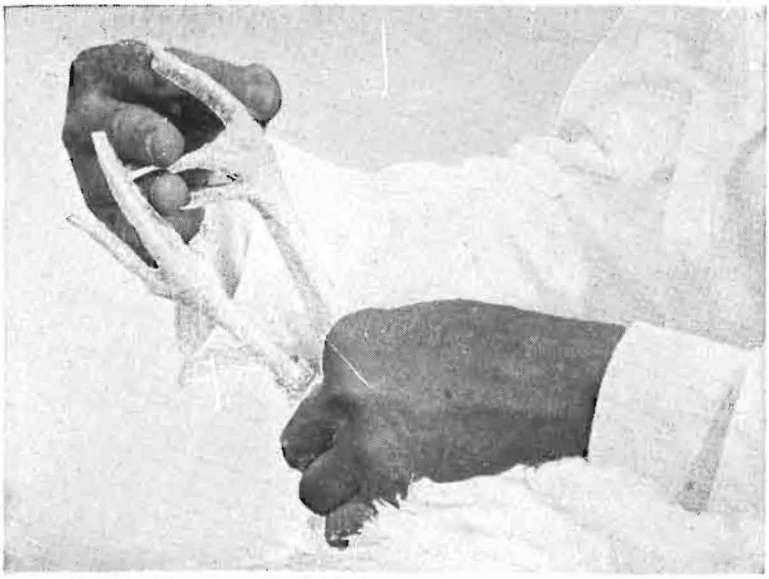


Fig. 18. — Looking between the toes for stubs, which are small and often almost invisible feathers. These unsightly feathers will soon spoil a whole flock, unless great care is taken to exclude from the breeding pens all cocks and hens exhibiting them.

Fig. 19. — Examining the shanks for stubs. At the same time cull any birds with willow (or green) shanks.

Drugs Of Choice In Veterinary Medicine

✦

PIROPLASMOSIS
ACAPRIN Ampoules 0.5% (small animal) 10 x 1 cc.
5% (large animal) 6 x 6 cc.
R.C. Bottle 5% (large animal) 10 cc.

STRONGYLOSIS
ALLEGON Powder 12 x 15 gm.

HARDPAD DISEASE
AMPHOTROPIN 50 cc.

DEBILITY
ARICYL Solution 1% Amps (small animal) 10 x 1 cc.
5% Amps. (large animal) 5 x 10 cc.

CANINE DISTEMPER
CANISERAN 100 cc.

ANTISEPSIS
ENTOZON Granules 10 gm. and 25 gm.
Bougies 10's and 100's.

CONSTIPATION
ISTIN Powder 15 gm. and 4 oz.
Tablets 30 x 2½ gr.

VITAMIN H
MURNIL Powder 6 oz.

TAPEWORMS
NEMURAL Tablets 10 x 18 mg. and 100 x 18 mg.

MANGE
ODYLEN Solution 8 oz. and 2 lb.

NON-SPECIFIC IMMUNIZATION
OMNADIN Vet. Conc. Solution 10 cc. and 25 cc.

DIARRHOEA
PULBIT Powder 4 oz.

ANALEPSIS
REPHRIN Solution 3½% 10 cc.

HEARTWATER
ULERON SODIUM Powder 10 gm.

✦

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ATYPICAL SYMPTOMATOLOGY IN BABESIA CANIS INFECTION

W. D. MALHERBE and B. S. PARKIN
Onderstepoort

ABSTRACT

When one considers the extensive literature on the subject of this disease it is indeed surprising that there are so few references to atypical symptomatology. These references are reviewed here, and include cases manifested by ocular, respiratory, digestive, nervous and rheumatic symptoms. After a critical statement on the criteria of diagnosis used by the present authors, cases that have occurred in the Onderstepoort small animal clinic are described according to the systems mainly involved. Respiratory symptoms include dyspnœa simulating pneumonia and anything from simple catarrhs to severe respiratory symptoms. Apparently for the first time symptoms are described involving the circulatory system and include ascites, œdemas in various sites, and purpuras. Nervous symptoms are representative of lesions of the central nervous system and of the peripheral nerves. Digestive symptoms can be those of gastritis. The pathogenesis of atypical lesions is discussed in some detail. Many symptoms are considered to arise as a result of blocking of capillaries by parasitized corpuscles while ascites and œdemas arise from hypoalbuminuria together with toxæmia, anæmia and a measure of myocardial insufficiency. Purpuras are explained on a basis of toxæmia (capillary fragility) and prolonged bleeding time. Body temperatures often do not conform with those of the typical disease and parasites are frequently not to be found in smears from the peripheral blood. Many of the atypical symptoms have their counterpart in human malaria.

INTRODUCTION

The clinical features of typical babesiosis or "biliary fever" of the dog present a very familiar pattern in a country like South Africa, where practically every dog acquires the infection sooner or later. These are briefly: fever (102 - 105°F), malaise, anorexia, depression, disinclination to move, rapidly developing pallor of visible mucous membranes, icterus in more advanced cases, and a full, bounding pulse. Hæmoglobinuria is sometimes present. Debility is progressive, and if the dog lives long enough emaciation is extreme. The causal parasites are in the majority of cases readily demonstrated in stained smears of peripheral blood. Chronic cases occur in which the temperature is irregular, the appetite very capricious and the loss of condition progressive.

Deviations from the typical pattern have been the subject of but few references in a voluminous literature on the subject of the disease. As will be shown from these references and from cases encountered in the Onderstepoort small animal clinic, the atypical forms of the disease may masquerade in such a variety of guises that one is left with little doubt that many cases of babesiosis are not diagnosed.

Literature

Cuillé and Darraspen[8] quote Nocard[15] as recording in 1902 that it was frequently difficult or impossible to make a diagnosis from blood smears even after examination for several days, and that the existence of the disease could only be confirmed by means of subinoculation into pups. Nocard noted this particularly in chronic cases.

Other sources of error were in those cases where the symptomatology differed from the classical picture. Parant[16] in 1905 described an acute case with "very severe nervous symptoms". The animal succumbed within 24 hours with agonal emission of dark brown urine, which caused him to suspect babesiosis. This was readily confirmed in smears from blood and spleen.

Cadéac[3] ascribed an outbreak of severe ulcerative keratitis in dogs used for hunting in a swamp in France to babesiosis, but this opinion lacked the support of smear examination. In 1925 Cauchemez[4] described an outbreak of babesiosis in the clinical forms of "divers paralyses, of aphasia, and of pulmonary forms," but Cuillé and Darraspen[8], in quoting his paper, do not mention whether the diagnosis was confirmed by microscopic detection of the parasites. This lack of any statement about confirmation applies also to the observations of Chéron[5]. His cases of babesiosis were completely lacking in mucosal pallor, hæmoglobinuria or notable alterations in the appearance of urine.

The paper of Cuillé and Darraspen[8] gives the best account available to the present authors of atypical forms as observed in France. Their diagnostic criteria appear to be entirely satisfactory and their observations covered a wide range. Their atypical forms were seen in the guise of respiratory, digestive, nervous and muscular aberrations which by their intensity masked the usual symptoms of *B. canis* infection.

The *respiratory manifestations* affected the upper respiratory tract, the bronchi and the lungs. One case showed a slight rise of temperature and a hard, painful cough productive of a mucous or mucopurulent discharge. The laryngeal region was painful on palpation and the picture was one of an ordinary laryngotracheobronchitis until yellow discoloration of the urine led to suspicion of babesiosis. Smear examination showed an infection of *B. canis*. Other cases showed pulmonary œdema with dyspnœa, dry cough with fluid and even bloodstreaked discharge. In cases showing severe symptoms of bronchopneumonia the temperature was elevated, respirations were dyspnœic and accelerated, and painful paroxysms of coughing were observed. Detection

of anæmia and of bile pigments in the urine led to blood smear examination which gave a positive diagnosis.

The *digestive forms* were as confusing as were the respiratory. Some animals showed a rise of temperature and severe obstipation resistant to both purgatives and enemas. Other cases appeared in the guise of persistent vomiting with severe thirst, anorexia, constipation or diarrhœa, and some abdominal pain. In all these the diagnosis of babesiosis was arrived at by smear examination after the changes in mucous membranes and urine had been noted.

Babesiosis was also found to be accompanied by *nervous* symptoms, beginning with some inco-ordination of the hind legs and followed a few hours later by a more or less complete paraplegia.

Rheumatic manifestations such as great tenderness in all the muscular masses, particularly in the region of the back and loins, were described. The slightest touch produced plaintive cries and the animals moved with great difficulty. The usual treatment for rheumatism failed, but specific treatment for babesiosis brought about an immediate response.

The authors moreover regarded *chronic babesiosis* as atypical for the reason that it was so frequently difficult to diagnose. There were: more or less depression, a variable and capricious appetite, progressive exhaustion and loss of condition, the mucosal pallor alone giving a clue to the real disease. The most meticulous smear examination, repeated over some days, was necessary to find the parasites, always rare in number.

Lesions of the eyes, occurring in other protozoan diseases such as toxoplasmosis, trypanosomiasis and leishmaniosis of dogs, were also found. Lavier and Fombeure[12] found in a systematic examination of a dog which had died of acute babesiosis, that, though the peripheral blood contained few parasites, the capillaries of the retina and ciliary body were positively bulging with parasitized cells. Other cases of theirs showed transitory keratitis and iritis and in one there was a large triangular opaque " body " in the aqueous humour of the left eye. In this latter instance the iris and cornea were not affected.

Of South African authors Parkin[17] described a very acute case of biliary fever which was characterized by ulcerative stomatitis and which recovered completely within two or three days after specific treatment, and Belonje[1] described cases showing gastritis with vomiting and enteritis, which responded equally well. Frean[10] has recently described a very good case of " cerebral biliary fever " encountered by him. When presented for examination, the dog, an eight-months-old Collie, showed a temperature of 106°F and a heavy infection of *B. canis* in the blood. Illness had developed suddenly. A subcutaneous injection of pirevan was given, but after a few hours nervous symptoms resembling those of hysteria developed. The dog tended to push his head under chairs or other objects, and whined incessantly. Control over the hindquarters was rapidly lost, the animal trying to get up by raising the forequarters with the head thrown back. Repeated peroral doses of three grains

of nembutal (15 grains in all) were required to quieten him for about two hours at a time. After each such period, however, the symptoms returned. Finally the animal was treated with phenamidine and, on the suggestion of one of us (B.S.P.), placed under complete anæsthesia with intravenous nembutal for 36 hours (30 grains being used during this period). When he came to, the cerebral symptoms had disappeared and recovery was uneventful.

Atypical Forms studied at Onderstepoort

Criteria of Diagnosis

The mere finding of parasites in the blood of a sick dog does not necessarily mean that all the symptoms shown are due to babesiosis. There may be a concurrent disease present, or, since immunity in this disease is not sterile, any acute attack of febrile disease or severe organic disease might provoke an exacerbation of the labile *B. canis* infection, so that the two diseases may then exist side by side. Moreover, subinoculation of blood into susceptible pups would provide no proof, as the pups would usually become infected if the patient were in a state of premunition.

For practical purposes the atypical cases have to be evaluated on the basis of their response to specific therapy for babesiosis. This response must be rapid and complete, and the animal must recover without any supportive treatment aimed at the particular atypical symptoms present. Diagnosis, or at least a presumptive diagnosis of *B. canis* infection, is of course desirable in all these cases. The methods employed to this end at Onderstepoort will be discussed in a later article, as will the available methods of specific therapy.

Cuillé and Darraspen[8] tested their cases, described above, by intravenous injection of trypan blue, and correctly stress the importance of a thorough examination in order, if possible, to make a diagnosis.

In rare cases where specific treatment is applied late, the confirmation by rapid response to specific treatment may fail on account of the development of secondary changes, e.g. insufficiency of the liver or kidneys, or both, or the presence of concurrent disease such as Rickettsiosis. For the purpose of this study, however, such cases are not included, as they would tend to cloud the issue.

For convenience the cases studied here are described according to the systems with which the main symptoms were found to be associated.

Respiratory System

Dogs are occasionally presented at the Onderstepoort small animal clinic showing what appears to be pneumonia. Dyspnœa is a very prominent symptom, the pulse is small and weak and there is an elevation of temperature. Percussion and auscultation, however, reveal no evidence of pneumonia. On further examination the mucous mem-

branes are found to be pale and blood-smear examination reveals the cause of the disease to be babesiosis. Anæmia together with myocardial weakness provide the explanation for the dyspnœa.

Disease pictures due to *B. canis* infection, varying from simple catarrhs to that of typical respiratory distemper have been seen with such frequency that it has become an established practice at Onderstepoort to examine blood smears, and in many cases also the urine, in these cases. The lungs may or may not be involved in the inflammatory process, but the response to specific therapy is quite striking. The symptoms as a rule disappear fairly rapidly without any supportive treatment. Obviously if the correct ætiology is not recognized and the specific therapy is not employed, treatment of these cases would be foredoomed to failure.

Circulatory System

Rather remarkably, in view of the frequency with which they are encountered at Onderstepoort, cases of severe circulatory derangements have apparently never been described in the literature. The derangements are shown as œdemas of the subcutis, accumulations of transudate in the body cavities (notably ascites) and purpuric lesions.

Ascites cases. These present a characteristic picture in which abdominal distension is usually, but not invariably, coupled with advanced emaciation. The subject is usually a young dog, seldom more than one year old. Severe subcutaneous œdema of the ventral abdominal region, often giving the impression of skin transparency, in some cases accompanies the distension of the peritoneal cavity.

On admission, these dogs usually have very pale mucous membranes, a decidedly subnormal temperature (ca. 96 - 97°F), and blood smears may or may not show the presence of parasites. Many hours have on occasion been spent on blood smears from such dogs and not a single parasite found from the time of admission until the time the treatment was instituted. All these cases show in the urine examination the presence of bilirubin, which is found to be derived from the "indirect" type in the plasma by the Van den Bergh diazo test. On such strong presumptive evidence these animals are treated specifically for babesiosis. They are not subjected to paracentesis, however desirable this procedure may seem. It has repeatedly been shown that this is unnecessary, and, in fact, is regarded as contra-indicated on account of the danger of the development of extensive subcutaneous œdema from direct escape of fluid through the puncture tract, and of cardiac collapse. The results obtained from specific treatment are striking. The temperature rises to the normal range within 24 hours. The peritoneal transudate is rapidly reabsorbed, this process being accompanied by polyuria and low urinary specific gravity. The disappearance of fluid is complete after 7 - 12 days and the specific gravity of the urine returns to a normal figure in the same time. The improvement in clinical appearance due to decreasing peritoneal transudate is moreover accompanied by a daily drop in weight. This continues till the process is complete, then

remains static for two or three days, after which normal weight increase takes place with the improvement in body condition.

Many of these cases are complicated by more or less severe ankylostomiasis, which is not treated until the ascitic fluid has entirely disappeared. The presence of hookworm infestation can thus be presumed to have no direct bearing on the pathogenesis of the ascites. Moreover a number of cases of ascites have occurred in animals free from worms.

Other oedemas. Some years ago an outbreak of morbidity and mortality in a group of greyhounds was investigated. The condition was characterised in a number of these animals by œdemas of varying distribution. They were, however, mostly associated with the scrotum, and the clinical appearance was suggestive of hydrocele. Simultaneously some of the dogs showed circumscribed œdema in other parts, e.g. the face and joints. Examination of blood smears showed the presence of *B. canis.* Specific treatment brought about the disappearance of œdema in 48 hours, with an improvement already evident in 24 hours.

In recent years œdema in cases of babesiosis have come to be regarded as a not unusual symptom. An interesting observation is that these lesions show no marked tendency to be disposed symmetrically. Œdemas have been noted involving one or both ears, a single joint, a line along one mandibular ramus, the periorbital region, the lips and the whole head. In young pups œdema of the periorbital region and of the whole face have also been observed in association with ascites.

Purpura hæmorrhagica. Much less frequently than the ascites cases, dogs are encountered which show the clinical picture of purpura. To this form, too, no reference has been found in the literature. Hæmorrhages varying from pinpoint petechiæ to ecchymotic patches up to 3 or 4 cm. in diameter (with irregular outline) are seen, involving the scleræ, the iris, the buccal or gingival mucous membranes, and usually the skin of the abdominal wall on either side of the prepuce, and the skin on the inside of the thighs. Some of the cases void red urine, on occasion even containing blood coagula. Similar clots have been observed in fæces, indicating hæmorrhage into the posterior bowel, and in the mouth, from gingival bleeding.

The temperature may or may not be elevated and blood smears may or may not show parasites. The course has been found to be very variable, from acute disease to ill-defined chronic malaise. The response to specific therapy is as satisfactory as in the typical disease. Extravasations disappear progressively over a few days, the time depending on the extent and degree of hæmorrhage, and this is accompanied by a return of appetite and improved habitus.

A recent case of this type, dog DOB 7649, aged two years, had been treated for suspected tonsillitis with penicillin and aureomycin, but had shown no improvement and was off its feed, taking a little milk only. The owner complained that the dog had been hæmorrhaging from the mouth. This was still in evidence. Examination revealed the tonsils to be of normal size but strikingly resembling blood clots. The

Fig. 1.— Photos of ascites case before and after treatment.

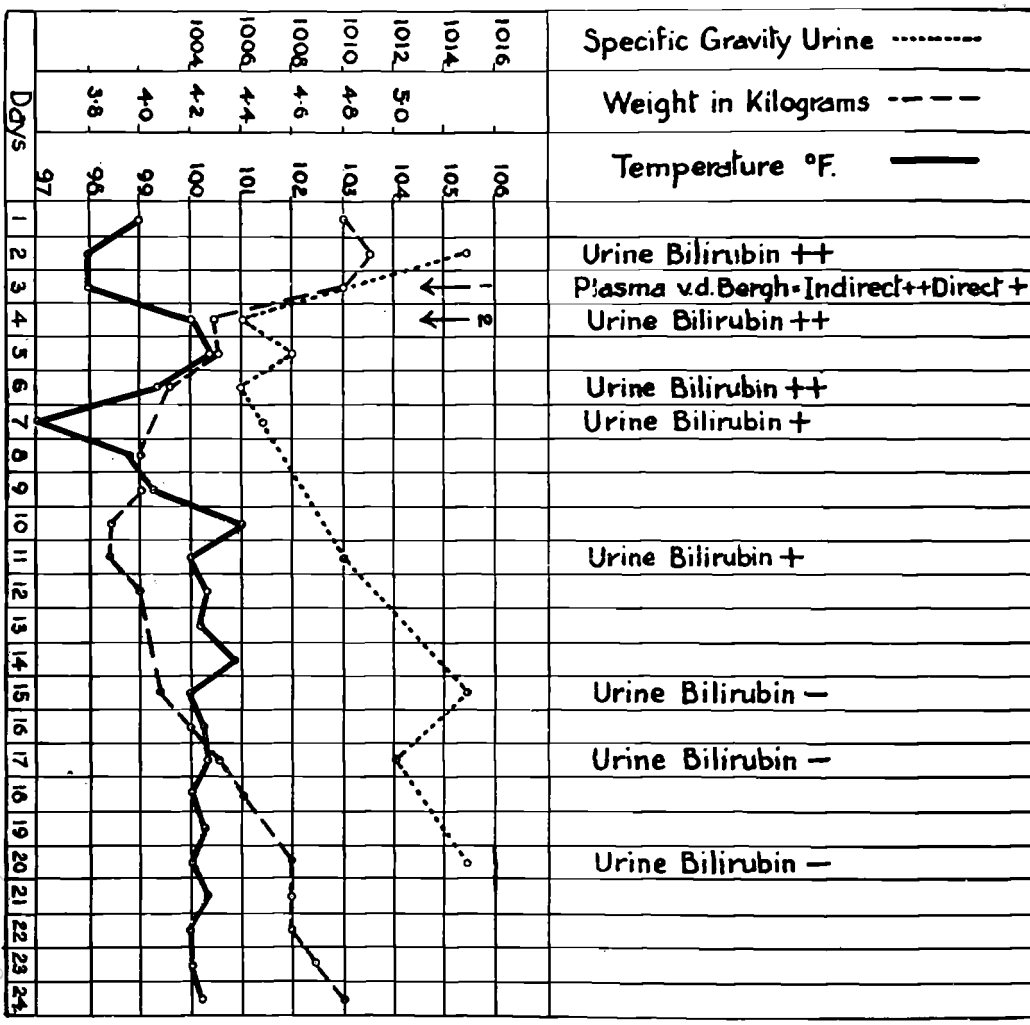
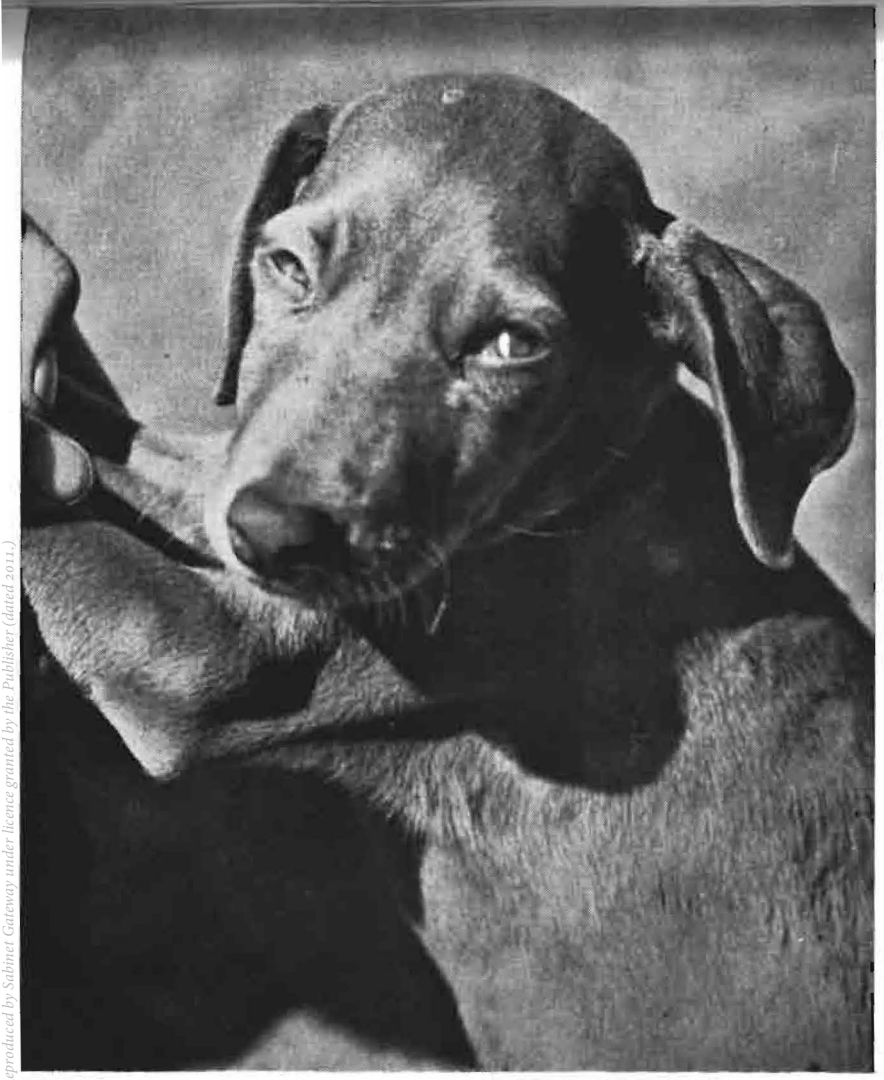


Fig. 2.—Typical temperature chart with weights, etc.



abdomen was tense and could not satisfactorily be palpated. The temperature was normal and blood smears negative.

Urine examination showed the following: the colour an opaque dirty green, S.G. 1044, pH 5.5, albumen +++, Sheftel's test for sugar negative, Rothera's nitroprusside test for ketone bodies negative, bilirubin +++. The centrifuged deposit consisted of blood elements and amorphous material. There was no evidence of inflammatory changes in the kidneys or urinary tract. Spectroscopic examination showed the absorption bands of hæmoglobin. The impression gained was that whole blood had been added to the urine by hæmorrhage somewhere in the urinary tract. This fact, coupled with the hæmorrhaging tonsils, inspired closer examination of the visible mucous membranes and skin. Extensive ecchymoses were found in the skin of the abdomen near the prepuce and the inside of the thighs. A diagnosis of purpura was now in order.

Two days after admission the two hind legs and the right fore and the scrotum were found to be œdematous.

Blood examination revealed a red cell count of 4·56 million per c.mm., white cell count 11,600 per c.mm., hæmatocrit 32%, hæmoglobin 9·15 G. per 100 ml., non-protein nitrogen 49 mG. per 100 ml.; plasma Van den Bergh reaction: indirect ++, direct trace. The plasma examined spectroscopically showed the presence of hæmoglobin. There were therefore: anæmia, hæmoglobinæmia and evidence of a hæmolytic process.

A presumptive diagnosis of hæmorrhagic purpura due to *B. canis* infection was then made and the dog treated by subcutaneous injection of phenamidine (Maybaker) 0·4 cc. of 5% solution per kilo.

Urine was examined daily and within a week bile pigments, hæmoglobin, blood and albumen had disappeared and the S.G. had returned to normal. Blood examination showed a slight improvement in the anæmia, always the slowest part of convalescence in uncomplicated babesiosis, and the Van den Bergh test showed only the faintest trace of " indirect " bilirubin. The tonsils now were of a healthy colour and normal size, while the purpuric lesions had all been absorbed. The œdema of the legs and scrotum needed but four days after treatment to disappear completely. The dog's interest in food revived rapidly and after a further ten days' observation the animal was discharged fit.

Nervous System

The cases in which the nervous system was involved were representative of lesions of both the central nervous system and the peripheral nerves.

Symptomatology indicating involvement of the *central nervous system* was shown in the following cases:—

1. A dog showed a peculiar action of the front limbs when walking. They were kept extended when moved forwards and were swung rather vigorously from the ground position through a large arc

forwards and upwards towards the chin, after which they were returned sharply to the ground. The effect produced resembled a " parade " or " goose " step. The blood smears were positive for *B. canis,* and the only treatment instituted was a specific one for babesiosis. The locomotor symptoms disappeared rapidly and the animal subsequently remained clinically healthy.

2. A Dachshund was admitted with a history of " fits " of recent onset. These were spaced at short intervals (several being observed during the afternoon of admission) and left the dog exhausted. No parasites were found in the blood smears. The patient died the same night. Histopathological examination of the hippocampus of the brain showed capillaries tightly packed with parasitized erythrocytes.

3. A Dalmatian bitch had been treated for babesiosis on three successive days by her owner. The doses of the specific drug used had been rather low and when the dog was admitted on the fourth day blood smears were still positive. In addition to the usual symptoms of the disease the animal showed rhythmic backward and forward synchronous movements of both ears at a rate of two per three seconds. On the fourth day after successful treatment the movements stopped whenever the dog's attention was distracted The next day the movements were less marked and were observed only now and again. By the eighth day they had completely disappeared.

Peripheral nerve lesions were observed in one case which was interesting on account of reappearance of the original nerve symptoms when the animal relapsed to babesiosis. The dog, a 6½-year-old Rottweiler, fully trained as a police dog, had recovered from *B. canis* infection six months prior to its admission. It then showed weakness and stiffness of the hindquarters. Blood smears were positive for babesiosis and specific treatment brought about recovery with disappearance of all symptoms. Shortly afterwards it relapsed and then a striking symptom was the dragging of its right hind leg with the dorsum of the toes in contact with the ground. Blood smears were again positive and specific treatment resulted in the disappearance of the leg symptom. A second relapse followed, with reappearance of the same paralysis in the right hind leg, but this time specific treatment was not followed by a further relapse and yet did not bring about disappearance of the gait symptoms. After autopsy six months later, during which period these symptoms had persisted, a histopathological examination of the right sciatic nerve showed evidence of severe degenerative changes.

Digestive System

This system is in typical babesiosis affected to some extent in that a varying degree of constipation is present in the majority of cases. The symptom can therefore not be regarded as atypical. Cases of gastritis with vomiting and abdominal pain are, however, on occasion found to be due to infection with *B. canis.* One case had been under treatment for a week for gastritis without showing any improvement at all. Its condition had in fact deteriorated progressively. On

admission to Onderstepoort examination of blood smears showed *B. canis* to be present and specific therapy was instituted. No attempt was made to treat the gastritis, yet in 48 hours recovery was complete.

Mention should in this connection also be made of gastritis and enteritis as a result of uræmia, supervening as a complication of babesiosis. In a later article it will be shown that this disease directly affects by intoxication both the kidneys and the liver. If a patient, already near the border line of kidney decompensation, contracts the disease the additional load would readily provide the last straw, with consequent renal failure.

Discussion

In a discussion of the pathogenesis of these atypical disease pictures, it appears profitable, after considering the possible mechanisms by which these could be brought about, to relate to these the known facts pertaining to babesiosis in order to arrive at conclusions as to which mechanisms are likely to be operative in the various instances.

It is, for instance, a well-known pathological sequence that interference with the blood supply of an organ or any portion of an organ will result in modification or loss of function of that organ or portion. The degree of loss of function would be determined by the degree of disruption or interference. Knisely and co-workers[11] have shown in a series of studies of capillary circulation in normal and diseased patients the existence of what they termed the " sludging " phenomenon in diseases of widely varying ætiology. This intravascular agglutination or " sludging " of blood cells in capillaries has, however, been observed on many occasions in infections with various protozoa. Fairley[9], e.g., in a textbook description of malaria, mentions " a number of manifestations, classified as acute pernicious malaria, which are mainly dependent on internal sporulation and localised blockage of the capillaries by *P. falciparum* in different organs, such as the brain, heart, intestines and spleen, by parasitied corpuscles, which adhere to one another and to the capillary endothelium." He holds this fact responsible for the diverse symptomatology of malignant tertian malaria.

Clark[6] drew attention to agglomerations of parasitized cells in the capillaries of the brain in cattle affected by *B. bigemina* infection in the Panama. Lavier and Fombeure[12] found in canine babesiosis the retinal and ciliary body capillaries to be " bulging " with cells containing the causative parasite. Heavy parasitization of clumped erythrocytes in brain capillaries in both canine and bovine babesiosis have been observed by Clark and Parkin[7] and Malherbe[13] in cases where smears made from peripheral blood of the same animals had shown rare or no parasites. In these cases brain derangements had been much in evidence, the dog's symptoms taking the form of " fits " and the clinical features of the cattle resembling those of heartwater, a disease usually showing inco-ordination, some loss of equilibrium, and pronounced hyperæsthesia. Purchase[18] reported from East Africa that he had in five years diagnosed three cases of what he called " cerebral babesiosis "

in pathological sections examined for rabies. One, which he could examine clinically, was comatose though still with a temperature of 102°F. Parasites were difficult to find in ordinary smears, but were numerous in the brain. They were mostly extracellular, filling the lumen of capillaries and small arterioles, the distribution in the brain being very uneven.

Cuillé and Darraspen[8] in their review also stressed the rôle of "parasitic emboli" trapped in capillaries in the symptomatology of atypical babesiosis. Brumpt[2] also referred to "parasitic emboli," but considered it likely that these were the main seats of multiplication of the parasites.

On this evidence it could be expected that a variety of organs and tissues would show deviations from their normal functioning. The relative or absolute anæmia of organs resulting from such capillary blocking would, moreover, open the way to invasion by various viruses or bacteria, resulting in symptoms apparently unrelated to those of babesiosis. The rapid response to specific babesiosis therapy, treatment known to be ineffective in the secondary conditions, would support the incrimination of *B. canis* as the important ætiological agent.

The whole explanation for œdema and ascites in babesiosis cannot be found in any single mechanism or change in the body. The most important common factor is the lowering of serum proteins, particularly serum albumin. In human medicine ascites develops frequently in both acute and chronic liver disease. Weir[20] has stated that portal hypertension, long considered as the most important causative factor, cannot be demonstrated in all cases, and lists other important influences as "lowering of serum proteins, disproportionate decrease in the serum colloid osmotic pressure, dietary factors, disturbance of the ability of the liver to handle water, and altered permeability of the capillaries."

B. canis infection is responsible for marked parenchymatous involvement of the liver. This may become so severe that in the untreated patient clinical icterus is observed. A later study of the pathological anatomy will enlarge on this contention. The parenchymatous damage can be held responsible for disturbance of the protein regulating function of the liver. Much work has been done on this subject. Marrack and Hoch[14], for instance, provide ample evidence from electrophoretic studies, that in disease of the liver parenchyma the albumin fraction of the serum is reduced to very low levels.

The kidneys, too, are deeply involved in the clinical pathology of babesiosis. In human medicine œdemas have as the result of numerous investigations been found to be closely associated with nephrosis and with severe hypoproteinæmia. In animals, however, very little tendency, if any, has been noted to gross œdema formation as the result of kidney disease. Vascular disturbances figure most prominently in this respect. It is probable, then, that local vascular factors are important in the pathogenesis in the notably asymmetrical œdemas of atypical babesiosis. Capillary blockage or "sludging" in certain localities may provide the explanation. The usual causes of œdema in disease, viz., increase in

capillary pressure, reduction of protein osmotic pressure of the blood, and toxic or anoxæmic alteration in the permeability of the capillary wall, are all potentially present in babesiosis.

To return to ascites, a recent case (DOB 7710) showed a plasma protein value of 3·64 G per 100 ml. with albumin at 0·84 G per 100 ml. and an albumin ratio of 0·33, compared with normal values of about 6 - 7, 3 - 4·5 and over 1 respectively. Parasites were demonstrated in this case and specific treatment was followed by disappearance of ascites in less than two weeks with coincident rise in the albumin and hence in the other values. Portal hypertension is an unlikely factor in these cases. The main ætiological mechanisms operating together with the hypoproteinæmia appear to be the associated anæmia, general toxæmia produced by the parasites in the blood, and a relative myocardial insufficiency.

Purpura, which is more usually associated with bacterial infections, is known to occur in occasional cases of malaria. Shrager and Keen[19] have described such cases. Fairley[9], in his systematic description quoted above, described purpuric skin eruptions, epistaxis, hæmatemesis, hæmoptysis, melæna, hæmaturia or vaginal hæmorrhages. In babesiosis of dogs there is evidence to support prolonged bleeding time and increased capillary fragility as to the important ætiological factors. The question of bleeding time and blood coagulation time in the disease will be discussed in a later article.

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This product has been developed as an alternative to Penicillin therapy in Mastitis, as earlier laboratory investigation had shown dibromopropamidine to be effective against various Gram-positive and some Gram-negative organisms.

The preliminary "in vitro" studies, concerning organisms commonly producing mastitis in the bovine, showed that the demonstrable bacteriostatic activity was reduced in the presence of milk. The lecithin content of the milk was then identified as the agent causing loss of activity, and a further study of the Sulphonamide group of drugs showed that lecithin potentiated the antibacterial action of Sulphathiaole. On combining dibromophopamidine and Sulphathiazole a synergistic action was obtained in testing against a standard strain of mastitis-producing hæmolytic staphylococcus; this action was optimum with a 4 : 1 ratio of dibromopropamidine to Sulphathiazole, and gave a three-fold potentiated activity to the dibromophopamidine in the presence of milk.

'PROTEGAN' was finally, after thorough investigation, issued as a suspension of 200 mgm. dibromophopamidine isethionate and 50 mgm. Sulphathiazole, in a 5 cc. tube of arachis oil and beeswax, for udder injection. This formula has proved to be effective, in a number of cases, against the following organisms causing bovine mastitis: beta-hæmolytic coagulase-positive Streptococci, Streptococcus agalactiæ, Staph. aureus, Streptococcus uberis, Streptococcus dysgalactiæ, and Corynebacterium pyogenes.

The recommended course of treatment is one tube per quarter, after each of four consecutive milkings. Severe infections may necessitate a further course.

Dibromophopamidine is well tolerated in general, though occasionally traces of blood are seen, in the milk, where a Streptococcus agalactiæ infection is being treated, but there is no evidence of permanent damage, and the use of 'PROTEGAN' is usually followed by an increase in milk production.

IMMUNIZATION EXPERIMENTS WITH FOOT AND MOUTH DISEASE VACCINE IN BECHUANALAND

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Onderstepoort.

The experiment in the first part of this article was carried out in collaboration and after discussion with Dr. E. C. Dawe, Chief Veterinary Officer, and Dr. N. H. Boardman, Veterinary Officer, Bechuanaland Protectorate, Dr. D. A. Lawrence, Assistant Director of Veterinary Services, and Dr. J. Adamson, Veterinary Officer, Southern Rhodesia, Dr. J. W. Macauley, Veterinary Officer, Northern Rhodesia, Dr. P. S. Snyman, Assistant Director of Veterinary Services, Union of South Africa, and Dr. J. H. van der Merwe, State Veterinarian.

During the course of the extensive outbreak of foot and mouth disease which occurred in the Bechuanaland Protectorate in the latter half of 1948, it was decided to do some experimental inoculation with a vaccine of the type used to combat the disease in Europe. For this purpose a consignment of four litres of vaccine was obtained from the Serum Institute in Copenhagen. This vaccine protects against the O and A types of the foot and mouth virus. The strain of virus from this 1948 outbreak has been examined at Pirbright in England and found not to conform to any of the recognized types; nevertheless, it was thought worth while to give the European vaccine a trial under field conditions in Bechuanaland, as it might be found to give some degree of protection.

The vaccine was brought over by air and arrived at Palmietfontein aerodrome a week before it was used. It was transported to Onderstepoort by car and on arrival was placed in an ordinary refrigerator. It was sent in four one-litre bottles and for transportation by motor to Palapye in Bechuanaland, the headquarters of the foot and mouth control staff, they were packed in ice, each in a galvanized iron tin. On arrival at Palapye after the 350-mile journey from Onderstepoort, the vaccine was still cold and all the ice had not melted. The vaccine was placed in a refrigerator and next morning more ice was put in the tins. It remained cool until used between 1 and 4 p.m. the same day. According to the instructions the vaccine should be kept at between 2 and 8°C, but up to 18°C for a few days would not harm it.

It was decided to try to get a simple "yes" or "no" to the question whether the vaccine would protect against the local strain of foot and mouth disease infection. A suitable farm on which to carry out the experiment was found with some difficulty on account of the extent of the disease. It was situated in the Moijabane area about

38 miles south-west of Serowe and 78 miles from Palapye. The cattle on the farm were healthy, but the owner had an infected farm 20 miles away where he was prepared to allow exposure tests.

According to the instructions accompanying the vaccine, cattle 2 years and over should receive 60 cc. subcutaneously, 6 months to a year 40 cc., and calves up to 6 months 20 cc. In our experiments it was decided to give the calves of varying sizes 20 to 40 cc., the cows, none of which was very big, 40 to 60 cc., and the oxen all 60 cc. each. In all, 37 cows, 27 oxen and 22 calves were inoculated. All the animals were lightly branded on the left cheek for future recognition, using multiples of 10, viz. 2=20 cc., 3=30 cc., etc. All the inoculations were done in the dewlap and were carried out on 1.9.48. The mouthing of a proportion of the animals by stock inspectors on 4. 8. 11. and 15.9.48 was arranged for, about 10 cows, 10 oxen and 5 calves on each date. Daily temperatures were also arranged for, early in the morning before it became hot.

The inoculation with virulent virus and the natural exposure experiments were arranged for at the other farm, Sibedi, 20 miles away. These experiments could not be carried out exactly as planned on account of unforeseen difficulties, but were completed as follows:—

Of the inoculated cattle 26 were transferred to Sibedi on 14.9.48 and were exposed to both artificial and natural infection, with 22 control uninoculated cattle. The experiment was arranged as follows:—

(1) 14 vaccinated cattle each received 1 cc. of virus from vesicular material, diluted 1:500 with normal saline, intramuscularly.

(2) 12 vaccinated cattle were exposed to natural infection.

(3) 11 control cattle each received 1 cc. of virus as in (1).

(4) 11 control cattle were subjected to simple exposure to natural infection on the farm. The natural infection was not very heavy.

An inspection was made of all these cattle on 22.9.48, with the following results:—

(1) Of lot (1), on 22.9.48, 7 showed lesions of foot and mouth disease and on 24.9.48, 3 more, 10 in all.

(2) Of lot (2) on 22.9.48, 2 showed infection. Two days later 5 showed infection, 7 in all.

(3) Of lot (3) on 22.9.48, 10 showed lesions and two days later another one, making 11 out of 12.

(4) Of lot (4) on 22.9.48, 2 showed lesions. Two days later another 3 were visibly affected, making 5 in all out of 11.

Summary of the Experiment

Cattle inoculated with Danish foot and mouth vaccine containing O and A antigens were not protected against exposure to natural infection 14 days later with the Bechuanaland virus or to intramuscular inoculation with it. There was no evidence that the vaccination delayed the onset of the infection.

A further lot of vaccinated cattle arrived at the farm on 23.9.48. In view of the failure of the first experiment to show that any immunity had developed, it was decided to test a number of these cattle which had been vaccinated just over three weeks before, by intralingual inoculation, using vesicle fluid diluted 1 :500 as before. The inoculation was carried out as follows:—

(1) 24 vaccinated cattle each received a few drops of virus intralingually.

(2) 26 vaccinated cattle were exposed to natural infection.

(3) 19 control, uninfected cattle were given virulent virus intralingually.

(4) 31 unvaccinated cattle were simply exposed to natural infection on the farm.

On 24.9.48, 24 hours after inoculation, all the inoculated cattle, vaccinated as well as controls, showed typical tongue vesicles, some of which had already ruptured.

By 30.9.48 of lot (2) 24 animals had developed the disease, and 26 of lot (4) used as controls.

Conclusions

Cattle inoculated with the Danish foot and mouth disease vaccine containing O and A antigens, were not protected against intralingual infection with or natural exposure to the Bechuanaland virus. The test was a severe one and owing to the previous experiment the exposure to infection from contact became very heavy. As a result of these two experiments, it was clear that a vaccine made from O and A strains did not produce any immunity against the 1948 Bechuanaland strain of the foot and mouth disease virus.

Crystal Violet Vaccine Experiment

As the Danish vaccine had not proved to be of any use against the Bechuanaland strain of the virus of the foot and mouth disease, it was decided to try the effect of a crystal violet vaccine made from cattle infected with the Bechuanaland strain. This vaccine had been prepared by Dr. Galloway, Director of the Foot and Mouth Disease Research Station, Pirbright, England, and he very kindly sent some of it to Onderstepoort for experimental trials under field conditions. On 26.10.48 Drs. Diesel and Snyman inoculated 53 adult cattle and 14 calves with the vaccine, adults receiving 100 cc. and calves 50 cc., in the dewlap. This experiment was carried out on the same farm where the cattle in the previous one were inoculated, not the one where those cattle were subsequently removed to.

On 16.11.49, twenty-one days later, 20 of the adult vaccinated cattle, mainly oxen, and 4 calves were inoculated with virulent virus intramuscularly (1 :500 dilution) and 5 susceptible cattle were inoculated as controls. By 25.11.48 all 5 controls showed generalized foot and

mouth disease lesions. None of the adult inoculated cattle showed lesions, but one of the calves showed the generalized disease. The subsequent history of these animals is given later in this article.

On 20.11.48, 16 vaccinated cattle and 4 calves were inoculated intralingually, each with 1 cc. of virulent virus (1:500). On 21.11.48 all except 4 of the vaccinated animals showed mouth lesions. Of these 4, 3 showed mouth lesions at 48 hours and the last one at 72 hours. Generalization occurred in the majority by 25.11.48. The calves all showed lesions at 48 hours. The controls, 5 oxen, all showed mouth lesions at 24 hours and generalization at 48 hours.

The other 17 adult cattle and 6 calves which had been vaccinated were simply exposed to infection and the rest of the herd, which could be considered as susceptible stock, were used as controls. On 24.11.48 one susceptible control showed foot and mouth lesions, but none was seen in the vaccinated animals at that date.

A further report on the subsequent history of the inoculated animals and controls was furnished by Dr. A. S. Erasmus, Bechuanaland Veterinary Department. The information received was as follows:— On 29.11.48 two of the twenty oxen inoculated intramuscularly with virus showed lesions of foot and mouth disease. Further examinations on 3, 7 and 11.12.48 did not reveal any further cases.

Of the group of cattle inoculated with crystal violet vaccine and exposed to natural infection, out of 18 oxen and 5 calves, 4 oxen showed lesions of foot and mouth disease on 29.11.48 and by 11.12.48 there were 8 cases, none of the calves becoming infected.

Of the 10 controls exposed to natural infection, 5 became infected. It is difficult to draw any conclusions from this exposure experiment as the numbers were rather small.

Summary and Conclusions

The results of the inoculation of cattle with crystal violet vaccine and subsequently inoculated with virulent virus intramuscularly and intralingually to test their immunity would tend to show that the vaccine did, in fact, confer what one would term a low-grade immunity on some of the animals. The intralingual test was a very severe one and there was little difference between the inoculated animals and the controls.

It would not appear that crystal violet vaccine would be of much use for combating outbreaks of foot and mouth disease under South African conditions.

VETERINARY SERVICES IN AUSTRALIA AND NEW ZEALAND: A FEW IMPRESSIONS.

(Concluded)

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New Zealand

New Zealand is a highly developed and progressive country of considerable resources and future promise. Her gifts are a temperate climate, a fertile and kindly soil, and absence of extremes of heat and cold. The average annual rainfall in the North Island is more than 40 inches, well distributed and reliable. Except in the severe climate of the South Island, grass grows practically the whole year round. New Zealand proper comprises North, South and Stewart Islands. Unfortunately time only permitted a brief visit to the North Island, which has an area of approximately 44,280 square miles. The population of New Zealand is approximately 1¾ millions, of which about 5% are Maoris. The bush-clad hill country of the northern part of the North Island contains the mammoth Kauri pines, the giants of the forest. On either side of the mountain ranges there are only relatively small areas of flat land. These are mainly coastal strips, river valleys forming but a small proportion of the total area. Most of the bush had to be felled and burned and grass sown in the ashes amongst the logs and trees killed by ring barking. Tussock and native grassed country are chiefly confined to the South Island, except for a comparatively small area of the North Island. Of the 17 million acres of sown pastures, about 12 million belong to North Island.

Agriculture is based almost exclusively on what might be called grassland farming. It was estimated in 1946 that it produced 80 million tons of grass annually. Over 90% of the exports are pastoral products, namely, meat, dairy products and wool. Of New Zealand's 66 million acres about two-thirds are used for primary production, with approximately 33 million sheep and 5 million cattle. Grassland has developed to an excellence unrivalled in the world by the selection of the introduced species of rye grasses and clovers, the use of machinery for drainage, the proper application of grazing, and the use of fertilizers. Fundamental grassland research at the Grassland Division of the Department of Scientific and Industrial Research, Palmerston North, is conducted in close collaboration with the Plant Chemistry Laboratory. Many lines of seeds have been sown and plot-tested and these seeds

(perennial rye grass, Italian rye grass, cocksfoot, browntop, Timothy, and several clovers, etc.) have been included in the Government Certification Scheme. Plant breeding and pasture ecology are also extensively studied.

It was found that New Zealand was too wet for the fine-woolled Merino sheep from Australia, and to-day the pure Merino is only used in the dry mountain country of the South Island. The Romney Marsh breed has undergone considerable changes since its original importation and to-day should be regarded as a distinct New Zealand breed. Production of fat lambs has assumed even greater importance than wool. The specialisation is in the production of fat lambs of 30 to 45 lbs. carcase weight, more than 10 million of which are exported annually. Surplus Romney ewes from the hill country are disposed of annually at 4 - 6 years of age to lowland fat lamb producers, who mate them chiefly with South Down rams.

The Waipaoa Station in the hills near Gisborne, comprising 34,000 acres, is one of the biggest single units in New Zealand. It operates some 18,000 breeding Romney ewes and 5,000 Aberdeen Angus and Herefords. More than 1,000 bales of wool are shorn, and near Gisborne there are approximately 1,000 acres for fattening lambs and steers. In the Hawkes Bay area one unit produces 12,000 fat lambs annually, with a carrying capacity of approximately two sheep per acre.

The Dairy Industry's growth has been phenomenal. In 1900, less than £1,000,000 worth of butter and cheese was exported, whereas in 1938 it was more than £22,000,000. This has been achieved by refrigeration, herd testing, herd improvement, co-operation and careful supervision by the State. On nearly all farms there are power-driven machines, and most of the average herds of approximately 50 - 60 cows are milked by machinery. Some farmers do not do their own milking, but employ what are called share-milkers, the owner producing the herd, and the milkers receiving a fair percentage of the returns. The national dairy herd of approximately 1¾ million head is unique, consisting of Jerseys (plus minus 80%), Fresians, milking Shorthorns and Ayrshires. At the factory (one of the largest was visited at Whakatane) the milk is turned into butter, cheese, and milk powder by large, up-to-date machinery.

The beef cattle population is small in comparison. They are kept more for the purpose of controlling pasture for sheep grazing, and keeping down fern and scrub in the hill country.

The Department of Agriculture at Wellington is under a Director-General and comprises five Divisions, namely, Animal Research, Livestock, Dairy, Extension and Horticulture.

The Animal Research Division

Director: Dr. J. F. Filmer, D.V.Sc. This is a purely research Division with no extension or administrative functions. It possesses

two main Research Stations at Wallaceville and Ruakura respectively. The former is primarily concerned with pathological problems, whereas the latter deals with production. In an endeavour to eliminate the present overlapping, it is the intention of the Department to combine the two, by transferring the Wallacevale activities to Ruakura as soon as suitable laboratory facilities have been provided. In addition, the Division has several "out-stations" located in particular areas for the study of problems specific to these areas.

Wallaceville Animal Research Station

This is situated about 20 miles north-east of Wellington and comprises about 100 acres with well-equipped laboratories. It is under the direction of Dr. Cunningham, who visited Onderstepoort in 1949. It is made up of the following main sections: Pathology and diagnostics, bacteriology, parasitology, animal nutrition, biochemistry and toxicology.

The Diagnostic Section receives specimens from officers of the Livestock Division and from practising Veterinarians. Where necessary, field investigations are initiated, thus providing an ideal link between the specialist research worker and the field veterinarian. Blackleg vaccine, especially for use in sheep, and scabby mouth vaccine, are prepared at Wallaceville, whereas all other vaccines are imported, mainly from Australia.

A number of disease problems are being investigated and brief reference will be made to the following of special interest to South Africa.

Facial Eczema (Geeldikkop) investigations are carried out at Manutuke, a special out-station, near Gisborne, comprising a well-paddocked farm of 68 acres. Although the causative agent of this disease is still unknown, a great deal of information has been gained by well-organised surveys and well-planned investigations. These have indicated the importance of environmental conditions of climate and soil, so much so, that farmers can be warned when to expect epizootics over the dangerous period, usually from February to April. The usual precautions that farmers take comprise a starvation diet, or the use of poor pastures or of pastures known to be less toxic. Recently there was a luxurious rapid growth of the pasture, and the heat and humidity were so ideal that farmers were warned by wireless to take the necessary precautions. A cold snap, however, interfered. At Manutuke an attempt is being made to produce cases artificially to study the chemistry of the toxic factor, and the possible liver damage from its inception. The various paddocks of red and white clovers. or rye grasses are subjected to different form of treatment, e.g., a system of grazing or cutting, irregular irrigation by a spray irrigation plant, the use of fertilizers, etc. It has recently been shown that a species of *panicum*, which in previous seasons produced jaundice (liver

damage) and photosensitisation at Manutuke, proved non-toxic when sown later and on a different soil type.

Trace Elements. Cobalt and copper deficiencies have been extensively studied in New Zealand and, by carefully planned surveys and investigations, the areas with soil types known to be deficient in copper and cobalt respectively have more or less been mapped out. Cobalt deficiency causes an enzootic chronic wasting disease of sheep and cattle called " bushsickness." Success in dealing with it has been achieved by the annual application of cobalt sulphate top-dressing, sometimes applied by aircraft. Apparently the feeding of licks containing the mineral has been less efficient. Copper deficiency is responsible for " steely wool " and enzootic ataxia (lamkruis) in lambs, whereas in cattle it causes a disease known as " falling disease," characterised by anæmia, unthriftiness and poor growth. Apart from this simple copper deficiency in cattle, more pronounced symptoms have been ascribed to a copper deficiency aggravated by some unknown factor. According to Cunningham this would appear to be due to an excess of Molybdenum in the pasture. The results of top-dressing affected pastures with copper sulphate, which can be mixed with agricultural fertilizers, have been spectacular.

Animal Research Station at Ruakura

This station, near Hamilton, in the rich pastoral Waikato area, has, under the able leadership and guidance of its superintendent, Dr. C. P. McNeekan, undoubtedly become one of the world's leading Animal Husbandry Research Institutions. It comprises five main sections, namely, animal breeding, animal nutrition, animal fertility, general biology and biochemistry. Although organised on a team and project basis, each section is more or less self-contained, with its own unit of pastures, feedstore, milking unit and laboratory. At this station studies of progeny testing and inheritance of specific characters are receiving attention. Of great interest and of fundamental importance are the studies of similarities and dissimilarities of monozygotic Jersey dairy cattle, of which there are at present more than 200 sets of identical twins. They are being observed under the same environmental conditions, and at different levels of nutrition, and their grazing behaviour is being studied. The portable observation tower for careful recording purposes has undoubtedly furnished very useful information. Identical Jersey bull twins are being used for fertility studies. Artificial insemination is being investigated as a practical means of improving sheep and dairy cattle. A comparison of the different breeds of sheep in fat lamb production is given close attention. Reference should be made to the studies on the use of (strain 19) abortion vaccine under controlled experimental conditions. Milking methods, including milking machinery, are being investigated.

It will be interesting to note that on the Ruakura Station of approximately 900 acres, reclaimed from peat and mineral deficient, approximately 760 acres available are under pastures. At present they carry: 500 dairy Jerseys of mixed ages, 2,000 breeding ewes, 500 hoggets, 250 Aberdeen Angus and 400 pigs. All hay and silage are produced on Ruakura, and, except for the purchase of a quantity of concentrates for the pig experiments and fertilizers, Ruakura is self-contained. This illustrates what can be achieved by the application of science to agriculture.

The Livestock Division

New Zealand is fortunate in that a number of the important infectious diseases of stock are not present, e.g. contagious bovine pleuro-pneumonia, foot and mouth disease, equine infectious anæmia, Newcastle Disease, infectious laryngo-tracheitis, rabies, sheep scab and swine fever. Fowl cholera has only recently made its appearance in North Otago. The main disease problems, apart from nutrition, and a limited number of poisonous plants, helminthic infestations, tuberculosis, contagious abortion, sterility, Johne's disease and mastitis. In respect of Johne's disease, a field experiment has been commenced to determine the value of the vaccination of calves on infected dairy farms. The demand for Strain 19 has steadily increased in the dairy industry and in 1948 more than 230,000 doses were sold. The results apparently continue to be satisfactory. The incidence and distribution of Trichomoniasis are being investigated, as well as various methods of penicillin treatment in bovine mastitis.

The head office of the Livestock Division in Wellington is under the direction of Mr. McIlwaine, who is responsible to the Director-General for the administration of the divisional activities. He is assisted by an Assistant Director, the Superintendent of Poultry Husbandry, the Superintendent of the Pig Industry and the Wool Supervisor. In respect of the latter three sections, it may briefly be stated: (a) As regards Poultry Husbandry, instructors mainly give advice and instruction to poultry farmers; (b) the Superintendent of the Pig Industry acts as a liaison between the national Pig Industry Council and the Department, primarily to foster and improve the industry; and (c) the Wool Supervisor and his staff are concerned with instructional and investigational work associated with the production of wool and allied problems.

Veterinary Control. This Division is divided into four main districts, each with a Superintendent (cf. Sub-director of Field Services, South Africa), stationed respectively at Auckland, Wellington, Christchurch and Dunedin. Each Superintendent's District is in turn divided into Stock Inspectorates under the control of Inspectors of Stock, while Veterinarians are placed at strategic centres to act as

consultants. According to this arrangement there are at present 62 Stock Inspectorates (some with Assistant Stock Inspectors) and 14 Field Veterinarians. Each District Superintendent has associated with him a Principal Stock Inspector, who effects adequate and proper liaison between him and the Stock Inspectorate staff. These Inspectors are called upon to carry out a wide variety of duties. They have to operate the Rabbit Nuisance Act and the Noxious Weed Act, and consequently they require a knowledge of rabbits and weeds, especially in respect of control. They also deal with the registration of dairies for town milk supply and the production of pure milk. They require a wide knowledge and experience of the care and management of stock and to have the ability to diagnose the principal diseases.

Field Veterinarians act as consultants to Stock Inspectors, wherever necessary, and collaborate with the Diagnostic Section at Wallaceville to confirm diagnoses, or to initiate field investigations. They perform tests in respect of tuberculosis, Johne's disease and glanders. An amendment to the Stock Act passed in 1945, gives the Department the right of the compulsory tuberculin testing of stock kept for producing milk for human consumption. This entails a heavy call on the time of the Field Veterinarian who also assists in the vaccination of calves with Strain 19, and carries out advisory work in respect of the parasitic diseases of stock. It may be interesting to note that in New Zealand a great deal of propaganda has been undertaken in an attempt to reduce the incidence of hydatid infestation. Field Veterinarians issue certificates of health for export purposes. Where necessary diagnostic tests are carried out under the Stock Act on stock entering the country at one of the two quarantine stations which are suitably situated on islands near Wellington and Auckland respectively.

In addition to Field Veterinarians there are a number primarily engaged on duties connected with the inspection of meat at the Meat Freezing Works at Auckland, Waitara, Palmerston North and Petane. About 260 Meat Inspectors are stationed at 38 Freezing Works and 42 Abattoirs in New Zealand. The Supervising Meat Inspector of the larger concerns is directly responsible to the Veterinarian in charge, or the Field Veterinarian for the district.

Veterinary Clubs in New Zealand

The Veterinary Service Council assists in the staffing of these clubs by an annual subsidy. Both government and farmers provide £50,000. On the Board of Control are representatives of the farmers, the Treasury, the Veterinary Association, the Wool Board, the Meat Board and the Directors of the Animal Research and Livestock Divisions.

An opportunity was offered at Gisborne to inspect the local club, which is considered one of the best organised in New Zealand. Under

the able and energetic leadership of the officer in charge (Mr. Crawford) the Gisborne Veterinary Club (Inc.) operates in what is probably one of the richest pastoral areas, approximately 40 x 100 miles on the East Coast of North Island. This club, incorporated under the Societies Act, has been formed for the purpose of providing veterinary service in Gisborne and surrounding districts. It is under the control of an Executive of not more than 12 members (mostly farmers), assisted by Areas Committees. The four Veterinarians employed by the Club at fixed salaries, are allowed no private practice. The services of the professional staff are available to all members (about 1,300) at all times. According to the 1949 annual report the following are some of the main services rendered: Treatment of 384 beef cattle, 1,073 dairy cattle, 99 sheep, 816 dogs, 358 cats. The immunization of 74 dogs against distemper, vaccination of 7,400 heifers with Strain 19, the clinical examination of approximately 10,000 rams for fertility, and the pregnancy diagnosis of approximately 1,500 cattle were also undertaken. The income in 1949 was £7,080, including a subsidy of £1,562. The expenditure was £4,509 (of which salaries amounted to £3,246), and the balance was added to the accumulated fund. The officer in charge at Gisborne is provided with a house and a well-equipped laboratory as well as offices, dispensary, storerooms, rooms for clinical examinations and post mortems, kennels, etc. Transport, as well as clerical and lay staff, is provided by the club, which also imports, purchases, prepares and dispenses stock remedies and veterinary equipment. The staff is also expected to promote and hold lectures, field days and demonstrations. Specimens for diagnostic purposes are submitted to Wallaceville.

Veterinary Education

There is no Veterinary Faculty or College in New Zealand. Students either proceed to Australia or to Great Britain. There are, however, two Agricultural Faculties of the University of New Zealand: Massey at Palmerston North and Lincoln at Christchurch. The courtesy title has not been adopted in Australia and New Zealand.

Appeal to Veterinary Authorities

This visit has stressed the absolute necessity of close collaboration between the Research Workers of Australia, New Zealand and South Africa, especially of those interested in animal health, nutrition and husbandry. There are many common problems being studied from different angles, and personal contact may result in a better understanding of the problems and their earlier solution. One thinks of the research at present undertaken in respect of mineral deficiencies and nutrition, copper and plant poisoning, the control and treatment of parasitic diseases, tuberculosis, Brucella and other forms of abortion,

infertility and sterility, mastitis, etc. Veterinary authorities of the countries concerned should approach their respective Governments without fail to make available study grants. It is appreciated that, with the critical shortage of trained research officers in these countries, it may be difficult to second several officers at the same time, but it is imperative that an early beginning be made by sending at least one officer annually for urgent special studies, either to Australia and/or New Zealand, and vice versa.

ACKNOWLEDGMENT

The writer is very much indebted to Drs. Filmer, Cunningham, McMeekan and Mr. McIlwaine for their friendly guidance and interesting discussions, for the supply of pamphlets and useful reports from which the writer has quoted freely and for the hospitality extended to Mrs. De Kock and to himself.

ROYAL SOCIETY FELLOWSHIP FOR DR. P. J. DU TOIT

All veterinarians in South Africa will join in offering congratulations to Dr. P. J. du Toit on having the Fellowship of the Royal Society of England conferred on him. The F.R.S. is a very high honour, and it has been conferred on a few outstanding workers in South Africa in the past. Dr. du Toit is the first veterinarian to receive this honour and he would be the first to admit that it is as much a recognition of the scientific achievements of the veterinary profession as his own. During his visit to Great Britain in June this year, he will be personally admitted to the Society at one of its meetings.

Jl. S.A.V.M.A. 22(2), 1951.

CREAM SMEAR EXAMINATION OF BULKED HERD MILK SUPPLIES FOR MASTITIS CONTAMINATION

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SUMMARY

Microscopical examination of milk smears made from 281 herd milk samples revealed mastitis contamination in 6 per cent of smears examined, whereas examination of gravity cream smears from the selfsame samples showed that 25 per cent of samples were contaminated with mastitis.

Breed smear examination of milk samples, taken from bulked herd milk supplies, is a widely used method for rapidly estimating the bacterial content of the milk. An additional advantage is that mastitis streptococci and cells are often identified at the same time as the Breed count is made, thus indicating milk supplies which are badly contaminated by mastitis.

The method is admirable for identifying badly contaminated milks, but, obviously, mastitis organisms and leucocytes are found less easily, as milk from a diseased udder is diluted progressively by uncontaminated milk. In a mildly contaminated milk it becomes necessary to search a large number of microscopic fields if a reasonably reliable picture is to be obtained from a milk smear, and this involves fatiguing work of a time-consuming character.

Any procedure enabling the organisms and cells contained in a weakly contaminated milk to be concentrated for microscopical examination, should facilitate the diagnosis of mastitis contamination. A simple method indirectly suggested in the literature, is the property of cream to gravitate to the surface when milk is left undisturbed. It is believed that the steadily rising cream particles catch up cellular elements and bacteria and carry them to the surface, so that microscopical examination of the cream layer should offer advantages as compared with whole milk.

In order to test this idea, cream smears and milk smears were made from a series of milk samples, using the loop method of preparing milk smears, as described in " Standard Methods for the Examination of Dairy Products " (1946). A milk smear was made from each sample immediately it was received at the laboratory, after which the sample was placed in the refrigerator until the following morning when

a cream smear was prepared in similar manner for microscopical comparison.

The results of this comparison are shown in the accompanying table:—

Comparative results obtained by examining microscopically for mastitis, 281 bulked herd milk samples.

Method	Negative	Doubtful	Mastitis	Per cent Positive
Milk Smear . . .	263	1	17	6%
Cream Smear . . .	201	9	71	25%

Mastitis contamination was evident in 17 of the 281 milk smears examined. Cream smear examination confirmed this diagnosis for these selfsame milk samples, but, in addition, another 54 milk samples which were negative or doubtful by milk smear examination clearly showed the presence of mastitis streptococci and leucocytes in the cream smears. Thus the cream smear method revealed an incidence of 25 per cent of mastitis contamination as compared with only 6 per cent by the milk smear method.

Throughout the experiment, care was taken to make a positive return only in cases presenting a typical picture of bacterial infection associated with leucocyte clumps, and in many instances, cream smears were returned as negative although the cellular picture was highly suspicious for mastitis.

The accompanying illustration serves to show the difference revealed by the two methods for the same milk sample, a difference which was fairly characteristic of the whole series of smears.

Although the results obtained are by no means conclusive because of the small number of samples examined, the series is reported in the belief that cream smear examination is likely to be of service for detecting mastitis contamination in herd milk supplies. It is hoped that this note will stimulate reports from colleagues engaged in this class of work.

ACKNOWLEDGMENT

Thanks are due to the Director of the Municipal Abattoir and Livestock Market Department, Johannesburg, for permission to publish this article.

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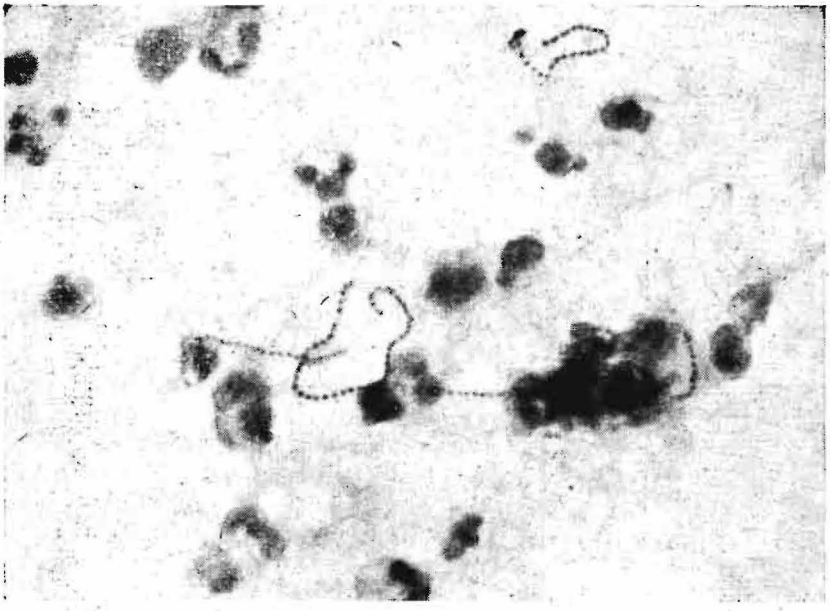
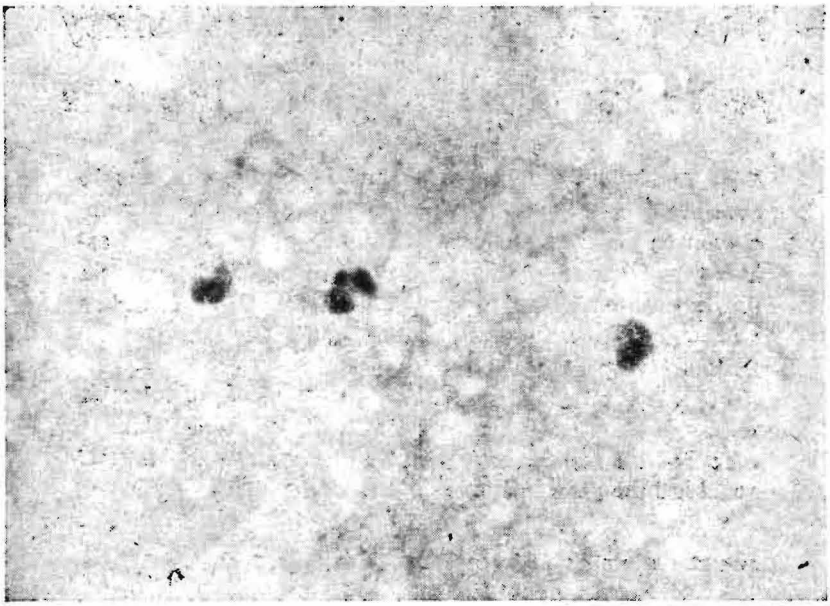
Comparison of cream and milk smears from the same sample



Cream smear



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MINERAL AND TRACE ELEMENT REQUIREMENTS OF ANIMALS IN SOUTH AFRICA

J. W. GROENEWALD,
Onderstepoort

Many requests have recently been received for a formula that would embrace most of the known essential minerals and especially trace elements in the correct proportions.

The literature which has become available during recent years on the subject of trace elements in nutrition is evidence of the importance with which these elements are regarded. Unfortunately much of this literature is contradictory, with the result that uncertainty and confusion are evident, especially in regard to the practical application of available information. The difficulty may partly be attributed to the fact that reliable chemical data are lacking, due to inadequate technique in the past. Tests are now so sensitive that the handling of a penny in a pocket before taking a sample may easily result in an analysis showing adequate copper content when actually it is low in copper. Folk lore from certain countries records that peasants drop a penny in the well with due ceremony. It was believed that unless this was done, the gods would be displeased, with the result that the fertility of the animals would suffer. The association of certain trace elements with fertility in animals and the increasing incidence of infertility have stimulated renewed interest in trace elements.

In view of the growing realization that an imbalance of minerals is as important as a straight deficiency of any particular element, all minerals known to be essential to nutrition will be referred to here. In order to coördinate available nutritional information on minerals and trace elements, the following will be discussed briefly: Calcium, Phosphorus, Sodium, Potassium, Magnesium, Sulphur, Iron, Copper, Iodine, Manganese, Cobalt, Fluorine and Zinc.

Calcium and Phosphorus.

The larger percentage of any mineral lick or compound for animals, should consist of calcium and phosphorus. In fact, mineral mixtures may not be sold in this country, unless they contain a minimum of 5·6% P, which is equivalent to 60% bone meal. The Ca content of bone meal is about 20%, as compared to 10% P. Not only is an optimal level of Ca and P intake desirable, but the ratio should approximate that of bone.

Balanced grain concentrates normally contain sufficient phosphate for the requirements of animals, but are usually notoriously low in calcium. Animals such as the pig and horse, that are not consumers

of large amounts of roughage, appear to be particularly susceptible to a calcium deficiency. All grain rations for pigs and horses should be supplemented by 1% of 90% calcium carbonate (90% $CaCo_3$). Animals such as cattle and sheep, dependent on natural pasture for their sustenance, are on the other hand more susceptible to a phosphate deficiency. This obtains particularly during the winter months when the Ca : P ratio in veld grass may be as wide as 9 : 1. Such an abnormal ratio aggravates the phosphate deficiency and is not infrequently the cause of a degree of sterility in veld-grazed animals[3].

There is also evidence which shows that in the presence of excess calcium or phosphate, manganese is rendered insoluble, with the result that a manganese deficiency occurs even when the nutriment contains adequate amounts of this mineral[1]. There is, therefore, danger in excess as well as in deficiency of calcium.

Sodium, Chlorine and Potassium.

A salt deficiency is manifested by osteophagia and unthrifty appearance. Apart from its importance in maintaining the acid base equilibrium of the blood, these elements are required by every body cell for its vital processes.

According to extensive analytical data[4] the sodium content of natural veld in the Union may be regarded as borlerline, if not actually deficient. This is a very important consideration, as a sodium deficiency results in retarded growth, reduced fertility and impaired digestion[11]. A salt deficiency is known to occur in the Rhodesias, where the supplementation of veld with common salt improves the growth of animals.

Unlike calcium and phosphorus, the body storage of sodium, chlorine or potassium is very limited. Regular supplies, especially in warm weather are, therefore, essential. At the same time, the necessity of supplying animals with free access to pure water, especially when salt supplements are given, must be stressed.

The salt requirements of animals will be met, as well as making the grain rations more palatable, by including 0·5 to 1% NaCl to such concentrates. On the other hand, stock licks may contain 25 to 30% of salt. It would be advisable to use one of the standard grades of salt specified in Government Regulation No. 1154 of the 4th June, 1948.

The body contains somewhat less potassium than sodium. As all feeds are relatively rich sources of potassium, it is unlikely that animals would suffer a deficiency of this element. It is thought that the ratio of sodium and potassium is of importance in nutrition[13]. However, definite experimental proof appears to be lacking.

Magnesium.

Although magnesium is an essential mineral associated with various clinical conditions in animals, surprisingly little information in regard to the requirements of this element is available. When animals receive normal grazing or other rations, no deficiency of magnesium is likely

to occur. However, young calves, if kept on a milk diet only, may show serious symptoms similar to grass tetany, but which is due to a deficiency of magnesium.

Magnesium is closely associated with calcium and phosphorus metabolism[13] and may influence the calcium balance in cases of acute hypocalmecia[11]. Such conditions are, however, secondary as they are sequelæ to disturbances in rumen digestion. A moderate excess of magnesium does not appear to have any ill-effects, provided the level of calcium and phosphate intake is adequate. Excess of magnesium, especially in the presence of a low phosphate intake, causes a high incidence of renal calculi in sheep. In such circumstances there is a marked loss of calcium through the urine[13].

Sulphur.

Many unsuccessful attempts have been made to demonstrate the nutritional advantages of the supplementation of flowers of sulphur[7, 8]. To-day it is appreciated that the animal can obtain all the sulphur it requires from the proteins. In the animal body sulphur is present in the form of amino acids such as cystine, methionine and their derivatives. The animal derives its sulphur requirements from feeds that are rich sources of these amino acids. A low intake of methionine would affect the synthesis of a hormone such as thyroxine and also the deposition of keratin. When sulphur-containing amino acids are ingested in excess of normal requirements, its does not appear to have any deleterious influence on animal health, but, on the other hand, an excess of sulphur, given in the inorganic form such as flowers of sulphur, may prove toxic.

Sulphur, however, is included in stock licks in this country as a preventive measure against geilsiekte (prussic acid poisoning). It is generally recommended that such licks contain 4 to 7% of flowers of sulphur during times of expected geilsiekte[3].

Iron and Copper.

Although iron is a very important constituent of hæmoglobin, an uncomplicated deficiency of iron rarely occurs. Iron can be assimilated by the body in the absence of copper, but unless a trace of copper is present, it cannot be utilized in the body for formation of hæmoglobin. Milk is deficient in both iron and copper and is the reason why young animals such as pigs are especially liable to suffer from anæmia. Suckling animals are provided for by the storage of iron in the liver, but in twins, or more commonly in large litters of pigs, such storage may prove inadequate and a straight nutritional anæmia may result[13].

After severe worm infestation, it is beneficial to feed an iron supplement in the form of a lick. It is usually recommended that such licks contain 1% iron sulphate and 0·1% copper sulphate.

It may be generally accepted that Union soils are comparatively

rich in iron and most feeds contain sufficient iron for the normal requirements of animals, especially after they have been weaned. When young pigs suffer from anæmia, it is a good practice to allow them out of the sty so that they can root for themselves and obtain iron and copper in the soil. If it is unpractical to allow pigs out, a few shovelfuls of fresh earth may be put into each sty daily. Another very simple way of supplementing iron and copper to pigs is by adding about 2 ounces of molasses to their daily ration.

An excess of iron in the diet interferes with phosphorus absorption by forming an insoluble phosphate. In this way rickets may result on a ration which is otherwise adequate.

In acute copper deficiency areas in Australia and New Zealand as much as 0·3% copper has been found necessary in licks in order to supply an extreme deficiency[1].

Mortality in stock, especially sheep, is not infrequently reported as a result of excessive copper. This is in many instances due to the careless use of copper-containing remedies. A condition known as Enzootic Icterus occurs in South Africa. The ætiology of this disease is not clearly understood, although it seems as if excessive copper may play a rôle.

There is evidence that a copper deficiency may be more widespread in the Union than is generally appreciated. The North-Western and South-Western coast has long been suspected of a copper deficiency. A copper deficiency in the Union is associated with straight wool in merino sheep and may be concerned in the ætiology of a condition known as " lamkruis ". In other parts of the world a copper deficiency is known to cause such conditions as " salt sick " " coast disease ", " falling disease ", " scouring disease ", " licking disease " and " swayback ". Copper is also necessary for the fertility of animals.

When pastures contain less than 5 p.p.m. of copper on a dry matter basis, it is definitely considered to be deficient, whereas 7·5 p.p.m. is considered a safe and good pasture[14]. Copper deficiency may, however, occur op pastures containing sufficient copper since other factors may interfere with the normal utilization of the copper. Such factors have been shown to be a high calcium : phosphorus ratio, the presence of lead or zinc or an excess of molybdenum[1].

Iodine.

Through its rôle in the synthesis of the hormone thyroxine, iodine is concerned in the regulation of the metabolic rate of the organism. Goitre is encountered in certain areas of the world where the water, soil and crops are relatively deficient in iodine. In such areas the supplementation of iodine is found to be an effective preventive for goitre, abortions and the alopecia of new-born in pigs, calves and lambs.

An extensive iodine survey of herbage and feeds was undertaken in the Union[2] with the object of determining possible deficiency areas.

According to the data collected in this way, no actual deficiency of iodine could be demonstrated even in the recognized endemic goitre area in the Uniondale district[2]. Although it may be accepted that no acute deficiency exists, goitre does occur in man and occasionally in animals. The presence of other contributory factors are, however, suspected:—

(i) Known goitrogenic substances which interfere with iodine metabolism have been shown to be present in soya beans and cabbages[1].

(ii) A deficiency of methionine would cause an insufficiency of thyroxine[13].

(iii) A high calcium content of the water supplies would inhibit the proper utilization of iodine[13].

(iv) Deficiency of vitamin A also appears to be associated with the prevalence of goitre[19].

In iodine deficiency areas in other countries, the usual recommendation is that stock licks should contain 0·5% of potassium iodide. In the Union, no beneficial results could be demonstrated by the supplementation of iodine to animals[12]. Such supplementation would prove costly and the results are quite likely to be disappointing, especially with substances such as iodinated proteins.

Manganese.

Most grains are comparatively low in manganese. Unfortunately analytic information on the manganese content of soils and plants cannot be relied upon because so many factors may apparently interfere with the proper utilization of this element by the animal body[17]. Manganese acts as a catalyst. Without this element a whole chain of chemical reactions is likely to be upset, resulting in various deficiencies, loss of resistance to infection and other disturbances[18]. Its presence in the soil is as important to the growth and development of plants as it is in the normal calcification of bone, or growth and reproduction in animals. Manganese benefits the intestinal flora with its subsequent formation of enzymes and hormones[17].

In order to prevent slipped tendon in poultry and improve the hatchability, manganese has regularly been included in the rations of poultry. The usual supplements are manganese chloride or manganese sulphate. On a deficiency of this element pigs become lame and often stand on their knees[17] The joints become swollen and painful. Newborn calves may show distinctive bow-leggedness and cows or other mammals are generally unable to suckle their young[17].

The manganese content of milk is related to the manganese content of the rations of dairy cows[18]. An especially important consideration is the fact that the fertility of bulls is related to the manganese content of their rations and that a high calcium intake will inactivate the normal useful function of the manganese[1].

Although there is no doubt about the necessity of incorporating manganese in properly balanced poultry rations, actual clinical cases of manganese deficiency in large animals have not been reported in the Union.

Cobalt.

A deficiency of cobalt causes such diseases as "bush sickness" in New Zealand, "grand traverse disease" in the United States, "pine" in Great Britain, "nakuruitis" in Kenya and "enzootic marasmus" in Australia.

In these countries ruminants, especially sheep, are commonly affected by a cobalt deficiency. Loss of appetite results in progressive emaciation, anæmia, craving for hair and wool, scaliness of skin, listlessness and a decrease in fertility and milk production[14]. In all cases oral treatment of the animals themselves, or the pastures, is both preventive and curative. If given orally, improvement is noticeable within a short time. However, an excess of cobalt intake is undesirable. When cobalt treatment was administered parenterally, there was no response. It is evident, therefore, that the bacterial ruminal flora is affected by cobalt deficiency[1]. It is incidentally interesting to note the fact that vitamin B_{12}, which is active in cases of human pernicious anæmia, has been found to contain about 4% of cobalt[1].

Pastures appear to be lowest in cobalt during the early growth period. When growth is slowed the percentage of cobalt in pastures increases[16]. As far as has been ascertained, there is no deficiency of cobalt in Union soils or pastures, although assimilation may be adversely affected by an upset in ruminal flora.

Fluorine.

Several of the natural mineral supplements such as phosphates and calcium unfortunately contain an excessive concentration of the poisonous element fluorine. For this reason Government Regulation No. 1154 of 4th June, 1948, specifies that any stock lick should not contain more than 0·3% F. Minute traces of fluorine have been proved to have beneficial results. However, it may be stated with certainty that in the Union man and animals in certain areas do not infrequently ingest amounts of fluorine in excess of their normal requirements[6]. Many waters may contain too high a concentration of fluorine[15].

In animals, as in man, mottling of the teeth occurs. There is then an accumulative deleterious effect, which results in defective bone calcification. The ultimate result is not unlike osteomalacia. In such cases reproduction is seriously affected. Fluorine is, therefore, closely linked to calcium-phosphate metabolism and is more likely to be excessive than deficient in the Union.

Zinc.

Although there is no experimental proof of a possible deficiency of

zinc, it is one of the latest trace elements shown to be essential to animal life. A lack of zinc will delay intestinal absorption, possibly due to its rôle in forming the carbonic anhydrase enzyme[1]. An insufficiency of zinc may impair the utilization of certain vitamin B-complex factors such as riboflavin which results in pellagra-like lesions[1].

Zinc has been found to be essential to the nutrition of plants, while an excess would prove harmful to the plants. Its availability is dependent on the presence of other minerals, as soils need not necessarily be deficient before such deficiency is reflected in the animal[1].

*Approximate Daily Mineral Requirements of Farm Animals**

	Dry Cattle	Sheep	Horses	Pigs
Calcium	12 gms. Ca	2 gms. Ca	13 gms. Ca	10 gms. Ca
Phosphorus	10 gms. P	1.5 gms. P	10 gms. P	6 gms. P
Sodium	11 gms. Na	2 gms. Na	10 gms. Na	4 gms. Na
Chlorine	13 gms. Cl	2 gms. Cl	12 gms. Cl	7 gms. Cl
Potassium	31 gms. K	7 gms. K.	30 gms. K	5 gms. K
Magnesium	3 gms. Mg.	0.5 gms. Mg	3 gms. Mg	1 gm. Mg
Iron	80 mgm.	12 mgm.	80 mgm.	15 mgm.
Copper	35 mgm.	7 mgm.	30 mgm.	5 mgm.
Iodine	2.5 mgm.	0.3 mgm.	2.0 mgm.	0.5 mgm.
Manganese	75 mgm.	15 mgm.	65 mgm.	10 mgm.
Cobalt	1 mgm.	0.1 mgm.	—	0.5 mgm.
Zinc	10 mgm.	2 mgm.	10 mgm.	4 mgm.
Sulphur	No inorganic sulphur to be supplemented, except as a preventive measure for geilsiekte. The body requirements for sulphur should be supplied through the medium of an adequate protein.			
Fluorine	Minimum requirements unknown, but not more than 0.01% of the total ration of animals.			

* Estimated from the references cited.

It will be appreciated that the amounts given as the mineral requirements for cattle, sheep, horses and pigs are approximate estimations. No attempt has been made to calculate the amounts necessary at various ages or for pregnancy and lactation.

Conclusion.

The available information about the minimum requirements of most of the trace elements must still be regarded as inadequate.

However, deficiencies or borderline cases may be established with a fair degree of accuracy by chemical analyses.

An aspect that should be stressed is the fact that no consideration need be given to trace elements before it has been established that the marco-elements, calcium, phosphorus, magnesium, potassium and salt (NaCl) are present not only in adequate amounts, but in the correct proportions. In most instances a high calcium : low phosphorus intake may be suspected of exercising a deleterious effect on the proper utilization of other mineral elements such as copper.

It is clear that the stoichiometric reactions of trace elements such as iron, copper, manganese, cobalt, zinc and iodine may readily result in insoluble complexes, especially in the presence of an excessive intake of the inorganic elements. Iodine, for instance, when incorporated in a lick has been found to be highly unstable in the presence of even minute quantities of iron, copper, manganese or cobalt, when these are present in inorganic form. The result in injudicious supplementation may not infrequently aggravate a diarrhœa in young animals, when the purpose of supplementation is to rectify such digestive disturbance. In cases of suspected mineral deficiency, it would be safer to call for basic determinations before prescribing.

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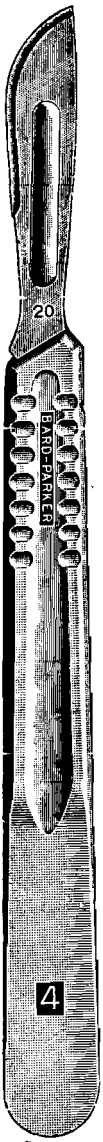

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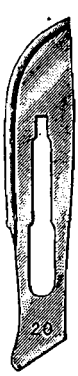

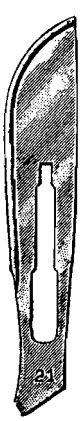

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LETSELS VAN OESOPHAGOSTOMUM COLUMBIANUM (KNOPPIESWURM) IN DIE BLESBOK [DAMALISCUS ALBIFRONS (BURCH)]

P. J. J. FOURIE,
Onderstepoort

OPSOMMING

Letsels van Oesophagostomiase is beskrywe in die blesbok (Damaliscus albifrons) *wat blykbaar besmet geraak het van skape wat op dieselfde weiveld loop.*

SUMMARY

Lesions of Oesophagostomiasis are described in the blesbok (Damaliscus albifrons). *Infection apparently took place from sheep running on the same veld.*

Oesophagostomiase is 'n ernstige en baie belangrike wurmsiekte van skape in Suid-Afrika. Alhoewel daar baie plase in die Unie is waar wild en skape in dieselfde kampe loop, is, sover ek weet, letsels van knoppieswurm nog nie in die blesbok beskrywe nie.

Gedurende 1950 was ek teenwoordig toe agt blesbokke op die plaas Badfontein, Vereeniging, geskiet is. Eintlik moes net ses bokke geskiet word, maar toe die eienaar se aandag gevestig is op 'n bok wat baie maer was, het hy meteens ingewillig om die bok te laat skiet, daar dit wenslik was om seker te maak of een of ander siektetoestand nie vir die vermaering verantwoordelik was nie. 'n Ander bok is geskiet omdat ons gereken het dat sy gekwes was, maar by ondersoek was dit duidelik dat die bok nie gekwes was nie, maar uitgesak het omdat sy brandmaer was.

Post-mortem-ondersoek.

Die ondersoek is gemaak so goed as moontlik in die omstandighede. Terwyl die bokke alger in die veld oopgesny is en geen belangrike makroskopiese letsels in die organe teenwoordig was nie, was die maag en derms deurmekaar huis-toe geneem en gevolglik was dit nie moontlik om die maag en derms met 'n besondere bok te identifiseer nie.

Resultate van die ondersoek.

Hierdie resultate sal kortliks beskrywe word onder (1) die twee maer bokke, (2) parasiete en (3) patologiese letsels.

(1) *Die twee maer bokke.*

Al ses die ander bokke was in besonder goeie voedingstoestand. Die twee maer bokke was twee stokoud ooie, sonder 'n tand in die bek, en die hoë ouderdom van die twee diere is toe aangeneem as die oorsaak van hul uiters swak voedingstoestand.

(2) *Parasiete.*

In die abomasum is haarwurms teenwoordig; dié is geïdentifiseer as *Hæmonchus contortus.* Daar was nie baie haarwurms nie en dis onwaarskynlik dat hull vir die dier van ekonomiese betekenis was.

In die dikderm is parasiete wat lyk soos knoppieswurms. Die wurms is geïdentifiseer as *Oesophagostomum columbianum.* In dié geval ook was daar nie baie parasiete nie, en dit is onwaarskynlik dat hulle enige simptome sou veroorsaak het.

(3) *Patologiese letsels.*

Daar was knoppies in die derms. Die knoppies is makroskopies betreklik klein. Een knoppie was feitlik in die serosa en dit was nie makroskopies duidelik of dit wel verkalk was of nie. Die knoppie, sowel as monsters van die derms, is in formalien gesit vir verdere ondersoek.

Om seker te maak of die letsels in die serosa nie miskien 'n masel is nie, is 'n noukeurige ondersoek gemaak en daarin is gevind die vierde stadium larwe van *Oesophagostomum columbianum.*

Mikroskopiese ondersoek van die letsels.

Die knoppies is in die submukosa (sien fig. 1).

Die letsel bestaan uit 'n sentrale gedeelte wat intensief met eosin verf. In dele van die sentrale gedeelte is die selle feitlik totaal vernietig en dis net die sel-detritus wat nog oorbly. In plekke is daar verkalking In ander dele van die letsel is die selle duidelik herkenbaar. Verreweg die meeste van die selle is eosinophile, maar hier en daar kan kerne van epithelioid-selle nog herken word. In sommige snitte is dele van die parasiete duidelik te sien (sien fig. 2).

Bespreking

Daar is heelwat plase in die Unie waar wild en die huisdiere deurmekaar loop. Dis ook die geval op die plaas Badfontein. In die geval van Oesophagostomiase blyk dit nou dat die diere mekaar oor en weer kan besmet. Die eienaar het vroeër moeilikhede met wurms in skape gehad. Hy het eers gereeld wurmmiddels gebruik, maar ten spyte hiervan was sy ondervinding dat sy skape nog steeds nadelig deur die wurmbesmetting beïnvloed word. Hy besluit toe om minder skape aan te hou en hy verklaar dat hy van toe af omtrent nooit meer enige

wurmmiddels gebruik het nie en dat sy skape se kondisie bevredigend is; blykbaar word hulle nie nadelig deur die wurms beïnvloed nie.

Die vraag is nou of die blesbokke ten spyte van besmetting geen kliniese tekens van wurmbesmetting wys nie omdat hulle genoeg weiding tot hul beskikking het. Moontlik sal daar op plekke wat oorstok is ook kliniese gevalle van Oesophagostomiase in wild voorkom.

Omdat dit nie prakties is om wild vir wurms te behandel nie, kan wild vir die veeboer 'n probleem skep, deur altyd 'n bron van besmetting te bly veral op kleiner plase waar wild en die huisdier op dieselfde veld loop.

Dankbetuiging

Mnr. J. Jacobs, eienaar van die plaas Badfontein, word baie hartlik bedank vir die fasiliteite wat hy beskikbaar gestel het, sowel as dr. R. Ortlepp wat verantwoordelik was vir die identifikasie van wurms.

Literatuur

FOURIE, P. J. J. (1936): A contribution to the study of Oesophagostomiasis in sheep. *Onderstepoort Journ. of Vet. Sci. and An. Ind.*, Vol. 7, No. 1, pp. 277 - 347.

BOOK REVIEW

LEHRBUCH DER VETERINÄR-MIKROBIOLOGIE, by Prof. Dr. Med. vet. Hans Dahmen (1949), edited by Paul Parey, Berlin.

The fourth edition (1949) of the above textbook suffers from lack of revision and modernization. The nomenclature used has little relation to any current scheme of classification. For example, the student will find it difficult to recognize *Clostridium welchii, Clostridium septicum* and *Clostridium chauvoei* as *Bacillus phlegmonis emphysematosæ, Bacillus parasarcophysematos* and *Bacillus sarcophysematos,* respectively. (No synonyms are given.)

Many procedures that have become standard practice in the last twenty-five years are not mentioned, as for example the use of the McIntosh and Fildes type of jar for anærobic culture, and although metabolism of bacteria is discussed in considerable detail, the knowledge gained of enzyme mechanisms is barely touched on.

Immunology is treated perfunctorily, and the author states, inter alia, that antitoxic sera differ in no way from normal sera except in their reactions to toxins.

A very abbreviated table of the Salmonella serological reactions is given (the O-antigens are omitted) together with the author's very personal view that the H-antigen reactions are due to a virus entangled with the flagellæ.

On the other hand four pages are devoted to a detailed exposition of the complement fixation test for glanders. This book requires extensive revision and modernization. — M.S.

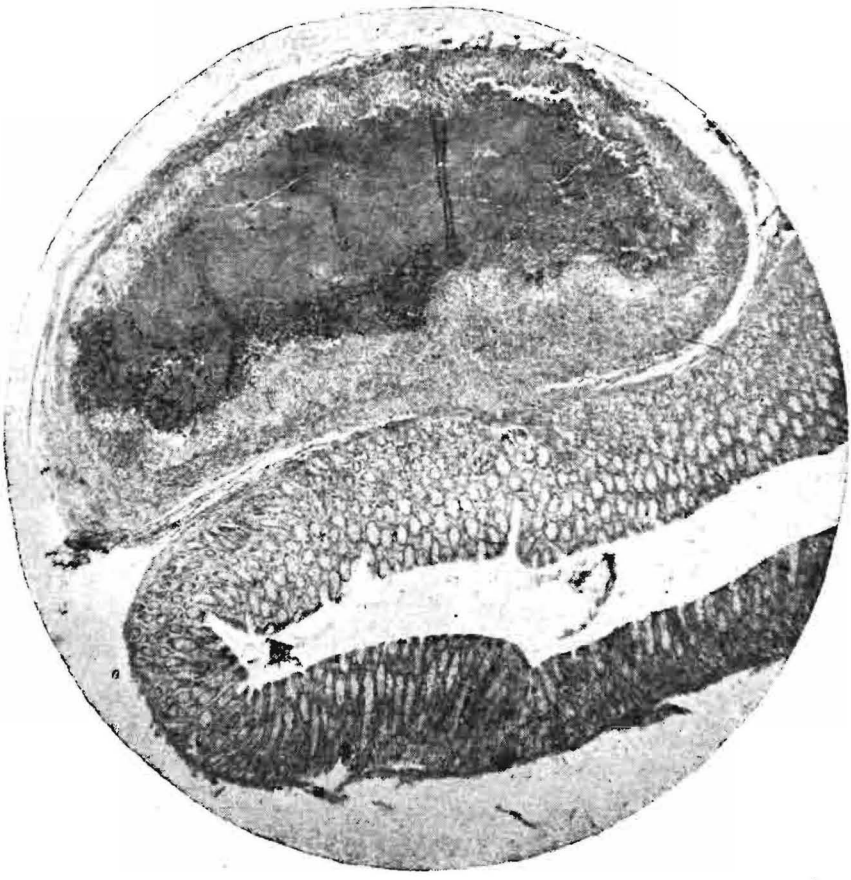

Fig. 1. — Monster 39114.

Letsel van *Oesophagostomum columbianum* dikderm — blesbok

Fig. 2. — Monster 39114.
Deel van die parasiet aan die peripheri van die letsel.

Rondom die sentrale gedeelte is 'n sone van epithelioid-selle en hier en daar ook reus-selle (sien fig. 3).

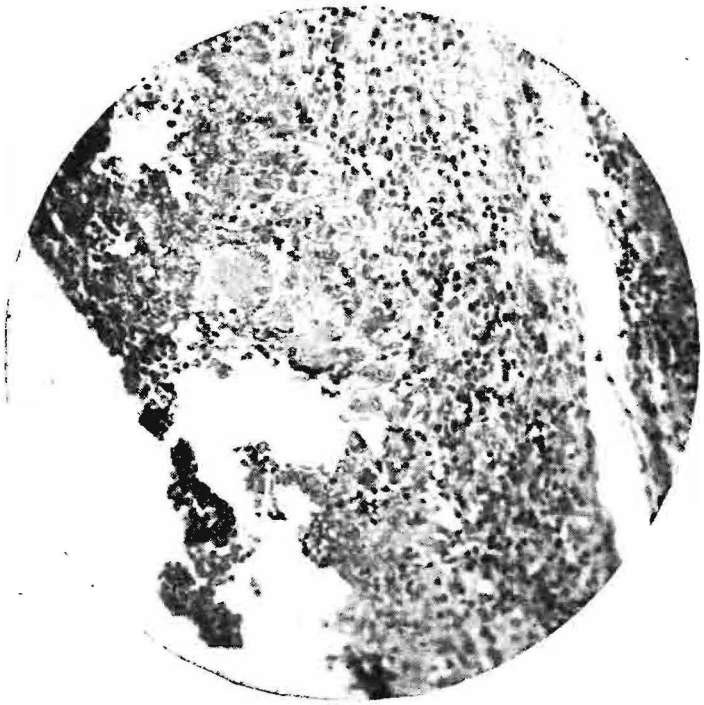

Fig. 3. — Monster 39114. Soos fig. 1. — Reus-selle.

Die letsels is presies soos dié van Oesophagostomiase van die skaap, soos beskrywe deur Fourie (1936).

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HYPERTROPHIC PULMONARY OSTEO-ARTHROPATHY IN A DOG

B. S. PARKIN

ABSTRACT

In this article there is presented the clinical description of the above disease diagnosed in a dog admitted to the Onderstepoort clinic for examination. The disease's characteristic changes in the limbs are noted and supported by a number of X-ray photographs which show clearly the periosteal proliferation affecting the bones of the limbs. These changes are secondary to the primary condition, a lung "tumour," which is also demonstrated by means of an X-ray photograph. The literature of the disease in various animal species and dating back to 1889 is recorded. This appears to be the first instance in which this condition has been described as occurring in animals in the Union of South Africa.

This disease or condition was first described in man by Bamberger[1] and Marie[2]. The name of the latter author is especially associated with the condition and consequently it is sometimes designated as Marie's Disease. In the literature are recorded cases in the horse, ox, llama, lion, dog, cat, rabbit, sheep and in birds. The object of describing the case of this disease in a dog is to place on record the first case observed, it is believed, in South Africa.

The case of hypertrophic pulmonary osteo-arthropathy encountered in the Onderstepoort clinic was in a two-year-old mongrel. The patient, on admittance on the 14th November, 1950, was in fair condition but deteriorated considerably during the observation period of 18 days. The owner reported that it was in July, 1950, that the dog was first noticed to cough, especially during exercise and after barking, and that the dog coughed up blood about two months later. It was not until October of the same year that the owner noticed the enlargement of the limbs.

The characteristic feature of the disease, namely the symmetric enlargement of all four limbs, was, at admittance, conspicuous. The limbs were about twice their normal thickness (fig. 1). On palpation they were found to be firm to hard, the deviation being easily detectable. The skin was tense but not adherent to the underlying tissues. The tendons and muscles were firm, and certain parts of these showed the presence of lumps or enlargements which were distinctly harder

than other parts but which were not demonstrable by even "soft" radiographs. The legs were pillar-like and the gait stilted, but no pain was evinced by palpation. The interference with joint movements was due apparently to the increase in the thickness of limb and the firmness of the soft tissues and not to pain nor changes in the joints themselves. Effusion into the joints was not detected. The long bones of the limbs showed neither bowing nor lengthening and only slight sensitiveness to deep pressure. The enlargement and other changes in the bones and tissues could only be traced by palpation to about the middle region of the humerus and femur.

Dyspnœa was in evidence. The dry cough which was only occasionally noted at rest was easily produced by exercise and by transverse pressure applied over the thorax. The temperature during the 18 days of observation never exceeded 103·2°F and fluctuated mainly between 101°F and 102·5°F. The pulse ranged between 160 and 168 per minute. The heart beat by palpation and the heart sounds by auscultation could be detected over the whole of the thorax. Bronchial sounds were dry and whistling.

The appetite, defæcation, urination and appearance of visible mucous membranes were normal.

The urinary examination was: Albumin trace, S.G. 1017, pH 5, bilirubin, acetone bodies, sugar and centrifuge deposit negative. Hookworm eggs were found in the fæces. The blood examination was: Red cell count 4·16 millions per cmm., hæmatocrit 39%, hæmoglobin 11·8 gm.%, white cell count 17,900 per cmm., non-protein nitrogen 24 mgm.% and plasma bilirubin negative.

I am indebted to Mr. D. de Vos, the Radiographer, for the following report on the X-ray examination. The periosteal proliferations were completely penetrated in the first too hard radiograph taken with double intensifying screens with penetration set at 50 K.V. The subsequent "softer" radiographs revealed the details of the periosteal proliferations and their extent. These were made without screens on non-screen films. Penetration had to be increased to 65 K.V. and exposture time had to be doubled to get the contrast detail and definition with this film.

It will be seen that the proliferation is especially in evidence on the diaphyses of the long bones. A series of radiographs made of the right front limb showed that the periosteal changes extended from the paw (fig. 2) up to near the proximal extremity of the humerus (fig. 3) and that the epiphyses and the joints were comparatively free of changes.

The radiographs further reveal the proliferation as a delicate lacework pattern equal in thickness over the metacarpals to the bones themselves. The lacework effect gives an impression of unevenness and serration due probably to this early case having variations in the degree of calcification. The new tissue is sharply differentiated from the original shafts, but this differentiation would probably be lost were

the case of longer standing. It will be noted that the joints are not involved.

The lateral radiograph of the thorax revealed a large shadow which merged with that of the heart and extended forward to near the entrance of the chest cavity. The dorso-ventral radiograph (fig. 4) shows that the heart is well over to the left side of the thorax and that the remainder of the shadow is due to a "tumour" which extends from the right side opposite the base of the heart forwards towards the entrance of the thorax on the right side and also over the midline to the left, anterior to the base of the heart.

Comments

The condition of the skeleton is almost invariably secondary to some primary disease, usually of the lungs and bronchi. In man the rôle played by chronic respiratory affections is well recognized, and of these, pulmonary tuberculosis heads the list. Most of the cases recorded in animals have as their primary disease pulmonary tuberculosis. So much so is this the case, that the majority of authors claim that the disease in animals is always associated with tuberculosis of the lung and that non-detection of pulmonary tuberculosis is a failure in the technique employed for its recognition. In man, however, there seems to be little doubt that the primary disease may be other than tuberculosis.

The changes in the skeleton, especially the long bones of the limbs, consist primarily in a slowly progressive ossifying periostitis beginning normally in the distal bones of the limbs. Later the changes involve the other bones of the limbs and even, in some cases, all the remaining bones of the skeleton.

The exact cause of the bony changes is unknown. Both Bamberger and Marie believed that the bony changes were toxic in origin. Others have suggested that the changes were due to prolonged venous congestion, but this theory fails to explain many cases; or that the primary factor is œdema associated with chronic low-grade anoxæmia in tissues where the circulation is slower; or that the condition is due to tissue destruction resulting from the primary condition.

In animals the cases which have been traced in the literature were, with few exceptions, cases associated with tuberculosis of the lungs. Ball and Lombard[3], who described a case in a lioness, state emphatically that their case once again showed that the disease was always associated with chronic pulmonary tuberculosis. This article of Ball and Lombard includes an excellent bibliography. Other workers, however, have described cases which they claim have not been associated with tuberculosis. Collet and Jolly[4] reported a case independent of tuberculosis. Poley and Taylor[5] recorded a case in which they assert

that the primary condition was a giant cell tumour of the lung. Cotchin[6] was unable to establish tuberculosis as a cause in a case which showed a lesion of the lung. Schnelle[7] reported a case in which multiple metastatic carcinoma appeared to be the primary condition. A remarkable outbreak of the disease was reported by Carré, Thiery and Bonnet[8] in 6 - 7-months-old sheep, in none of which they were able to establish presence of tuberculosis. The case of Rumney and Schofield[9] was associated with a bronchogenic carcinoma.

In view of the fact that the disease in man is regarded as frequently being associated with conditions not of tubercular origin and that a number of cases has been recorded in animals in which tuberculosis could not be established, it seems advisable to regard the disease in animals as one which may have a primary cause other than tuberculosis. It should, however, be remembered that, in the dog, lesion of pulmonary tuberculosis frequently simulates a sarcoma.

In the case described tuberculosis of the pulmonary, sarcoma-like, tumour could not be established.

The diagnosis of this disease hypertrophic pulmonary osteo-arthropathy rests on the characteristic changes in the limbs associated with, most frequently, a chronic diseased state of the lungs and bronchi. The extent of the changes in the limbs and even in the skeleton as a whole and also the state of the organs of the thoracic cavity may, in most cases, be determined by the use of X-ray studies.

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Fig 1 – Symmetric enlargement of all four limbs

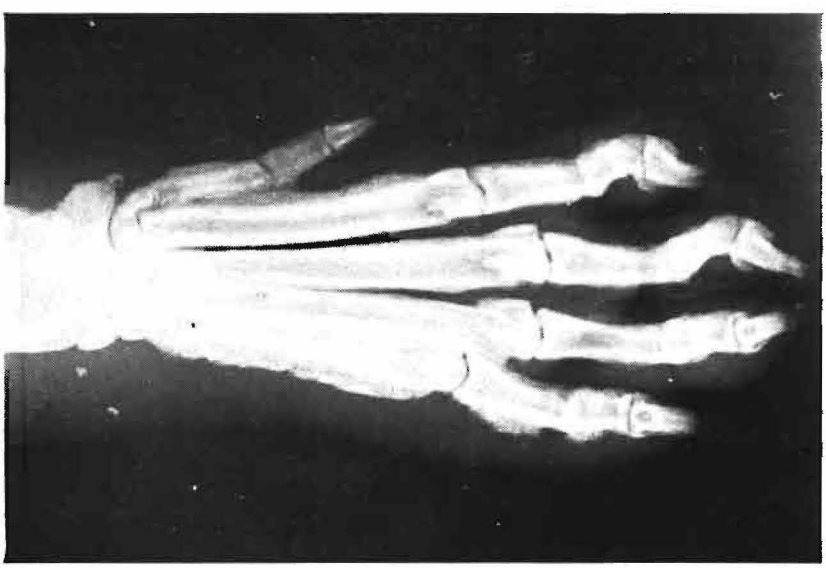

Fig 2 – Periosteal changes of metacarpi and phalanges

Fig. 3. — Periosteal changes extending up humerus.

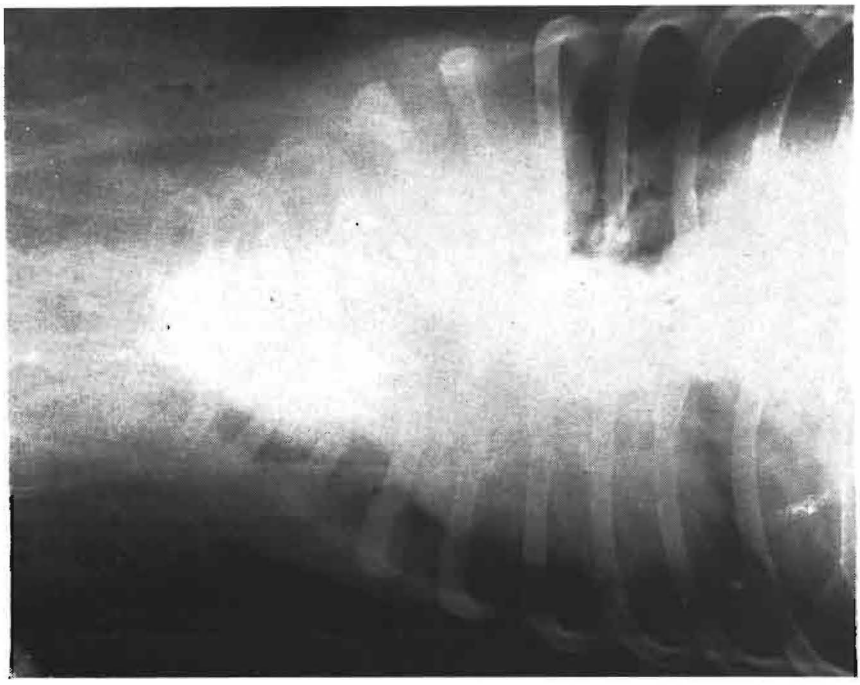

Fig. 4. — Tumour of the thoracic cavity.

Jl. S.A.V.M.A. 22(2), 1951.

OOPHORECTOMY OF THE BITCH

C. F. B. HOFMEYR,
Pretoria

SUMMARY

A complete description has been given of oophorectomy of the bitch, when the linea alba approach is employed The merits and demerits of the flank approach are also discussed.

Proficiency in performing oophorectomy on the bitch is of the utmost importance to the small animal practitioner, because it is so often requested by his clients, and for the young graduate the operation has additional interest inasmuch as it affords him the opportunity of rapidly acquiring considerable skill in various surgical procedures.

TIME OF OPERATION

It is preferred to operate between the age of three months and the onset of the first oestrum. Refuse very young puppies, as they are constitutionally weaker and relatively bad anæsthetic risks. The fat, so often present in adult bitches, increases the difficulty of operating. Old age presents additional problems; for instance, a clinically normal bitch with chronic nephritis may die of renal failure a few days after subjection to the strain of the operation. Lastly, try to avoid performing oophorectomy on a bitch in season, owing to the danger of excessive bleeding. Unless the time for operating is propitious, the client should be warned accordingly.

PREOPERATIVE PREPARATION

Generally speaking this follows the usual lines. Nembutal Solution Veterinary Abbott is preferred as the anæsthetic, and it is given intravenously until the pedal, but not the corneal, reflex has disappeared. It is unnecessary to run the risk of infecting the bladder by inserting a catheter. A distended bladder, however, gets in the way during operation and so it is emptied by pressure when anæsthesia is complete. The patient is then placed on her back with the caudal lumbar vertebrae on a fairly thick sandbag, and supported on either side by other sandbags running the length of the body. The thoroughly shaved abdomen is disinfected and then the operation cloths are fastened in position.

THE OPERATION

Divide the distance between the pubis and the umbilicus into quarters and make the incision forwards along the linea alba from

the junction of the third and fourth quarters, meaning from behind forwards. A Bard-Parker No. 15 knifeblade is excellent if very sharp. The scalpel is held like a pen at the starting point and is pressed firmly through the skin, subcutic and muscles until there is a sensation of "give". The knife is then swept along the linea alba for the required distance (about 1 cm. in young, small bitches and 3 cms. in large, fat subjects).

A assistant then lifts the hindquarters high enough for the abdominal organs to slide forward. Dressing forceps are inserted into the wound with the jaws closed. When they are opened they act as dilators. By forcing them open even wider it is possible to lift the wound slightly, and then the peritoneum is incised. An adjustable light illuminates the interior of the abdomen.

A small blunt-pointed hook, slightly larger than a buttonhook, is introduced to withdraw one horn of the uterus. The immediate recognition of the horns is essential. In the six-weeks-old pup the bifurcation is hidden under the bladder, and the horns resemble flat, narrow, pale bands (one on either side of the rectum) diverging towards the respective kidneys. Until puberty is attained, the horns get bigger and more rounded and definitely pink in colour. With increasing age the blood vessels running across the long axis become easier to see. At oestrum there is a marked hyperæmia, and the horns assume a wavy appearance when handled due to sluggish peristaltic movements. Over the years the uterus becomes greyish-yellow in colour.

Even in well-covered puppies there is relatively little fat in the ligaments; more is to be found in the adult virgin bitch, but the increase in the amount after the first season is slight. In multiparæ there is a greater tendency to fat accumulation in the ligaments, and the internal genitalia are much larger than in virgin bitches, and, because of the increased length of the uterus, the bifurcation may be close to the abdominal wound and the horns may tend to vary in position. Furthermore, the surface of the uterus shows longitudinal creases or striations and the free border shows a smooth, rounded ridge. In primiparæ these changes are naturally not so marked.

In the young bitch the horns can almost invariably be seen at a glance. In mature, stout subjects with horns varying in position, the broad ligaments laden with fat may hide the horns from view. By hooking the broad ligament and pulling it through the wound the horn is brought to the surface. Occasionally when the omentum has not moved forward far enough with the abdominal organs when the hindquirters have been lifted, it may be brought out instead. The omentum is different from the broad ligaments in being more lace-like and sliding easily through the wound. Perhaps the plicus unbilicalus media or the plicæ umbilicalæ laterales of the bladder are secured, but the error is obvious when the bladder wall appears.

When the uterine wall has been brought outside the body, it is

grasped by the fingers, as instruments are too harsh, and pulled gently until the bifurcation is visible. In the event of difficulty, the assistant flexes the lumbar region. By bringing the pelvis closer to the umbilicus and relaxing the abdominal muscles, the desired result is achieved. If necessary, the caudal end of the wound may be hooked and drawn backwards. When the second horn is seen it is withdrawn with dressing forceps. Both horns are then held with forceps, and the two broad ligaments are pierced with the hook, which is then passed across the wound to secure the horns on the surface of the abdomen.

In the young bitch it is immaterial which ovary is removed first. Using the fingers, apply traction to the one horn until the utero-Fallopian junction is seen. Grasp this firmly with artery forceps and pull gently until the ovary and as much as possible of the ovarian ligament are delivered. In a case with short ligaments this is helped by flexing the lumbar region and depressing the abdominal wall with the one hand.

If the forceps are held vertically, a triangle is formed by the Fallopian tube, ovary and ovarian ligament on the one side, the uterine cornu on the second side and the abdominal wall on the third. The centre of this triangle contains less fat than the other parts of the ligaments and has no large blood vessels. A big window is made with a blunt instrument. Catgut (No. 0 to 2, depending on the size of the bitch) is then passed through the window and the ovarian ligament tied off as far as possible from the ovary. A second ligature is put round the horn. Hold the ovary between the thumb and first finger when it is invisible through being embedded in fat and divide the ovarian ligament with scissors. Remove the artery forceps and divide the crushed part. The other ovary is treated similarly.

In the mature, fat bitch certain modifications may be required. Where the ligaments are rather short, it is advisable to deliver only one horn and ovary at a time, in order to have more room. The ovarian ligament, when laden with fat, should be tied off one-half at a time. The needle passed through the ligament must be *round-bodied.* In these cases the ovarian blood vessels are so tortuous and prominent that a cutting-edge needle may damage them and cause unpleasant hæmorrhage. When the ligament has been cut through, examine the stump carefully for hæmorrhage before returning it to the abdomen. In older, fat patients the veins in the broad ligament are very friable and tying off the horn or even handling it gently may produce hæmatomata in the ligament. Small hæmatomata are of no consequence, but if they are large or if metritis is present it is best to perform a panhysterectomy. In other circumstances, panhysterectomy is considered unnecessary.

In the puppy the ovarian ligaments are elastic and relatively strong, but in older subjects considerable elasticity is lost and they become friable. Remember this when applying tension. The mesovarium is composed of a strong part, which is shorter than the other part carrying

the blood vessels. If excessive traction has been applied and there is some tearing of the dorsal attachments, alarm need not be felt, as the part carrying the blood vessels will still be intact.

It has already been stated that no matter how old the dog, the posterior commissure of the abdominal wound remains unaltered in position. Lengthening of the wound is done anteriorly when it is necessary to cope with the decreased elasticity and the greater fragility of the ovarian ligaments in older bitches.

Catgut is used to close the abdominal wound. Where the incision is short a single interrupted stitch is used, traversing all layers except the skin. A longer wound requires a short continuous suture.

The skin wound is closed with silk or nylon used as a *subcuticular suture*. A small bead is tied to the end of the thread. A straight, *sharp* spear-pointed needle is pushed through the skin on the linea alba, a short distance from the commissure of the wound, to emerge under the wound at the commissure. The needle is guided through the cut edge of the skin itself (not the subcutis) and is allowed to emerge after a short distance. The needle is passed in similar fashion through the opposing edge, and then from side to side until the other commissure is reached, when the needle is made to dip under the skin and emerge further on on the linea alba. The thread is pulled taut and another bead is applied as an anchor.

The skin wound will be small and almost invisible, and it will heal more rapidly than if other conventional ways of suturing are adopted. Young bitches can easily be spayed routinely in well under ten minutes if the above technique is employed, and so surgical shock, risk of infection and devitalization of the tissues are reduced to a minimum. Care and thoroughness should not be sacrificed to speed, however.

Rapid healing is the rule, and bitches are generally discharged after four or five days in hospital, when the cutaneous suture has been removed. It is not necessary to apply any postoperative dressing to the wound, which is characterised by remarkably little irritation.

It is interesting to record that some bitches that have experienced oestrum before operation, tend to become temporarily attractive to dogs when the following season is due. This, however, is not repeated subsequently. Although the writer has performed a few thousand oophorectomies, no bitch has genuinely come in season afterwards.

Comparison of Different Methods

As some proficient surgeons make the approach through the right flank, it is desirable to compare the two methods, particularly as the writer has had sufficient experience of both.

Linea alba Approach.	Flank Approach.
1. *Preoperative Preparation*	
The relatively bare abdomen facilitates shaving and skin operation.	The dense hair of the flank greatly complicates these procedures.
2. *Trauma*	
Practically none, as the abdominal wall here is thin.	Where the incision is vertical, considerable division of muscle fibres is unavoidable. If a grid-iron incision is made, the wound must necessarily be longer.
3. *Hæmorrhage*	
Insignificant. In young bitches often not a single swab is needed. In older cases the subcutaneous vessels are seen before they are divided, and so are easily secured.	Even if the by no means constantly situated bloodvessels are avoided, there is unpleasant oozing from the muscle wound.
4. *Location of Uterine Horns*	
As direct observation is possible, this is nearly always accomplished easily.	Blind probing with forceps is generally necessary.
5. *Ease of Delivery of the Ovaries*	
There is no significant difference. Only one case (a Dachshund) was encountered where the operation had to be accomplished by removing one ovary through the linea alba and the other through the flank. Both ligaments were so short that both flanks would have had to be opened if the flank method had been employed.	
6. *Post-operative Complications*	
a. ***Hæmatomata***	
Very unlikely.	Not infrequently seen.
b. ***Infection***	
If it occurs the site favours localisation.	By opening fasciæ planes, the spread of infection is facilitated.
c. ***Hernias***	
In the young bitch the wound is so small as to preclude the formation of a hernia. In older subjects careful suturing has the desired effect.	Do not occur unless the wounds are made unnecessarily large.
d. ***Healing***	
The subcuticular suture favours rapid healing, which is also promoted by the other virtues already enumerated.	The subcuticular suturing does not answer well when loose subcutaneous tissues are involved, and the other methods of skin closure do not lend themselves to the rapid union of the lips of the wound.

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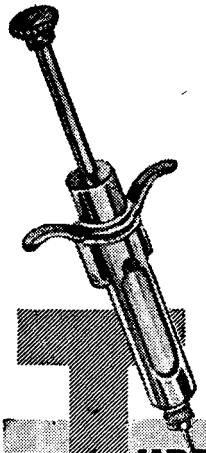

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EQUINE SPOROTRICHOSIS

P. W. THOROLD,
Department of Veterinary Services, Kenya

While the writer was working in the section of Bacteriology, Onderstepoort, a specimen of equine pus, aspirated from an unopened abscess, was submitted for bacteriological examination by Dr. F. du Casse of Sandown, Johannesburg. Smears stained with Giemsa showed a number of darkly staining, circular bodies, 1 - 3μ in diameter. They were found to be Gram positive and no other organisms were present. The material was seeded on serum agar and Sabouraud's dextrose agar. After 3 - 4 days incubation at room temperature ($\pm$ 22°C), fine stellate colonies appeared, composed of a mass of radiating, septate hyphæ with short lateral filaments and conidia. A tentative diagnosis of Sporotrichosis was made and a culture submitted to Dr. H. I. Lurie, Mycologist, South African Institute for Medical Research, Johannesburg, for confirmation; he identified the organism as an undescribed species of *Sporotrichum*.

In 1929, Robinson and Parkin[1] described a case of Sporotrichosis in a horse from Pretoria North. As far as the writer is aware these are the only two cases of Sporotrichosis in domestic animals recorded from South Africa. Piratininga[2] describes a case in a mule, the hind limbs and lips being chiefly affected. The animal died and on post mortem lesions were present in the subcutaneous tissue and musculature. Albanoz[3] describes a case in a horse with skin lesions and enlarged lymph nodes; treatment with potassium iodide gave good results. Dodge[4] mentions *Sporotrichum equi* occurring as an epizootic in horses in Madagascar.

Human Sporotrichosis has been reported from all continents. The fungus is widespread in nature, infection is usually by mechanical means from plants or from infected animals. Of interest in South Africa are the outbreaks which have occurred in miners in the Rand Gold Mines (Pijper and Pullinger[5] 14 cases, Dangerfield and Gear[6] 74 cases, Proceedings of the Transvaal Mine Medical Officers' Association[7] over 2,000 cases). In the latter outbreak the timber used underground was found to be supporting the growth of the fungus. Potassium iodide administered orally is considered as practically specific for the treatment of human Sporotrichosis; if ill effects follow its use, sodium iodide may be given intravenously[8].

Case History

For the following data on the case history the writer is indebted to Dr. du Casse.

The case was an eight-year-old chestnut gelding, owned and ridden by a child who, two to three months prior to the horse developing lesions, had a persistent sore on one of her fingers. No definite record is available, but there is reason to believe that the sore was associated with a *Sporotrichum* infection. The horse had been running with two others in a camp for three years, neither of which developed the condition, so that it would seem that the child was the source of infection.

The first lesion appeared on the medial aspect of the fetlock of the near fore, subsequently lesions developed progressively higher up the medial aspect of the limb to the sternum. The lesions commenced as small, hard, subcutaneous nodules developing over a period of ten to fourteen days into abscesses which finally burst, discharging a thick, creamy pus. Below the carpus the lesions were about 4 inches apart, above the carpus 1 - 3 inches apart and over the sternum, almost confluent. The abscesses ($\frac{1}{2}$ - 1 inch) in diameter, responded to no initial treatment: they would scar over for a few days and then reopen and suppurate. When the author visited the case on 26th November, 1949, the lesions on the limbs appeared to be drying up, whereas those on the sternum were suppurating. As laboratory investigation had proved the presence of *Sporotrichum* in the lesions sodium iodide was prescribed at a dosage level of 3 mgs./100 lbs. bodyweight in 10% solution to be given intravenously. Three treatments were given which appeared to achieve a complete cure. No symptoms of iodism were noted.

The following is a history of the treatment:

22.5.49 Inj. Penicillin; Tinct. Iodine mit. p.a.a.
1.7.49 Ung. Chloresium p.a.a.
12.8.49 Pus specimen submitted to Onderstepoort.
11.11.49 Inj. Sod. Iod.
12.12.49 Inj. Sod. Iod.
3.1.50 Inj. Sod. Iod.
15.5.50 Case last seen, all lesions healed.

Conclusion

Sporotrichosis is a rare condition in the domesticated animals in South Africa, although, owing to the wide distribution of the infective agent, ample opportunity for infection exists.

Treatment with sodium iodide appears to be specific.

Literature

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2. PIRATININGA, J. R. (1943): Esporotrichose em muar. *Rev. Fac. Med. Vet. S. Paulo,* 2 : 219.
3. ALBANOZ, J. E. (1945): Primer caso de Sporotricosis equina compro-

bada en el pais. *Rev. Med. Vet.,* Bogota, 14 : 33.
4. DODGE, C. W. (1936): Medical Mycology, 803.
5. PIJPER, A., ad PULLINGER, B. D. (1927): An outbreak of Sporotrichosis among South African Native Miners. *The Lancet,* Oct. 20th: 914.
6. DANGERFIELD, L. F., and GEAR, J. (1941): Sporotrichosis occurring on the Witwatersrand. *S.A. Med. Jnl.* 15 : 7, p. 128.
7. (1947): Sporotrichosis Infection on Mines of the Witwatersrand. Published by Transvaal Chamber of Mines, Johannesburg.
8. (1947): Manual of Clinical Mycology, 177; Natural Research Council of U.S.A. publication.

BOOK REVIEW

LINTON'S ANIMAL NUTRITION AND VETERINARY DIETETICS; 3rd Edition, by J. T. Abrams (1950), M.Sc., Ph.D., Lecturer in Nutrition, Royal Veterinary College, London. (Published by W. Green & Son, Ltd., Edinburgh.)

The new edition contains 29 chapters which include 15 instructive illustrations. A voluminous work of 503 pages which bids well to become a "British Morrison,' crammed with valuable technical and scientific information on the newer knowledge of nutrition. It is a book that would be a valuable acquisition to anyone interested in the nutritional requirements of animals.

The first section (chapters 1 to 6) deals with water, carbyhydrates, fats, proteins, minerals and vitamins respectively. In the second section (chapters 7 to 16) such subjects as feeding standards and the various farm feeds are discussed. Section 3 deals with the fundamental bases of feeding standards. Section 4 (chapters 20 to 29) handles the feeding of cattle, sheep, goats, horses, rabbits, pigs, small domesticated carnivora, poultry, laboratory animals and the efficiency factor in nutrition.

As indicated in the chapter headings cited, the present edition has lost some of the Veterinary Dietetic character of the first and second editions of Linton. In fact, it is an entirely changed edition in which practical and applied feeding problems are not sufficiently stressed. In most instances, naturally, the advice given and feeds used refer specifically to conditions which are different from those met with in the Union.

Certain information may even prove to be misleading. For instance, the fasic feed in the ration of pigs is given as oats. In the Union, oats is not only regarded as too expensive, but too high in fibre for pigs. Corn-and-cob and even ground cobs are referred to as being suitable for pigs, which is definitely not the case. In the same way the mineral and pasture management problems of the Union are entirely different from European conditions. Similarly the systems of sheep farming described would be unknown to the majority of Union farmers. However, the emphasis should not be placed on the points of disparity, but rather the rich source of basic information contained in the work.

The volume is strongly bound and well printed on good quality paper.

ACTINOBACILLOSIS OF CATTLE IN SOUTH AFRICA

A REPORT ON TWO OUTBREAKS OF THE DISEASE

E. M. ROBINSON,
Onderstepoort

In recent years actinobacillosis in cattle has been diagnosed on several occasions, usually in sporadic cases, but in two outbreaks of the disease a large number of cattle were involved. Actinomycosis in cattle in South Africa has frequently been diagnosed in the past, but no attempt was made to make a differential diagnosis between it and actinobacillosis. Most of the cases were associated with lesions of the jaw bones so were probably due to the actinomyces.

The first outbreak of actinobacillosis in cattle to be recorded in South Africa, occurred on a ranch in the Potgietersrust area of the Transvaal. The owner reported that he was having a lot of trouble with his young cattle on account of the formation of abscesses. In previous years he had had cases of abscesses occurring at the side of the root of the tail, in the upper portion of the udder, and sometimes in the head region. It is impossible to say whether any of these cases were due to actinobacillosis as no material was obtained for examination, but it is probable that they were due to Corynebact. pyogenes bovis. In the outbreak which has been referred to, about 40 of a herd of 70 young bulls and in addition, a few cows showed abscess formation in the head region. These abscesses formed in the region of the parotid glands, along the lower jaws, in the intermaxillary space, in the cheek region and occasionally on the lips. Some animals had as many as six abscesses at the same time in different stages of development. When the abscesses were opened and the pus evacuated, they healed up quickly leaving only small, hard lumps to show where they had been. In a few cases where the abscesses had involved the deeper tissues and infiltration with pus had occurred, recovery was slow. The tongue and the bones of the jaw were not involved in any of the cases. Snoring was noticed in some of the animals, probably due to abscesses pressing on the larynx or obstructing the naso-pharyngeal region. Owing to the large number of animals affected, internal treatment with potassium iodide was not carried out on account of expense, but local treatment of the abscess cavities with tincture of iodine and Lugol's iodine helped to clear the condition up. Odd cases continued to occur for the next six months after the first cases.

The cases which occurred were all among a lot of animals which

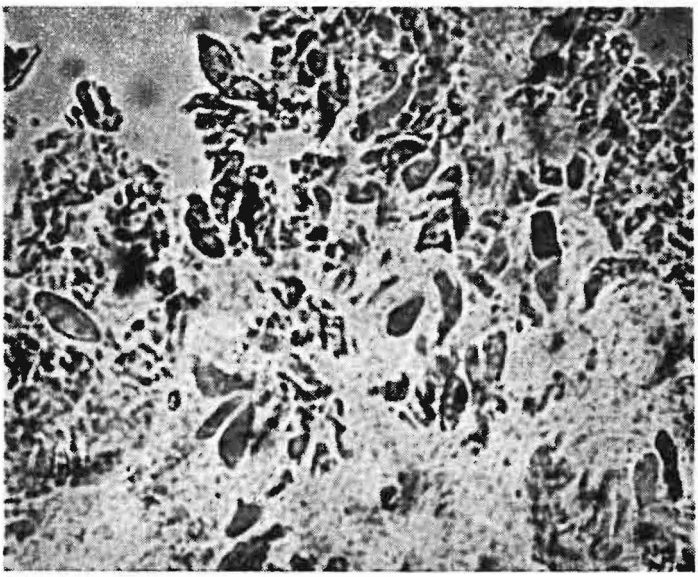
were being fed on Balbala and silage owing to prevailing drought conditions. Balbala is a very rough feed and might easily cause small abrasions of the mouth and head regions. On discontinuing the feeding of these substances, no further cases occurred for a time, though later odd ones were seen as it was impossible to discontinue the feed entirely. Subsequently, in a case which had been sent from this ranch to Onderstepoort for observation, it was found that when the animal was killed for post mortem, portions of the grass had penetrated the mucous membrane of the abomasum and were causing pathological changes there.

The pus in the abscesses in these cases was of a light yellowish-green colour and could not easily be picked up with a platinum needle, as it slipped off. Club colonies were present in large numbers. The clubs did not stain well with Plaut's method for the club forms of actinomycosis and were apparently decolorized. No evidence could be obtained of Gram positive filaments or organisms as seen in actinomycosis. Cultures made from the pus showed a small Gram negative organism corresponding to the description of Actinobacillus lignieresi.

Another big outbreak of an actinomycosis-like disease was reported from a farm in the Vryburg area of Bechuanaland. In this case a dairy herd of 34 Jersey cows was affected. The cows had been brought from the Western Province six months previously. One of the animals was noticed to be showing swellings in the throat region. Subsequently several other cows began to develop similar swellings and at the time when the cases were investigated, 19 of the animals showed lesions in different stages of development. The condition appeared to start as a hard swelling of the mandibular gland which became very large and subsequently the subparotid glands and several others on the cheeks became involved. In some cases the infection spread to the prescapular, precrural and supra-mammary lymphatic glands. This generalization was only seen in old standing cases and in the early stages only the lymphatic glands of the head were involved. As no deaths occurred, it is impossible to say whether any internal abscesses occurred. In the previous outbreak described, only lesions in the head region were seen. In the Vryburg outbreak some of the swelling reached the size of a cricket ball and were about 8 cms. in diameter. Softening occurred, but the abscesses did not burst spontaneously and had to be opened. When opened they were found to contain a yellowish caseous pus. The animals showed no general symptoms, but a few which had been affected for a month or more had lost condition. From one of the glands which contained pus centres, club colonies of the actinobacillus were found without difficulty and the histological examination confirmed the diagnosis.

The cows developed the disease shortly after being moved into a new stable which had been built for them. The feed was a mixture of soya bean hay, dried mealie stalks and dried sweet cane. The soya

Heifer showing actinobacillosis abscesses.



Clubs of the actinobacillus in pus × 1250.

bean hay was of bad quality, mouldy and mixed with soil. It was suggested that this feed was probably the cause. It should be mentioned that there were 350 oxen on the farm, but none developed the disease.

The pus samples which were examined were of a greenish-yellow colour and of the consistency of thick cream. As with the pus samples in the previous outbreak, it was found that the material was difficult to pick up with a platinum loop, though it was not as fibrinous as in the previous outbreak.

The pus showed numerous club colonies, but the clubs were decolorized by Plaut's staining method. There was no evidence of Gram positive filaments and cultures from the pus gave a growth in 24 hours of an organism corresponding to the description of Actinobacillus lignieresi. It was not obtained in pure culture at first, but was associated with Pseudomonas æruginosa (B. pyocyaneus).

Attempts were made to reproduce the condition in cattle, both with pus from cases and cultures of the organism, but without success.

II. INTERNATIONAL CONGRESS OF PHYSIOLOGY AND PATHOLOGY OF ANIMAL REPRODUCTION AND OF ARTIFICIAL INSEMINATION

Copenhagen, Denmark, July 7 - July 10, 1952

The International Standing Committee, appointed at the Milan Congress in 1948, having examined the possibilities for holding the next Congress, it has been agreed that the II. International Congress of Physiology and Pathology of Animal Reproduction and of Artificial Insemination will be held in Copenhagen, Denmark, from July 7th to 1t0h, 1952, with the following programme:

(1) The physiology of reproduction

(2) The pathology of reproduction

(3) Artificial Insemination (A.I.) of domestic animals.

The Standing Committee has nominated Dr. John Hammond, School of Agriculture, Cambridge, as president, Professor Nils Lagerlöf, Stockholm, as vice-president, and Professor Ed. Sórensen, Copenhagen, as secretary-general.

The Congress is sponsored by the Danish Ministry of Agriculture and will be organized by The Royal Veterinary and Agricultural College, Copenhagen, the Danish Federation of Cattle Breeding Societies for A.I., and the Society of Danish Veterinary Surgeons.

A more detailed, tentative programme will be issued as soon as possible. All particulars are obtainable from the secretary-general, Prof. Ed. Sórensen, The Royal Veterinary and Agricultural College, Bülowsvej 13, Copenhagen, V. Denmark.

SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION

Minutes of Council Meeting held at Prudential House, Pretoria, on October 12, 1950, at 2.15 p.m.

Present: S. W. J. van Rensburg (President), G. Pfaff (Vice-President), W. D. Malherbe, J. G. Boswell, C. J. van Heerden (Hon. Life Vice-President), P. S. Snyman, M. C. Robinson, A. M. Diesel, G. D. Sutton (Hon. Treas.), R. Clark (Editor), A. D. Thomas and M. de Lange (Hon. Sec.).

Apologies: P. J. du Toit, R. A. Alexander, H. P. Steyn.

1. *Minutes* of meeting held on August 24, 1950. Adopted.

2. *Arising* from these minutes:—

(a) *Dog Licences in the Province of Transvaal*: No reply had as yet been received from the Provincial Secretary. Stand over to next meeting.

(b) *Appointment of Lecturer to Pretoria University*: President reported on interview with Rector. Letter of explanation received from Rector read. From this it was learned that the University Council had acted within its full legal rights in making the appointment contrary to the unanimous recommendation of Faculty. Council therefore had to accept that the matter could be pursued no further.

(c) *Delay in Filling of Posts of D.V.S. and Chairman of Veterinary Board*: See (a) below.

3. *Resolutions* 1950 *General Meeting*:

(a) Resolution re delay in filling of posts of D.V.S., and senior posts in Division of Veterinary Services: President explained that resolution had not been submitted to the Minister, and the reason for this. It was therefore decided to alter the word "failure" to "delay" in the final sentence, and to submit resolution in this form. Also decided: that interview with Minister be requested for President and Vice-President to explain matters embodied in the resolution.

(b) Resolution re "cropping" of Dogs Ears: After discussion decided to submit resolution to S.A. Kennel Union, at the same time requesting an interview with representatives of the Union. Drs. Thomas, M. H. V. Brown and B. C. Jansen were nominated to represent Council.

(c) Resolution re Appointment of Biologist on Staff of National Parks Board: Reply from Minister of Lands, stating that resolution recommending appointment of a veterinarian on the staff had been submitted to the Parks Board. Noted.

4. *Correspondence*:

(a) Letter from Wits. Branch read, expressing dissatisfaction with brevity of Council's published minutes. After discussion decided that

room for improvement existed and that matters not of confidential nature, or sub judice, could be reported on more fully, but with due regard to the cost of printing. Secretary instructed accordingly.

(b) Letter S.P.C.A., Welkom - St. Helena Branch: Decided to refer matter to Johannesburg Branch for guidance to the affiliated Branch at Welkom.

(c) Letter Capt. Dickson re appointment of consulting veterinarian by Bloemfontein City Council read. Decided that the matter could be regarded as closed.

5. *General*:

(a) *S.A.V.M.A. Representative on Veterinary Board*: President congratulated Dr. Diesel on his re-election to this office, there having been no other nominations.

(b) *I.C. (Pharmaceuticals) Ltd. Prizes*: Decided that President in consultation with Professors of Medicine, Infectious Diseases, Surgery and Gynæcology was to select the two prize winners from among the final-year students.

(c) *Maud Bales Scholarship*: Secretary to notify registrars of all S.A. Universities and Colleges of details of scholarship. Also to notify present students as well as new arrivals that applications for the 1951 award would close on January 31, 1951.

(d) *Finance*:

(i) Application for loan by student referred to Finance Committee for recommendation.

(ii) Treasurer reported on repayment of a student loan in full, and of an emergency loan granted to a student. Approved.

Next meeting: Late November or early December.

Meeting closed at 4.50 p.m.

S. W. J. VAN RENSBURG, *President.*
M. DE LANGE, *Secretary.*

SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION

Miutes of Council Meeting held at Victory Buildings, Pretoria, on December 7, 1950, at 2.15 p.m.

Present: S. W. J. van Rensburg (President), G. Pfaff (Vice-President), A. M. Diesel, M. C. Robinson, J. G. Boswell, H. P. Steyn, W. D. Malherbe, P. S. Snyman, A. C. Kirkpatrick (Hon. Life Vice-President), A. D. Thomas, R. Clark (Editor), R. A. Alexander, and M. de Lange (Hon. Secretary).

Apologies: P. J. du Toit and G. D. Sutton (Hon. Treas.), on leave.

1. *Minutes* of meeting held on 12th October, 1950. Adopted.

2. *Arising* from these minutes:—

(a) *Dog Licences in the Province of Transvaal*: Secretary reported that Provincial Executive Committee had agreed in principle to the

reduction of licence fee for spayed bitches to 10s., but that this amendment to the draft ordinance would have to be passed by the Provincial Council during its next session.

Dr. Alexander informed the meeting that the Fauna and Flora Committee were also in favour of the proposed reduction.

(b) *Resolutions* 1950 *General Meeting*:

(i) Resolution re delay in filling posts of D.V.S., senior posts and Chairman to Veterinary Board: President reported on negotiations with the Minister and Secretary for Agriculture re the appointment of a chairman to Veterinary Board. Dr. Diesel had since been appointed. A letter had also been received recently from the Secretary for Agriculture stating that the question of filling vacant posts in the Division would be cleared up shortly.

(ii) *Resolution re cropping of Dogs' Ears*: Letter received from S.A. Kennel Union stating that the Federal Council of the Union felt very strongly against cropping and that a meeting with representatives of the S.A.V.M.A. Council would serve no purpose. Decided to let matter drop.

(c) *Welkom - S. Helena Branch of S.P.C.A.*: Dr. Boswell informed the meeting that one of the mining concerns in that area was appointing a veterinarian in the near future in connection with Public Health work and that he should be able to assist this branch of the S.P.C.A.

(d) *Imperial Chemicals (Pharmaceuticals) Prizes* 1950: President announced that the Medical Prize had been awarded jointly to Messrs. H. O. Flanagan and S. V. O'Brien and the Surgical Prize to Messrs. H. O. Flanagan and C. H. van Niekerk.

Decided to publish the above announcement as well as the Book Fund, Theiler and Witwatersrand Clinical Medals 1950 awards in the next issue of the Journal.

(e) *Printing of Minutes in Journal*: Dr. Malherbe remarked on the greater detail with which the minutes of last meeting had been drawn up and indicated that a number of items of confidential nature could not be published as such in the Journal. Decided to request Editor and Secretary to attend to this aspect.

3. *Complaint of Member: Competition of Commercial Firms*: Letter received, complaining against a representative examining and prescribing for animals in certain area.

Dr. Diesel reported that similar complaints had recently been received by the Veterinary Board. Decided that the matter was sub judice with the Veterinary Board, and that if concrete instances could be cited, with names and addresses of parties involved, Council would be prepared to pursue the matter.

4. *Comment on Suggested Amendment to Veterinary Act*: Letter from Dr. Scheuber re Section 17(i) read. Decided to thank Dr. Scheuber for drawing attention to certain points and for his suggested amendments, which would be considered.

5. *Editorship of Journal*: Letter received from Dr. Clark, stating that owing to divisional and academic duties he was compelled to resign

from his position as Editor and from the Editorial Committee at the end of his present term of office — i.e., September, 1951. After discussion decided to leave matter to President and Secretary to approach certain members who might be willing to undertake the Editorship, and to report to next meeting.

It was also felt that the Editor should be assisted with the assembly of the Journal in order to avoid wastage of unprinted space, etc. Decided to refer the matter to the Editorial Committee.

6. *Restriction on the Sale of Drugs*: Letter from member to D.V.S. re sale of drugs marked "For use by or on prescription of a veterinarian only" to the lay public, read. As there is no protection for the above type of restriction under the Medical, Dental and Pharmacy Act it was felt that no useful purpose would be served by pursuing the matter further. Decided to refer back to D.V.S.

7. *General Meetings*:

(a) *Paper Presented*: After discussion decided that if subject warranted it, papers to be printed in advance either in the Journal or separately to enable members to study the subject for discussion at Congress. Also decided that wherever possible the agenda be extended so as to include a short summary of each item. Matter to be referred to programme committee.

(b) *Refresher Courses*: Decided that programme committee should again consider the organisation of refresher courses for the next General Meeting.

(c) *Entertainment*: Decided that programme committee should consider the extension of the social and entertainment aspect of the next conference by the inclusion of excursions, sport fixtures, etc.

8. *Correspondence*:

(a) *Letter C. C. Irvine-Smith,* offering to present a framed photograph of Col. J. Irvine-Smith, former President of the Association, read. To be accepted with thanks.

(b) *Vacancy Permanent Committee of International Veterinary Congresses*: Letter from Permanent Secretary read, stating that vacancy resulting from Dr. Quin's death was to be filled. Dr. Alexander nominated by Council — recommendation to be submitted to Secretary for Agriculture.

(c) *Letter Dr. Pullinger re National Health Council*: Handed to Dr. Snyman for examination and report to next meeting. Report to be circularised to all members of Council (report enclosed).

(d) *National War Memorial Health Foundation*: Decided to nominate Dr. A. C. Kirkpatrick to represent the Association on the National Council of the above organisation. The vacancy occurred as a result of the death of Dr. Quin.

9. *General*:

(a) Dr. Diesel inquired whether the courtesy title was limited to members of the Association. It was pointed out that at the time when

the referendum on the courtesy title was held, it was decided that the matter concerned not only members of the Association, but all registered veterinarians in the country, who were given an opportunity to express their views. Hence it was felt that the title was not limited to members.

(b) On Dr. Pfaff's suggestion it was decided to hold the next meeting of Council at Sandown Veterinary Hospital, Johannesburg.

(c) On Dr. Boswell's suggestion it was decided to ask Dr. Diesel to find some method of advising veterinarians of outbreaks of scheduled diseases occurring in their areas.

The meeting closed at 5.10 p.m.

S. W. J. VAN RENSBURG, *President.*
M. DE LANGE, *Secretary.*

NATIONAL HEALTH COUNCIL

REPORT BY DR. E. J. PULLINGER

(a) *Measly Meat*: After a discussion with the Standing Committee, it was decided to shelve the whole matter pending the redrafting of the Regulations re Slaughtering. The draft of the new regulations will be put before Council for consideration.

(b) *Health Inspectors — Powers of Condemnation*: The Health Officials' Association is now asking that certain Health Inspectors having specialised (as yet undefined) experience shall be given powers of condemnation. Dr. Pullinger's attitude was that a Health Inspector's training did not give him the diagnostic and discretionary ability necessary to exercise full powers of condemnation. The disability under which Health Inspectors sometimes work could best be met by the extension of the system of "Condemnation by Consent".

Comment: I am in full agreement with these views; in fact, the general opinion is that the training of Health Inspectors is not sufficient to give them power for condemnation under Government Notice 463 of 1929.

(c) *Bovine Tuberculosis*: The Interim Scheme was placed before Council. There was no discussion.

(d) *Vehicles for the Transport of Bulk Foodstuffs*: On a resolution submitted by the Health Officials' Association "that a definite standard should be laid down for the construction of vehicles used for the transport of bulk foodstuffs," Dr. Pullinger, while agreeing in principle, wishes to emphasise the need for careful investigation to meet South African requirements.

(e) *Horse and Whale Meat*: The Health Officials' Association also called for special legislation for the control of horse and whale meat. This resolution has also been passed to the Standing Committee.

(f) *Poultry Abattoirs*: It is suggested to instruct Dr. Pullinger, our representative on the National Health Council, to raise the question of the

desirability of having poultry slaughtered under control with ante-post-mortem inspection under veterinary supervision.

Dr. Pullinger was present at a meeting where this matter was discussed. He could be referred to the minutes of the meeting and instructed to bring the conclusion arrived at to the notice of the Council, and, if necessary, to endorse them by suitable resolutions.

P. S. SNYMAN, *Council Member, S.A.V.M.A.*

ETHICAL PHARMACEUTICAL ASSOCIATION OF SOUTH AFRICA

At a Special General Meeting held on the 6th December, 1950, the Ethical Pharmaceutical Association (formerly known as the Association of Importers and Manufacturers of Ethical Pharmaceutical Products of South Africa and the Rhodesias), adopted a new Constitution.

The official title of the Association is now " The Ethical Pharmaceutical Association of South Africa."

Correspondence should be directed to:

The Hon. Secretary,
Ethical Pharmaceutical Association,
P.O. Box 6158,
Johannesburg.

Jl. S.A.V.M.A. 22(3), 1951.

PRESIDENTIAL ADDRESS

THE ROLE OF THE VETERINARIAN IN MAINTAINING HUMAN HEALTH

S. W. J. VAN RENSBURG

The importance of veterinary medicine as an integral part of any programme which aims at the promotion and maintenance of good health in human beings is generally known.

There is a tendency, however, to limit the responsibilities of the veterinarian to controlling those animal diseases which are common to both man and animals, and to preventing their transmission through infected food to humans. Another aspect that has hitherto not received the attention which it merits and that is bound to assume paramount and world-wide importance in the future, is the rôle which our profession has to take in the preservation of human health at the proper level by ensuring to every person the availability in sufficient quantity and at a reasonable cost, of all the protective foods of animal origin, which are so very essential in human nutrition.

Consideration of the nutritive value of the principal foods derived from animals, such as meat, fats, milk, butter, cheese and eggs, shows that these form by far the most important contribution of protein, fat, minerals and vitamins to the diet of man. Not only are they indispensable for building up and maintaining a strong and healthy body, but they also constitute a vital protective factor against many bacterial diseases. Both man and animals, when properly fed, should not only be able to withstand the many nutritional and constitutional disturbances which affect them in the present age, but should also show a strong resistance to many specific diseases.

The effect of protein intake on resistance to disease appears to be considerable. Profound undernutrition and its resultant depletion of the protein reserves influence adversely the mechanism of natural resistance, because a prolonged period of protein deficiency leads eventually to a marked atrophy of the liver, spleen and bone marrow, from which tissues originate most of the phagocytic cells which form the main defence line of the body against bacterial invasion. It has also been noted that for the maintenance of this phagocytic defence an animal protein is superior to vegetable protein, probably because of a wider range of amino acids in animal protein.

The most striking example of the marked susceptibility to infection resulting from a deficiency of animal protein in the diet is afforded by the native who exists mainly on a carbohydrate ration. Notwithstanding the fine stature and physique of many native tribes, which make them the object of admiration by Europeans, they show constitutionally an inherent and marked absence of natural resistance to infectious and

deficiency diseases, which render them most vulnerable to conditions like tuberculosis and blindness.

Competent authorities have estimated that malnutrition was costing the Union £165,000,000 annually in medical expenses and loss of wages and production, and that it affects from 16 to 47 per cent. of European and 32 to 90 per cent. of non-European school children.

It does seem surprising that all attempts to control these diseases are directed to the end results such as the provision of medical aid, clinics and hospitals for the victims of under-nutrition, and that more vigorous action is not taken to prevent these by building up the natural defences of the body by the provision of better balanced diets.

The whole world to-day has to face the very definite possibility that population growth might outstrip food production. Even now many countries experience an insufficiency, and in the list of foods in short supply those that are rich in animal protein take a very high ranking.

In no other country is the threat more real than in Africa. On the one hand we have the gradual realisation by the vast majority of the population that it has been underfed in the past, and this section will assuredly demand its fair share of the protective foods in future. Then there is the unpleasant but true fact that the most fertile soil of the sub-continent is rapidly being washed into the sea. Associated with this is the inevitable shrinking of our water supplies. Unless these factors are countered by very energetic measures, the productive potential of this country is bound to show a steady decline.

Insufficiency of the essential foods is not the only danger, but with the consistent increase in the cost of production and the concurrent rise in prices, there is an unfortunate tendency amongst consumers, most of whom are wage earners whose insignificant salary increases cannot keep pace with the rising cost of living, to practise false economy by cutting down in the first instance on the most important foods. Their primary aim is to obtain bulk and provide a meal that stills the immediate pangs of hunger, without consideration for the nutritive value or the ultimate effects on health and constitution of such foods. We thus observe a regrettable tendency amongst a large section to drift more and more towards a carbohydrate diet.

Meat is becoming as foreign in many South African homes as it is in the most severely rationed country in Europe. According to a report by the United Nations Food and Agriculture Organisation, the average consumption of meat in South Africa is even less than that of France and Britain which have an average of 99 lb. as compared with 266 lb. a head in Argentine and 244 lb. in Australia and New Zealand.

Within a brief decade South Africa has changed from being a meat exporting to a meat importing country.

The traditional egg and bacon breakfast is gradually making way for a meal of mealie meal porridge and bread alone. Butter and cheese have become luxuries unknown in many South African homes. Examination of the milk position makes yet the most tragic revelation of all. Milk is still the most perfectly balanced, most digestible and most nutritious of all human foods. When we come into this world it forms our sole source of nutriment for the first year, when growth is

greatest, and with many of us it provides our only nourishment before we pass out. We, therefore, literally come into the world on milk and pass out on it. Nevertheless, as our national beverage, it is being rapidly ousted by a great variety of cheap mineral drinks, all of which have only one characteristic in common, and that is that they are totally devoid of any nutritive value whatever.

The question is how to arrest this decline in the consumption of protective foods. The answer in a nutshell is to provide more at less cost.

It is extraordinary to note in the great struggle against the ever rising cost of living how little effort is made to counter the problem at its root by trying to reduce or to stabilise the cost of production. There appears to be an eternal struggle on the one hand for higher prices and on the other for increases in salaries and wages. It is very obvious that an increase in price or a rise in salary affords but only temporary satisfaction to a small section, but increases hardship to the multitude. On the contrary, any method whereby more food can be produced at less cost will confer lasting benefit on the whole community.

Mere theorising on this aspect will, however, bring us no nearer to a solution. We must examine the position and ascertain what contribution our profession can make towards easing the burden and promoting the good health of the community.

If agriculture in this country has reached such a stage of perfection that no further improvement was possible, we may well sit back and be content with treating the isolated sporadic cases of animal disease which occur from time to time. Far from this being the case, however, it is very evident that the whole agricultural set-up in this country is simply bubbling over with opportunities for improvement.

The Union, for instance, has 12,000,000 head of cattle, but only 1,500,00 are slaughtered annually, and the latter includes importations from South West Africa and the Protectorates. With proper management 12 million head should make at least 2½ million available for slaughter every year. The deficit is due to a combination of factors, such as not slaughtering at an early age, maintaining too many unproductive animals, high infertility rate, absence of selective breeding, and the ravages of disease and drought.

The average age at which cattle are slaughtered is 5-6 years, whereas it should be between 2-3 years. They thus consume twice as much food as was necessary to bring them to maturity, which is an important factor in a country notoriously deficient in animal food.

Paradoxical as it may seem, our beef position would be better, if the cattle population were reduced by 2 or 3 million by elimination of all the culls and by better management and feeding of the remainder.

A trip by train or car through the countryside at this time of the year reveals the pitiful sight of large numbers of old and emaciated animals which obviously do not reproduce or perform any useful service. Nobody can tell what economic advantage is obtained by keeping them alive. They fatten during the summer, only to lose all that condition again in the following winter. This process is repeated from year to year, until eventually they die of disease, old age or

poverty. In the meantime, each has consumed sufficient food to rear several other animals.

Veterinary services have gone a long way towards preventing many of the diseases of animals, but losses from disease, infertility, droughts and poverty can be still further reduced by better management in the form of slaughtering at an earlier age, elimination of unproductive stock and more careful and selective breeding only from families of known high fertility.

Another objectionable sight is the large number of scrub animals parading as bulls on farms and along our highways, and that in districts which have been proclaimed Cattle Improvement Areas, where every bull is supposed to be approved.

The possession of a big pair of horns with proper curves is still regarded not only by many farmers but also by some of those who judge cattle at shows, as the most important feature of a good beef or dairy animal. We still await proof that quality and quantity of beef and milk are directly dependent on the size and shape of the horns. Meanwhile horns continue to produce thousands of pounds worth of damage to hides, meat and udders every year, quite apart from the pain, suffering and loss of condition which they cause.

The problem of the rapidly rising cost of milk production cannot be permanently solved by mere periodic increases in the price of milk. higher price of animal food and of labour does not constitute the main cause of high cost of milk production. In Britain where the price of animal food, of land and of labour is much higher than in South Africa, milk is sold profitably at sixpence a gallon less than here. There are other and more fundamental factors, all of which can be eliminated if properly tackled. Our stud breeders have some of the best blood lines in the world of several dairy breeds, but notwithstanding this the average yield of our dairy herds is only 242 gallons per cow per annum, which is the lowest of all civilised countries. It is apparent that our dairy animals are subjected to a terrific amount of abuse in many of the commercial herds, which very effectively nullifies the efforts of breeders to improve production. Cost of feeding and labour fades into insignificance in the presence of factors like the wide prevalence of disease in dairy animals; the unscrupulous selling to unsuspecting buyers of diseased and unproductive animals, and the careless and indiscriminate manner in which such diseased animals are brought into clean herds; the resultant brief average lactation life of cows; the killing of many potential good dairy cows by the wholesale slaughter of young calves which in 1949 amounted to 128,000; the consequent high cost of replacing dairy cows eliminated by disease; the undertaking of dairy farming by so many who have no knowledge of cattle nor of dairying; the bad management, poor feeding and unhygienic conditions on many so-called dairy farms; the absence of a definite breeding programme and of a proper system of recording yield and fertility; the widespread use of inferior and even scrub bulls on many well-bred dairy cows. Many of the dairymen in peri-urban areas refuse to pay the moderate fee for insemination of their cows with semen from good bulls, because they find it cheaper to get their cows settled by native

bulls from the neighbouring locations. The commercial and speculative aspects figure far too prominently in the dairy business for it to develop into a sound and profitable industry.

The sheep industry of this country presents still the greatest enigma. The number of sheep in the Union has dropped from 56,000,000 in 1930 to 37,000,000 in 1949. That represents a decrease of 1,000,000 per year and no account can be given for this decline. They are certainly not being killed for mutton, since the number of sheep slaughtered has also dropped from 4,600,000 in 1942 to 2,800,000 in 1949. Either there is a very high infertility rate or the mortality from drought and disease is far higher than is generally believed. The probability is that it is a combination of these two factors, but nobody seems disturbed about it.

According to Dr. F. E. Newson, a specialist in sheep diseases, of Colorado Agricultural Experiment Station, a reduction in the sheep population is going on all over the world. There has been a great decrease in all countries excepting Turkey and Italy. In America it has gone down by about 25 per cent. in the last ten years. This decline is ascribed to the difficulty of raising sheep on account of the diseases which develop as they grow up, and particularly those which occurred through the breaking up of large ranges in many countries.

These are but some of the problems which confront animal husbandry in this country, and which call for correction. They are problems which concern our profession as much as the farmer, since it is only by the combined efforts of the two that improvement can be brought about.

Unfortunately we have to contend with many misconceptions about the strength and the function of the veterinarian in this country. There are many oft repeated but quite erroneous statements about the alleged scarcity of veterinarians in South Africa. Only within the last month the President of one of the Provincial Agricultural Unions was reported to have stated that South Africa needs 360 veterinarians but only has 40. In actual fact, the number of veterinarians has been trebled in the past 20 years and our membership is now over 300. All those bodies and organisations which offer fair conditions of service experience no difficulty in filling vacancies. Numbers of young graduates, born and bred in the Union, are eager applicants for posts in other territories where better conditions obtain, and finally there is lately an increasing tendency among recent graduates to forsake the profession for other spheres where prospects are better.

Another fallacy is that the veterinarian is merely the healer of sick animals, and that he should take no part in all those activities which aim at the prevention of disease and the improvement in the health and quality of animals. This opinion is held not merely by a few ignorant people, but even by some who are supposed to be well informed and are expected to provide leadership to agriculture. Thus in the past two months one of the agricultural journals in an editorial comment on the calf rearing scheme proposed by the Pretoria branch of this Association showed deplorable ignorance by making some very caustic remarks about veterinarians concerning themselves with the rearing of calves. This

after similar previous schemes had failed chiefly because they completely ignored the health aspect of calf rearing.

The inclusion of subjects like veld management, zoo-technics, nutrition, hygiene and animal management in the curriculum for the veterinary degree resulted from a realisation by those concerned that all these subjects are very intimately related to the aetiology and control of animal diseases. This applies particularly to Africa which has an unusually large number of adverse conditions, such as poor soil, poor vegetation, irregular rainfall, variable climate, primitive methods of farming by natives, all of which have a very definite influence on the incidence of disease and infertility in animals.

In addition, the veterinarian's responsibility to the animal starts even before its conception when he frequently has to take measures to get the mother to conceive. After that he has to safeguard against death of the foetus, to assist at its birth and to protect it from all the diseases to which it is subject throughout life. He has to ensure the purity of the milk supplied by animals to man, and even after the animal is slaughtered his responsibility only ends after the meat has been finally passed as fit for human consumption. The veterinarian is, therefore, the only specialist who, by virtue of his training and responsibility, is competent to deal with every aspect of the production of human food of animal origin.

Veterinarians are perhaps in part to blame for the erroneous ideas held by some people about their functions, in that those in practice concentrate too much on treating the sick animal, and do not devote sufficient attention to the removal of the fundamental causes of disease. It may appear more spectacular to cure a disease than to prevent it, and in the past the undeniable value of prevention over that of cure has frequently been underestimated by breeders. While they may still be quite prepared to use such preventive remedies as inoculations which are easy to apply and yield immediate results, many are tardy in adopting long-term policies which aim at improving health and conferring greater resistance to disease. It is, therefore, incumbent on our profession to bring more prominently before the public eye the undoubted benefits of factors like the proper utilisation of soil, veld and grazing, feeding adequate and correctly balanced rations, showing greater selectivity in breeding, and applying better hygiene and management.

There is happily allround evidence that farmers are getting alive to these facts, and many are applying them with good results and in close co-operation with our profession. There is the case of a prominent dairy farmer in this district who boasts that he is making handsome profits. A year or two ago when other producers were agitating for an increase in the price of milk, he threw a spanner into the works by stating in the press that an increase was not justified. He described his up-to-date and scientific methods of farming, stated that all his cows were healthy, that each yielded milk from four sound quarters and that each calved regularly every year. He detailed his receipts and expenditure. The latter included an item of £25 per month retaining fee for a veterinary surgeon. Back came the query from the inevitable sceptic:

" If Mr. Z's animals are free from disease, why does he still waste £25 per month on veterinary services ?" His reply was brief and to the the point: " That is precisely the reason why I employ a veterinarian."

Another example of the realisation by breeders of the value of the profession in preventing losses came to notice recently. A large stud breeding and milk producing concern employed a full-time veterinarian as manager some time ago. The elimination of losses and the improvement in the health and condition of the animals since was so marked that the principal recently remarked, " If this man ever leaves us, he will be succeeded by another veterinarian."

There is a tendency to ascribe the shortage and the high cost of foods of animal origin to inefficient methods of farming. That may be so, but it is most unjust to blame the individual farmer, when there is, in fact, no strong body or organisation to steer him along the right course.

Dependence on the State for a solution of all its problems has left South African agriculture peculiarly devoid of a central controlling and organising body to provide the necessary leadership. We assuredly have a real plethora of unions, boards, associations, societies, etc., all of which purport to be promoting the interests of agriculture, but the modus operandi of these shows that the great majority attempts to solve the farmer's difficulties through the line of least resistance by aiming at the elimination of competition, by demanding higher prices and by referring all the really serious problems to the relative department of the State.

None appears willing or capable of tackling the root causes of high costs and inefficient farming, and very few contribute anything towards the efforts made by the State in this direction.

It is deplorable that the only tangible contribution that has yet been made by agriculture in this country towards veterinary science and veterinary education has come from its two smallest branches, namely the horse breeders and the poultrymen. The two major industries, sheep and cattle, have done little yet in this direction. Yet there does not appear to be a lack of funds for other less deserving causes. Thus last year when the price of sheep and wool was rocketing sky high thousands of pounds were spent on bringing a group of foreign mannequins from Europe to come and show South African womanhood how to wear woollen clothes ! More big sums were spent on sending show cases round the country to show our farmers what wool and woollen goods really look like — all in an effort to boost a commodity which was already in short supply. At the same time, thousands of sheep were dying from bluetongue and enterotoxaemia, both of which diseases can easily be prevented by inoculation but production of sufficient vaccine was held up by lack of funds. If the money spent on these theatrical stunts and on the ill-timed propaganda was rather devoted to providing better veterinary facilities for combating sheep diseases, it would at least have indicated a genuine effort to safeguard the farmer and the country against the unnecessary loss of sheep.

A good example of the futility of a multiplicity of bodies all professing to work in the interests of one section is provided by the dairy

industry. This is supposed to be nursed by several Agricultural Unions, a Milk Producers' Union, Dairy Industry Control Board, several breed societies, local municipal authorities and at least four divisions of the relative State department. There is, however, no co-ordination between these. Each functions on its own in a water-tight compartment. They all merely nibble at the problems which confront the dairy industry, and indulge in patch-work. None has the initiative, the authority or the staff to embark on any major scheme for putting the industry on a permanent and sound basis. Consequently dairying is to-day the most chaotic branch of our whole agricultural set-up.

In preference to the existing state of affairs one visualises one main central body, on the lines of the Milk Marketing Board in Great Britain, composed of representatives of farmers, breeders, consumers and scientists, with statutory powers and the necessary staff to safeguard the interests and strive for the improvement of every aspect of milk production. Such a body would not do research work, but should obtain, correlate and put into practice all the relative results of researches done by different institutes. It should have the necessary funds and staff to initiate and control all schemes which aim at producing more milk at less cost, such as a proper system of milk recording and testing which will enable the farmer to cull all cows of low production and poor fertility; provide a sound artificial insemination service for areas where the cow population warrants it; prescribe a sound policy for breeding and management which will increase the present poor average yield, and eliminate all undesirable hereditary characteristics; institute a sound system of rearing well-bred dairy calves which will stop the present killing of potential good milkers and lower the prevailing high cost of replacement; eliminate the vast, vicious and iniquitous traffic in diseased and infertile animals, and arrange for the proper disposal for slaughter of all animals unsuitable for milk production on account of disease or poor production.

The Milk Marketing Board of Great Britain is an outstanding example of the great national service which such a competent body can perform. To anyone revisiting Britain now after an absence of 20 years, the most striking feature is the complete disappearance of all evidence of malnutrition even in the poorest quarters of its great cities. This is all the more remarkable when one considers the strict rationing of food to which that country has been subject for the past twelve years.

While other factors may play a contributory part, the greatest credit for the unprecedented high standard of good health enjoyed by that nation must without doubt go to the Milk Marketing Board. It has both popularised milk and increased its production, so that consumption is now 155 per cent. above pre-war level, the average having risen to three-quarters of a pint per person per day, and an organisation has been created whereby every child in the country, rich and poor alike, gets its full daily milk ration. The increased consumption of milk has apparently compensated most effectively for the decrease in the meat supplies.

If any country under European conditions, and while forming the main target for assault during the most devastating war, was able to

bring about such a marked improvement in the health of its population by stepping up its methods of farming and making protective foods available to all, there is no reason why South Africa, which presents so many opportunities, should not do the same under normal conditions. We should not wait for a war and the threat of starvation to stimulate an all-out effort.

In such an endeavour the veterinary profession must be right in the fore-front. By virtue of our training and our close contact with agriculture we are in a better position than any other to observe defects and offer suggestions for improvement. To that end we must realise that the treatment of sick animals forms but the smallest part of our responsibility to the country and its people. Apart from it being a national duty, we must realise that the ability to detect and suggest remedies for allied subjects like over-stocking, wrong veld management, incorrect feeding and faulty methods of breeding and management enhance the status and the prestige of the veterinarian far more than his mere skill as a clinician.

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Jl. S.A.V.M.A. 22(3), 1951.

RIFT VALLEY FEVER IN THE UNION

(Symposium given at 46th Annual Meeting.)

R. A. ALEXANDER (Onderstepoort).

Since Daubney and Hudson described Enzootic Hepatitis or Rift Valley Fever in 1931, thereby giving the first authentic account of a hitherto undescribed virus disease of sheep, cattle and man, little attention has been paid to this disease. This is rather surprising because it is an important disease of man and his domestic animals, how important possibly only the immediate future in the Union will reveal.

Findlay (1932) described the pathology and histopathology in some detail. During the next three years a limited number of publications appeared, directing attention chiefly to infectivity for man, the danger of accidental laboratory infection and the relative susceptibility of a variety of domestic and laboratory experimental animals. Then there was a gap until 1948 when Smithburn and his team working in Entebbe, Uganda, reported the isolation of the virus from wild mosquitoes, and later followed this up by a report on the experimental transmission by mosquitoes. Then, in 1949, again, Smithburn reported the neurotropic adaptation of the virus to mice and expressed the opinion that this modified virus might be used as a basis for investigation in the field. This conclusion was drawn from the results of experiments on an exceedingly limited number of sheep under laboratory conditions and no trials were carried out in the field.

Other publications have appeared, notably by Kitchen, but it is not the intention in this paper to give an exhaustive review of even the exceedingly limited literature. All that need be said is that the symptomatology, pathology and histology have been described, the virus has been isolated and by modern standards subjected to a cursory examination both in its natural and artificially modified forms, that recovery is followed by a solid durable immunity certainly in man and possibly in domestic animals and that certain genera and species of mosquitoes are true vectors. By comparison with what is known of such diseases as yellow fever, rinderpest and horsesickness, to name but three, our knowledge of Rift Valley Fever may be regarded as rudimentary.

The origin of the name of the disease is a point of interest. The Rift Valley is the name given to a huge geological depression which starts in Persia, continues through Northern and Central Africa, until it ends in the Eastern Transvaal. This so-called valley is responsible for the formation of the great Central African lakes. The disease which bears its name was first encountered at Naivasha in Kenya, but it is not confined to the Rift Valley, since it has been isolated, for instance, in Japan. Prior to the summer of 1950-51, it had not been encountered in the Union.

Not a great deal is known of the virus which is one of the smallest

disease producers, being about 30 m. in diameter, i.e. about three times the size of foot and mouth virus and one-third size of influenza virus. Apparently it is fairly stable and remains viable for long periods at ordinary temperatures. It belongs to a group of tropical infectious diseases transmitted by mosquitoes, which includes Yellow Fever, Dengue Fever and Stiffsickness (three-day sickness) of cattle. It will be noted that Yellow Fever is highly fatal for man but does not affect domestic animals. Dengue Fever has a similar morbidity but a lower mortality rate in man. Man and animals are about equally susceptible to Rift Valley Fever. Stiffsickness does not affect man and the mortality rate in cattle is low. It is a matter of interest to speculate whether there remains to be isolated the counterpart of Yellow Fever which is highly fatal for animals but non-infective for man, always remembering that horsesickness and bluetongue are not transmitted by mosquitoes.

The virus reservoir of infection is not known. Smithburn and his co-workers have shown that a species of Eretmapodites, E. chrysogaster, is a true vector. A limited amount of experimental work with species of Aedes and Culex produced negative results but an extension of this investigation is an urgent necessity since mosquitoes of these two genera appear to predominate in that part of the Union where the disease has been encountered. Eretmapodites does occur in the Union but in keeping with our general lack of knowledge of the identity and distribution of mosquitoes in the Union, little beyond the fact that the genus has been identified is known. In other words, we do not yet know which genus or species of mosquito is responsible for the spread of infection in the Union. Further, we do not know how infection was introduced nor from where it came, in fact, one of the few things we do know with certainty is that Rift Valley Fever is present in the Northern Cape, Western Free State and Southern Transvaal to-day. It will be noted that roughly speaking this comprises the "pan-veld" area characterised by numerous vleis, pans and lakes of all sizes which were filled by the heavy rains last year and includes some of our largest water conservation and irrigation schemes such as the Vaalhartz Settlement, the Vaal River Barrage and the Loskop Dam.

Although the disease is transmitted by mosquitoes spread of infection by insects is not the only means of transmission. Apart entirely from the authentic records of accidental laboratory infections to be found in the literature, and, unfortunately, a number of similar accidents have occurred at Onderstepoort, it is now clear that the disease may be contracted by contact with any material containing virus. In this way every veterinarian who had conducted a post mortem examination on a diseased carcase was laid up within five days. Farmers who have tended their flocks and herds, butchers and housewives who have handled infective meat passed for human consumption, have in turn, become infected. Now the results of a single experiment at Onderstepoort have shown that the milk from each of two cows artificially infected contained the virus in high concentration, if only for a period of from three to five days. Moreover, these two cows showed no clinical

symptoms of infection other than a transient fever and only a slight drop in milk production (Haig, to be published). It will be a matter of great interest to determine whether the exceedingly high morbidity and mortality in young lambs is due to the ingestion of infective milk. On the other hand, under mosquito-free conditions in the laboratory there has been no evidence of the spread of infection from diseased to susceptible animals maintained under conditions of close contact. In man there has been no evidence of spread of infection within a family, e.g. a man has been nursed at home by his wife, yet neither she nor her children have picked up the infection. It would appear, therefore, that contact with the virus is necessary and that the virus gains entrance through the skin and mucous membranes possibly also by inhalation.

The symptomatology, pathology and epizootology will be dealt with by other speakers, so I propose to deal now with the circumstances which led to the establishment of the diagnosis and to outline possible methods of control for the future.

Towards the end of December, 1950, and during the early months of this year there were received a number of reports of heavy mortality in sheep and cattle in the western area of the Free State. The majority of these reports came through the office of the Sub-Director of Veterinary Services, Free State. At the time, enterotoxaemia was rife in that and other areas of the Union and Onderstepoort was unable to meet the tremendous demand for vaccine. From some of the material submitted for examination a definite diagnosis of enterotoxaemia was made and issues of the vaccine in short supply were diverted preferentially to the area. Reports of mortality continued to be received. For instance, the State Veterinarian, Bloemfontein, reported deaths amongst cattle and sheep in the Wolwespruit and Dealesville areas of the Boshof district and believed that bluetongue was the cause. It must be remembered that owing to the unprecedented demand, bluetongue vaccine was also in short supply. Early in February the same State Veterinarian reported from the Kafferrivier area a disease in cattle characterised by high temperature, bloodstained mucopurulent discharge from the nostrils, hyperaemia of the buccal mucosa with erosions on the tongue, lips and cheek. Coronitis was present with hyperaemia around the dew claws. The teats of unpigmented skin appeared dry, hard and cracked. Virulent bluetongue was suspected and blood was submitted to Onderstepoort for isolation of the virus. This blood was injected into sheep and cattle. After an incubation period of 36 to 48 hours there occurred a marked febrile reaction of one to two days' duration. There was no mortality and the diagnosis of bluetongue could not be confirmed clinically or from the results of cross-immunity tests. After consultation, owing to the extreme pressure of other work, suitable material was stored at —70 degrees C. for future reference. It is now known that this material contains the virus of Rift Valley Fever.

An officer from Onderstepoort assisted with the investigation in the field and found a variety of conditions: Three-day sickness, lamsiekte, heavy worm infestation, bluetongue and enterotoxaemia. A press statement to that effect was issued but all the time there was a suspicion of some other condition of unknown aetiology. For instance,

a considerable amount of work was carried out to determine if enterotoxaemia did in fact, occur in cattle with completely negative results.

Meanwhile histological examination of material submitted was completed. No aetiological diagnosis was made but throughout there is repeated the report of a peculiar severe multiple focal necrotic hepatitis not previously encountered. On reading these reports to-day, it is of more than usual interest to note that an excellent description of the histopathology of Rift Valley Fever was given but the aetiological factor was not known. For this blame may be attached to nobody.

Then, early in April, the State Veterinarian, Bloemfontein, reported what he considered to be a new disease in lambs at Koffiefontein. Read to-day, the report is an accurate description of Rift Valley Fever in lambs and sheep. It is again of interest to note that this veterinarian emphasized that the disease, whatever it might be, was not bluetongue.

About this time, the Director of the Johannesburg Abattoirs and Livestock Market reported that a valuable bull under their care, belonging to the Department of Social Welfare, had died and that in spite of careful ante and post mortem examination a definite diagnosis had not been made. The usual material was collected for examination. Then it was learned that four veterinarians and two assistants who had participated in the examinations suddenly had become ill and were either under medical care or in hospital. These facts emerged during a consultation and, to use a popular expression, immediately rang a bell. Two conditions merited attention: Q Fever and Rift Valley Fever. The reported incubation period four days was too short for Q Fever. Histological preparations were examined and compared with the descriptions in the literature of Rift Valley Fever. The identity was immediately apparent and a tentative diagnosis was made. Preparations from a number of previous cases were re-examined and the similarity of the lesions was obvious.

Meanwhile the necessary biological tests were carried out. It was found that mice that received bacteriologically sterile material intraperitoneally died after an incubation period of two to three days. After intracerebral injection the mortality was also 100% but the incubation period was about 24 hours longer. The guinea-pig was insusceptible to infection by either route.

The Director of Veterinary Services, Kenya, was approached immediately for the supply of specific antiserum. The Kabete Laboratories unearthed and forwarded by air the only remaining bottle of hyperimmune serum that had been prepared in 1945. In vivo and in vitro neutralisation tests immediately established the identity of the virus whose size had been determined by gradocol membrane filtration as approximately 35 m. The tentative diagnosis of Rift Valley Fever was confirmed. Full reports of further investigations will be published in due course elsewhere. In passing, it may be stated that every officer who has handled this condition, except the biophysicist, who did the filtration, shows a history of severe influenza-like infection. In each case their serum has been shown to contain specific antibodies to high titre. Also in passing, it is of interest to report that re-investigation of material collected prior to the present outbreak has shown that Rift

Valley Fever virus was not present and that when a virus was present the previous diagnosis has been confirmed. It is confidently believed that this virus was not encountered prior to the summer of 1950-51.

At present nothing more than a guess can be hazarded as to where the infection came from and how it was introduced. Infected mosquitoes may have been introduced by air or by other means. An infected person may have entered the Union during the incubative stage of the disease. Irrespective of the severity, the condition would almost certainly be diagnosed as influenza but a virus reservoir for infection of mosquitoes would have been introduced. The fact that a definite diagnosis was made from material collected from a bull in the vicinity of Palmietfontein Airport may be merely a coincidence. The infection may have been introduced by the migration of game in the " pan-veld " area of the Kalahari Game Reserve combined with the legitimate movement of stock in the course of normal trade. After careful investigation all that can be said is that we do not know and in the meanwhile the disease has been diagnosed as far east as Standerton.

What of the future ? It was hoped that as a result of the severe winter the cycle of infection might be broken by the elimination of the infected mosquitoes. This has proved to be a forlorn hope. Active infection was established after the middle of July in man and cattle at Andalusia. A suspicious but unconfirmed report was received last week (mid-August) from Kempton Park in the Transvaal. Consequently it may be assumed that, with the advent of warm weather and the spring rains, wide-spread infection may be anticipated. What will happen in the future only the future can tell but that future can be regarded only with extreme pessimism.

As regards control, elimination of the unknown mosquito vector with the organization in existence is an impossible task. Mass immunization of susceptible animals is the only answer. Smithburn's neurotropic-adapted attenuated strain of virus has been obtained. Again, it was the last tube of material unearthed at Entebbe and immediately forwarded on request by Dr. Horgan, Director of that Laboratory. Its value as an immunizing agent has yet to be established. The work is proceeding, but we should be immunizing now and it is doubtful whether Onderstepoort will be able to meet the demand in the immediate future. The vaccine will have to be made from mice. At a conservative estimate 20 million doses will be required for cattle and sheep. By similar technique we prepare each year some 200,000 doses of horsesickness vaccine containing eight strains of virus, i.e. the equivalent of 1,600,000 doses of monovalent vaccine. At short notice we could not lift the production to 20 million. That is the present position: This summer we may have to sit back and watch the disease take its toll of animals and man. As I said, initially only the future will tell.

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Clinical Symptoms:

The Peracute Form:

This is common in lambs. The incubation period is about 12 hours and collapse and death follows within 36 hours. The mortality rate is from 95-100 per cent.

The Acute Form:

This is commonly encountered in lambs and also, to a lesser extent in adult sheep. The symptoms appear suddenly with a rapid rise in temperature, vomition, a muco-purulent discharge from the nose, rapid pulse, unsteady gait and abortion. Death usually takes place 24 to 48 hours after the onset of symptoms. The mortality rate is high in lambs and in adult sheep varies from 20 to 30 per cent.

The Sub-Acute Form:

The sub-acute form is common in adult sheep and cattle. The temperature rises to between 104 and 106 degrees F. and the fever lasts from 24 to 96 hours. There is inappetence and general weakness. In pregnant animals abortion may be the only symptom. The milk production decreases rapidly. In cattle this form resembles Three Day Stiffsickness. The mortality rate is low and in cattle is less than 10 per cent.

The Mild or Inapparent Form:

This occurs in adult sheep and cattle. There is only a slight febrile reaction and the disease can only be diagnosed serologically.

Infection in Game:

Cases of mortality and abortion among game were reported from the affected area but these were not confirmed as being due to Rift Valley Fever.

Post Mortem Symptoms:

Rapid decomposition of the carcase is a significant symptom on post mortem examination. The most characteristic lesions are found in the liver which is often of a light brown yellowish colour. Small white spots of necrotic tissue about 1 m.m. in diameter, frequently surrounded by small haemorrhages under the capsule are seen. These lesions are evenly distributed but may coalesce into large foci. The lymphatic glands, especially the mesenteric glands are enlarged, moist and show small haemorrhages. The kidney is pale but firm and shows small haemorrhages under the capsule and the blood vessels are congested. The heart usually shows subepi- and subendocardial haemorrhages. The digestive tract is affected from the abomasum, through the small intestines to the large intestines and shows inflammatory changes. In acute cases in both cattle and sheep there is a severe haemorrhagic gastro-enteritis.

The diagnosis of the disease is difficult. The high incidence of the disease particularly amongst lambs, the clinical symptoms, the mortality rate, abortions in ewes and cows, and the lesions in the liver, glands and digestive tract, are all suggestive of Rift Valley Fever. A definite diagnosis can however only be made by microscopic examination of the liver and by serological tests.

Clinically, Rift Valley Fever must be differentiated from such other diseases as Enterotoxaemia, Blue-tongue, Heartwater, Three Day Stiffsickness and Bloedpens in lambs.

No figures are available in connection with the numbers of sheep and cattle lost in the Free State, but there are cases on record where farmers have lost 100% of their lambs, and the disease has definitely been responsible for the loss of thousands of sheep and hundreds of cattle in the affected areas.

Prior to the definite diagnosis of Rift Valley Fever, the use of Sulphamezathine was tried out with indifferent success. The best results were obtained by farmers by spraying their sheep and cattle with the B.H.C. dips.

Discussion

Dr. Gear (S.A. Institute for Medical Research)

Over 100 cases of Rift Valley Fever had been diagnosed in humans, all of whom had been in direct contact with affected animals. The incubation period was about four days and the temperature reaction was biphasic. The initial fever, of up to 105 degrees F lasted for 2 to 3 days and was followed by a recrudescence also of 2 to 3 days. Recovery was usually rapid. In several cases defective vision had appeared about a week after the attack and this had persisted for up to 3 months. No opinion could be expressed as to whether recovery would finally take place.

The virus neutralisation test exposes laboratory workers to infection. His institute were using the complement fixation test which was very reliable, and the result could be obtained in 24 hours. So far 50 comparative tests had agreed.

Dr. Thorburn enquired whether calves were more susceptible than adult cattle and what specimens should be submitted in suspected cases.
Reply: Almost all cases had been in adult cattle and the majority in cows. This might be due to the fact that the cows were usually grazed in the better and more low-lying pasturage while calves were kept at the homestead.

Specimens of affected internal organs, and especially the liver, should be submitted in formalin from autopsies. From live animals in the acute phase blood should be sent in O.C.G. mixture. From recovered cases blood with boracic, as for Contagious Abortion tests, was required.

Dr. van der Linde added to the post-mortem symptoms seen in the acute form. In sheep he had seen dermatitis, inflammation of the hard palate, vaginitis and pure blood in the faeces. In lambs perforation of the abomasum and caecum had been encountered.

Jl. S.A.V.M.A. 22(3), 1951.

THE PATHOLOGY OF RIFT VALLEY FEVER OR ENZOOTIC HEPATITIS IN SOUTH AFRICA

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During the course of this year a serious fatal disease affecting sheep, especially ewes and newly-born lambs and to a lesser extent cattle occurred in certain parts of the Free State and Western Transvaal. At the onset of this condition some difficulty was experienced in arriving at a definite diagnosis for the following reasons.

In sheep the malady was manifested by a heavy mortality, a rapid course and by early decomposition of the carcasses; features previously described as characteristic of enterotoxaemia ([1], [2]). The demonstration of enterotoxaemia toxin in several specimens, sent in for that purpose, further complicated matters, although the histological findings, especially in the liver, differed considerably from those of enterotoxaemia. However, in other cases all attempts to confirm this diagnosis failed. The microscopical lesions in the liver were suggestive of paratyphoid but this could not be substantiated on bacteriological examination. A systemic affection possibly complicated with an anaerobic infection, not necessarily *Clostridium ovitoxicus*, was suggested. The characteristic liver lesions, to be described later, were ascribed to a toxic-infectious agent. Subsequently by cross immunity tests, as previously mentioned, Rift Valley Fever was diagnosed. Thus there exists no demonstrable difference between the virus causing the disease in Kenya and South Africa. The pathological anatomical changes of the local condition differ, however, in several respects appreciably from those described on former occasions ([3], [4]). The factors responsible for these apparent variations cannot definitely be stated at this stage of the investigation.

Review of Literature

It has been previously shown by *Daubney and Hudson* (1931)[3] and *Findlay* (1931-32)[4] that in susceptible domesticated animals the most characteristic lesion is found in the liver. Histologically a focal necrosis, characterized by degenerated neutrophiles and hyaline degeneration of the cytoplasm of hepatic cells and bearing a striking resemblance to the Councilman lesion of yellow fever, is seen. In adult sheep these changes appear to be quite different from those found in lambs. In the former cases the liver necrosis is focal in character, whereas in the latter it is widespread affecting most of the liver tissue. This apparent difference is correlated with the acuteness of the process and with the rapidity with which the lesions develop. Other lesions found in sheep and lambs were oedematous and haemorrhagic mesenteric

lymph-nodes, congestion and sometimes haemorrhage of the gastric and intestinal mucosa, subepicardial and subendocardial echymoses, degenerative changes in the tubules of the kidney. The absence of a *tumor splenis,* slight changes in the lung and no naked eye lesions in the adrenals are points stressed by these authors. On a later occasion *Findlay* (1933)[5] described in detail the cytological changes in the liver in Rift Valley Fever with special reference to the nuclear inclusions. He was able to demonstrate intranuclear inclusions in the livercells of sheep, goat, rhesus monkey, marmoset, rat, mouse, field vole, wood vole, golden hamster and grey squirrel infected with Rift Valley Fever. Subsequently *Findlay et al* (1936)[6] indicated that the lesions produced by the neurotropic strain of Rift Valley Fever virus in lambs differed from those produced by the pantropic strain. By intracerebral inoculation an encephalitis resulted, whereas no illness is noted after a subcutaneous injection. It is of interest that no lesions occurred in the viscera; the liver being entirely free from areas of focal or widespread necrosis.

Materials and Methods

The material examined was obtained from (a) sheep and cattle submitted by the field staff to this laboratory for histological examination (b) sheep and cattle personally autopsied in the field and (c) cases in transmission experiments, the latter included various organs from mice and hamsters.

Bacteriological examinations were made of the viscera of sheep to exclude enterotoxaemia and paratyphoid. Tissue blocks were taken of the viscera, various portions of the brain, the adrenals and the visibly affected lymph nodes for histopathologic study.

Representative blocks were embedded in paraffin and stained with haematocylin-eosin, Giemsa, van Gieson, Mann's and haemalum phloxin. Frozen sections of the liver were stained with Sudan III.

Results of Pathological Investigation

On autopsy the pathological anatomical changes of natural cases varied somewhat in degree and extent from one animal to the other but were essentially the same in all cases. The characteristic lesions in adult sheep may be briefly described as follows :—

The most constant and striking morbid change occurs in the liver. The surface of the enlarged organ is characterised by a distinct mottled appearance, the colour varying from a grey to a greyish-red, red-brown and purplish-red. In some areas the subserosal bloodvessels are markedly congested having an arborescent pattern. Petechiae often occur along their course and in their vicinity. A number of small, fairly well defined, greyish-white, opaque necrotic foci appear under the capsule. The cut surface is less distinctly mottled, but the necrotic foci distributed throughout the parenchyma, may easily be seen on using a handlens. Signs of venous stasis are in evidence, the lobulations are indistinct and haemorrhagic foci of variable sizes are seen. The consistence of the liver is markedly reduced although the

majority of farmers considered it to be firmer than usual. This apparent increase in consistency probably is associated with the turgidity of the organ. The gall-bladder is not infrequently markedly affected, its wall being hyperaemic and oedematously infiltrated. Extensive subserosal haemorrhages may occur especially in the region of its attachment to the liver. Necrosis and extravasations may involve the mucosa to a variable extent. The affected surface has a mottled, roughened, greyish-opaque appearance. The bile may be fluid or is definitely viscid and its colour may vary in intensity from green to dark green with a reddish-brown tinge.

It is of interest that in lambs the appearance of the liver differs considerably from that in adult sheep. As a rule the colour of the surface varies from grey to reddish-brown, but in some cases it is of an ochre yellow with petechial haemorrhages distributed over the surface. As the necrotic lesions, instead of being focal, are wide-spread, the lobulation is even more indistinct than that in adult sheep.

It is generally accepted that a great variety of acute diseases will cause the development of haemorrhages visible on post mortem examination, so that extravasations in themselves, no matter where found, are not diagnostic of this disease. Localized haemorrhages occur in different parts of the body. The degree and extent of these however, are subject to marked variations. Cutaneous, subcutaneous, subperitoneal involving chiefly the gastro-intestinal tract and the diaphragm, mucosal, submucosal, inter- and intramuscular, subpleural, supepicarial, subendorcardial and myocardial haemorrhages may be noted. In addition extravasations occur in the pancreas, liver, kidney, adrenal, lung, thymus and lymphglands especially in the mesenteric.

The visible mucous membranes and the skin are markedly cyanotic. Not infrequently the udder may be intensely purplish discoloured without any signs of mastitis being present. In addition in some cases haemorrhages, varying in size, occur in the axillary region, the medial aspect of the hind-limbs and in the lower portions of the extremities. Soiling of the skin in the peroneal region with soft faeces often mixed with blood indicates a fairly severe gastro-intestinal affection. As in enterotoxaemia([1]) the bloodvessels on the internal surface of the skin are prominently injected and extravasations and reddish discoloured patches usually involve the area over the forequarters and neck. The subcutaneous tissue in these areas may be oedematously infiltrated to a variable extent, the fluid being reddish discoloured.

In the majority of cases small to large, blotchy haemorrhages under the peritoneum are visible along the entire course of the gastro-intestinal tract. They have a similar appearance and distribution as those illustrated and described for over-eating disease([7]). Focal mucosal and submucosal haemorrhages accompany muco-catarrhal changes. These may occur in the abomason, small intestine and large intestine at the same time or they are confined to any one or two of the mentioned organs only. Not infrequently areas of necrosis are seen involving the distal end of the ileum or caecum or anterior portion of the colon. Sometimes the caecal lesion may extend some little distance along the colon, which otherwise shows no change. Occasionally ulcers appear in

these localities. In a fair number of adult sheep there is a marked haemorrhagic gastro-enteritis, affecting the whole gastro-intestinal tract. On other occasions the ileum and large intestine are chiefly affected and the abomason to a lesser extent. Sometimes the reverse holds good, the lesions being most pronounced in the abomason and duodenum. The intensely reddened mucous membrane is markedly oedematously infiltrated and the intestinal content contains a large amount of blood. The changes are very suggestive of some form of poisoning and arsenical poisoning has been suspected on several occasions. However, this could always be excluded by chemical analyses. It is by no means certain that the enteritis (haemorrhagic or necrotic) is not due to some complicating infection. In lambs the intestinal lesions closely resembled those of bloedpens (lamb dysentery) and infectious enterotoxaemia (milk colic), a disease of lambs in West Texas and other parts of the world. The latter condition presumably affects the older suckling lambs. It is of interest, that is some cases, the caecum is impacted with a pultaceous mass resembling a canine stool. In addition lesions of nodular worm occurred in a number of adult sheep. Marked hyperaemia and oedema of the lungs is invariably seen in the sheep on autopsy. In addition subplural and focal pulmonary haemorrhages occur in a few cases. In lambs the lung lesions are not so pronounced, but in some the apical and cardic lobes are consolidated, a fibrinous pneumonia having developed. The small slightly raised areas on the surface of the organ, considered a fairly constant lesion by *Daubney and Hudson*(3) did not occur in any of our cases.

As a rule the kidneys are somewhat enlarged. The capsule strips off easily. The consistence, although not appreciably changed just shortly after death, is considerably reduced a few hours after death. The cortex and medulla are hyperaemic. Degenerative changes appear in the tubules, which are greyish discoloured and sometimes small, irregular haemorrhages and a yellowish-brown pigmentation are visible especially in the cortex.

Subepicardical echymoses are common in the vicinity of the coronary grooves on the ventricles of heart. As a rule fairly extensive subendocardial extravasations occur in the left ventricle. In the right heart, lesions are relatively rare, but occasionally the most pronounced haemorrhages develop in this part. Degenerative changes and petechiae occur in the myocard, the consistence of which is appreciably reduced. In bovines the myocardial haemorrhages seen comparatively more extensive than in ovines.

The lymph glands, as a rule, are always enlarged and on section appear more moist and may be redder than normal. In most cases there are extensive haemorrhages in the cortex of the mesenteric and periportal glands, the outer surface having a distinct mottled appearance. As a rule a distinct *tumour splenis* with petechiae beneath the capsule is noted. On section the malpighian bodies appear to be fairly prominent. The adrenals are definitely enlarged, having a greyish-brown discoloured appearance. Echymoses are seen in the cortex and the medulla. An ascites and a hydrothorax are not constant changes, but a hydropericard of variable extent is invariably present. The

pericardium contains comparatively less fluid and a smaller coagulum than that usually seen in enterotoxaemia cases. In the blood smear no causal organism can be demonstrated but in some smears made from the contents of the small intestine (ileum) gram positive bacteria are present, several of which resemble organisms of the *Clostridium Welchii* group.

The lesions occurring in experimental cases (sheep) differed in no way from those described above, except in one case which had been injected with blood of an affected laboratory assistant. The animal in question had been recumbent for several days before being sacrificed. It may be stated, however, that the microscopic changes observed in the liver of succumbed mice, injected with the same material, were typical for Rift Valley fever.

In general the macroscopical pathological changes noted in cattle closely resembled those described in sheep but differed in some respects, for instance, usually an acute catarrhal stomatitis often complicated with erosions involving the lips, tongue and mucosa of the cheeks, nocrosis of the skin in several parts of the body especially of the udder in cows and the scrotum in bulls, haemorrhages in the light coloured portion of the hoofs, signs of coronitis, laminitis and exungulation of hoors, a marked ascitis, in some cases the fluid dark reddish discoloured, are recorded. For these reasons bluetongue was suspected at the onset of the disease. The subepicardial, subendocardial and myocardial haemorrhages are relatively more pronounced and extensive than those in sheep.

Histology

Histologically the liver lesion may be regarded to be pathognomonic for this disease. Even whenever the macroscopic changes are insufficiently pronounced to enable a diagnosis to be made, which sometimes may be the case, the diagnosis may be clinched beyond any possibility of error by a histological examination. Although there may be an individual variation yet the nature of the process remains essentially the same in all cases. In adult sheep it is characterised briefly as a haemorrhagic, necrotic foci containing degenerated hepatic cells, polymorphnuclear leucocytes and histiocytes, chiefly the former. A number of these infiltrating cells soon degenerate and fragments of chromatin derived from the nuclei of both infiltrating and paranchymatous cells are scattered throughout the lesion. These foci resemble, to some extent, those of paratyphoid (fig. 1). In certain areas of the section the sinusoids are invisible and contain no erythrocytes. Here the hepatic cells appear swollen and are in a state of necrobiosis. In the vicinity of the foci, however, the sinusoids are markedly distended, the hepatic cells being pushed apart by a number of erythrocytes. The cytoplasm of the affected cells has an increased affinity for eosin (hyalin degeneration). In the more advanced cases the cells contract to a certain extent, become rounded or oval and separate more or less completely from one another and nuclear changes are apparent as described by *Findlay* (1933)([5]). In cattle the lesions are similar, but in lambs they differ from the above in that, instead of being focal, they are widespread. Even in these cases venous stasis and some haemorrhages are

seen. The lesions noted in sections taken from experimental animals (sheep, mice and hamster) did not differ in any way from those described in natural cases. However, in no case could inclusion bodies be definitely demonstrated. The Kupffer cells showed advanced signs of necrobiosis and in some cases a number of cytoplasmic inclusions, the nature of which still remains obscure, could be demonstrated. The observation of *Findlay et al* (1936) ([6]) namely that by using the neurotropic strain of Rift Valley fever on mice, the liver remained entirely free from areas of focal or wide-spread necrosis, could be confirmed.

The wall of the gall-bladder is markedly thickened due to entensive subserosal and intermuscular haemorrhages, hyperaemia and oedema. The mucosa shows advanced signs of necrosis and it is desquamated over large portions of the surface.

Spleen: The structure differs appreciably from that of normal one. Malpighian bodies are indistinct, the cellular content being apparently reduced. Haemorrhages and necrobiotic changes in pulpa. A number of pyknotic and karyorrhectic cells occur especially in the vicinity of the haemorrhages. In some areas there is a marked increase of neutrophiles.

Lymph gland: Usually hyperaemia, oedema and haemorrhages of variable extent are seen in the macroscopical affected lymph glands. In addition necrobiotic foci especially in areas in which the circulatory disturbances are in evidence; focal infiltration of neutrophiles, pigmentation, marked karyorrhexis, vascular changes and catarrh of the sinuses may occur.

Lung: Invariably hyperaemia, oedema and emphysema with subpleural or perivascular haemorrhages occur in the lungs of affected adult sheep. In lambs the changes are less marked, but in some cases signs of a fibrinous pneumonia are observed.

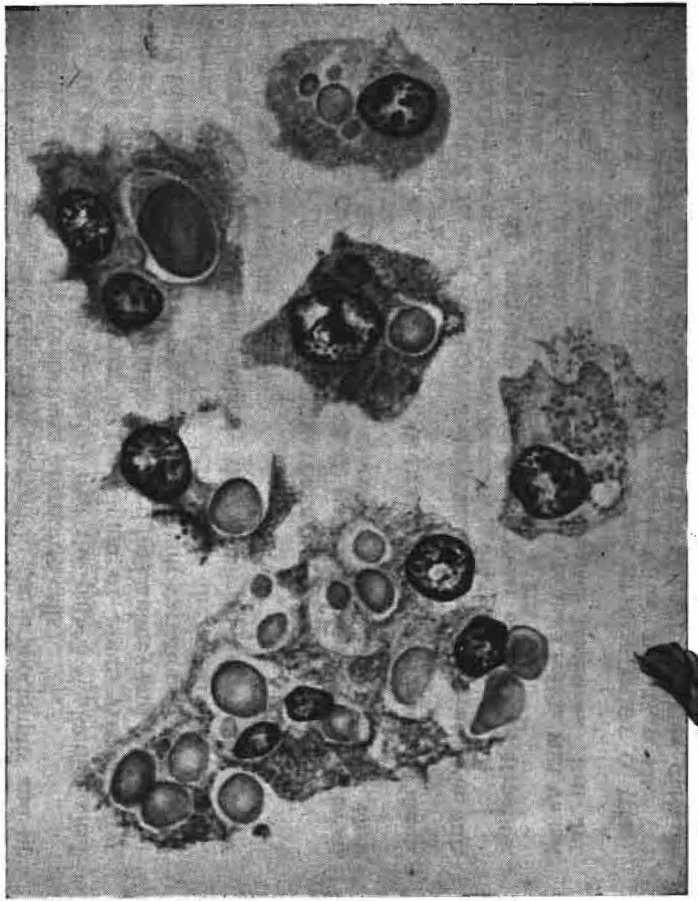
Adrenal: Degenerative changes occur especially in the medulla where a number of cells contain hyalin tinted inclusions, the nature of which has not been determined yet (fig. 2). In addition cortical and medullary haemorrhages occur, their distribution and sizes may vary in individual cases.

Heart: There is nothing characteristic about the subendocardial subcardial and myocardial haemorrhages. The myocard has undergone degenerative changes to a variable extent.

Alimentary Tract: The changes vary considerably in individual cases. Briefly the following lesions were observed: A mucocatarrhal gastro-enteritis with localized hyperaemia or haemorrhages, submucosal and subserosal extravasations, areas of a croupous, necrotic enteritis and ulcerations involving either portions of the small or large intestine and not infrequently an extensive haemorrhagic gastro-enteritis.

Kidney: The most common pathological change in the kidney is a tubular degeneration or nephrosis. In addition focal congestion and haemorrhages, a marked haemosiderosis in the tubules and signs of albumenuria may be seen.

Nervous System: Apart from hyperaemia and oedema of the meninges and brain tissue which are usually discernible to the naked



eye, degenerative changes of the nerve cells are seen in various parts of the brain. They are especially marked in the hippocampus and in the ganglion layer of the cerebelbum (Purkinje cells).

In concluding, it may be stated that the pathological anatomical changes of Rift Valley fever in the Union of South Africa differ appreciably from those previously described by Daubney and Hudson(3) and Findlay(4) in several respects. The main variations occur in the spleen, lung and adrenals. The lesions in the remaining organs, although not identical will probably differ only in degree and extent from those observed in Kenya.

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Jl. S.A.V.M.A. 22(3), 1951.

THE HAEMAGGLUTINATION TEST FOR TUBERCULOSIS

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(Paper read at 46th Annual Meeting)

The present article is intended to be a review of the work done so far on this particular serological test, mentioning some of the preliminary experimental work which has been done at Onderstepoort on it in recent months.

Serological tests of various types have been tried out extensively in the past in the diagnosis of tuberculosis. The only one which proved of some value was the complement fixation test, but even with in the results were not very reliable.

Middlebrook and du Bos (1948) showed that the haemagglutination test could be applied to the diagnosis of tuberculosis in man. The principle underlying the test is that if sheep's red corpuscles are sensitized with extracts of the tubercle bacillus and subsequently exposed to the action of serum from a case of tuberculosis, the corpuscles will clump together and undergo what is known as haemagglutination. The recation is apparently due to the sensitization of the corpuscles by the polysaccharide produced during the growth of the tubercle bacillus and is specific. The tuberculo-protein does not play any part in the reaction. Various methods have been used to obtain as much polysaccharide from the bacilli as possible but in practice a concentrated tuberculin without the addition of glycerine has been found satisfactory. This can be obtained in the ordinary production of purified protein derivative tuberculin (PPD) but in the final product the glycerine is not added.

Scott and Smith (1950) tested samples of serum from 50 cases of tuberculosis in man and found 38 positive. Of 40 students who had been given BCG vaccine four months previously 30 reacted positively. Of 15 negative skin test reactors, all were negative to the test. Fisher and Gregory (1951) have published an article dealing with the application of the haemagglutination test to the diagnosis of tuberculosis in cattle. They showed that of 224 cattle known to be free from tuberculosis, all gave negative reactions to the test. With 40 tuberculous adult cattle 85% gave positive reactions. Of the negative reactors, one was a cow with extensive lesions of tuberculosis. In a series of ten calves with active lesions of tuberculosis, nine reacted negatively. The test was found not to be specific for any particular type of tubercle bacillus, the avian bacillus and M. Johnei causing reactions as well with antigen made from a human strain.

Rothbard, Dooneief and Hite (1950) give some interesting figures from their tests on human beings. Of 110 normal adults, 105 were

negative, four reacted at 1:2 and one at 1:4, which is below the positive standard. Of 106 people with non-tuberculous diseases 98 were negative and eight reacted at 1:2. In 168 active cases of tuberculosis, 155 or 92% were positive in 1:9 to 1:512. Some negative reactors occurred with minimal tuberculosis, moderate infection and advanced cases. Of 33 who had tuberculosis at one time but had been well for seven years, two reacted at 1:2 and 31 were negative. This suggests that antibodies are concerned in the disease. In a group of 120 tuberculosis patients tested at monthly intervals, in ten the reaction disappeared and this could be correlated with the occurrence of negative sputa, stomach washings, etc. There seems to be a definite relationship between the activity of the disease and antibody production. The positive titre that will probably be accepted is 1:8 or over.

Technique of the Test

The technique of the test is comparatively simple but is somewhat more time-consuming than the complement fixation test. For carrying out the test one needs —

(1) Serum from the suspected case of tuberculosis;

(2) Washed sheep's red corpuscles, and

(3) An antigen made from M. tuberculosis.

The serum has to be inactivated by heating to 56° C. for half an hour. It is then allowed to stand for a few minutes with washed sheep's corpuscles to absorb any haemagglutination which would interfere with the test. This is done twice.

As *antigen* one can use extracts of tuberculosis cultures made by various methods which will produce the maximum amount of polysaccharide present in the bacteria. In practice it has been found that concentrated tuberculin such as is produced in the preparation of PPD (purified protein derivative) is an efficient antigen. No glycerine must be used in the final product as it haemolyzes sheep cells. Before setting up the test one adds some of the antigen to some washed corpuscles and allows the mixture to stand at 37° C. for two hours, shaking them every few minutes to prevent settling out. The corpuscles are then washed three times and the suspension of sensitized corpuscles for the test is then prepared.

In setting up the test serial dilutions of the absorbed serum are made from 1:4 up to 1:512 or over, if necessary. One adds the sensitized sheep's corpuscles and incubates for two hours at 37° C. The tubes are shaken up and allowed to stand overnight at room temperature. The reading is then done and in positive cases marked clumping of the corpuscles is noticed in the dilutions up to 1:8 or over. This clumping is very characteristic and appears as an irregular layer at the base of the tube and on shaking large clumps float up into the fluid. In a negative reaction the corpuscles settle out in a well-defined circular deposit which, on shaking, forms an even suspension of corpuscles.

The tests themselves can be done quite rapidly and it is only the preparation stages which are time-consuming. It has been found that

the reaction can also make use of complement. This has enabled the test to be set up in another way and a positive reaction is shown by haemolysis. The test is set up as for the ordinary haemagglutination one, complement is added to each tube and the results can be read after half an hour's incubation at 37° C., a great saving of time. The results correspond very closely with those obtained with haemagglutination.

Having described the technique of the test, without going into the finer technical details, one may now discuss some of the work which has been done on it at Onderstepoort in the last year. It will be understood that all the work done so far has been of a confirmatory nature and has been an attempt to see in how far the test may be of use as a help in confirming the results obtained with the tuberculin test, and in how far the results correspond to post mortem findings. All the work done will need much repetition and elaboration before any definite pronouncement can be made as to the real value of the test. In the work carried out at Onderstepoort we were fortunate in being able to obtain concentrated tuberculo-protein containing polysaccharide material during the preparation of PPD tuberculin, and all the work was done with this type of antigen. As recommended by other workers, it was found that for use in the test the antigen should be much stronger than standard tuberculin as judged by potency tests in tuberculous guinea-pigs. It should be about four times standard strength to give the best results.

Experimental Results

As the work so far has been of a preliminary nature, a brief description will be given of what has been done. Unfortunately it has only been possible in a few cases to kill the animals, so, with the exception of the last series of tests to be described, the results are mainly a comparison of those of the haemagglutination test as compared with the tuberculin one.

Tests on Normal Cattle

No positive reactors were obtained in non-tuberculous cattle, but such animals should be tested on a much bigger scale than has been possible so far. A number of blood samples sent in for contagious abortion tests were tested and were all found negative except one which gave a reaction at 1/8, which is considered positive. These samples were not from tuberculin-tested herds, so that the positive reaction loses some of its significance.

Tests on Onderstepoort Cattle

In the annual tuberculin tests done on the cattle at Onderstepoort in August, 1950, eleven animals gave reactions which had to be considered as positive or very suspicious. These were tested by the haemagglutination test and two gave definite positive reactions. One of these showed lesions at post mortem and the other did not.

Of the remaining nine, five were subsequently slaughtered at different times, but did not show any visible lesions. They were

subjected to the Gregory test with negative results, as were the five which are still alive.

Tests at Armoedsvlakte

During the annual tests in August, 1950, of approximately 600 cattle on the experimental farm, 58 cattle gave reactions which had to be regarded as suspicious. As far as is known there is no tuberculosis on the farm. The reactions were in most cases shown by increases of up to 6 mm. in measurement of the skin fold. In 10 of these increases of 10 to 11 mm. were recorded but in no case over 11 mm. What these reactions were really due to is difficult to say. None of the animals was killed to see if lesions were present. As a matter of interest haemagglutination tests were carried out on all 58 animals. Of these one reacted at 1/128, three at 1/64, six at 1/32, twelve at 1/26, eleven at 1/8, six at 1/4, 19 partial in 1/4 or negative. Taking 1/8 as the positive standard, 33 conformed to it and 25 not, so that there was a considerable correspondence with the tuberculin tests results.

Tests at Rietfontein Hospital

In a test carried out on the dairy herd at this institution, 13 cows gave reactions to the tuberculin test. The reactions were not very good and were more of the nature of very suspicious ones. Haemagglutination tests were made on sera from all 13 cases. The results were that four of them reacted at 1/8 or over, the other nine being partial in 1/4 or negative. One of the cows was slaughtered but showed no lesions. It reacted to both the tests.

Tests at Pretoria University

In the annual tests on the herd at this institution 14 cows gave doubtful tuberculin reactions but only three were really considered as very suspicious. About 300 animals were tested. Haemagglutination tests were done on the 14 animals but only two gave suspicious reactions, the rest being under the positive standard.

Tests on Cattle, with Subsequent Slaughter

Samples of serum were sent from twelve animals tested in Southern Rhodesia with Weybridge PPD tuberculin. The reactions to tuberculin were definitely positive but at post mortem no lesions were found in any of the animals. With the haemagglutination test, seven of the sera from the animals were clear negatives, and the other five were just on the positive titre.

A good opportunity was found for carrying out a comparative series of tests on a bigger scale in connection with the large scale tuberculin testing carried out on a ranch in Southern Rhodesia. The tuberculin tests were first completed and subsequently some of the positive reactors were slaughtered. A table is given, with the comparison of the tuberculin test results, those of the haemagglutination test and the post mortem findings. From this table it will be seen that on the

whole there was not a great discrepancy between the results of the two tests.

In 21 animals the results with both tests coincided. In one the tests coincided but no lesions were found. In eight the haemagglutination test was negative but lesions were found, the tuberculin test being positive. In three the tuberculin test was positive and the haemagglutination test negative but no lesions were found. In nine the tuberculin test was positive and lesions were found. The haemagglutination test was partial (1-4).

These sera from Rhodesia have only been tested recently and have been preserved for retests which will be repeated several times.

In addition to these herd tests a few were carried out on experimentally inoculated animals. In one experiment two calves were given living cultures of tubercle bacilli and the results of tests on them are recorded in table 2.

TABLE 1

No.	*Tuberculin Test*	*Haemagglutination Test*	*Lesions*
1.	+	1-8	0
2.	+	1-8	+
3.	+	1-16	+
4.	+	1-8	+
5.	+	1-8	+
6.	+	1-8	+
7.	+	1-16	+
8.	+	1-16	+
9.	+	1-16	+
10.	+	1-8	+
11.	+	1-16	+
12.	+	1-32	+
13.	+	1-8	+
14.	+	Negative	+
15.	+	Negative	+
16.	+	Negative	+
17.	+	1-16	+
18.	+	1-32	+
19.	+	1-16	+
20.	+	Negative	0
21.	+	1-32	+
22.	+	1-16	+
23.	+	1-4	+
24.	+	1-16	+
25.	+	1-16	+
26.	+	1-32	+
27.	+	Negative	0
28.	+	Negative	0
29.	+	1-4	+
30.	+	Negative	+

31.	+	1-16	0
32.	+	1-4	0+
33.	+	1-4	+
34.	+	1-4	+
35.	+	1-4	0
36.	+	1-4	0
37.	+	1-8	+
38.	+	1-32	+
39.	+	Negative	+
40.	+	Negative	+
41.	+	Negative	+
42.	+	Negative	+

TABLE 2.

	Calf 5052 50 mg. Vole culture subcut	*Calf* 5057 10 mg. Bovine strain 1442 subcut
27.6.50		
Haemagglutination Test		
28.6.50	Negative	Negative
17.8.50	1/32	1/8
19.9.50	1/32	1/32
3.11.50	1/128	1/64
19.3.51	1/32	1/16
10.4.51	1/32	1/16
6.6.51	1/32	1/16
13.8.51	1/32	1/16

Both calves showed marked swelling of the prescapular glands on the side of the neck where they were inoculated. Six months after the inoculation the glands were still enlarged and hard but have become reduced in size later. Their sera are being used as positive controls in all the haemagglutination tests being carried out.

A few other experiments were carried out on the test. Some experiments were made to see whether preservation with merthiolate or boracic acid had any effect on the results of the test. They were not found to influence the haemagglutinins in any way.

It was thought that the test might be used to standardize tuberculin batches, using the material before the addition of glycerine and using a known positive haemagglutinating serum. It was shown that by diluting the tuberculin used down to 1-20, it no longer acted as an antigen and the test may be found to be of some value in standardization in combination with guinea-pig tests.

CONCLUSIONS

In this paper an attempt has been made to give some preliminary information about the haemagglutination tests for tuberculosis which have been done at Onderstepoort. A great deal of work is still necessary before the tests can be properly evaluated but it may prove very

valuable in conjunction with tuberculin testing in the diagnosis of tuberculosis in the domesticated animals.

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* **The Use of Anti-Frothing Agents in the Treatment of Acute Bloat. Clark, R. (1950). J. S. African Vet. Med. Ass. xxi, 173.**

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THE DIAGNOSIS OF FILAROIDES OSLERI (COBBOLD 1897) INFESTATION

W. D. MALHERBE,

Onderstepoort.

(Paper and Demonstration given at the 46th Annual Meeting).

ABSTRACT

A simple, practical method of diagnosis of infestation with this nematode in dogs is described. General anaesthesia is induced by intravenous injection of the short-acting barbiturate "Intraval" Sodium, and swab material collected from the bifurcation of the bronchi. This material is examined directly by squeezing it on to a glass slide, or it is suspended in water and centrifuged, the deposit being placed on a slide for microscopic examination.

INTRODUCTION

From the point of view of examination the characteristic nodules[2,3] containing these nematodes are situated somewhat inaccessibly, as they are disposed in the lower trachea and in its bifurcation. The majority of cases reported[1,2,5,6] have been diagnosed from autopsy material. Antemortem diagnosis has been made in a few instances[4,7] by swabbing the back of the throat and examining the collected mucus for eggs. Pillers[6] however, tried this method and failed to make the diagnosis. At Onderstepoort it has only occasionally been possible to diagnose the infestation in this manner even in dogs known to harbour the parasite. This is, nevertheless, the procedure usually[2,3,5,7] suggested.

A further suggestion[7,8] has been made, viz. to examine faeces for eggs by the flotation method. About a half dozen examinations at Onderstepoort of faeces from dogs known to be infested have failed to reveal any eggs. This method can, therefore, scarcely be regarded as a reliable one.

Bronchoscopic examination has been found to be efficient[5,6] and is therefore regarded as a good method of diagnosis[3]. The anaesthetics used[6] for this type of examination included morphine with A.C.E. mixture, and morphine with throat sprays of cocaine solution. The apparatus needed for bronchoscopy is, however, not always available, so that this procedure cannot be regarded as generally applicable.

For consulting room diagnosis and for routine study of affected or suspected cases it was considered necessary to devise a more practical method.

METHOD OF DIAGNOSIS

The method which has recently given consistently good results has been the collection of material directly from the vicinity of the nodules

with the subject under general anaesthesia. The instrument used was a swab (sponge) holder about 23 inches long to which was fixed a swab of about ½ inch diameter. The anaesthetic of choice was "Intraval" Sodium (thiopentone sodium) which, injected intravenously at a fair speed, produced anaesthesia for the short period required for the procedure. This barbiturate has been used successfully even in a severely dyspnoeic dog.

The procedure has been as follows. The mouth of the dog is kept open by means of a gag across the canine teeth of one side, and the tongue pulled out. The gauze swab, moistened with water, is pushed over the epiglottis, through the larynx, and down the trachea as far as it will go without resistance, moved from side to side, and then withdrawn, avoiding unnecessary contact with throat and mouth. In the case of large dogs it is found useful to have a spatula handy to depress the tongue or to elevate the soft palate in order to expose the epiglottis.

The swab is then detached from the holder and the mucus squeezed onto a slide for direct microscopic examination. Alternatively, the swab is rinsed and squeezed into about 6-10 c.c. of water which is centrifuged. The supernatant water is decanted or pipetted off and the sediment examined in the usual way. Water is preferred to physiological saline for the reason that red blood corpuscles, often present in these specimens, are thereby haemolysed.

The embryonated eggs, with their thin, pliable and nearly invisible membranes, are easily found under low power objective. Under high (dry) power the characteristic "kink" in the tail of the larvae can be recognized. On occasion, adult worms have been found in these preparations.

It is a very simple matter to improvise a suitable swab holder from a piece of baling wire, or wire a little heavier, so that with a minimum of equipment any veterinarian would be able to make the diagnosis with certainty and despatch.

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NOTES ON THE CONTAGIOUS ABORTION TEST

(Discussion held at 46th Annual Meeting)

G. C. VAN DRIMMELEN,
Onderstepoort.

After being used at Onderstepoort for forty years the tube agglutination test for brucellosis is still the best method for diagnosis of Contagious Abortion in cattle. From time to time other tests such as

the plate test,
the whey test,
the complement fixation test,
the intradermal test,
the opsono-cytophagic test,
the cultural test,
the biological test and
the milk ring test,

have shown particular advantages, but not one of them has become more than an adjunct to routine diagnosis. Consequently any plan for combating brucellosis will have to take cognisance of the limitations of the serological test.

In South Africa vaccination with Strain 19 is used to combat contagious abortion and testing is of secondary importance to vaccine production. Issues of vaccine has, therefore, doubled during recent years while the number of tests performed has been restricted to the average number previously handled.

The screening of applications for permission to submit samples was, however, very irksome and resulted in much waste of time and funds. It was hoped that a more satisfactory alternative would be suggested. The problem was considered from the following aspects:—

1. *Would increased large scale vaccination reduce the demand for* testing ? If all heifer calves were vaccinated in South Africa the disease would be suppressed by lack of highly susceptible animals. As calfhood vaccination produces hardly any permanent reactors the breeder need not fear a limitation of his market on account of positive reactors amongst his young stock. In fact, as was pointed out by Dr. McFarlane, breeders were realising more and more the greater value of vaccinated heifers and the demand for animals certified as vaccinated during calfhood was already inadequately met on export markets. Dr. Snyman suggested that some stockowners were disinclined to vaccinate because of he erroneous idea held by many backward farming communities, that if a farmer vaccinated his calves it was tantamount to an admission that the disease was rampant in his herd. He asked if the test could be made to show whether an animal was an infected reactor or merely reacting as the result of being vaccinated.

In reply to this Dr. van Drimmelen said that the Milk Ring Test could, with slight modifications in technique (v. Drimmelen 1949 a and b) be used by a qualified veterinarian for distinguishing the two types of reactors. Titration of the ring test reaction in milk had first been shown in South Africa to show a marked difference between infected and vaccinated reactors. This had now been confirmed by tests on a large scale in the U.S.A. (Holm, Eveleth and Renault, 1950) and in Canada (Moore, 1951). The difference was believed to be connected with the localization of the infection in the udder and the local formation of antibodies. The milk thus became a source of information unobtainable from the blood serum. Confidence was expressed that a very useful service could be rendered to the breeder by this test.

2. The next consideration was whether priority for testing should, in view of the limited facilities, be granted to stud herds, breeding stock, dairy herds or animals intended for public auction. The favourable treatment of stud and breeding animals as applied at present had no opponents. It was even suggested by more than one member that the requirements of importing territories were unnecessarily strict, since the C.A. test involved great inconvenience and delay to exporters. Dr. A. M. Diesel, explained that reactors under 18 months old and certified as vaccinated between the ages of six to ten months were permitted into many of the importing territories.

3. Concerning the use to which the results of the tests carried out under the limitations at Onderstepoort were being put, it was believed that the herds in which positive reactors were detected often failed to receive adequate attention. In many cases nothing was done and it was suggested that if the reactors were not eliminated according to an approved scheme or plan, the heifers and cows on the farm should be inoculated. The State Veterinarian could consider methods which would promote or induce vaccination of the contact animals on the property.

4. The basis of the actual technique of the test was demonstrated. The achievement of Robinson (1918) when he eradicated contagious abortion at Bestersput in 1916 by the test and slaughter method was recalled. This is believed to be the first authentic record of a herd cleaned by testing. With the aid of charts the standard sponsored by the F.A.O./W.H. Organisation was explained and it was demonstrated how South Africa had conformed with the conditions agreed to by the Office l' International des Epizooties in 1937.

5. The possibility of negative reactions being found in infected cattle was always considerable. The incubation period, which should be specified as the period between infection and the appearance of the first symptom, whether this was abortion or a positive reaction, could be 225 days (Thomsen, 1950). The animals known as "ceased reactors" in the U.S.A. could be carriers of the infection in localized lesions in the joints or elsewhere. Repeated testing of recorded animals was therefore, the only really useful method of testing after a diagnosis had been made. The herds on which a testing scheme could be of use were not numerous in this country.

Reactors usually showed sub-acute infection of the udder. *Brucella* organisms are often to be found in the blood and in lymphoid tissue in all parts of the body soon after infection or during and after recrudescences preceding abortion or calving. At such times the titre of the reaction is high as a rule but it recedes slowly while the organisms disappear from the lymphoid tissues. Positive reactions may be produced by feeding killed *Brucella abortus* in large amounts or by subclinical infections which show no more than a transient bacteriaemia (Smith, Birch, Bishop, Donham and West 1949). The cross-agglutinating sera found in cases of some *Escherichia Salmonella, Proteus* and *Haemophilus* infections and in vaccination with killed *Vibrio* vaccines cannot be ignored (McCullough, Eisele and Beal, 1948). False positives due to haemolytic specimens of serum may occasionally slip through.

A few cases of partly decomposed positive sera showing a hardly perceptible low grade agglutination have been encountered. It was demonstrated that blocking antibodies were present to a fairly high titre (1:160) in these sera pointing to a very real source of false negatives in our routine testing here.

6. The value of the Ring Test Antigen as a tool for screening and survey purposes has been adequately demonstrated in some large municipal areas. Owners of herds with successive positive tests could be warned and if confirmed by blood testing of a representative sample of the animals in the herd, compulsory heat treatment of the milk could be instituted and vaccination recommended. Here the differential test for locating vaccinated and infected reactors would in future be of great help to the dairy farmers. Owing to the greater sensitivity of recent batches of Ring Test Antigen this test was being carried out by testing the reaction of the milk in a 1:10 dilution in non-reacting milk as well as in undiluted milk. Six months after vaccination a reaction in the undiluted milk but not in the diluted milk could be considered a vaccinal reaction but a positive result in both tests was an indication of infection. The latest details about this and the antigen can be obtained by registered veterinarians, from Onderstepoort.

The participants in the discussion were thanked by the President, Dr. S. W. J. van Rensburg, who said that the subject of C.A., though an old one, should not suffer from lack of interest. Brucellosis continued to be a serious menace to the cattle industry and was responsible for financial loss which neither the farmer nor the consumer could suffer.

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Jl. S.A.V.M.A. 22(3), 1951.

MODERN THEORIES ON THE PATHOGENESIS OF MILK FEVER AND BOVINE KETOSIS

K. E. WEISS and R. CLARK,

Onderstepoort.

(Paper given at the 46th Annual Meeting)

The pathogenesis of Milk Fever and Ketosis is still unsettled, despite intensive investigations in many parts of the world. The object of this paper is to bring some of the modern theories to the notice of our colleagues.

In considering metabolic disturbances of the ruminant, the fundamental peculiarities of this class of animal must be clearly borne in mind.

Importance of Ruminal Function

Foods, drugs and toxins entering the ruminal mass undergo profound changes due to microbial action, before entering the animal body. Not only is there breakdown of potential foodstuffs, but also the synthesis of new organic products (amino-acids, vitamins and probably at times toxic agents such as amines). Furthermore, chemicals may be transformed (Urea to ammonia, nitrates to nitrites, etc.). These reactions depend both quantitatively and qualitatively on the activity and composition of the ruminal flora and fauna. In addition, the normal ruminal contractions, the passage of ingesta, the absorption and even the excretion of certain substances have been shown to depend on the composition of the ruminal contents. It can, therefore, be fairly stated that the health of the ruminant animal depends primarily on the welfare of its ruminal population.

Carbohydrate Metabolism

The animal with a simple digestive tract absorbs all its carbohydrates in the form of monosaccharides. The ruminant on the other hand absorbs the greater majority of carbohydrate in the form of lower organic acids.

This not only necessitates a difference in carbohydrate metabolism, but also a fundamental difference in the regulation of the acid-base ratio of the blood.

Milk Fever

Recent work has suggested that the basic cause of milk fever is an alkalosis (Craig 1947) caused by either or both of the following factors:

(a) Removal of acid ions in the milk or

(b) The failure of the formation of organic acids in the rumen.

Normal milk is slightly acid, while colostrum is more so (pH below 6). The high producing cow will, therefore, lose large amounts of acid radicles from her blood, which will predispose towards alkalosis. That this occurs normally in all parturient cows has been proved by the demonstration of an increase in the alkali reserve of the blood.

High producing cows are normally fed rations rich in protein which tends to the production of alkalinity of the ruminal contents by the inhibition of the normal acid fermentation of carbohydrates and, in extreme cases, by the production of ammonia. The flow of organic acids for the production of blood glucose and milk sugar is, therefore, reduced, while at the same time there is a tendency to alkalosis.

Clark and Lombard (1951) have shown that an alkalosis reflexly inhibits ruminal motility. If the drain of acid radicles in the milk causes an alkalosis, ruminal paresis will develop, resulting in inappetence and a cessation of fermentation. The vicious cycle can, therefore, be initiated either from excessive acid loss or from primary digestive disturbance.

The long recognised association between milk fever and high production and digestive disorders, can, therefore, be explained on physiological grounds.

Hypocalcaemia

Twenty-five pounds of milk contain approximately four times the total amount of calcium present in the blood of a 1,000 lb. cow. This enormous loss of calcium has to be replaced from the calcium stores of the body and from the food, an ability of the high producing cow. (A study of the parathyroids under these conditions would be of great interest.) The successful mobilisation of calcium is said to depend partly on the acid-base ratio of the blood, being retarded by alkalosis. The well known hypocalcaemia of milk fever is, therefore, explianed as being secondary to the alkalosis; it is a symptom, not the cause, of the disease.

To quote from Craig and Stoll (1947).

" While hypocalcaemia existed in all these cases of milk fever, when they received their first injection of calcium gluconate, it is evident from a study of the data, that some of the cows were labouring under a considerably reduced blood calcium level twenty-four hours later, even though they appeared perfectly normal. Cow 3 for example was paralysed and comatose when she received an injection of calcium; her blood calcium level was 5.3 mgm. per 100 c.c. On the following day she appeared normal notwithstanding a blood calcium level of 5.2 mgm. per 100 c.c. and she continued normal. This case and others like it in the series, indicate that the symptoms of milk fever are not due to hypocalcaemia. It seems more rational to regard hypocalcaemia as another symptom, like paralysis and coma, a result of the underlying disturbance — a symptom of secondary importance ".

In contradiction to this theory, experiments at Onderstepoort have failed to establish a reduction in blood calcium following artificially induced alkalosis. In one sheep, for instance, the CO_2 combining power of the blood was raised from the normal of 65-70 vols. per cent. to

91 by dosing sodium carbonate, without any alteration in the blood calcium level.

Effects of Calcium-Gluconate Therapy

Craig and Stoll consider the beneficial effects of calcium-gluconate therapy to be due to :—

(1) Adding calcium, if only temporarily, to the circulating blood.

(2) Acidification (pH of solution 5-6).

(3) Combating dehydration.

Effects of Acidification

Craig and Stoll present the following evidence in support of the beneficial effects of acidification in milk fever:—

(1) Acidification produces hypercalcaemia in normal parturient cows.

(2) Cases of milk fever complicated with acetonaemia show an increase in blood calcium, 24 hours after calcium-boro-gluconate treatment, four times as great as do uncomplicated cases.

(3) Acidification after standard calcium-boro-gluconate therapy, virtually abolishes relapses in the natural cases of milk fever and sustains the increase in blood calcium levels.

(4) Good results have been reported in the treatment of milk fever with other acidifiers namely magnesium sulphate and monobasic sodium phosphate intravenously.

Methods of Acidification

Craig and Stoll used chlor-ethamine (a brand of ethylene-diamine-dihydrochloride) per os, which releases hydrochloric acid.

We have advocated the use of acetic acid to acidify the rumen as being physiological, both to the ruminal flora and the animal, but its acidifying action is admittedly transient. The addition of sugar to restore acid fermentation in the rumen is also of considerable value. During studies on the effect of various acidifiers on the CO_2 combining power of the blood, we have recently been able to show that ammonium chloride is most effective in counteracting alkalosis. Being readily procurable, it could thus be used with great advantage in practice.

Treatment of Milk Fever

According to the above theory, the rational treatment of milk fever would be as follows :—

(1) Standard treatment with calcium-boro-gluconate to get the cow on her feet.

(2) Acidification with one of the following :—

(a) Chlor-ethamine (40-60 grm.) repeated every eight hours (Craig and Stoll).

(b) Acetic acid (40-60 c.c.) suitably diluted repeated every 6-8 hours.

(c) Ammonium chloride (40-60 grm.) repeated every 8 hours.

(3) Although the alkalosis theory cannot be accepted as proved, we consider that acidification of the rumen in addition to calcium therapy is strongly indicated if only to restore normal ruminal fermentation and appetite.

The administration of sugar together with acidification is strongly indicated. The rumen is very strongly buffered against acid and with reasonable care, there is little danger of overacidification. The subsequent diet should be high in sugar and relatively low in protein. The full production protein ration should be gradually re-introduced.

Ketosis

According to current theories ketosis may arise from any of the following causes :—

(1) Insufficiency of available carbohydrate in the food.

(2) Disturbance of carbohydrate digestion and absorption due to cessation of ruminal fermentation.

(3) Disturbances of carbohydrate metabolism such as in Diabetes mellitis. (This disease has never been proved to occur in ruminants.)

(4) As a physiological attempt to counteract an alkalosis.

(5) The possible formation of ketones or ketogenic substances in a deranged rumen.

Ketosis as a Sequel to Milk Fever

The fact that ketosis and milk fever occur under such similar conditions has long led to a suspicion of their similar pathogenesis. Craig and Stoll suggest that the incipient milk fever cow, due to shortage of available organic acids from the rumen, katabolises fat in an endeavour to supply (1) energy, (2) materials for the synthesis of butter fat and (3) acid radicles to correct the alkalosis. Under this conception ketosis can be regarded as a result of compensatory mechanisms — a self-cured milk fever.

Hoflund and Hedstrom classify ketosis as :—

(1) Primary Acetonaemia.

(a) Underfeeding acetonaemia. This occurs where the diet is highly fibrous and poor in other nutrients, leading to attrition of the ruminal organisms and a decrease in acid fermentation. Alkalinity of the rumen results and, if such an animal still possesses adequate deposits of fat, ketosis may develop. If in poor condition the animal will show ruminal atony only (popularly termed droë galsiekte).

(b) Overfeeding Acetonaemia. Here the primary cause is an excess of protein over carbohydrate (especially sugars). As

described before this leads to alkalinity of the rumen and cessation of fermentation.

(2) Secondary Acetonaemia.

This occurs especially prior to calving, when a cow ceases to feed for any reason, e.g. traumatic reticulitis. Post partum it can occur due to acute metritis, etc. Ketosis as a sequel to milk fever would fall under this class.

According to current theories ketosis is caused by an excessive katabolism of fat made necessary by deficiency or non-availability of carbohydrate, with the resultant formation of excessive amounts of aceto-acetic acid, hydroxy-butyric acid and acetone. When we remember that the main source of carbohydrate to the ruminant is organic acids derived from the fermentation of carbohydrate (largely cellulose) it is logical to conclude that ruminant ketosis arises basically from ruminal dysfunction. The conception that ketosis is preceded by alkalosis, and should be treated in much the same way, is not, therefore, as paradoxical as would at first appear.

Treatment of Ketosis

(1) As hypocalcaemia is not present in ketosis, calcium-boro-gluconate would not appear to be indicated.

(2) The replacement of blood sugar by parenteral glucose is of immediate but transient benefit.

(3) Restoration of normal ruminal function by acidification and sugars per os.

Johnson (1951) has postulated that ketogenic butyrates may be formed in the rumen from sugars, and, therefore, he suggests the dosing of glycerine as a non-ketogenic carbohydrate source. The dose given to cows was from .5 to 2 kilos glycerine per day, either drenched mixed with water or given over the grain during convalescence.

Prevention of Milk Fever and Ketosis

As both conditions probably arise primarily from digestive disorders they are best controlled through the diet, which should be well balanced, but not too high in protein and contain adequate starch and sugar. The feeding of molasses (200-300 grm. per day) for the last month of pregnancy has given good results in many countries.

Ovine Ketonaemia

As the pathogenesis of ovine ketosis (domsiekte) is apparently on all fours with that of bovine ketosis, the treatment and prevention of the disease should be on the same lines. The feeding of molasses to ewes on farms where domsiekte is threatened or present is also indicated.

The Possible Role of the Adrenal Cortex in Acetonaemia

Apart from the alkalosis theory, another current theory which has recently come to the foreground, should be mentioned. It has frequently been suggested that the adrenal cortex plays a role in the pathogenesis

of acetonaemia. This aspect is now being reviewed in a series of articles by Puntriano. Although Shaw (1951) recognises the fact that acetonaemia may arise from digestive disorders, faulty feeding regime and also as a result of post partum metritis, he believes that this is not true acetonaemia, but that true spontaneous acetonaemia arises basically from a dysfunction of the pituitary, adrenal system. He also claims to have successfully treated cases of true spontaneous acetonaemia with A.C.T.H. and cortisone, but has apparently failed to treat the secondary cases successfully, unless the basic cause was removed or treated. The theoretical and experimental evidence submitted in these recent articles is admittedly not very convincing, but should, nevertheless, receive due consideration.

The modern conception of the main function of the adrenal cortex is that it reinforces the tissue cells in their reactions to maintain homeostasis. The maintenance of both glucose and ketone bodies in the blood at physiological levels would fall under this function. Furthermore the most characteristic action of the -oxy steroids (cortisone, etc.) is the mobilisation of blood sugar from protein. Theoretically then, the stress as a result of the hypoglycaemia encountered in ketosis, would tend towards a hyper-corticism as a compensatory mechanism. Clark (1941), however, reported a marked lymphocytopenia in sheep suffering from ketosis, an observation which, in the light of later knowledge, strongly suggests a state of hyper-corticism. This is contrary to the hypocorticism theory advanced.

Although the administration of cortisone or A.C.T.H. may bring about an increased blood sugar concentration by gluconeogenesis and a decreased ketonaemia in cases of ketosis, this is no justification for assuming that a hypocorticism is the root cause of the disease. It is generally accepted, for instance, that the basic cause of arthritis and other rheumatic states in the human is not a deficiency of cortical hormones, despite the dramatic beneficial effects obtained with A.C.T.H. and cortisone.

In short, it is our opinion that although cortisone or A.C.T.H. may be proved to alleviate some of the symptoms of ketosis, for instance hypoglycaemia, this does not prove that the adrenal cortex is primarily involved in the pathogenesis of the condition. It is remarkable that the protagonists of the cortex hypothesis make no mention of Craig's alkalosis theory.

Vitamin Theory

Deficiencies of either Vitamin A or Thiamine have been suggested as playing a role in the aetiology of ketosis but subsequent work has failed to substantiate these ideas.

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STANDARDISATION OF ANIMAL FEEDSTUFFS

During the past fifteen to twenty years, the whole animal feedstuffs industry has undergone profound changes. Probably no country has been affected more than South Africa and there are important reasons for this.

To begin with, the science of nutrition has grown at a remarkable rate. Not only is it necessary to lay down figures for protein, fibre, fat and carbohydrates, but minerals like calcium and phosphorus have to be considered as well as vitamins such as thiamine, riboflavin, pantothenic acid, niacin and ascorbic acid. At times it is essential to pay special attention to some of the amino-acids and trace elements like manganese, copper and cobalt. It is no wonder that few farmers can now work out rations that are truly economical and satisfy all known nutritional requirements. Even if a man can formulate a ration, he still has to face the almost impossible task of procuring all the ingredients.

Our farming practices are changing, and perhaps more rapidly than most people realise. Farms are getting smaller by the day and their owners are being forced to go in more for intensive agriculture. There is a greater tendency for highly productive animals to be kept and these have to be fed more scientifically than scrubs and hence the rations have to be compounded accurately. And perfect blending of feedstuffs is absolutely essential to the well-being and proper growth of the young, such as chickens, calves and piglets.

With the rapid increase of factories processing human foodstuffs and vegetable oils, more and more of a greater variety of by-products are coming on to the market, that are of considerable value in feeding animals if used intelligently.

Finally, it is fast becoming impossible to obtain adequate quantities of the ingredients required for the rations of our animals. Manufacturers recall wistfully the days when they could buy unlimited supplies of peanut meal, meat meal, bone meal, wheaten bran and several other things. There may be so-called surplusses again, due to freak economic and climatic conditions, but on the whole we have got to realise that

from now on there will be too many people and to many animals chasing far too little food.

In all these circumstances, it was inevitable that large firms should arise to produce and purchase in bulk the necessary raw materials, so that scientifically blended mashes could be sold to the farmers. Since 1940, the activities of these firms have increased out of all recognition and they now supply nearly all the mashes that are consumed by our livestock. About 80% of the trade is in the hands of four or five large companies, which employ properly qualified technical advisers.

Almost at the beginning, the government realised that control had to be exercised over the purveyors of mixed feedstuffs in order to protect the farmers. Government Notice 1154 of 4/6/48 contained regulations under the Fertilizers, Farm Feeds, Seeds and Remedies Act 36 of 1947, prescribing the quantities of calcium, phosphorus, fibre and protein in the different mashes. Everyone realised that these specifications were of limited value, because mashes could be worked out that satisfied the demands of the law-makers but certainly not the equally urgent demands of the animals for vitamins and other minerals. The state was in a dilemma. It is no use making regulations, unless they are going to be applied not only to the few large firms, but to the dozens of very small ones as well. And it is no use stipulating what vitamins and trace elements must be incorporated, if the funds and staff do not exist for the proper analysis and assessment of the mashes collected by the samplers for examination.

There was only one way out of the predicament and that was to invite the South African Bureau of Standards to run a voluntary scheme. Henceforth, if a farmer chooses to buy his feed requirements from a concern that employs no technical advisers and does not worry about the stringent demands of the Bureau of Standards, he will have only himself to blame when things go wrong.

Associated with all these developments have been a few growing pains. Some firms have not always distinguished themselves by giving the farmers a square deal, and more than once we have had the childish spectacle of a company cornering an essential ingredient in order merely to discomfit its competitors. Happily, these disreputable practices have disappeared — at least we sincerely hope so, for human protective foodstuffs like milk and eggs are in short supply and people are suffering in consequence.

To sum up. It is incumbent on the companies to make the most rational use of the animal feedstuffs at their disposal, always bearing in mind the dictates of the Bureau of Standards, and to sell the mixtures at the lowest possible prices. If they do not fail us veterinarians, as custodians of the health of our animals, it is our duty in return to see that the best companies secure the goodwill and business of the farmers. In this issue are the first advertisements of those companies now entitled to use the mark of the Bureau on poultry mashes. When the necessary facilities for testing can be provided, it is hoped that the mark will be extended to mashes for pigs, cows and other animals. The mark of the Bureau is the guarantee of quality and satisfaction, and the only lasting bond that can link the farmer and feed merchant.

LETTERS TO THE EDITOR

In a note* published in this Journal, I produced evidence to show that canker of the foot of the horse may be cured by minor surgery and the application of a paste consisting of kaolin, zinc oxide, boracic and acriflavin and glycerine.

Some two years elapsed before the disease appeared again in our stables — in a fore foot of one horse and in both hind feet of another. In each animal, the disease had obtained a firm hold before being detected. The frog and a considerable portion of the sole of each foot was involved, and although improvement was noted after some 4 weeks' treatment, it was clear that a complete cure would demand many more weeks of further work.

The diseased horn was soggy, and a seropurulent discharge oozed from the junction of the sole and frog and sole and wall. It was obvious that the paste was not getting to the depths of the lesion in adequate quantity and that an irritant, probably microbial in origin, was at work deep in the diseased horn.

Each horse received a course of procaine penicillin intramuscularly — two million units three times daily for four days. The effect was spectacular. The soggy look had disappeared, discharge was absent or nearly so and the disease was under control. Although a complete cure had not been effected, the length of treatment had been reduced by many weeks.

Naturally, I cannot say if this result is reproducible but would suggest that treatment with penicillin is worth a trial.

I have pleasure in thanking Mr. J. M. Scott, of B.P.D. (South Africa) (Pty.) Ltd., for the generous supply of procaine penicillin for trial.

J. H. MASON.

* Jl. S.A.V.M.A. (1946) XVII (3): 166-168.

SOUTH AFRICAN BUREAU OF STANDARDS

17th August, 1951.

Model Building Regulations for Farm Dairy Buildings

It would be much appreciated if you would publish the attached information regarding the set of model building regulations for farm dairy buildings which has recently been published by the Council of the South African Bureau of Standards.

Yours faithfully,

J. W. SWARDT,

for Acting Director.

The difficulties experienced by farmers supplying milk to municipal areas where differing regulations for farm dairy buildings exist, and by municipalities who have to administer their regulations separately, have emphasized the need for uniform regulations. Bearing this in mind, the

Council of the South African Bureau of Standards, at the request of the Standardizing Committee of the Department of Agriculture, appointed a technical committee to prepare the set of model regulations for farm dairy buildings, which has recently been published.

At the outset, however, it should be pointed out that there is no intention of securing compulsory adoption of these regulations, which cover structural aspects only, and that they have been compiled purely for the assistance and guidance of local authorities in formulating their draft by-laws. Furthermore it should be noted that these regulations have been so framed that they would not be retroactive. This means that even if they are eventually promulgated as by-laws, those dairy buildings which were previously erected with the sanction of a local authority, would not be affected.

All farm dairy buildings where milk or milk products are produced for human consumption in areas controlled by local authorities, are covered by the regulations. It is required for instance, that every dairy shall consist of at least a cowshed, milkroom, receiving room, utensil wash-up room, change and ablution rooms, a latrine and a boiler room (except where approved electric boilers have been installed). In addition, the rooms themselves are required to conform to certain standards with regard to such essentials as size, doors, floors, walls, water supply, drainage, lighting and ventilation.

In the near future, a code of practice for farm dairy buildings, amplifying the regulations and setting out recommended methods to be followed in the construction of such buildings will be prepared as the next step in a long term programme designed to establish similar sets of model building regulations and codes of practice for silos, reservoirs and other farm structures.

A PRACTICAL FIELD TEST FOR DIAGNOSIS OF KETOSIS (ACETONAEMIA) IN CATTLE AND SHEEP

One of the standard tests for the presence of ketone bodies is that of Rothera. In this test about 1 gram (excess) of a mixture of 1 part finely powdered sodium nitroprusside and 100 parts ammonium sulphate is added to 5 c.c. of urine or other fluid to be tested. After shaking, approximately ½ c.c. of concentrated ammonia is added. In positive cases a violet (permanganate) colour develops.

Concentrated ammonia has however to be kept in a refrigerator and cannot be regarded as a portable substance on account of explosion hazard. I should therefore like to bring to the notice of collegues a method(1) which has recently been brought into use at Onderstepoort for laboratory and field work with very satisfactory results.

The only reagent required is a powder made up as follows:—

Sodium nitroprusside 1 Gm. (very finely ground).

Ammonium sulphate 20 Gm.

Anhydrous sodium carbonate 20 Gm.

These ingredients must be powdered separately and then mixed very well. The mixture should be kept thoroughly dry, and will keep for a considerable time. One drop of urine or serum is added to a small pinch of the powder, and a violet (permanganate) colour is immediately developed

if ketones are present. The test works equally well on milk. No discoloration, or only a brownish tinge, indicates a negative result.

It has been found(1) that the lowest ketone level to give a definitely positive reaction is 10 mg. per 100 ml. A useful quantitative determination can therefore be made by serial dilution of the specimen with distilled water. The procedure is as follows: If the undiluted specimen has given a positive result, 1 c.c. of water at a time is added to 1 c.c. of the specimen so that dilutions of 1 : 2, 1 : 3, 1 : 4 . . . etc., are obtained. Each time a dilution has been made, one drop is removed and tested with the powder till a negative or indefinite colour reaction shows the end point. The last positive reaction is noted and the dilution factor multiplied by 10, the result being expressed as mg. per 100 ml. If, in a given sample, 6 c.c. of water with 1 c.c. of specimen have given the last positive dilution, i.e. 1 : 7, the estimation would be 70 mg. %

This method provides a reasonably accurate quantitative estimate of ketones but in practice one would after a little experience be able to assess the clinical significance of the simple qualitative test result, and relate it to the symptoms shown by the animal. In the field its usefulness will be obvious in the diagnosis of acetonaemia in cattle and domsiekte in sheep.

I remain, etc.,

W. D. MALHERBE.

Reference: (1) *Dumm, R. M., and Shipley, R. A.* (1946). The simple estimation of blood ketones in diabetic acidosis. J. lab. clin. Med. 31, 1162-1163.

Onderstepoort, September 14, 1951.

VACANCIES FOR VETERINARIANS: SUDAN GOVERNMENT

Applications are invited for posts of Senior Research Officer and Research Officer in the Sudan Veterinary Service.

Further details obtainable from the Honorary Secretary, S.A.V.M.A., P.O. Onderstepoort.

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Spencer monocular microscope with two oil immersion, high dry and low power objectives. Complete in case and in excellent condition. Property of deceased member. Purchased new three years ago. Price £50 or nearest offer. May be inspected at office of Sub-Director of Veterinary Services, New Revenue Offices, Cape Town. Apply Hon. Sec., S.A.V.M.A.

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BOOK REVIEWS

VETERINARY OBSTETRICS, INCLUDING CERTAIN ASPECTS OF THE PHYSIOLOGY AND PATHOLOGY OF REPRODUCTION IN DOMESTIC ANIMALS by Franz Benesch and John G. Wright (1950). Published by Balliere, Tindall & Cox, 7 and 8 Henrietta Street, Covent Garden, W.C. 2.

The original translation by Wright of Benesch's "Geburtshilfe bei Rind und Pferd", which was first published in English in 1938 has now been superseded by an entirely new publication which has just appeared under the above title and which is nearly three times the size of the former. This increase in the contents of the book is due entirely to a mass of valuable information on the physiology and pathology of reproduction contributed by Wright.

The book now consists of three Sections:

Part 1 deals with the oestrous cycle in the mare, cow, sow, bitch and cat, special consideration being given to the changes noted in the genitalia during the various stages of the cycle. Of interest to South African veterinarians is the fact that the differences shown in the cycles of some animals in the Southern Hemisphere are also indicated. Pregnancy and its diagnosis in the mare, cow and bitch are fully described, as are also the changes that take place in the genitalia of the pregnant animal and the methods of examination for pregnancy, including the biological and chemical tests for the mare. This section further gives an account of the physiology of normal parturition and of various aspects of dystokia which are not dealt with by Benesch. It includes a very useful contribution on dystokia in other animals like the bitch, ewe and sow. A chapter on the approach to an obstetrical case will be particularly helpful to students and inexperienced practitioners.

Part 2 consists of the original translation of Benesch's obstetrics in the cow and mare. The high standard of this work is so well known that it requires no further comment.

Part 3 contains the most comprehensive and detailed description of Caesarian Section in the cow, ewe, sow, bitch and cat yet published. Among the pathological conditions incidental to parturition is a vary instructive chapter on perineal deformity, and for the first time we are supplied with an account in English of Gotze's operation for the repair of recto-vaginal fistulae. It is observed that Wright has modified the Gotze method by including the rectal mucosa in the sutures, and in our experience this has denitely given better results.

The final five chapters of the book are devoted to various types of infertility in the cow, mare and bitch.

The two parts contributed by Wright are as profusely illustrated as the Benesch portion, and Wright can be complimented on having a Senior Lecturer in Veterinary Surgery with the artistic ability of Mr. Shuttleworth. His illustrations of the various operations and manipulations are so vivid that in many cases it is hardly necessary to refer to the text at all.

Current literature has been freely drawn upon and the relative references are given at the end of every chapter. These facts associated

with the wide practical experience of both authors, which forms the foundation on which this work is based, stamps Benesch and Wright's latest publication as the most outstanding contribution in English yet made to veterinary obstetrics and gynaecology. It is indispensable to veterinary students and to veterinarians engaged in obstetrical and infertility work.

S.W.J.v.R.

RESTRAINT OF ANIMALS by John R. Leahy and Pat Barrow. Cornell Co-operative Society, Ithaca, New York. Price $3.50.

This book of 234 pages contains over 300 drawings showing various methods of restraining, casting, securing and handling the horse, cow, pig, dog, cat, fox, minx, rabbit, chicken, turkey and other birds. There is a useful chapter on ropes and how to splice and knot them. The drawings are clear and descriptions concise, so that the methods can be understood easily. It is difficult to include most of the methods used without making such a book too bulky. There is no chapter on sheep or goats. These might well have been dealt with. In the chapter on knots, the square knot (reef) is used for securing the ends of two ropes togther. This cannot be recommended as a sharp tug on the standing part of either rope would probably cause the knot to capsize and come loose. The Weaver's knot (sheetbend) is better for this purpose. The figure of eight knot is omitted and might well be shown. In the chapter on horses, stallion leading gear, the belly hitch to stop horses hanging back when secured, a kicking block, a single sideline, service hobbles applied to the pasterns, and a few more methods for securing to rails or rings could be included. The term "hopple" used, corresponds to "hobble" in this country. The chapter on cattle could be improved by also describing the bull head chain for facilitating catching bulls, the single belly hitch for casting young calves, and giving more detail about bull rings and the use of the bull pole.

The Veterinary Student and Veterinary Surgeon will find this a very useful book as it shows how to deal with so many of those problems which are encountered during the course of their work, when they have to handle animals.

G.D.S.

DOLLAR'S VETERINARY SURGERY by J. J. O'Connor, M.R.C.V.S. (Fourth edition).

This popular text book has again been revised. The addition of new material will be welcomed by both practitioners and students. Valuable information is given on inhalation anaesthesia in small animals and new apparatus used for this purpose is described. For various reasons the induction of anaesthesia in small animals by inhalation has not been very popular in South Africa. The information given in the Fourth Edition should help to bring this method of anaesthesia into more general use here.

On the subject of intravenous anaesthesia in large animals by chloral hydrate interesting views by various authorities are included. It is praised by some and condemned by others, but whatever one's opinion of this drug may be all who have used it extensively will agree that the technique for

its administration must be good if complications like phlebitis are to be avoided.

While one appreciates that it is no easy matter to decide what should be omitted from a book of this nature, it is nevertheless disappointing to nd that the fleam and the lancet are still included among the instruments used in phlebotomy. Surely such barbarous methods have no place in a modern textbook on surgery.

Concise information is given on penicillin and the sulphonamide drugs and their uses. Other new material includes the treatment of fractures by bone pinning, blood transfusion and methods of dehorning. Appendix I deals with the examination of the horse as to soundness. This is a very welcome addition and here the veterinary surgeon will find information which is well worth careful study.

N.C.S.

INDEX OF TREATMENT IN SMALL ANIMALS PRACTICE by Hamilton Kirk, M.R.C.V.S. (Second Edition), published by Baillière, Tindall & Cox, 7 and 8 Henrietta Street, London W.C. 2. Price 40/- net.

Part I of the Second Edition of this text book consists of some excellent chapters on therapy of a specialised type. The chapters on Hormone Therapy and Chemotherapy in particular are concisely written and should be of great value to the practitioner who wishes to make himself conversant with the latest on these lines of treatment.

The overseas veterinarian is also catered for and even though there are in certain cases, lack of detail in the therapy of some of the diseases occurring in overseas countries, the references provided should compensate to some extent for such shortcomings.

On page 561 under the heading of piroplasmosis the treatment of this disease in dogs is given. On page 478 the treatment is again given with considerably more detail. Amalgamation of these two parts would avoid any confusion. There is apparently no mention of sulphamezathine enema therapy of feline and canine coccidiosis, of the highly efficacious treatment of canine rickettsiosis with intravenous aureomycin and of penicillin for the treatment of salivary retention cyst.

There is no doubt that this textbook is one of the best available for the treatment both medical and surgical of small animals.

B.S.P.

DIAGNOSTIC METHODS IN VETERINARY MEDICINE (3rd Edition) by Prof. G. F. Boddie, published 1950 by Oliver & Boyd Ltd., Tweedale Court, Edinburgh 1. Price 20/- net.

This clearly written, concise and extremely useful book of Professor Boddie has reached its Third Edition during the course of 5 years. This alone is ample proof of the appreciation the book has received from the members of the veterinary profession. It must be very gratifying to Professor Boddie that his book has in such a short period become one of the most valued books for the veterinary student and for the practitioner.

The chapter on Clinical Biochemistry is a new one which includes

the examination of the urine formerly under urinary analysis, and certain blood analyses. The chapters on Allergic Reactions has been brought up-to-date. A few other chapters have also been amended.

Even though the diagnoses of the diseases met with in South Africa are not always sufficiently covered in this book, yet undoubtedly there is a considerable amount of material of great value to veterinarians practising in the Union. B.S.P.

THE FEEDING OF FARM ANIMALS IN INDIA by P. E. Lander (1949), published by Messrs. Macmillan & Co., Ltd., St. Martin's Street, London, W.C. 2. Price 25/- net.

In an authoritative text, which covers 534 pages with 46 plates and many valuable charts, Dr. Lander ably portrays the feeding conditions in India and suggests the application of modern scientific knowledge. As indicated in his preface, the author has been able to collect considerable data during his 22 years at Lyallpur. The names of feeds, their uses and especially the chemical analyses are a valuable contribution. In addition to being able to compare the values of Indian grown feeds, the scientist would be particularly interested in digestibility trials conducted on such feeds and the nutritive requirements of different Indian cattle as compared with European breeds.

The chapters on the feeding of buffaloes and camels would be of special interest to many. Economists would appreciate the detail in regard to cost evaluation of different feeds for comparative purposes.

Although the author has drawn extensively from well known nutrition authorities, such as Morrison, Armsby, Kellner and Linton, the book is lacking in the more recent information on minerals and vitamins.

J.W.G.

OBITUARY

BATELY SCOTT PARKIN

The unexpected death of Bately Parkin on July 16th at Enkeldoorn, Southern Rhodesia, has deprived the Veterinary Faculty at Onderstepoort and the profession as a whole, of one of its outstanding members.

Bately was born at Middelburg, Cape, on July 16th, 1892. His great-grandfather, John Parkin, emigrated to South Africa with the 1820 Settlers and settled in Port Elizabeth.

He studied at the Christian Brothers' College, Kimberley, where he matriculated in 1909, obtaining the Max Michaelis Scholarship. He then proceeded to the Rhodes University College, Grahamstown, where he graduated in Science in 1912. Soon after graduation he entered the Public Service and in 1914 volunteered for Military Service in S.W. Africa. A year later he was awarded a scholarship and proceeded to the Royal Veterinary College, Dublin. After a brilliant academic career, he graduated in 1918 and enlisted in the R.A.V.C. for service in the East. On his discharge from the Army in 1920 he returned to South Africa to take up an appointment as lecturer in Veterinary Science, at first at Elsenburg and later at the Elsenburg-Stellenbosch Agricultural College.

In 1927 he was appointed Research Officer at Onderstepoort and two years later Professor in Veterinary Medicine. In 1934 and 1935 he visited a number of veterinary institutions in Europe and America.

In 1923 Bately married Violet Cooper. They have one child, a daughter, Ethne, who recently obtained her M.A. degree at the University of Pretoria.

Professor Parkin had always taken a keen interest in the practice of medicine, and particularly in chemo-therapy. The many facilities provided at Onderstepoort stimulated his interest and gave him the opportunity for investigating the value of many therapeutic agents and for introducing several new diagnostic methods into veterinary medicine. His contributions in this field, both published and unpublished, are outstanding and will remain a constant source of inspiration to his students and to those of us who had been intimately associated with him. Although gifted with a unique mental capacity, he was extremely modest and reserved and disliked any form of publicity. It was only in connection with his beloved golf that he revelled in relating his wonderful performances.

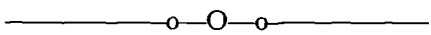
No cause was nearer his heart than the welfare of the veterinary profession and he would unselfishly go to any trouble in endeavouring to serve its interests. Owing largely to his efforts the methods of training veterinarians in this country have been improved so much that the course at Onderstepoort compares most favourably with the very best elsewhere. Nevertheless, he preferred to make his contributions incognito and would never accept any office or other reward.

On account of his reserved disposition he remained, in several ways a stranger to many of his colleagues and it is probably only his intimate friends and close collaborators who were fully capable of assessing the value of his manifold contributions to veterinary medicine and to the profession.

Bately also was a great sportsman. As a youngster at school he represented Griqualand West in cricket and in association football. Later he became a keen rugby enthusiast and there are probably very few supporters of our national game who had a better knowledge of the game and of the players who represented South Africa on various occasions. He was a very keen golfer.

Owing to his sudden death we have lost a valuable colleague and a true friend, and we extend our deepest condolence to his wife and daughter for their bereavement.

M.W.H.



SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION

Minutes of Meeting of Council held at Sandown Veterinary Hospital, Johannesburg on March 8, 1951, at 2.30 p.m.

Present: S. W. J. van Rensburg (President), G. Pfaff (Vice President), G. D. Sutton (Hon. Treasurer), A. D. Thomas, R. A. Alexander, J. G. Boswell, A. C. Kirkpatrick (Hon. Life Vice President), W. D. Malherbe, R. Clark (Editor), M. de Lange (Honorary Secretary).

Apologies: P. J. du Toit, A. M. Diesel, P. S. Snyman, H. P. Steyn, M. C. Robinson.

1. Minutes of Meeting held on 7.12.50.

2. Arising from these minutes :

(a) *"Cropping" of Dog's Ears:* Decided to request Dr. B. C. Jansen (with powers to co-opt) to assemble a short article for the Journal on "fashionable" operations including cropping, docking, removal of dew claws, spaying, castration, etc.

(b) *Editorship of Journal:* President reported that through unforeseen circumstances, the proposed member was no longer available to take over the editorship from Dr. Clark. Decided to leave matter till next meeting pending developments of staff matters at Onderstepoort.

(c) *National Health Council:* Dr. Snyman's report noted with thanks.

3. *Nameplates:*

(a) Letter, Secretary Veterinary Board, stating that the Board had ruled that a Veterinarian can display two nameplates — one at his residence and one at his surgery, provided he practises at both places. Noted.

(b) Letter, Secretary Veterinary Board, requesting that Association investigate all aspects of the displaying of nameplates, etc., at Kennels and Hospitals owned or controlled by Veterinarians, and to submit recommendations to Board. Decided to request existing Ethics Committee of Witwatersrand Branch (consisting of Drs. Mason (convenor), Steyn, M. C. Robinson and Boswell) to investigate and report back to Council.

4. *Financial Matters:*

(a) *Maud Bales Scholarship:* Treasurer reported on three applications received for the 1951 award of the above scholarship. Finance committee recommended to Council that the scholarship be awarded to final year student, D. C. L. Wacher. This recommendation, endorsed by Council, to be submitted to the Board of Trustees. Also recommended that in future applicants to be interviewed personally by Secretary and Treasurer before final recommendation. Agreed.

(b) *Assistance to Dependants of Deceased Members:*

(i) Mrs. A: Finance Committee recommended a further grant of £100. Agreed.

(ii) Mrs. B.: Grant of £50 recommended by Finance Committee. Agreed.

(iii) Claim against estate of late member. Decided to write off arrear subscriptions (£4 4s.).

A further amount of £4 4s. outstanding in respect of books bought through Book Fund. Secretary to investigate whether a claim could be lodged against the estate.

6. *Correspondence:*

(a) *Circular letter from Spanish Society of Veterinary Zootechnicians:* Inviting exchange of Journal with their publication "Anales". Owing to high cost of printing the Association cannot consider exchange of publications.

Also invitation to attend their Congress in Madrid in October, 1951. Regret that Association not able to send delegates.

Secretary of above Society to be informed accordingly.

(b) Letter, Director, Bureau of Standards re Appointment of Committee for Intravenous Saline Dextran. Dr. R. Clark nominated with Dr. M. H. V. Brown as alternate.

(c) Letter re pharmacist doing veterinary work. Decided to leave matter to President and Secretary to deal with.

7. *General:*

(a) *Holloway Committee of Enquiry:* Decided that President and Secretary have powers to act as soon as terms of reference of above committee are known.

(b) *Provisional date of General Meeting:* August 21, 22 and 23, 1951.

8. The meeting closed at 5.45 p.m. with an unanimous vote of thanks to Dr. Boswell for providing the facilities at Sandown to hold the meeting.

S. W. J. VAN RENSBURG,
President.

M. DE LANGE,
Hon. Secretary.

SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION

Minutes of Meeting of Council held at the office of the D.V.S., Victory Buildings, Pretoria, on May 10th, 1951, *at* 2.15 *p.m.*

Present: S. W. J. van Rensburg (President), G. Pfaff (Vice-President), A. M. Diesel, G. D. Sutton (Hon. Treasurer), H. P. Steyn, E. J. Pullinger (representing M. C. Robinson), W. D. Malherbe, P. S. Snyman, A. D. Thomas, A. C. Kirkpatrick (Hon. Life Vice-President), R. Clark (Editor), M. de Lange (Hon. Secretary).

Apologies: P. J. du Toit, R. A. Alexander, J. G. Boswell, M. C. Robinson.

1. Minutes of meeting held on March 8th, 1951, adopted after slight amendments.

2. Arising from these minutes:

(a) *Editorship of Journal:* Decided to approach Dr. E. M. Robinson. In the event of his non-acceptance, matter to be left to President, Editor and Hon. Secretary with powers to act.

(b) *Maud Bales Scholarship:* The meeting was informed that Council's recommendation had been accepted by the Board of Trustees and that Mr. D. C. L. Wacher had been awarded the Scholarship for the year 1951.

(c) *Assistance to dependants of deceased members*: Acknowledgments of receipt had been received for financial assistance given in two cases.

In order to avoid cases in need of assistance being overlooked, Hon. Treasurer was instructed to compile a complete list of dependants of deceased members, with latest addresses, for use by Finance Committee whenever required.

3. *Publication of Minutes of Council Meetings in Journal:* The Editor suggested that the minutes as such should no longer be printed in the Journal, but that short items on the proceedings be inserted. After some discussion, Council accepted the proposal. It was also decided that the President scrutinise the notes before publication.

The above decision would mean that the attendance list of Council members at the meetings would no longer appear in the Journal. Council felt that members of the Association were entitled to this information, which is vital in the nomination of candidates and the ballot for members. It was therefore decided to ask the views of the Association at the next General Meeting.

4. *Correspondence:*

(a) *Powers of Condemnation by Meat Inspectors:* A memorandum on the above subject drawn up by the Veterinary Group of the Witwatersrand and Pretoria Public Health Consultative Committee was placed before the meeting. Discussion was introduced by Dr. E. J. Pullinger on behalf of Dr. M. C. Robinson. From the lengthy discussion which followed, it became apparent that there was a possibility that powers of condemnation were to be extended to the health inspectorate staffs.

The Veterinary Group was strongly resisting this movement and Council decided to give the Group its fullest support.

A sub-committee consisting of Drs. Snyman (convenor), M. C. Robinson and I. P. Marais was appointed, with powers to co-opt, to investigate the matter fully and to report to next meeting of Council.

It was further left to members of Council to discuss the matter with influential members of the M.O.H. Group of the above consultative committee.

(b) *Australian Veterinary Association — General Meeting:* The above meeting was to be held in Sydney in August and the Association was requested to nominate a representative. Decided to nominate the Secretary of the A.V.A., Max Henry, who was a member of the S.A.V.M.A. At the same time to invite A.V.A. to nominate a representative at the General Meeting of the S.A.V.M.A.

5. *General:*

(a) The President drew the attention of the meeting to an apology, published in the Eastern Province Herald of April 25th, 1951, signed by " S. P. A. Schoeman, Veterinary Extension Officer in

the employ of the Department of Agriculture, Pretoria", in which he apologised for making certain false, defamatory and insulting statements in a certain public bar.

The meeting was informed that no person of that name was registered as a veterinarian in the Union and that the matter had been referred to the Veterinary Board for attention.

Decided to obtain further information through all possible channels and to publish a letter in the abovenamed newspaper disclaiming that the person in question is a member of the veterinary profession.

(b) *General Meeting:* Decided to invite the Minister for Agriculture to open the meeting and Ministers for Agriculture and Health to attend the dinner.

(c) *Senior Posts in Division:* Attention of the meeting was drawn to the continued delay in filling of senior posts at Onderstepoort. Decided that, depending on Dr. Alexander's return from Cape Town with definite information, a telegram be sent by the President to the Minister requesting immediate attention to the appointments.

(d) *Restriction on the sale of drugs:* Dr. Diesel drew attention to the fact that in terms of Government Notice 385 of 1948, penicillin could only be dispensed under prescription signed by medical practitioner, or a dentist or an authorised veterinarian.

As the question of the sulphonamides and antibiotics was being discussed at the Annual Meeting of the Pharmaceutical Society, Secretary to enquire whether any definite recommendations had been made by this Society.

(e) *Examiner for Associations Books* 1950/1951: Finance Committee again recommended Mr. C. J. v. d. Walt. Approved.

(f) Treasurer reported that a further £100 had been invested in Union Loan Certificates — approved.

The meeting closed at 5.25 p.m.

S. W. J. VAN RENSBURG,
President.

M. DE LANGE,
Hon. Secretary.

SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION

Minutes of Meeting of Council held at the office of the Director of Veterinary Services, Victory Buildings, Pretoria, on August 16, 1951, *at* 2.15 *p.m.*

Present: S. W. J. van Rensburg (President), G. D. Sutton (Hon. Treasurer), H. P. Steyn, A. M. Diesel, A. D. Thomas, M. H. V. Brown (representing J. G. Boswell), E. M. Robinson (Editor elect), R. A. Alexander, M. C. Robinson, P. S. Snyman, C. J. van Heerden (Hon. Life Vice President), A. C. Kirkpatrick (Hon. Life Vice President), R. Clark (Editor), W. D. Malherbe, M. de Lange (Hon. Secretary).

Apology: G. Pfaff.

In opening the President remarked on the great loss sustained by the Association through the sudden death of Dr. B. S. Parkin, and requested the meeting to stand as a token of respect.

He welcomed Dr. E. M. Robinson to the meeting and expressed his appreciation that Dr. Robinson had again taken upon him the Editorship of the Journal.

He welcomed Dr. Brown who came to represent Dr. Boswell.

1. Minutes of meeting held on May 10, 1951, adopted after slight amendments.

2. Arising from these minutes:—

(a) *Editorship of the Journal.* President reported that Dr. E. M. Robinson had accepted Editorship.

(b) *Powers of Condemnation by Meat Inspectors.* Letter from Sub-committee in which it was indicated that nothing could be added to the memorandum drawn up by the Veterinary Sub-group of the Health Consultative Committee. After discussion decided to send a copy of the memorandum to all members of the M.O.H. group attending the Medical Congress in October next and to request representation on this Conference. The sub-committee consisting of Drs. Snyman (convenor), M. C. Robinson and I. P. Marais to attend to this aspect.

(c) *Apology in "Eastern Province Herald".* Secretary reported that a notice had been published in the "Herald" of June 19, 1951, in which it was indicated that no person of the name of Solomon Petrus Albert Schoeman is registered as a veterinarian in South Africa and that no such post as "Veterinary Extension Officer" exists in the Union Department of Agriculture.

It was also indicated that the Veterinary Board was dealing with this matter.

(d) *Senior Posts in the Division.* The President reported that the Senior Posts had now finally been filled.

(e) *Restriction on the Sale of Drugs.* Secretary reported on a discussion he had with the President of the Pharmaceutical Society and that a memorandum would be received in due course from the Executive Comittee of the above Society. Decided to write to the Society giving the views of Council.

3. *Natal Veterinary "Co-op."* Letter from Dr. A. F. Tarr read. President and Dr. Alexander reported on interviews with the Organising Secretary of the N.A.U. from which it was apparent that there had been several misunderstandings which had been cleared up. Dr. Tarr to be informed accordingly.

After lengthy discussion it was decided to appoint a sub-committee to assist the "Co-op" with advice, etc. The committee to consist of Drs. Thomas, Diesel and a member to be appointed by the Natal Branch of the Association. The Organising Secretary of the N.A.U. to be notified of Council's decision.

4. *Australian Veterinary Association.* Secretary reported that Dr. Malherbe had now finally been elected as member of this Association representing the S.A.V.M.A.

5. *New Members.* The following candidates were proposed and seconded and were to be recomended to the General Meeting by Council :—

R. T. Bangay, I. R. Banks, G. C. Dent, H. O. Flanagan, E. M. Hearn, D. H. G. Irwin, R. C. Nixon, S. V. O'Brien, D. J. Schneider, Ursula D. Sigwart, L. A. Simpson, P. R. B. Smith (Jnr.), T. Smuts, L. G. Steel, C. J. V. Trichard, C. H. van Niekerk, A. van Heerden, I. van Schalkwyk.

Application for membership had also been received from D. L. Kelly, M.R.C.V.S., Palapye, Bechuanaland, but no proposal had as yet been received. Also indicated that Mr. Roe, new Director of Veterinary Services, Bechuanaland, might wish to join the Association. Secretary to wire Dr. Boardman re these two candidates, prior to General Meeting.

6. *Resignations.* That of E. C. S. Dawe and W. E. Pearson considered. Decided to recommend acceptance to General Meeting, with regret.

7. *Election of Honorary Association Members.* Due to their valuable contributions to Veterinary Science the following were proposed:

Drs. J. W. Groenewald, J. G. Louw, R. J. Ortlepp and G. Theiler.

Unanimously decided to recommend their election to General Meeting.

8. *Notification of Scheduled Diseases to Veterinary Practitioners.* Letter from D.V.S. read in which it was suggested that a weekly statement be passed by the Sub-Directors to the affiliated branches of the Association. The diseases reflected in the return to be left to the discretion of the Sub-Directors.

9. *Poultry Slaughters National Health Council.* Letter from Dr. Pullinger read. Decided that Council had no proposals to place before the above body for the time being. Dr. Pullinger to be thanked for his continued interest as representative on the National Health Council.

10. *Veterinary Certificates in Non-Scratching Races.* Letter Dr. O'Dowd read. In the discussion it was pointed out that this matter had been raised on previous occasions and that Council had no jurisdiction over the Jockey Club rules and regulations. Dr. O'Dowd to be informed accordingly.

11. *Displaying of Name-plates.* The recommendations submitted by the sub-committee were endorsed by Council and were to be passed on to the Veterinary Board. With regard to No. (5) — road signs to Veterinary Hospitals — Council felt that in cases where Veterinary Hospitals were genuinely difficult to find, the owners were to apply to the Board for permission to erect road signs. Each case should be dealt with on its merits.

12. *Notication of Election of Council for* 1951/52. Nominations were received for the following which were elected without opposition :—

President: S. W. J. van Rensburg.
Vice-President: G. Pfaff.
Hon. Secretary: M. de Lange.
Hon. Treasurer: G. D. Sutton.
Members for 1951/53: R. A. Alexander, W. D. Malherbe, M. C. Robinson, H. P. Steyn.
Sitting Members for 1950/52: J. G. Boswell, A. M. Diesel, P. S. Snyman, A. D. Thomas.

A vote of appreciation was recorded for the active interest taken in the affairs of the Association by the Hon. Life Vice-Presidents.

13. *Standing Committees for* 1951/52.

Finance Committee: A. D. Thomas (Chairman/convenor), R. A. Alexander, A. M. Diesel, W. D. Malherbe, G. D. Sutton (Hon. Treasurer).

Editorial Committee: E. M. Robinson (Chairman/convenor) G. P. Bishop, R. Clark, H. P. A. de Boom, P. S. Snyman.

Library Committee: J. D. W. A. Coles (Chairman/convenor), E. M. Robinson, G. D. Sutton.

General Purposes: W. D. Malherbe (Chairman/convenor), J. G. Bosell, M. C. Robinson.

Book Fund: G. D. Sutton (Chairman/convenor), M. de Lange, A. D. Thomas.

14. *Financial Report* 1950/51. Income and Expenditure Account and Balance Sheet were placed before Council for discussion.

The following recommendations by Finance Committee were dealt with:

(a) The following to be removed from list of members: Drs. K. A. Ross and Casserley. Decided to recommend to General Meeting.

(b) The following items to be transferred to the Benevolent Fund:

Exhibition Stand Receipts, 1950 Conference	£ 57 15 0
Net Profits, 1950 Conference	£ 62 1 3
Legacy (late Mrs. Footner) Agreed	£220 0 0

(c) Group Endowment Insurance. An attempt should be made to persuade participants in this scheme to make other arrangements for payment of their premiums in order to reduce the administrative work in this connection. If members should refuse, the Association was compelled to retain them on the scheme. Agreed.

(d) Sundry Debtor. Member of the Association (Dr. Ross) owed £12 10s. To be written off as bad debt. Agreed.

(e) Auditor's Fee. 25 guineas to be paid for examining the books for the financial year 1950/51. Agreed.

(f) Salaries-clerical assistants.
Mrs. Malherbe's salary to be increased to £10 p.m.; Mrs. Coles' salary to be increased to £10 p.m. for clerical assistance and £5 per month for work in connection with Journal. Agreed, commencing from August 1st, 1951.

(g) Debts: Student.

Cadet Subs. £1 10s. Book Fund £27 4s.

Attempt will be made to recover as much as possible. Balance or all, if necessary, to be converted into a student loan, with interest at 6% per annum from date of qualification. The necessary legal agreement to be drawn up. Agreed.

President thanked the Hon. Treasurer, Hon. Secretary and Dr. Clark, the retiring Editor, for their services during the past year.

15. *Resolutions Committee for General Meeting.* Drs. R. Clark and W. D. Malherbe were elected.

16. *Correspondence.* None.

17. *General.* Secretary reported that The Honourable the Minister for Agriculture would open Congress but was unable to attend the Dinner and Dance.

The Minister for Health was also unable to attend the Dinner and Dance.

Mr. J. J. Adams, Acting Secretary for Agriculture, with Mrs. Adams would probably attend as guests of honour.

Decided to invite the Portuguese officials as guests of the Association to the Dinner and Dance.

S. W. J. VAN RENSBURG,
President.

M. DE LANGE,
Hon. Secretary.

SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION

Minutes of the 46th General Meeting

Present: Dr. S. W. J. van Rensburg (President), Drs. L. Abrams, A. A. L. Albertyn, T. F. Adelaar, R. A. Alexander, R. T. Bangay, D. B. V. Barrow, J. G. Bekker, C. W. A. Belonje, G. P. Bishop, J. H. R. Bisschop, J. G. Boswell, H. N. Botha, J. W. A. Brookes, M. H. V. Brown, P. H. Brown, W. H. B. Buhr, P. H. Bunton, A. S. Canham, R. Clark, J. D. W. A. Coles, V. Cooper, Major L. L. Daly, J. A. de Kock, O. T. de Villiers, D. J. de Waal, G. J. de Wet, Capt. J. L. Dickson, A. M. Diesel, J. L. Doré, F. W. B. du Casse, J. F. du Plooy, P. J. du Toit, R M. duToit, C. J. Erasmus, H. O. Flanagan, C. H. Flight, P. J. J. Fourie, H. Graf, M. M. Greathead, D. A. Haig, L. L. Hansmeyer, R. E. Hartig, F. J. D. Hempstead, M. W. Henning, H. M. Hodkin, C. F. B. Hofmeyr, L. R. Hurter, J. H. Huyser, C. E. Isaacs, B. C. Jansen, C. v. M. Jonker, P. F. Joubert, V. R. Kaschula, A. C. Kirkpatrick, E. B. Kluge, A. B. la Grange, G. E. Lay, A. Littlejohn, A. J. Louw, D. J. Louw, Jac. Louw, R. K. Loveday, I. S. McFarlane, W. M. McHardy, B. M. McIntosh, W. du T. Malan, W. D. Malherbe, P. R. Mansvelt. I. P. Marais, C. Maree, J. H. Mason, P. J. Meara, M. J. N. Meeser, B. Moring, Major D. D. Morton, I. Mowat, R. W. Muir, W. O. Neitz, J. J. Oberholster, S. V. O'Brien, J. J. Oosthuizen, E. J. Ortlepp, J. W. Pols, E. M. Robinson, M. C. Robinson, L W. Rossiter, W. H. G. Schatz, J. R. Scheuber, J. H. Schoeman, K. Schultz, J. Schuss, Maj, G. K. Shaw, Miss U. Sigwart, J. D. Smit, P. S. Snyman, R. A. Solomon, N. C. Starke, N. C. F. Steenekamp, M. Sterne, G. J. H. Stevens, Prof. D. G. Steyn, H. P. Steyn, H. J. J Terblanche, A D. Thomas, J. A. Thorburn, S. G. Turner, W. P. van Aardt, W. van Aswegen, J. R. van Blerk, L. W. van den Heever, N. T. van der Linde, G. F. van der Merwe, J. P. van der Merwe, K. van der Walt, G. C. van Drimmelen, Col. C. J. van Heerden, J. S. van Heerden, I. van Schalkwyk, F. J. Veldman, W. C. Viljoen, L. von Maltitz, P. P. C. Wacher, J. Walker, J. S. Watt,, C. C. Wessels, T. C. W. Wessels, W. J. Wheeler, J. G. Williams, G. D. Sutton (Honorary Treasurer) and M. de Lange (Honorary Secretary).

Apologies for Absence: The following were received: Dr. Pfaff (Vice President), Drs. H. Nelson, Tarr, Woollatt and Keppel.

Tuesday, 21st August, 1951.

8.45 a.m. Congress was opened by President.

Obituaries: Maj. F. C. Gavin and Drs. A. S. McChlery and B. S. Parkin, members of the Association, had passed away during the year, as well as Lady Theiler, Dr. J. Reid and Col.

Watkins Pitchford. The President requested the meeting to stand as a token of respect. He thereafter welcomed the Hon. Mr. S. P. le Roux, Minister of Agriculture, who had come to open the Conference.

The Minister then delivered his opening address and was thanked by Dr. R. A. Alexander, Director of Veterinary Services.

9.30 a.m. Rift Valley Fever: This symposium was intrduced by Dr. R. A. Alexander, after which Capt. J. L. Dickson read a paper on the clinical and field aspects of the disease, while Dr. K. C. A. Schulz discussed the pathological changes, illustrated by lantern slides.

Notification of Election of Council: The following were elected for 1951/52:

President: S. W. J. van Rensburg.
Vice President: Dr. G. Pfaff.
Honorary Secretary: Dr. M. de Lange.
Honorary Treasurer: Dr. G. D. Sutton.
Members for 1951/52: Drs. R. A. Alexander, W. D. Malherbe, M. C. Robinson, H. P. Steyn.
Sitting Members (1950/51): Drs. J. G. Boswell, A. M. Diesel; P. S. Snyman and A. D. Thomas.

New Members: The following were recommended by Council and unanimously accepted by the meeting: Drs. R. T. Bangay, I. R. Banks, G. C. Dent, H. O. Flanagan, E. M. Hearn, D. H. G. Irwin, R. C. Nixon, S. V. O'Brien, D. J. Schneider, (Miss) Ursula D. Sigwart, L. A. Simpson, P. R. B. Smith (Junior), T. Smuts, L. G. Steel, C. J. V. Trichard, C. H. van Niekerk, A. van Heerden, I. van Schalkwyk, J. B. Condy and J. E. R. Roe.

Election of Honorary Associate Members: By virtue of their long association with Onderstepoort and their valuable contributions to Veterinary Science, the following were recommended by Council and accepted unanimously by the meeting: Drs. J. W. Groenewald, J. G. Louw, R. J. Ortlepp and G. Theiler.

12.00 noon Dr. Robinson delivered his paper on "The Haemagglutination Test for Tuberculosis" followed by a brief discussion.

1.30 p.m. Demonstration on the Metal Detector and Rumenotomy by Drs. F. J. D. Hempstead and F. W. B. du Casse.

This was followed by a discussion on after-treatment by Dr. Hempstead and a paper on the diagnosis and differential diagnosis by Dr. C. F. B. Hofmeyr.

3.00 p.m. Dr. G. C. van Drimmelen opened a discussion on the Contagious Abortion Test, indicating the scope of the test and its relation to inoculation.

Wednesday, August 22nd, 1951.

8.45 a.m. Dr. C. W. A. Belonje gave his paper on "Pseudo-Tuberculosis in Sheep in the Cape Midlands."

At this stage Drs. J. G. Louw and R. J. Ortlepp expressed their appreciation for being elected honorary Associate members of the Association.

9.45 a.m. Dr. W. M. McHardy gave a paper on "Some Observations of the control of ticks by Serial Dipping and Spraying", by himself and Mr. J. A. F. Baker.

11.15 a.m. Demonstrations at Kaalplaats :—

(a) By Dr. R. du Toit on spraying of cattle with new insecticides.

(b) By Mr. N. Reinach on the administration of phosphates in soluble form in drinking water.

Both demonstrations were followed by lengthy discussion and were greatly appreciated by members.

1.30 p.m. Demonstration by Drs. R. J. Ortlepp and W. D. Malherbe on lungworm (Filaroides osleri) in dogs, its occurrence in South Africa and the symptoms and diagnosis.

2.15 p.m. At this stage the President welcomed the Trade Exhibition to the meeting, saying that the exhibition was becoming increasingly important and thus formed a great attraction at Congress every year.

The following films were then shown. "Anavenol-K Anaesthesia in Large Animals", by kind permission of Messrs. Imperial Chemical (Pharmaceuticals) Ltd. "Nagana in Zululand" by the Division of Veterinary Services and the Union Film Bureau. "Aureomycin" by Messrs. Lederle Laboratories.

7.30 p.m. A pleasant evening was spent at a dinner and dance at the Union Hotel, which lasted till midnight.

Thursday, August 23rd, 1951.

8.45 a.m. A discussion on "Heartwater Immunisation" was opened by Dr. R. E. Hartig, who related his experiences in practice on immunisation of calves and adult animals. The lively discussion which followed emphasised the importance and popularity of this subject.

9.45 a.m. Dr. R. E. Hartig opened a discussion on "Cattle Sales and Market Inspection" by pointing out how serious the position had become regarding the indiscriminate sale of dairy cows.

In the discussion which followed, Dr. Loveday drew attention to the chaotic state of affairs on the Witwatersrand with regard to the sale of dairy cows, transmitting Brucellosis, Mastitis, Infectious Sterility, etc., the dairy industry bordering on insolvency on account of these diseases and he thought that the time for government interference was overdue.

Dr. Diesel agreed with the previous speakers and pointed out that in Great Britain there was a scheme in operation for combating disease in dairy animals. Some scheme should be devised for raising healthy calves, salvaged from dairy herds, now being slaughtered.

Dr. Cooper felt that dairymen should be educated into buying with greater discretion, rather than introducing legislation.

Dr. J. S. van Heerden emphasised the appallingly low rate of conception of dairy cows in the urban areas, as compared with the fertility of cows in rural areas.

Dr. v.d. Heever indicated that the problem was even greater from the farmer's point of view as cows suffering T.B. and C.A. not necessarily showed any outward signs, yet could disseminate disease.

The President in thanking Dr. Hartig for his two papers expressed the opinion that dairymen should be educated and warned against the problems involved. He also sounded a note of warning on the issuing of certificates by veterinarians on the state of health of dairy animals.

10.15 a.m. Dr. D. G. Steyn gave his paper on " Nitrate and Nitrite Poisoning in Animal and Man ". This was followed by a lively discussion.

11.30 a.m. Dr. K. E. Weiss read his paper on " The Modern Conception on the Pathogenesis of Milk Fever and Bovine Ketosis ".

1.30 p.m. *Business Meeting of Members.*

1. Minutes of the 45th General Meeting published in the Journal. Adopted.
2. Arising from these minutes:
   (a) *Membership Australian Veterinary Association*: Dr. Malherbe was now a member of the A.V.A., as representative of the whole profession, this in recriprocity with Dr. Hindmarsh of Australia, who is one of our members.
   (b) *Dr. Bales Scholarship*: Award for 1951 had been given to Mr. D. C. L. Wacher, final year B.V.Sc. student.
   (c) *Resolutions of the 45th General Meeting*:
      (i) Re Biologist on National Parks Board, the resolution had been passed on to the board concerned and an acknowledgment received.
      (ii) Appreciation of the effort of the S.A.A.U. on behalf of the Veterinary profession had been passed on to that body.
      (iii) Senior posts and appointments to the Veterinary Board: Shortly after representations had been made by the S.A.V.M.A., a Chairman had been appointed to the Veterinary Board, and more recently the matter of making appointments to the Senior Posts at Onderstepoort had been concluded.
      (iv) Re Cropping of Dogs' Ears: Secretary had written to the S.A. Kennel Union suggesting the opening of negotiations about this matter but was met with a complete unwillingness to hear the case for Cropping. The matter had therefore been dropped for the time being. Would be reopened in the form of an article published in the Journal on this subject. This article to be sent to the S.A. Kennel Union and other bodies.
3. *Resignations*: Dr. Dawe wished to resign as he was returning to England. Dr. W. E. Pearson, of Vom, Nigeria, tendered his resignation. These were accepted.

4. *Deletion from Membership List*: It was unfortunately found necessary to delete the names of two members from the membership list. Dr. Casserley of whom all trace was lost and who is believed to be living in Ireland. And of Dr. K. A. Ross, for other reasons.

5. *Presidential Address*: Dr. van Rensburg then gave his Presidential Address. He was warmly congratulated by Dr. Coles and other members of the Veterinary Profession for drawing attention to some very serious and important aspects of farming in South Africa.

6. *Reports from Standing Committees*: *Finance*: Dr. Sutton, Honorary Treasurer, read the report on the Balance Sheet and commented on the Auditor's report. The finances of the Association were in a healthy state, with comparatively little outstanding in subscriptions and other debts. The report was unanimously accepted.

7. *General*:

   (a) *Publication of Minutes of Council Meetings*: President invited members' views on the suggestion that instead of publishing the minutes of Council meetings in their entirety, the more important items should be more fully recorded and published in the Journal for information of members. Agreed. Proposed by Maj. L. L. Daly and seconded by Dr. Coles that a list of members of Council who attended each meeting be published for information of members.

   (b) *Early Conference Date*: Dr. O. T. de Villiers expressed his thanks to Council for arranging for General Meeting to be held in August. He complimented President on his address and the other office holders for their able conduction of the meeting.

   (c) *Publication of Papers*: Dr. Meeser requested that attending mebers be provided with copies of papers to be given at the Conference. President stated Council was considering matter but there were difficulties. Response to appeal to members for papers for presentation at Conference had been good, but summaries were sent too late for inclusion in Journal published before Conference. Also it should be noted that of necessity some papers would have to be read without previous publication if the very latest problems of the profession were to be elucidated. This should therefore be kept a flexible rule.

8. *Instructions to Council*:

   (1) "This 46th General Meeting of the S.A.V.M.A. in session at Onderstepoort on August 23, 1951, requests Council to consider in which way the Profession can best play its part in combating the widespread and indiscriminate sale of diseased dairy cattle in the Union."

   Proposed Dr. R. E. Hartig, seconded Dr. R. K. Loveday.

(2) "Council should appoint one or more Standing Committees to keep under continuous review the production of foodstuffs of animal origin in the Union."

Proposed by Dr. J. D. W. A. Coles, seconded Dr. J. Boswell.

President concluded the meeting with thanks to Dr. Alexander, D.V.S., for placing the facilities of Onderstepoort at the disposal of the Association, and also to the office bearers of the Association, Drs. de Lange, Sutton and Clark to whom fell the task of organising the programe and carrying it into effect. Also to the two clerical assistants of the Association, Mrs. Coles and Mrs. Malherbe. The meeting closed at 3.30 p.m.

S. W. J. VAN RENSBURG,
President.

M. DE LANGE,
Hon. Secretary.

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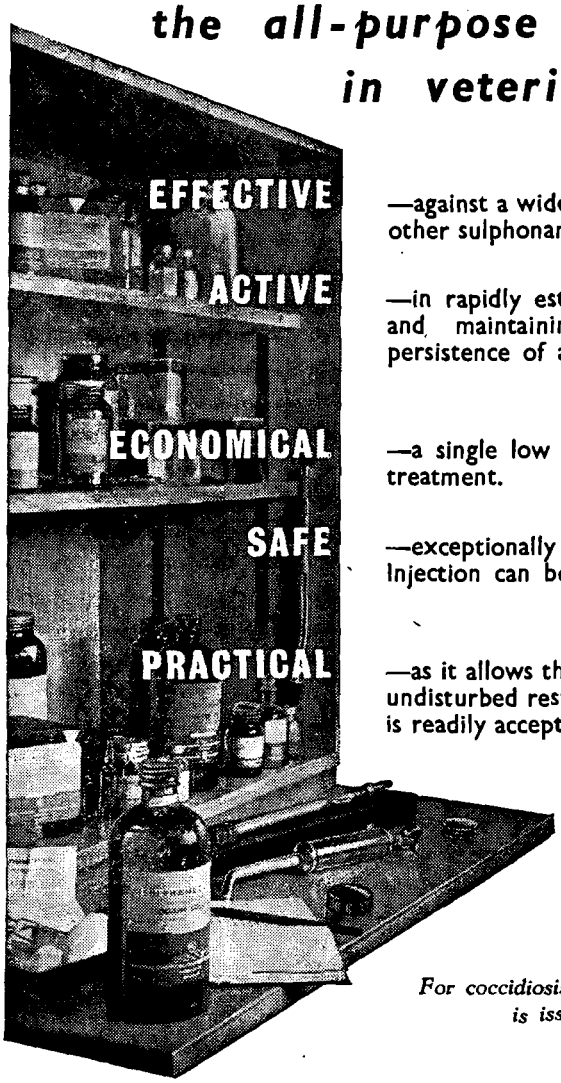

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Jl. S.A.V.M.A. 22(4), 1951.

PSEUDOTUBERCULOSIS OF SHEEP

C. W. A. BELONJE
Middelburg (Cape)

The purpose of this paper is to draw attention to the ever-increasing incidence of this disease in the Cape Midlands.

Mortality in Merino Lambs

The experience of Grootfontein in the past has been that lamb mortality among merinos is rather high. Generally the opinion was that due to an over emphasis on wool production, milk production and mothering qualities of the merino have been neglected by breeders.

In a breeding experiment conducted here since 1942, the lamb mortality ranged from 0 to 46.3% for the two studs of 100 ewes (A & B studs). These two studs are under identical conditions. They are in one flock, in the same camp, the whole year round. For the past two years another stud (the O stud) of 100 ewes has been run with the above-mentioned two studs. These three studs represent three different types of merino sheep (classified on degrees of bodyfold development) and among the many factors studied, fertility and lamb rearing ability, are regarded as very important.

The probable causes of deaths during 1950 when the mortality was the highest for the experimental period, will now be considered. The difficulty was that in 1950 no veterinarian was available, with the result that no accurate post mortems were performed in order to determine the actual causes of mortality.

The procedure of management was as follows :—

Every morning the ewes that had lambed, were brought in and their lambs ear-tagged. They were then put into another camp. Unfortunately this camp was very heavily infested with "duwweltjie" (tribulus terrestis).

The lambs started to limp and a general stiffness of the limbs was observed. Occasionally the "duwweltjies" were removed from the hoofs. Abscesses started to make their appearance in between the hoofs and also at the coronets. A greenish pus was found in the abscesses.

With the heavy rains at this time, the position seemed to grow worse. Lumpy wool with a general hardening of the skin was also found.

In the absence of accurate post mortem analysis, the following table may give an idea as to the probable causes of death:

1950

Stud	*No. of lambs born*	*% Died at birth*	*% Died after 7 days*	*% Died between 7 days and weaning*
A	80	7.5	7.5	31.25
B	91	4.4	5.5	8.8
C	53	3.8	3.8	5.7
Total	224	5.4	5.8	17.4

(1) Still-birth may be due to hereditary factors, accidents or bacterial infection.
(2) Deaths during the first week of life may be due to lack of milk, poor mothering qualities or some form of disease.
(3) Deaths after the first week of life may be mainly due to disease.

Owing to the nature of this experiment which was a genetic one, it is very important to determine the disease factor. It may be argued that as all the lambs were subject to the same degree of infection, why then this great difference in mortality among the three studs ?

Although the figures for the 1951 lambing have not been sorted out into the above age groups, I wish to give you the figures of mortality within the first 6 weeks of life. These include —

(1) still-births,
(2) those that died shortly after birth, such as weak lambs, twins and others.

1951

Flock	*No. of Lambs Born*	*Mortality*	*Remarks*
A	98	22.4%	These three flocks ran in one camp
B	100	16.0%	
C	94	8.4%	
D	79	10.1%	These two flocks ran in one camp
E	81	8.6%	

I was consulted about this 1951 outbreak after several lambs had died. The affected lambs showed great difficulty in walking, being very stiff, particularly in the fore-quarters, although one case had an enormously enlarged stifle. Palpation of the superficial lymph glands revealed no abnormality. Post mortems conducted on two cases revealed no abnormality. Post mortems conducted on two cases revealed no infection of the prescapular or precrural glands, but extensive lesions in the thorax. Acute broncho-pneumonia with adhesive pleuritis, purulent pericarditis and abscessation of the bronchial and mediastinal glands, were present. In one case the pericardium contained about 4 ounces of pus.

The lamb with the very enlarged stifle had extensive ulcerations of the articular surfaces, with fibrous thickening of the joint capsule and commencing ankylosis. In all cases the pus was watery and of a creamy-yellow colour. The condition and vitality of the lambs considering the pathological changes was nothing short of marvellous.

These lambs, being stud lambs, had also been ear-marked by means of an ear-punch and aluminium tag.

Epidemic Pneumonia.

One outbreak seen in the Graaff-Reinet district had the predominant symptom of pneumonia. It occurred in a flock of stud merino lambs of about 4-6 weeks old and about 7 days after ear-marking and tailing. The flock was running in a lucerne land, but when deaths started, the owner immediately moved it to another land, as he suspected poisoning and failed to halt the mortality.

About 30 lambs died and the post mortems conducted on three lambs revealed acute broncho-pneumonia. There was no emaciation or anaemia, the lambs being in excellent condition. Two sick lambs were railed to the Onderstepoort Laboratories, where bacteriological examination revealed the cause to be Corynebacterium ovis.

Bacterial Icterus.

Robinson(4) in investigating deaths occurring in a flock of sheep, subsequent to bluetongue inoculation during February, 1926, isolated a bacterium from a swelling at the site of inoculation of one of these sheep. This bacterium was later identified as C. pseudotuberculosis ovis.

Emulsion of cultures made from this organism were inoculated subcutaneously and intravenously into sheep and in a large percentage of cases gave rise to very high temperature reactions, haemoglobinuria, well marked icterus followed by death.

At post mortem this bacterial icterus resembles enzootic icterus so closely, that it can easily be confused with it. According to de Kock(7), however, in bacterial icterus the haemoglobin pigmentation of the kidneys is less extensive and these organs are not so intensely reddish-brown in colour and the zones can always be identified.

Isolated cases of icterus occur throughout this area, although its appearance is very sporadic. Some farmers observe one or two cases one year, followed by an interval of a few years when no cases occur. Invariably the sheep is found dead in the veld and on cutting open reveals the generalised jaundice. This is most evident in the adipose tissue which is stained a deep bright canary yellow colour.

One large outbreak of enzootic icterus occurred in the Murraysburg area during 1949, but all attempts to unravel the aetiology of the condition proved fruitless.

It is therefore impossible to say whether the few odd cases of fatal icterus encountered in this area are the result of this disease called " enzootic icterus " or the haemolytic form of the Corynebacterium ovis as demonstrated by Robinson(4).

Epididymitis in Rams.

During his work on the seasonal variation of sperm production in rams, the late Mr. D. Engela of Grootfontein College, encountered more and more cases of infertility. This was indicated by varying degrees of abnormality in semen collected by means of the Gunn's electric ejaculator. These abnormalities in the sperm picture, were particularly noticeable in the imported breeds and he ascribed the condition to lack of adaptability of these animals to local conditions.

Working together we found that there was a very close relationship between palpable testicular abnormality i.e. in the structure, texture or consistency, and the sperm production.. Where the testicle became firmer in the glandular portion, the percentage of abnormal sperms increased. These abnormalities were predominantly broken off heads, cytoplasmic protrusion of the middle piece, curled tails and decreased motility.

Where extensive structural alteration had taken place with enlarge-

ment and hardening of particularly the tail of the epididymis, the percentage sperm abnormalities increased even more, cellular debris was distinct, motility became even more reduced and the total number of spermatozoa per ejaculate became smaller.

These testicular and epididymal changes were not always confined to the one testicle alone, but very often affected both in a remarkable symmetry.

In examining rams offered for sale during the annual ram sale at Bloemfontein, Mr. D. Engela stated that he found no less than 30% affected with these structural changes.

During 1948 forty (40) of these Grootfontein rams were forwarded to Onderstepoort, where they were post mortemed in the presence of Engela and myself. Bacteriological examination revealed C. ovis lesions, either in the form of the usual caseous nodules or as disseminated pinhead size pustules throughout the head or tail of the epididymis. The organs in the advanced cases were very fibrotic, the testicle usually being atrophied, whereas the tail and frequently the head of the epididymis were hypertrophied and very firm. This hyperplasia of the epididymis is a very distinctive feature of the disease and it was particularly the tail of the epididymis which was mainly affected and clinically demonstrable.

It appears that the fibrosis of the epidimymis leads to a compression of its tubules with consequent passive congestion of the spermatozoa and back pressure on to the glandular structure of the testicle with resuling testicular atrophy and abnormal sperm production.

Strangely enough many of these rams did not show other foci in the rest of the body. Others had the usual abscessation of the mediastinal and bronchial lymph glands, the prescapular or very rarely the precrural glands. From this, one would be inclined to surmise that where the disease was localised in the genital organs only, its origin was either from coitus or due to local infection through the scrotum.

Most of these rams had pendulous testicles and had been kept confined in these small pens for years. Up to date no genital infection of ewes has been found and coital infection can be ruled out. It must be mentioned, however, that this organism does give rise to the Strauss reaction in the guinea-pig, i.e. a suppurative orchitis follows an intra peritoneal injection. The testicle hence does appear to exercise a definite attraction for this organism even though its point of entry may be remote from the genital organs. De Lange in his histopathological report on these rams, states that 18 of these rams had a purulent epididymitis and another 12 showed foci in other parts of the body. All the merino rams were infected although not all showed the typical abscesses in the genitalia. The majority of Preisz Nocard abscesses in the epididymis occurred in the Dorset Horn and in the $\frac{3}{4}$ and F^2 Dorset x Persian crosses. No cases were found in the F^1 Dorset x Persian rams and the purebred Persian rams appeared least affected.

The question of a virus infection was excluded by using a bacteria free filtrate inoculated intra-scrotally, into the scrotal sac and also into

the testicular substance. No reactions occurred. It is interesting to mention that the sub-inoculation of this filtrate could not be performed at Onderstepoort immediately, as the two rams submitted for the experiment were found to be suffering from epididymitis.

Several letters have been received from farmers in the Cape Midlands asking for advice on the treatment of stud rams that have developed a swelling above the testicle. What actually happens is that the tail of the epididymis is taken for the testicle and the testicle itself for the abnormality.

Emaciation and Cachexia.

The disease in adult sheep runs a very insidious course. Enlarged glands may be felt during life at the point of the shoulder, in the flank or near the udder. Bursting glands with a green discharge matting and crusting the wool, are frequently observed.

Probably many of these cases originate as wound infections either in early youth following castrations, docking or ear-marking, but there must be little doubt that in adult sheep, the repeated shearing with its consequent and unavoidable nicking of the skin, must form the most obvious source of germ introduction by means of contaminated machines, shears or kraals. To give an indication of the percentage infection, found in normal healthy looking sheep, slaughtered at Grootfontein College, for human consumption, the following figures are available for the period 18 September, 1950, to 19 April, 1951:—

487 slaughtered (107 infected): 70 in liver lymph gland,
42 in pluck,
7 in superficial lymph glands

i.e. just on 22%.

Where the internal lesions become large, particularly in extensive lobular caseous pneumonia, the animal becomes unthrifty, does not respond to better feeding and eventually emaciates and dies. Two farms within the Middelburg district, are already so infected that I have had to advise the owners not to keep sheep over 4 years old.

Whether the emaciation, debility and cachexia are the result of the bacterial toxins or due to toxic absorption of pus, has not been solved. It is, however, a fact that the use of antitoxic sera has proved of little value therapeutically(1).

Post Mortem

The post mortem examination usually reveals one or more lymph glands with the changes typical of the disease. The gland is enlarged, often enormously so. The content is caseous, greenish-yellow in colour, either moist or dry, and when dry is arranged like the scales of an onion (laminated). Calcification is absent, but the pus is surrounded by a fibrous capsule which increases in thickness with age. The lining membrane of the abscess cavity is, however, smooth.

According to Gaiger and Davies(1) the prescapular gland is the most commonly affected and after that the inguinal, mammary or precrural. This has not been my experience, the predominant seat of the infection being in the hepatic lymph glands. The lesions here are

usually small and rarely exceed a hazelnut to a walnut in size. Next most frequent are the bronchial and mediastinal lymphatic glands and even the lung tissues itself, and it is here where one frequently encounters large abscesses up to and even larger than an orange.

Meat Inspection

The examination procedure for all carcases is laid down in S.A. by Section 12 of G.N. 2118 of 1924. The superficial inguinal, precrural and liliac lymph glands shall be incised and the surfaces examined. In making such incisions, care shall be taken to avoid any unnecessary soiling, contamination or damage (as regards marketability) of the carcase or organ.

Furthermore every organ and the associated lymph glands, shall be examined by inspection and palpation and incised if deemed necessary.

As caseous lymphadenitis is one of the diseases not specifically mentioned for any line of action, Sec. 18 becomes applicable.

This section authorises every meat inspector, with powers of condemnation, finding in a carcase or organ evidence of any disease or parasitic infestation not mentioned in the regulations, to remove and condemn the whole, or such portion which in his opinion is unsound, unwholesome or unfit for human consumption.

In actual practice this means that the affected superficial glands are excised and the limbs passed. Where the pluck is involved, this is condemned and the carcase passed.

Even assuming that the bacterium is innocuous to man, about which there is no apparent unanimity yet, the passing of the carcase as fit for human consumption in extensive infection is, to my mind unsound. In that case the condition is distinctly one of pyo-bacillosis and its evaluation should be dealt with as under Sect. 17 of the same Government notice, which demands total condemnation of the whole carcase and all its organs for cases of pyaemia, including joint ill and umbilical pyaemia.

In 1937 I was stationed as meat examining officer at the Imperial Cold Storage Abattoir, East London, for the export of lamb and mutton to the Smithfield Market, England. The English Importation Law demands the examination and incision of the superficial glands and insists that these incised glands remain in situ. Only carcases with healthy glands were allowed to be passed for export, the rest being rejected. Dr. Horwitz stated that since 1933 an ever increasing incidence of this disease, was noticed in the Port Elizabeth Abattoir. These " rejects " as they came to be known, were sold on the local market where the excision of such infected glands is permitted by the above-mentioned law.

To indicate the percentage rejections that took place the following figures are given:—

1937 Lambs under two tooth 5%

± 2,000

Sheep, two tooth and over 33%

These were sheep that came predominantly from the Eastern Cape and Karoo Midlands, many being merino crossbreds reared on lands,

although towards the end of the export contract more and more old merino ewes and hamels were being received for slaughter.

Differential Diagnosis

Differential diagnosis suggested, is by bacterial examination of the pus, particularly that lying next to the abscess wall. More often than not these abscesses contain a very mixed bacterial infection.

Opperman([10]) suggests the tuberculin test to exclude cases of tuberculosis in sheep and goats which apparently do occur in Germany. The incidence of tuberculosis in sheep and goats in South Africa, is unfortunately unknown.

Treatment

The organism being gram positive, the disease responds very well to penicillin and sulphonamide treatment. For the pneumonia outbreak and in the joint ill cases sulphapyridine gave excellent results, but naturally required repeated 6 to 12 hour interval dosing.

During the recent (1951) outbreak at Grootfontein, amongst lambs, the following were tried:—

No.	*Temp.*	*Dosage.*
1. A 51.20	101.8	Penicillin (Squibbs) in oil. 300.000 units i.m. Penicillin crystalline 200.000 in 1 c.c. intravenously. Lamb very cripple and stiff.
2. A 51.50	102.0	The same as above.
3. A 51.45	102.5	Soluseptasine 20% 2 c.c. i.v. and 2½ c.c s.c.
4. A 51.43	100.0	Penicillin crystalline 200.00 in 1 c.c. intravenously. Penicillin oil 300.000 i.m. Soluseptasine 20% 2 c.c. in joint.

Cases 1 and 2 were discharged after 3 weeks as apparently cured. Case 3 appeared normal in health except that its posture was abnormal, the head and neck being carried very low and the animal breathing with difficulty after being chased. On post mortem it revealed no C. ovis lesions, but showed an enormous thyroid gland extending from the pharyngeal region to the thoracic inlet and obviously compressing the trachea.

The 4th case revealed articular lesions of the stifle joint, a purulent pericarditis containing approximately 4 oz. of pus, and pneumonia upon post mortem.

Superficial abscesses can be treated by surgical excision or by evacuation of their contents. The first procedure is preferable, as it avoids dissemination of the pus.

Preventive Inoculation

In Australia experiments are being conducted with a Preisz Nocard vaccine, by the use of which annual inoculation prior to shearing appeared to reduce the incidence of caseous lymphademitis quite appreciably. Nevertheless, it was felt that the degree of protection was not nearly good enough and further modification of the vaccine is apparently still in progress([8]).

At Grootfontein several batches of sheep have been inoculated with a C. ovis toxoid prepared at Onderstepoort, but as these sheep will not be slaughtered for another six months, no data are available.

Prevention

In view of the fact that preventive inoculation may not prove entirely satisfactory, it remains essential to take all adequate steps to prevent the further spread of the disease on infected farms.

As the disease, in the merino at any rate, appears mainly associated with shearing, docking, castration and ear-marking, the following procedure is recommended on infected properties in Australia(9).

A. *Before Shearing*:

(a) All litter and dung should be removed from the shearing shed, soaked in paraffin and burnt.

(b) The floors to be scrubbed with a 5-10% cresol or other coal tar product, such as lysol, Jeyes fluid, creolin, etc., and shut up for 24 hours.

(c) The floors may then be cleaned with hot or boiling water containing washing soda. All iron-work can be seared with a blow lamp.

(d) The shearing shed can now be closed and left to dry, after which the walls can be white washed with the solution containing up to 5% carbolic acid or any of the other preparations mentioned.

(e) All movable objects such as pails, shovels, wheelbarrows, tools, can be soaked or washed in Jeyes fluid.

(f) Persons, such as the shearers can disinfect their hands by means of scrubbing with soap in a 5% Jeyes fluid solution. Boots may be dipped in disinfectant.

B. *At Shearing Time*:

At shearing time(9) the dust should be kept down by hosing or spraying the receiving and holding yards with a disinfectant solution. The shearing boards should be kept clean and sprayed daily with disinfectant. After each sheep is shorn, the shears or blades of the shearing machine should be dipped in an antiseptic solution and in the case of machines, they should be kept running while in the solution.

During shearing the dust in the pens should be kept down by spraying, using a disinfectant in the water. Sheep should be counted out as often as possible to prevent accumulation of droppings.

Shear cuts should be treated with an antiseptic. Owing to the difficulty of effectively treating every cut on the shearing board, Vernon recommends the sheep to be put through a carbolic dip, not an arsenical one, immediately after shearing. Such dipping would ensure that every cut, no matter how small, would be treated.

C. Sheep with swollen glands should be isolated and the gland excised or the abscess drained. When draining such abscesses, the greatest care must be exercised, to avoid contamination of the wool, the pen, crush or shed, to prevent forming foci of infection. Such animals should be kept in isolation until they have completely healed.

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2112-1

MODERN METHOD OF WIRE DETECTION IN BOVINES

F. J. D. HEMPSTEAD and F. B. W. DUCASSE,

Johannesburg.

Our object in submitting this article is to acquaint the veterinarian with the advantages we have derived from the use of the Cintel Metal Detector in the diagnosis of metal bodies, or " wire ", in the reticulum of cattle.

Previous to the acquisition of a metal detector, the diagnosis of wire was on occasions, a " hit or a miss " one or, a " last resort " diagnosis where no other specific cause could be found for an animal's general decline in condition.

The veterinarian will often be called in, to attend an animal where the owner will offer no other information than that the cow has been off her food for the past few days, there has been a considerable drop in her milk yield, and her temperature has varied from normal up to 105° F. After making his examination the veterinarian will, more often than not, be unable to find any symptoms other than those already described by the owner. He may then suspect the presence of wire in the reticulum. We have found that the symptoms of wire are extremely varied and it is sometimes virtually impossible to make a diagnosis without the use of the Detector. Our experience is, that the following symptoms are the most common in affected cows:—

1. Atony of the rumen.
2. Hoven.
3. Arched back and abnormal gait.
4. Shallow, accelerated respiratory movements.
5. Grunting on respiration.
6. Grunting when forced to walk downhill.
7. Obstipation.
8. Violent purging, the faeces often containing blood.
9. Violent colic with the animal thrashing about in pain.
10. Cessation of rumination.
11. Abdominal colic during or after feeding.
12. Chronic cough with ejection of sputum, sometimes containing blood.
13. Chronic bloat of one or more cows in a dairy, where one can exclude oesophageal obstruction due to abscessation, etc.
14. " Not doing well " after calving. The practitioner is often called in to see a cow which was in the pink of condition prior to calving, and calved normally. In such a case one naturally suspects a metritis and where this can be excluded, he can be fairly certain of the presence of a penetrating foreign body. The strain of calving seems to accentuate the penetra-

tion of the foreign body and the first symptoms manifest themselves just after calving.

As the general practitioner will appreciate most of the above symptoms, if not all, can be attributed to many other causes than wire.

In the past we have often made a fairly definite diagnosis of wire on the following symptoms:—

1. Pericarditis with jugular pulse.
2. Oedema in either the throat region, neck or dewlap.
3. Abscess formation on the chest just behind left elbow.
4. Liver hypertrophy (suspected abscess).

With the above symptoms, it gives no satisfaction to the owner or the veterinarian if wire is diagnosed and in the same breath the diagnosis is qualified by the statement that treatment is of no avail and it is merely a matter of time before the animal will die. It is embarrassing to the practitioner after attending the animal on numerous occasions during the course of a few weeks to finally be able to diagnose wire and then to inform the owner that the condition is so far advanced that further treatment will be of no avail.

Tests we have used in the diagnosis of suspected wire are well known to the general practitioner, viz:—

1. The feeding of lucerne or teff to see whether discomfort is caused.
2. To drive the animal downhill to see whether it shows pain when walking.
3. Pinching the area in the region of the withers to see if it went down.
4. The "pole test" applied over the region of the zyphoid to see whether grunting would result.

It is obvious that the above tests will often give extremely satisfactory results but, when confirmed by use of the metal detector, one can be almost positive in one's diagnosis and proceed to operate with an easy conscience.

Prior to the use of the metal detector we found that by the time we were in a position to diagnose wire, our percentage of operative successes was not more than 50%. Since adopting the metal detector as a confirmation of diagnosis our successes have risen to over 90%.

The Cintel Metal Detector is a small compact unit, fitting neatly into a box which can be transported in the practitioner's car without taking up much room. In weight it is little more than the average pracitioner's instrument bag. It is simple in operation, consisting of three parts, viz.:—

(a) A small box suspended from the operators shoulder by means of a leather strap.
(b) Earphones.
(c) Magnets contained in the detector head.

It is an exact replica of the mine detector. When in operation, the operator is advised of the presence of metal by a high-pitched scream in the earphones. When testing an animal it must be kept away from all metal fittings, e.g. neck-chain and steel stanchions, and the detector

head must be kept away from the magnetic box or it will give a positive note in any position on the cow. The detector will give a positive reaction to a steel stanchion up to a distance of 2 feet. The detecting head is passed slowly along the sternum and the exact position of the metal is fixed by clipping the hair over the region where the detector gives out the highest pitch.

Since the introduction of the wire detector, it is amazing how enthusiastic the dairy farmer has become over the use of this instrument. The more experienced dairy farmer, who is quite capable of diagnosing the more or less straight-forward ailments often, when demanding attention for a sick animal requests that we bring the wire detector and be prepared to operate should the animal in our opinion be suffering from wire. Many dairy farmers, particularly those some considerable distance from our hospital, who have suffered heavy losses in the past through wire, have had their whole herds tested. Their object in having this done is to know the percentage of positive reactors in their herds so as to be able to pay more particular attention to these animals. Should they show any deviation from normal health over a period of a few days, excluding of course any other common ailment, they are in a position to prepare the animal for rumenotomy should it in our opinion be necessary.

The immense value of the use of the metal detector to the practitioner can perhaps be judged by the following examples:—

1. Pedigree Friesland herd numbering 85. Prior to the use of the metal detector, there had been 4 rumenotomy operations done. All died and at post mortem the animals showed advanced pericarditis, peritonitis, abscesses, etc. Since the use of the metal detector there have been 23 rumenotomies during the past 2 years. Mortality has been nil.
2. Friesland Grade Herd numbering 310. Approximately one animal per month had been lost through wire. Since using the metal detector 31 rumenotomies have been performed. Mortality has been nil.
3. Mixed Pedigree Herd — Friesland and Ayrshire. On four occasions wire was diagnosed with the metal detector. The owner was not anxious to have operations performed immediately, but preferred to wait to see if animals would recover. Operations were eventually performed. All four died.
4. A grade Friesland Herd of 36 animals. All were tested and rumenotomy performed on 11. Mortality was nil. (From one animal 26 nails and large pieces of wire were removed, apart from small pieces. Three large abscesses could be felt bulging into the reticulum in this animal, yet in spite of this the animal did very well after the operation.)

One point which must be stressed is that a negative "wire test" does not always exclude wire or a foreign body. Often after a negative test, if the animal dies and the practitioner does a post mortem, he may find a very advanced pericarditis, gangrenous pneumonia, etc., and yet no sign of "wire", it having completely rusted away.

In one case where there was a negative test, and a post mortem examination held after death, a "track" was found leading to the heart, yet no sign of wire or severe pericarditis. On incising the myocardium a piece of wire was found exactly 4½ inches in length, completely buried in the heart muscle and bent to the shape of the heart.

This piece of wire was so far forward that one could not get the detector between the forelegs, hence the negative test.

Indications for Operation.

Once a diagnosis of "wire" has been made the veterinarian must decide whether an operation is indicated or not and advise the owner accordingly. In arriving at this decision he must be influenced by a number of factors, most essential of which are age, fertility in the case of breeding animals, and milk production in the case of dairy animals. Further a very careful examination must be made of the animal's health — any history of a chronic cough or the presence of any indications of pericarditis, myocarditis or pleurisy are contra-indications for operation. Pregnancy plays little or no part. We have operated on animals up to within 14 days of calving without any untoward effects.

The Operation.

Much has been written on the technique for performing this operation. In many cases a very intricate and involved technique is described. The procedure adopted by us is the simplest we have devised and it has given very good results in the field, often under far from satisfactory conditions. The animal is preferably starved for 24-48 hours prior to operating although this is not essential. It is tied in a clean stable with the right flank nearest to the side wall. The left flank between the last rib and the point of the hip and down from the spine for 12 inches is shaved and the whole area cleaned with soap and water and finally with spirits. A local anaesthetic is injected down the site of the incision, which is approximately 1 inch behind the last rib and extending down approximately 10 inches from the spine. We use approximately 40 c.c. of a 5% Planocaine Solution injected subcutaneously and intramuscularly. (The only restraint used is holding the animal's nose.)

Five minutes after injecting the local anaesthesic the area is again cleansed with spirits and the operator's hands are washed with soap and water and finally rinsed with spirits. Three assistants are required — one to hold the animal's nose, one to keep the animal pressed against the wall and one to hold the rumen when required.

Technique.

An incision approximately 8 inches long is made through the skin commencing as high up as possible. A small incision is then made through the muscular layers in the centre of the wound, the fingers are inserted into this incision and the muscles are separated by swift traction. The peritoneum is grasped and incised and the hand then inserted into the abdominal cavity and the rumen grasped as high up and far back as possible and pulled through to the exterior. Long handled towelling forceps are used to grip and hold the rumen and

these are held by the third assistant. The forceps are placed about 7 inches apart and a vertical incision is made through the ruminal wall about 6 inches in length — sufficient to admit the operator's arm.

The operator's hand is then well soaped and inserted deep down and forward into the reticulum until his fingers can feel the point of the heart. The wire will normally be felt lying at the base of the reticulum, and is gently pulled out of the wall and removed through the ruminal wound. The hand is again washed and soaped and inserted for a further search. It is advisable to retract the hand with the wire as soon as it is found and not to try to " palm " it and go on searching, or one is bound to lose the piece and spend a further 10 minutes searching for it. When all the loose pieces have been removed a very careful finger touch search is made over the reticular wall as often one finds nothing in the reticulum, and yet on careful search one feels a metal object in the honeycomb and extracts it to find it is a nail that has penetrated right through and the head of the nail has prevented further penetration. One is greatly assisted in one's search by grasping the reticular wall at intervals and pulling backwards. At the point of the penetration adhesions will have formed preventing retraction and one then has only to search the adhering area for the foreign body. It is essential that a thorough search be made as one may remove any number of foreign bodies and yet after the operation the cow may die and on post mortem one finds a further piece which one has missed. If the farmer is present this takes quite a lot of explaining away.

If no foreign body can be found in the reticulum after a positive Metal Detector test one must assume that the foreign body has penetrated through the reticular wall and is beyond recovery. In this case the operation will be unsuccessful and the owner is advised accordingly. It must be stressed that foreign bodies will not always be found at the base of the reticulum. We have found them high up in the reticulum and even penetrating laterally on either side.

Finally we search the rumen itself for any loose pieces of metal (to prevent future trouble).

If a diligent search is made it is not essential to use the Metal Detector during the operation but it's use will prevent a lot of needless searching if a negative indication is given after the initial " rough " search is complete. Similarly a positive after a negative exhaustive search will indicate a foreign body beyond recovery.

The operator's hands are washed and cleaned with spirits and the ruminal wound edges cleaned with a sterile swab. The ruminal wound is then sutured with a double row of Czerny Lembert sutures using No. 3 or 4 Chromic gut (ordinary plain gut will not suffice. In every case where this was used the wound broke open on about the seventh day and a ruminal fistula remained). The wound is then smeared with Penicillin ointment (or Sulfanilamide crystals), the forceps removed and the rumen returned to the abdominal cavity. The peritoneum and muscles are then sutured together with a single continuous row of sutures using No. 4 Chromic gut. The wound is then dressed with Penicillin ointment (or Sulfanilamide crystals).

Finally the skin is sutured with No. 3 Nylon, or, what we use are metal skin clips, leaving a small ½ inch opening at the base for drainage. The wound is finally smeared with Penicillin ointment (or Sulfanilamide crystals).

Post-Operative Treatment.

The animal is allowed to feed as soon after the operation as it likes. No restrictions are placed on diet at any time except that an excess of green food is not recommended for a few days, in case of hoven. The wound itself is not touched after the operation except to clean below where the drainage is left. If flies are troublesome and there is a danger of " strike ", the wound should be protected with a cloth covering. By the third day the wound is usually dry and requires no further handling of any kind. Washing of the wound itself is strongly contra-indicated. We have had trouble with healing in every case where this has been done by the owner. The animal is allowed whatever exercise it desires.

If the animal is not eating 48 hours after the operation and there is no temperature we generally prescribe a gastric tonic — either a strychnine-ginger mixture [Bo So Tone (Fort Dodge) is our usual choice] or a few doses of vinegar, sugar and yeast.

Where inappetence persists after the operation we consider it essential to keep a check on the animal's temperature. In all cases where the temperature rises to above 104 degress after the operation we advocate the examination of blood smears. (In three cases we have had deaths due to Redwater relapses and one death due to Anaplasmosis before we learned this lesson). If blood smears are negative we prescribe Penicillin in oil and wax, 2 million units daily for four days — or Sulfamezathine 120 cc. per day for 3 or 4 days. We are not keen on sulfonamides per os owing to the danger of interference with ruminal flora.

In approximately 80% of cases recovery is uninterrupted and we never have to see the animal after the operation. Milk production usually returns to normal about one month after the operation, provided the operation is not delayed for too long after milk production drops.

Conclusion.

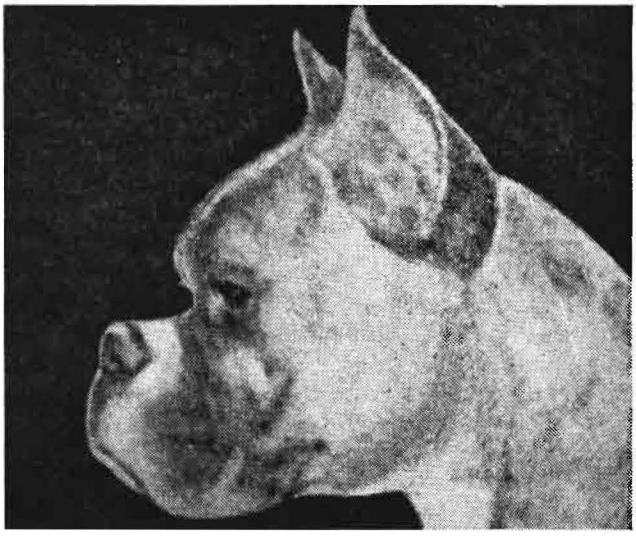
Using the technique here described, we, together with our colleagues Drs. Boswell and Littlejohn, have performed approximately 250 operations during the past 12-15 months. Our mortality rate has been roughly 8% and this includes deaths due to Redwater and Anaplasmosis. (The majority of deaths have been due to an advanced purulent traumatic hepatitis or splenitis due to atypical foreign body penetrations.) In no single case have we ever had a death due to peritonitis or septicaemia as a direct result of our operational technique — even when we have operated on badly blown animals where the wound has become seriously contaminated with ruminal ingesta.

Since introducing the Metal Detector as an aid to diagnosis we have come to the conclusion that it is an indispensable part of the practitioner's equipment.

Jl. S.A.V.M.A. 22(4), 1951.

THE CROPPING OF DOGS' EARS

B. C. JANSEN,
Onderstepoort.



Most people in South Africa are at present strongly prejudiced against the cropping of a dog's ears. Surely the reason is ignorance of what this involves and of the effects of the whole procedure ?

It is with the object of throwing some light on the subject that the arguments in favour of and against cropping are here set forth.

The first well-grounded reason for trimming a dog's ears is that it undeniably improves the appearance of the animal. This is best illustrated by comparing an untrimmed Boxer with a cropped member of the same breed. Trimmed ears give a dog an improved neckline, interesting head and an alert and elegant look, as illustrated by the accompanying photographs. Why people justify the docking of a dog's tail, which involves cutting through *bone,* merely for aesthetic reasons and resent cropping, which only means cutting through *cartilage,* is difficult to understand.

Secondly, a dog whose ear tips have been wounded in a fight will shake his head almost incessantly. This may prolong bleeding for days and prevents the healing of the wounds. Irritating tumours on the ear tips are likewise aggravated. Similarly, hunting dogs may have their ears torn by wild animals and thorn bushes, very often the dog is permanently disfigured by tattered edges to his ears. Cropping definitely eliminates these unpleasant occurrences.

In the third place, it is a well-known fact that dogs with long ears have a predisposition to conditions like otitis, othaematomata and otorrhoea, while these ailments are practically unknown in dogs with short, upright ears. *Ertl* proved with figures obtained from the Clinic for Small Animals in Berlin that Dobermann Pinschers and Boxers are tenth and eleventh respectively on the list indicating the frequency of otorrhoea in the different breeds of dogs.

Fourthly, during summer long-eared dogs often develop bleeding patches on the hairy sides of the ears. These are caused by biting flies, and when once the condition appears, ordinary flies are attracted to the blood to such an extent that the dog cannot rest or eat in peace.

Fifthly, cropping must improve a dog's power of hearing as an erect, cup-shaped ear is more capable of receiving sound waves than an aural opening covered by a pendulous flap. No wild animal, which requires all its faculties in the struggle for existence, is encumbered by flaps over its ears.

The main opposition to cropping comes from people who think that it is nothing but an act of cruelty. It is difficult to imagine any cruelty in the performance of an operation under complete anaesthesia together with the application of correct after-care, ensuring comfort to the patient. Admittedly a cropped pup will suffer some discomfort for about a week but subsequently it behaves absolutely normally. When, however, the operation is performed as a "backyard job" by the breeder and his neighbour, it is a different matter. The aseptic surgical technique applied by a veterinarian eliminates infection of the cut edges and promotes quick healing. If a properly performed cropping

is regarded as cruel, can docking and the removal of dewclaws without anaesthesia be justified ?

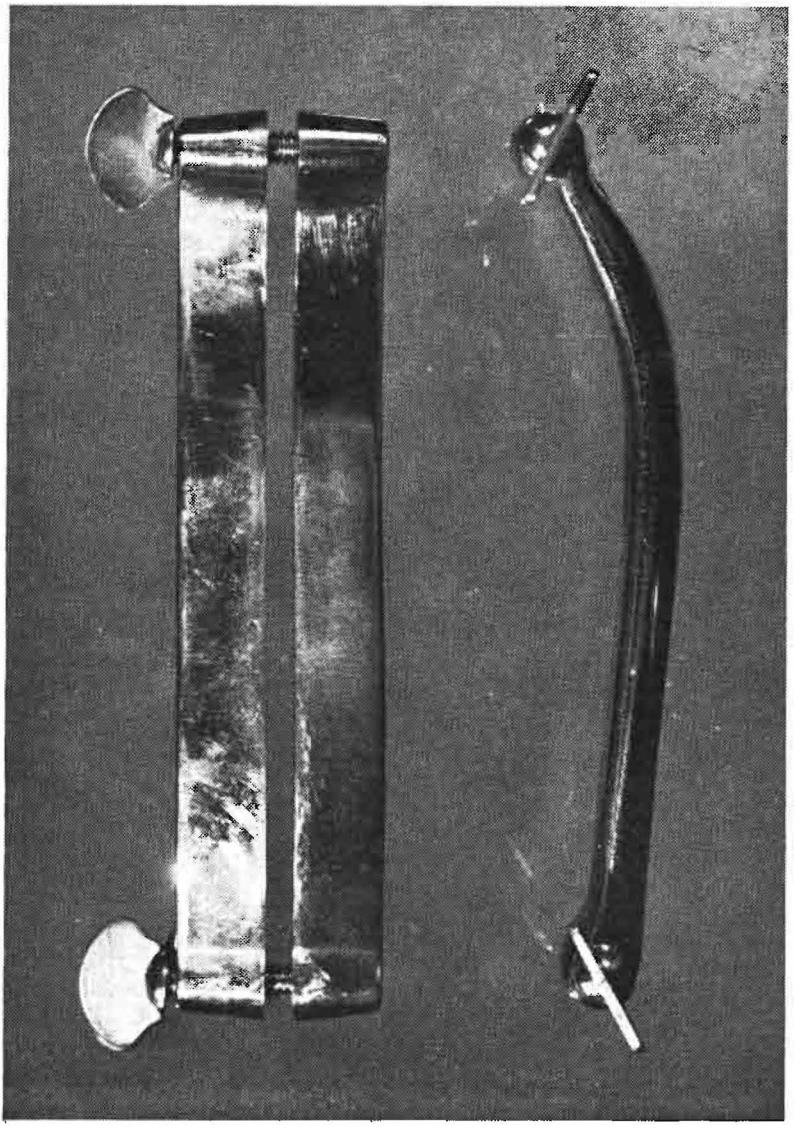
With the passage of time certain ear patterns have been developed for the different breeds of dogs. The size of the ears of a particular animal, however, has to be in proportion to the size of it's head, e.g. long, slender ears on a dog with a heavy head would be poor aesthetically. After seeing a few properly cropped specimens one soon forms an idea of what this signifies.

Dobermann Pinschers look their best with ears of moderate length

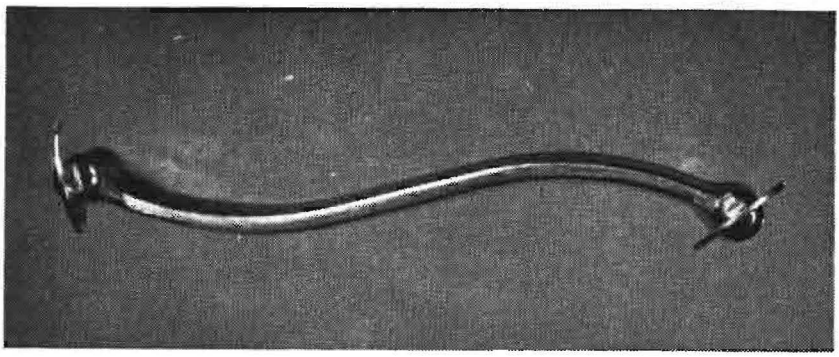
cut in a practically straight line from the tip to the base. As a general rule the tip of the cropped ear when folded over the head should reach to where the opposite ear joins the top of the head.

The cut edge of a Boxer's ear should be in the form of a gently sweeping curve. The tip can be fairly sharp but a wide base is essential.

Great Dane breeders like a fancy ear because long, mobile ears with deeply curved posterior edges considerably add to the dogs' imposing beauty. The base should be wide.



From the accompanying photographs the requirements for the three most commonly cropped breeds can be seen. Photographs are also included of the cropping clamps which have been developed to guide the operator in obtaining uniformity of pattern in different members of the same breed.



The most desirable age for this operation is from eight to twelve weeks, depending on the development of the pup. Where the ears of a pup assume considerable size and weight the ear muscles develop rapidly after twelve weeks. Late trimming, i.e. after twelve weeks in such cases, causes the ears to be pulled over the head. Pups that are undernourished, worm-infested or sick should not be operated upon because their ears will seldom have the strength to stand erect.

Pre-Operative Preparation.

The hair on the ears is closely cut with clippers and then both surfaces and the meati are thoroughly cleaned with ether. The meati are tightly plugged with cottonwool to prevent the entrance of blood.

Operative Technique.

For anaesthesia Nembutal given intravenously is preferred although some surgeons find Evipan-sodium satisfactory.

Aseptic surgical technique is applied.

The pup is placed on its chest on the operating table with its legs stretched comfortably, and the head and ears are surrounded with sterile cloths.

The site of the tip of the trimmed ear is then marked by nicking the anterior edge of the intact ear, taking into account the size and type of patient, the size and shape of the head and the shape, length and weight of the ears. By stretching both ears above the patient's head, hairy surfaces against each other, the second ear is nicked at a point exactly corresponding to that on the first ear.

The clamp is applied to one ear at this stage. At the site of the tip of the cropped ear the nick should be right against the lateral

border of the clamp and at the base of the ear the instrument should be right against the head (Figure I). Leaving too much ear tissue lateral to the head at the lowest part of the base gives the ear a bat-wing appearance. From the shape of the clamp it can be determined in which way it should be applied to obtain the correct ear-pattern.

Fig. I.

The ear is now cut from top to bottom right against the abaxial surface of the clamp, with a sharp knife. Remove the clamp and apply a straight bowel clamp about ¼ inch from the cut edge along its whole length with the object of preventing excessive bleeding. Trim the cut edge at the base of the ear by means of a pair of scissors so that a smooth continuity on to the side of the face is effected.

At this stage stitching is undertaken with a fine needle and thin catgut. By means of interrupted sutures spaced ½ inch apart the skin on both surfaces of the ear is stitched over the cartilage. The edge of the skin on the dorsum should be flush with the cut edge and not over it. Avoid coarse sutures and injury to the cartilage as this may lead to necrosis. Stitching is started about one-quarter of the length of the

cut edge from the tip and continued downwards. It serves no purpose to stitch any nearer the tip.

Post-Operative Treatment.

When both ears have been trimmed, clean up the lines of incision and dust the sutured edges with sterile sulphanilamide powder. Remove the plugs from the meati. Cover the occiput with a pad of cottonwool and fold both ears over the top of the head. Apply a thick bandage over the ears and around the neck and leave this on for about two days.

After removing the above bandage the ears are taped in an erect position, comfortably stretched, with the object of avoiding wrinkling of the cut edge during the process of healing. For this purpose prepare a frame from light metal sheeting on the following pattern:

The mid-piece of this frame is well padded with bandage and has to ride the occipital crest of the pup. This is attached to the top of the head, between the ears, by means of adhesive tape. The ears are taped to the lateral surfaces of the upright portions in a comfortably stretched position (Figure II). Do not cover the cut edges too much but dress them daily with sterile sulphanilamide powder. The frame is removed after four days and then all after care stops in the normal course of events. If, after the first bandaging the ears are inclined to stand erect without wrinkling of the cut edges the later taping need not be applied, but dressing of the cut edges should continue. During the period of healing the pup should be kept by itself in clean quarters.

If, after the above-described procedure, the ears do not stand erect they usually come up within three weeks. Trimmed ears will stand erect only by virtue of the rigidity of their cartilage. Strong, rigid cartilage is obtained by proper feeding and care. Undernourishment, worm-infestation and disease during puppyhood account for practically all the failures after the operation of trimming, but occasionally a pup's

Fig. II.

ears refuse to stand erect due to inherent lack of sufficient cartilage. Prolonged taping in the erect position will not correct these ears. Incorrect surgical technique, resulting in cicatricial contraction is responsible for the rest of the failures.

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Jl. S.A.V.M.A. 22(4), 1951.

ACUTE PSITTACOTIC CONJUNCTIVITIS IN THE DOMESTIC PIGEON

CASE REPORT

J. D. W. A. COLES,
Onderstepoort.

In February, 1942, a carrier pigeon with unilateral conjunctivitis was submitted for examination by the military authorities. A smear of the conjunctival scrapings from the affected right eye was made and stained with Giemsa, but the bird was removed, and unfortunately destroyed, before examination of the preparation suggested that the disease was psittacosis. The case was reported in 1943.

In March, 1951, a three-months-old domestic pigeon (Columbia livia) was brought for examination by a woman living in Pretoria. She had obtained it, with the normal-looking parent birds, about ten days beforehand from a friend residing in the same town. The three pigeons were put into an aviary already housing twelve others. Because the young pigeon was emaciated and had sore eyes, the new owner and her children spent a week fondling and trying to cure it. Due to the absence of any improvement, it was brought to the laboratory for diagnosis.

The subject was listless and moderately emaciated and suffered from a severe and acute bilateral conjunctivitis. There was practically no ocular discharge, however, and there were no signs of keratitis.

Smears of the conjunctival scrapings from both eyes were stained with Giemsa in the ordinary way and revealed numerous foam cells containing colonies of initial and elementary bodies (L.C.L. bodies or Microbacterium multiforme).

A tentative diagnosis of psittacotic conjunctivitis was made, and the bird was killed but not opened. A broth emulsion of conjunctival scrapings, heavily charged with L.C.L. bodies, was prepared carefully to avoid extraneous contamination and injected intracerebrally into six young white mice and intraperitoneally into four. On the sixth and seventh days the former died of typical psittacotic meningo-encephalitis; the latter all survived. In view of this, a final diagnosis was made of bilateral psittacotic (or ornithotic) conjunctivitis due to the pigeon or Columbidian type of virus.

The remaining pigeons were destroyed but not examined, and so were ten budgerigars (Melopsittacus undulatus) in a nearby aviary. The family was kept under observation, but no illness developed.

SUMMARY.

A case of bilateral, acute psittacotic conjunctivitis, due to the Columbidian type of virus, has been described in a pigeon. Psittacosis (or ornithosis) should be suspected whenever a pigeon suffers from conjunctivitis.

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Jl. S.A.V.M.A. 22(4), 1951.

FOWL CHOLERA IN SEA-GULLS ON DASSEN ISLAND

V. R. KASCHULA and D. E. TRUTER,

Cape Town.

The cause of fowl cholera, *Pasteurella aviseptica,* has a wide parasite-host range. Its importance economically lies in the devastation it causes in poultry flocks. It is probably the most important duck disease in the world, but it is also the cause of heavy losses in fowls and other avian species. Its distribution is world-wide. The disease has been reported in sporadic outbreaks in various parts of South Africa [Henning and Coles (1933), Canham and Haig (1942), Cooper (1948)]. An extensive outbreak was experienced in 1948 in the Malmesbury area (Stephan, Kaschula and Canham 1949). In this area, acute virulent fowl cholera is continually being diagnosed, where it causes losses mainly in ducks, but also in fowls and pigeons (Cooper 1948).

This is a report of the finding of this disease on Dassen Island in sea-gulls (Syn. Southern Black-backed gull, *Larus dominicanus*).

The Disease on Dassen Island

A description of the bird life on this island was given by Coles (1941) and Jackson (1941). Our visit to this island followed a report by the Superintendent of Guano Islands, that unusually heavy mortality was occurring in sea-gulls on the island. He feared for the safety of the chief guano producers — the jackass penguin (*Spheniscus demersus*) and the cormorant (*Phalacrocorax capensis*). The sea-gull, in contrast to its gracefulness in plumage and flight, is a scavenger and pirate, and is an unwelcome member of the bird community. On the day of our visit to the island, there were about 200 dead sea-gulls in and around a water-hole in the centre of the island. It is probable that the sick birds developed a thirst and were attracted by the water. The mortality was confined to the sea-gulls, though the headman of the island reported that Egyptian geese (*Alopochen aegyptiacus*) had died in large numbers a few weeks before the sea-gulls, from an undetermined cause. The penguins and cormorants remained unaffected. The only control measure taken was to remove the dead sea-gulls from the the water-hole and its vicinity.

Diagnosis

A number of autopsies were performed, but no striking lesions were noted. Smears were made from the blood, liver surface and

spleens, and organ material was collected for biological and bacteriological examination at the Regional Veterinary Laboratory, Cape Town.

The smears all showed large numbers of a bipolar bacterium. This organism resembled *P. aviseptica* in its morphology, staining reactions, cultural and biochemical characteristics. Biologically it was highly virulent for the fowl and pigeon, killing within 24 hours. It killed guinea-pigs in two to four days, when injected subcutaneously.

Discussion

Dassen Island is situated 39 miles up the west coast from Cape Town, being four miles from the shore and it lies approximately midway between Cape Town and Saldanha Bay. The enzootic nature of fowl cholera on the mainland just opposite Dassen Island, suggests a link with the disease on the island. The overall low mortality on the island, which teems with millions of birds, living under unhygienic and crowded conditions, ideal for the spread of a disease of this type, indicates that they are resistant and the disease is probably enzootic on the island.

Sea-gulls range far inland and have been observed at Bon Accord Dam, Pretoria, by Coles (1951). They may possibly be connected with the occasional sporadic cases reported in other parts of the country.

Summary

The description of mortality in sea-gulls (*Larus dominicanus*) on Dassen Island due to *Pasteurella aviseptica* is given. Its possible connection with acute virulent outbreaks in poultry flocks on the mainland just opposite, is discussed.

It is thought that the disease is enzootic on Dassen Island.

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AN OBSERVATION ON THE PATHOGENESIS OF ARTIFICIAL NEWCASTLE DISEASE IN PIGEONS

V. R. KASCHULA,

Onderstepoort.

Ever since Doyle (1927) reported that the pigeon was susceptible to Newcastle disease (N.D.), this bird has been extensively used for diagnostic purposes, especially when fowl plague has to be considered in the differential diagnosis. It is a curious fact that all strains of N.D. virus, which are pathogenic for the pigeon are highly neurotropic for this bird, the disease being characterised by a progressive paralysis and ending in death.

The pigeon was used extensively in Natal during the 1945 outbreak (Kaschula *et alia*, 1946). In the 1950 South African epizootic, this bird was again used in experimental work. The paralysis that was produced in pigeons in the two outbreaks, however, differed in that in the first outbreak, paralysis of the wings was the first symptom noticed, while in the second outbreak, paralysis of the legs occurred without paralysis of the wings. On comparing the experimental inoculation methods used in the two outbreaks, it was noted that in the 1945 outbreak, the routine site of inoculation was into the pectoral muscles of the breast, while in the recent epizootic, the inoculations were made into the muscles of the legs.

In order to determine whether the site of inoculation was the cause of the difference in the symptoms exhibited, an experiment was conducted using three sites (e.g. the neck, the wing and the leg) for the intramuscular (i.m.) inoculation of N.D. virus.

Materials and Methods.

A freshly isolated Cape virulent strain of N.D. virus was used. This strain, like all other South African strains tested, was highly virulent for the pigeon. 0.01 c.c. of undiluted allantoic fluid (embryo LD50 of 10^{-9}) was injected intramuscularly (i.m.) at the neck, wing or leg site chosen for this inoculation.

Twelve selected pigeons were divided into 3 groups of four each, group (a) were injected in the cervical muscles of the upper neck, immediately behind the occipital region; group (b) in the fleshy portion of the left wing near the carpal joint; group (c) in the flexor muscles of the leg adjacent to the tibial joint.

Results of the Experiments.

The only symptom of significance was paralysis which ended fatally. The results of the inoculations are summarized in Table No. 1.

TABLE No. 1.

The inoculation of N.D. virus in pigeons at three different sites

Group and site of inoculation	Pigeon No.	Symptoms (days after inoculation) 3	4	5	6	7	8
(a) Intramusc. in neck	1	p. of neck	p. of neck	D			
	2	n.u.	p. of neck	D			
	3	n.u.	p. of neck	D			
	4	n.u.	n.u.	p. of neck	D		
(b) Intramusc. in wing	5	n.u.	p. of wing	p. of wing	D		
	6	n.u.	p. of wing	p. of wing	D		
	7	n.u.	n.u.	p. of wing	p. of wing	D	
	8	n.u.	n.u.	p. of wing	p. of wing	D	
(c) Intramusc. in leg	9	n.u.	p. of legs	p. of legs	D		
	10	n.u.	n.u.	p. of legs	p. of legs	D	
	11	n.u.	n.u.	p. of legs	p. of legs	p. of legs	D
	12*	n.u.	n.u.	n.u.	n.u.	n.u.	n.u.

p=paralysis D=death n.u.=nothing unusual

*=survived without exhibiting symptoms

From the data given in the table it is noticeable that those inoculated in the neck showed paralysis of the neck, and similarly those inoculated in the wing and leg showed paralysis of the corresponding limbs. In the latter two groups the particular limb inoculated (the left leg or wing) developed a paresis several hours earlier than the right limb, but in all cases the paralysis eventually became bilateral. A striking feature of the symptoms shown for each group was that the particular limbs inoculated were affected without affecting the control of the other limbs, e.g. when the neck was paralysed, collapse and coma set in before the wings and legs became paralysed; when the wings were paralysed the legs and neck were unaffected, and conversely when the legs were affected, collapse and coma set in before the wings and neck became paralysed.

The results indicate that the inoculations made into the neck produce death more rapidly than in the other two sites.

Routine inoculations in pigeons subsequent to this experiment were made in such a manner as to check up on the findings recorded in this paper. The results thus far confirm these observations.

It is concluded that the site of inoculation has a profound effect on the ultimate symptoms; and for this reason for uniformity in experiments, the site of inoculations should always be constant.

Discussion.

From the foregoing it is evident that the paralysis commences at the site of inoculation, progressing to the C.N.S. There is thus a

marked difference in effect with the inoculation of N.D. virus at different sites in the pigeon. When the virus is injected into the wing, the pigeon may walk but cannot fly, and when injected into the leg, it may fly but cannot walk. There is thus reason for speculation on the causes of this difference. A local reaction apparently sets in, and the progression to the C.N.S. is apparently via the nervous system. The actual mechanism of this effect requires elucidation, since it may have bearing on the difference between the so-called "pneumo-encephalitis" and the "Asiatic" forms of Newcastle disease. The "pneumo-encephalitis" forms are highly aerogenic, the prominent symptoms being respiratory and the dominant lesions being in the respiratory tract (bronchitis and aerocystitis). The Asiatic forms are generally considered to be contracted via the alimentary tract. A severe gastro-enteritis develops, and on post-mortem examination, changes in the alimentary tract are the main lesions.

Summary.

An experiment is described which shows clearly that the site of inoculation of N.D. virus intramuscularly in pigeons is of importance in relation to the nervous symptoms eventually exhibited. Pigeons inoculated in the neck showed paralysis of the neck and finally death, without affecting the wings and legs. Similarly when the virus was injected into the wings or legs, paralysis of the respective limbs occurred, without causing paralysis of the legs or wings respectively, before death supervened.

The course of the disease was more rapid in the case of those inoculated in the neck, than in those inoculated in the wings or legs.

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Jl. S.A.V.M.A. 22(4), 1951.

TWO OUTBREAKS OF SWINE ERYSIPELAS

E. M. ROBINSON,

Onderstepoort.

Although swine erysipelas has been recorded in the past in South Africa, the diagnoses were made entirely on clinical and pathological grounds and were not confirmed bacteriologically. Haig and Adelaar (1944) described a case of swine erysipelas which they confirmed, pure cultures being obtained from the endocardial lesions. The pig in question was sent from Vereeniging to Onderstepoort for post mortem and was an isolated case. Although there was a marked erythema of the snout, ventral surface of the abdomen and the insides of the legs, swine erysipelas was not suspected until the heart was opened and extensive verrucose endocarditis of the mitral valves was noticed. The organism was obtained in pure culture from the lesions of the endocardium and its identity confirmed by biological and cultural tests.

In February, 1949, the carcase of a pig which had been condemned as a suspected case of swine erysipelas was forwarded to Onderstepoort for examination. Unfortunately no internal organs were sent. The skin after the hair had been removed at the abattoir showed a number of bluish-red irregularly shaped patches up to about roughly 3 cm. in diameter on the back, flanks and head. On cutting into these patches, they were seen to extend into the skin to a depth of about 3 to 4 millimeters. Cultures were made from the skin lesions but no growth was obtained. Fortunately a number of the lymphatic glands were preserved in the carcase and from some of them pure cultures of Erysipelothrix rhusiopathiae were obtained without difficulty.

Bacteriological Examination. The organism was a thin Gram positive one, occurring singly, in small clumps or in short chains. It was non-motile and about 1.5 to 2μ in length by .2 to .5μ in width. Cultures were obtained on serum agar and the colonies were very small and transparent, rather dewdrop-like. Rabbits, guinea-pigs, mice and pigeons were inoculated each with 1 c.c. of a 24-hour old culture on serum agar in normal saline. The pigeons were inoculated intramuscularly and the mice intraperitoneally, the others subcutaneously. The guinea-pigs survived but the other animals and the pigeons all were dead between the 24th and 48th hours after inoculation. Pure cultures were obtained from the heart's blood of the rabbits, mice and pigeons which died. Further cultural tests confirmed the diagnosis. An attempt was made to find out whether cases had occurred on the farm and neighbouring ones where the pig came from but no evidence could be obtained that anything resembling swine erysipelas had ever been noticed.

The second outbreak was recorded in May, 1950. A consignment of pigs sent to Germiston abattoir, on examination after slaughter showed lesions very similar to those seen in the previous case. Glands

from the carcases were forwarded for bacteriological examination, preserved in 50% glycerine.

Bacteriological Examination. Pure cultures of Erysipelothrix rhusiopathiae were obtained from the glands on serum agar. The colony form and morphology of the organism corresponded to those seen in the previous case.

As no pigeons were available, rabbits, guinea-pigs and white mice were again inoculated. The guinea-pigs survived but the rabbits and mice were all dead in 48 hours. Pure cultures were obtained from the hearts blood of the animals. As in the first case, it was not possible to find evidence of the occurrence of the active disease in the neighbourhood from which the pigs came.

Summary. Two outbreaks of swine erysipelas are described, both of which were diagnosed at abattoirs. It seems probable that swine erysipelas is of commoner occurrence than was previously thought.

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THE SALE OF STUD POULTRY AND DAY-OLD CHICKENS

In the last issue of our journal appeared the advertisements of certain firms entitled to use the mark of the South African Bureau of Standards on their poultry rations. In this number is an advertisement placed by the South African Poultry Association, on behalf of the members of two of its subsidiary organisations, known as the Chicken Producers Association and the Breeders Register.

It is only right and proper to comment on this development, because of the evils so often associated with the sale of stud poultry and day-old chickens. There is an extensive trade not only in poor quality chickens, but even in birds infected with B.W.D. and fowl typhoid. At times, possession of the official B.W.D.-free certificate is deliberately used to tempt purchasers into buying chickens that have been so indifferently bred that they cannot develop into profitable birds.

Members of the Breeders Register are required to enter teams regularly at Egg-Laying Tests in order to retain membership; they must also possess the official B.W.D.-free certificate and their plants have to be clean and hygienic. If the farmer desires to purchase foundation stock, he will be able to fulfil his requirements by approaching a member of the Breeders Register and *specifically asking for R.O.P. (Record of Production) leg-banded fowls.*

Very stringent regulations also apply to members of the Chicken Producers Association. The B.W.D. certificate is essential, and government officials approve all birds from which it is intended to produce chickens before each breeding season. Accurate records have to be kept of all sales and purchases of fertile eggs and chickens, and no eggs may be acquired for incubation except from other members in good standing. Many members of the Chicken Producers Association trapnest hundreds of pullets every year and keep adequate breeding records, even though this is not demanded by their constitution.

To farmers wanting hundreds or thousands of chickens every season for replacement purposes, no better advice can be given than to patronise the members of the Chicken Producers Association.

The veterinary profession has been asked to co-operate in making a success of the feed testing scheme run by the Bureau of Standards. However, it takes poultry of exceptional quality to make the best use of good mashes, and so the profession can and should assist everyone concerned in the production of protective foodstuffs for man, by advising their clients to purchase their poultry requirements from the sources recommended above.

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AN OUTBREAK OF AN UNUSUAL TYPE OF CATTLE DISEASE IN THE VRYHEID DISTRICT

E. M. ROBINSON and M. C. LAMBRECHTS

Onderstepoort Vryheid

In May, 1949, a farmer in the Vryheid district reported that he was losing cattle from a disease which, from his description, somewhat resembled snotsiekte. One of us (M.C.L.) visited the farm and a few days later again, accompanied by the Senior State Veterinarian, Natal.

History. According to the owner, the animals lost condition rapidly, ceased to feed and tried to get into dark places. Their muzzles were dry and appeared as if the skin had been burnt. The skin round the eyes, the anus and the vulva showed a similar appearance, as did the skin of the teats in cows. There was a slight nasal discharge, and a little yellowish pseudomembrane-like material in the eyes, with a yellowish discharge. No foot lesions were seen and the animals were not lame. Dr. Lambrechts noticed that under the tip of the tongue and running along the sides, the mucous membrane showed a yellowish necrotic appearance with a tendency to clear from the back forward. Two to three days before death a profuse blackish diarrhoea developed, sometimes with blood in the faeces. Intermittent groaning was noticed, probably due to abdominal pain. Death occurred in all except one case. Altogether ten cattle were affected, six cows and four oxen, all adult. The duration of the disease was between one and two weeks.

At post mortem intense icterus was noticed throughout the carcase. The liver showed a deep, greenish-brown colour, like that seen in piroplasmosis. The kidneys were greenish-brown in colour and the spleen was normal in size but showed signs of atrophy, having a thin appearance. The gall bladder was enormously distended and in one case there was a pseudomembrane lining it. Fat necrosis was seen in the omentum and coronary grooves. There was no gastritis or enteritis. The condition was afebrile and blood smears were negative. Three days later Dr. Lambrechts and the writer visited the farm. At the time there was one case which had died the previous afternoon and one in the last stages of the disease which the owner sacrificed for us. A post mortem was made on the dead animal, an old cow, and the lesions were as follows:—

Under the free portion of the tongue the mucous membrane was necrotic and showed a layer of yellowish pseudo-membranous material. There were no changes further back on the tongue or on the roof of the mouth, except for a small, deep, punched out ulcer near the base of the tongue on the left side. The skin of the muzzle was hard, dry and cracked. Pieces could be peeled off. The skin round the eyes was similar and the teats showed a dark brown thickening of the skin.

All the tissues showed a deep yellow colour. The lungs were hyperaemic. The liver was enlarged and had a dark brown colour. On section the colour was a deep greenish-brown like that seen in piroplasmosis cases. The gall bladder was enormously distended and was the size of a football. The contents were pale brown and the pigment had disappeared. The kidneys were normal in size and had a greenish-brown colour throughout. The spleen was thinner than usual and had an atrophied appearance. The urine in the bladder was dark yellow in colour but there was no evidence of haemoglobin. The brain was normal in appearance. There were slight post mortem changes in the carcase which, fortunately, did not obscure the pathological picture. Smears from the spleen and liver were negative.

The case which was still alive was a black cow, six years old. It was very weak and could walk only with difficulty. It showed a blackish diarrhoea which had matted the hair of the tail and thighs. Blood was collected in citrate and the animal was then killed for post mortem examination.

The changes seen were very similar to those in the previous case. The lesions in the liver, gall bladder and kidneys were essentially the same. The lesions in the mouth were similar and were confined to the underside of the tip of the tongue. There was only a slight icterus but the blood was very thin and watery and gave a brownish stain. The lesions of the skin of the muzzle, eyes and teats were very similar to those in the first case. The contents of the stomachs were normal in appearance. There was no gastritis or enteritis but the contents of the large intestine were fluid and of a brownish to black colour. In this case smears from the blood and spleen revealed a well-marked anaemia, with anisocytosis, polychromasia, punctate basophilia and normoblasts. Very few A. marginale and Th. mutans were seen in the smears.

The report of the Section of Pathology (Drs. Schulz and Smit) did not clear up the etiology of the condition. A slight catarrhal pneumonia was present. The liver showed proliferation of endothelial cells, degeneration and proliferation of the liver cells and a slight cirrhosis. The report did not support the idea that the condition was a photosensitization. It was suggested that plant poisoning might have been the cause and the liver changes been due to it. The icterus, it was suggested, might have been due to the liver damage with consequent accumulation of bile pigments. The possibility of photosensitization, according to the icterus, could not be entirely excluded in spite of the pathological report. The lesions somewhat resembled those of anaplasmosis but there was no splenic enlargement and blood smears were negative except in one case. There was extreme bile stasis. All the affected animals became sick within a few days and in the 97 remaining cattle no further cases occurred. The veld was in good condition and not overstocked. There had been good rains recently. There was a river running through the farm but no algae could be seen on the surface. No mortality was reported in the cattle on the neighbouring farms.

Summary. An outbreak of an unusual type of disease in cattle is recorded with icterus, bile stasis and skin lesions as described.

Jl. S.A.V.M.A. 22(4), 1951.

SOME DISEASES ASSOCIATED WITH THE BREEDING OF HORSES

C. W. A. BELONJE,
Middelburg (Cape).

PART I. — SOME CAUSES OF MORTALITY IN FOALS

PRENATAL DEATHS

ABORTIONS

DEFINITION

The designation of " foetus " is applied to any dead young animal from a parturition which occurred prematurely by more than two weeks. Any specimen which lives at the time of parturition, provided it is not more than thirty days premature or is born dead within two weeks of the normal period of gestation, is classified as a " foal ".

I. EQUINE VIRUS ABORTION

Cause. — A filterable virus. Cultivable organisms can not be incriminated and serum of affected mares consistently gives negative agglutination tests with abortus equi antigens. Diagnosis is made on the presence of intranuclear inclusion bodies in the foetus in the nuclei of the epithelium lining the respiratory tract, alveoli or in the nuclei of the parenchymal cells of the liver which surround the necrotic foci. (1, 2, 9, 10, 11)

Occurrence — U.S.A. (1, 2) Europe (4, 5, 7) and possibly in S.A. (6) although Henning was not able to demonstrate the presence of the inclusion bodies. The disease does not occur in England. Incubation period in transmission experiments was from 15-30 days.

Symptoms — The disease is highly contagious and usually produces abortion in mares during the ninth to eleventh months of pregnancy. The mare appears normal before and after abortion and except for the expulsion of the foetus is apparently unaffected by the disease. Fluid in the thoracic cavity of the aborted foetus together with oedematous lungs, haemorrhages on the surface of the myocardium and small necrotic foci beneath the capsule of the liver are suggestive of this disease. The finding of the intranuclear inclusion bodies is essential for the diagnosis. There is no concrete evidence that horses, particularly pregnant mares, are chronic carriers of equine virus abortion, nor has there been any indication that the stallion was connected with the disease or played any role in its transmission.

Preventive Inoculation — Sera from mares which have aborted and vaccines made from the livers of aborted foetuses have been used in attempts to immunise mares against this disease. Use of these products produced no ill-effects, but to date field trials have not established their efficacy.

Method of Spread — Infection appears to be spread through the foetus, the amniotic fluid, the foetal membranes, the discharge from the genital tract and materials contaminated by them.

If a mare aborts in her stall, the person or persons caring for the mares should not go into the stall. The foetus and afterbirth should be submitted to a laboratory in a water-tight tub. After external cleansing with an antiseptic solution the aborting mare may be removed from the stall and placed with the other non-pregnant mares. If the straw is removed, it certainly should not be handled by men taking care of the other mares and it should not be scattered around the stables or yard. It is probably more advisable to leave the bedding and hay in the contaminated stall and to spray the stall and contents thoroughly with a strong cresol solution. The stall should then be closed for the remainder of the foaling season.

Control of the Disease — If only a small group of mares is stabled with the infected mare they should probably not be moved. If the disease occurs late in the foaling season and the mares are within three weeks of term they should not be moved. If a large group of mares is concerned, it is advisable to divide them into smaller groups if suitable uninfected quarters are available. In this case the mares should be divided into groups according to the period of gestation. Those which are to foal within three weeks may be left in the original surroundings. Those to foal at later dates may be moved to available stables. Indiscriminate moving of mares each time a case of abortion occurs is to be discouraged.

How long a mare may continue to disseminate the virus of equine virus abortion is unknown. Experience seems to indicate that it would seem advisable to wait as long as possible before the mare is again served. If the reproductive organs are not absolutely normal, she should not be bred, neither should she be bred if she is a late-foaling mare and has aborted late in the period of gestation. In an early abortion it seems advisable to wait at least from three to four months before mating again.

Virus abortion is not known to have occurred on any farm in two successive years. This lack of recurrence does not seem to be due to any acquired immunity as cases are on record of three mares that had contracted the disease a second time. The disease recurred in these mares, two, three and four years respectively after the first attack.

II. Contagious Equine Abortion

Cause — Salmonella abortivo-equinus (3, 6, 8, 10, 11). The organism may be isolated from the foetus, from the foetal membranes

and from the uterine discharges of the mare. In addition the blood of the mare will usually give a decided positive reaction to the agglutination test, especially one to two weeks after abortion (6), and to the complement fixation test (8). Infection is mainly spread by ingestion of materials contaminated by discharges from infected animals. Abortion usually takes place between the sixth and ninth months of gestation. The mare may suffer a brief period of septicaemia during the course of infection. Before abortion, symptoms of fever and general disturbance occur. After abortion the only lesions are in the foetal membranes which are oedematous and frequently show haemorrhages and areas of necrosis. The foetus may show hydrothorax, hydropericardium, ascites, epicardial and endocardial haemorrhages, petechiae on the lungs and spleen.

Occurrence — U.S.A. and South Africa (3, 6, 8, 10, 11) but not in England.

Diagnosis — (i) Cultivation of the causal organism by ordinary cultural methods.

(ii) Agglutination test.

Although a mare at the time of abortion may have a low agglutination titre, infection with the specific organism raises the titre within the following 10-14 days. Vaccination stimulates the production of agglutinins, but a high agglutination titre in a non-vaccinated animal indicates infection.

Preventive Inoculation — Bacterin treatment has proved highly satisfactory as a prophylactic against natural infection (8). Pregnant mares are vaccinated in early fall with three injections subcutaneously, one week apart (10). In the past ten years the disease has disappeared from the Bluegrass area of Kentucky because of this preventive inoculation.

Recently Henning (6) described an outbreak of abortion in South Africa in which S. abortivo-equinus appeared to have a significance comparable with that of S. cholerae-suis in hog-cholera. He concluded that there is a synergistic action between S. abortivo-equinus and the virus of equine abortion. Whether the results reported in his investigations justify his conclusions remains to be seen.

III. Streptococcal Abortion (10, 14, 15)

Cause — Streptococcus pyogenes equi: usually beta-haemolytic cocci fermenting lactose and sorbitol, belonging to the Lancefield group C. (12, 13), called Str. pyogenes equi to distinguish it from Str. Equi. The latter is unable to ferment lactose, sorbitol or trehalose. Cultures from influenza, pneumonia and infectious rhinitis of horses were found identical with cultures from metritis of mares and joint ill and septicaemia of foals.

Occurrence — In U.S.A., also confirmed at Balaton Lodge, Newmarket, England. In many cases these bacteria were isolated from all

the internal organs of the foetuses. In some cases they appeared only in the cultures from the stomach fluids and the lungs. Often streptococci grew only in cultures from the umbilical cord and the blood vessels of the chorion. The maternal surface of the chorion frequently yielded streptococci when other parts of the membranes and the foetus were negative.

The fact that streptococci were recovered from one or more organs of the foetus or from the umbilical vein and blood vessels of the chorion denotes the presence of these organisms in the uterus of the mare. In Kentucky streptococci were found in aborted foetuses more frequently than any other micro-organism (11).

It is generally known that streptococci cause abortion by their action on the chorion. Invasion of the foetus is a secondary phenomenon, and may or may not occur (10). It is evident that in many cases of intra-uterine infection abortion occurs before the tissues of the foetus are invaded by streptococci, resulting in bacteriologically negative findings in the foetus itself. It is also of great value in the differential diagnosis of abortion to know the condition of the genital tract of the mare and the breeding record of an animal that has aborted.

The pathological changes are hence often confined to the foetal membranes, the allantois-chorion and the allantois-amnion, particularly the former. Lesions on the membranes vary from small to large haemorrhages on both membranes to large areas of necrosis of the chorion and the presence of similar areas on the amnion. The streptococci are isolated from the contents of the blood vessels of the membranes, not from their exposed and contaminated surfaces.

When changes are present in the foetus itself their nature and extent varies according to the extent of infection, and length of time the foetus has been dead in utero. In the case of a foetus dead only a short time prior to abortion, few changes may be seen or there may be just a few haemorrhagic areas on the serous membranes and possibly on the epi- and endocardium. More advanced cases show softening of all the internal organs, particularly the liver (16).

Many foals carried to full term are found to be diseased at birth and many foals so diseased die. In such cases the dam is often found to be suffering from metritis. Had such a mare been exposed to a severe injury, great excitement or extreme exposure during the gestation period, the possibility of abortion would have been greater than in the case of an absolutely healthy mare subjected to the same degree of injury (8).

Treatment — The subjection of each pregnant mare to a course of intramuscular penicillin treatment at some time or other during her pregnancy has been suggested. Before such a procedure could be adopted numerous factors should be taken into consideration, viz., the presence of streptococci, the incidence of streptococcal abortion, etc., factors of which too little is known at present.

The question of the resultant endometritis and sterility will be dealt with under *Mares*.

Preventive Inoculation — The use of streptococcal vaccines have not yielded any startling results. The immunity developed is poor and the results, generally speaking, have proved disappointing.

IV. Abortion Due to Other Micro-Organisms (8, 10, 11)

In the U.S.A. other bacteria isolated were Escherichia coli, staphylococci, Shigella viscosum-equi and Corynebacterium equi.

Escherichia coli and staphylococci often occurred as contaminating organisms but when they were recovered in pure culture from organs of the foetus it was inferred that they were present before abortion. It has been shown that bacteria of the colon group may become established in the genital tract of a mare. When such a mare conceives it is quite probable that colon bacteria remain active, producing gross pathological changes in the placenta, and causing death and expulsion of the foetus. Further work has indicated that staphylococci and other semi-parasitic micro-organisms, when present in the uterus, may produce changes resulting in abortion. Shigella viscosum-equi was rarely found in abortion in mares although it frequently causes infection in new born foals. (See Sleepy Foal Disease.)

V. Non-Infectious Abortion (10, 11, 17)

Many isolated cases of abortion in mares are apparently not caused by either bacteria or viruses. These could be classified as follows :

(i) No cause determined.
(ii) Traumatic injury.
(iii) Nutritional — avitaminosis, poisonous feeds, etc.
(iv) Twinning.
(v) Torsion of the umbilical cord and anomalies of the foetus.
(vi) Hormonal dysfunction.

(*To be concluded*)

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LETTERS TO THE EDITOR

A VET ON A RANCH

G. E. LAY,

Liebigs Ranch, Southern Rhodesia.

On a red hot day I arrived, as a vet wet behind the ears, as a man, desiccated. Rhodesian hospitality remedied the latter, time I hope will remedy the former.

The ranch is large. Divided into four sections, it has 45,000 dehorned Africander grades grazing over 1,500,000 acres of Mopani bush and granite koppies, watered by dams, river pools and boreholes. In winter, as dams dry up, handpumps in sandy river beds come to the rescue. Cattle are run in herds of about 180. They disappear into the bush with herd boys for six days of the week and are dipped and counted on the seventh. Boss boys do the castrating and disbudding, and also have to see that all the cattle in the areas arrive at the dips, all 2,000 of them in many cases.

It took months to get to know the ranch, and develop a sense of direction. Getting lost became a habit, and it was not unusual to start for home only to find the sun setting in the "East". Only the unerring homing instinct of my indigenous companion prevented another uncomfortable night in the bush, and another sundowner from going flat.

My primary duty was to investigate tuberculosis and contagious abortion but it soon became apparent that heartwater was the main trouble and with cattle dying in all directions it was not long before I knew heartwater in every shape and form, from textbook post mortems to a few petechiae on the spleen.

In the bush one's post mortem technique is not always orthodox but is none the less effective, and for removing brains the saw was soon abandoned in favour of a native axe made from a car spring, four blows from which removes the top of the cranium leaving the brain intact. Anyone with over 600 bovine scalps to his credit can accomplish this.

The local strain of R. ruminantium is extremely hard to find. Intima smears are useless and smears from any vascular part of the cerebral hemispheres give better results than the hippocampus or cerebellum, but even the best smears require a lot of patient search before the organism is found.

Ball 3 strain rickettsiae in the brain smears of sheep are found under similar conditions of staining and magnification with comparative ease.

One can only post mortem a small proportion of animals which die. Sections are 35 miles apart; animals which die during the day are mutilated by carnivora at night, and fly larvae alone can reduce a carcase to a mere skeleton in 3 days. "Too decomposed" is a common diagnosis, and many deaths remain unrecorded until the herd boy produces the animals ears at the dip.

On account of the great distances and the inaccessibility and low value of the stock, treatment is unpractical and uneconomical, prophylaxis being the only solution to our problems.

Susceptible sheep which had recovered from a Ball 3 Strain Heartwater infection were experimentally injected with blood from a local clinical case of Heartwater. The sheep showed no reaction whatsoever, proving that the Ball strain was effective in immunising against our local one. Unfortunately, owing primarily to the extreme difficulty in obtaining susceptible Merino sheep in Rhodesia, controls were not used, and as this is the first time heartwater immunisation has been tried in Rhodesia, the State Department demanded that the experiment be repeated with controls, before they would allow the scheme to operate.

To get blood to 10,000 calves, some of which may be 100 miles apart, before they are three weeks old takes organisation, but ultimately we hope to have sheep kept at each section. The scheme will cost £400 per annum in sheep alone, but will save many thousands of pounds worth of stock.

Epivaginitis is rife, and examination of the 600 bulls was my first job. The first animal I handled kicked me in the face by way of introduction. It seems Afrikander bulls do not realise they are under control when in a crush. The bulls were examined twice, involving 2,400 testicles. Later 150 were branded positive, ready for the bully beef tin. All infected bulls were examined post mortem at our own factory.

Unilateral cases occurred more often in the left than in the right epididymis, 2% showed thickening in the vesiculae seminales. Abscesses in the enlarged epididymes were common, and cysts containing a clear brown fluid occurred in 10% of cases. Rare cases showed the head markedly enlarged, while the tail, though hard, was hardly changed in size. Diagnosis of early cases is often difficult as the size and texture of the epididymes vary very considerably in individuals. Some bulls normally have large hard epididymes. Incidentally game have extremely large hard epididymes, as compared with cattle. There is a depression in the curve of the tail of the epididymis, which can be felt through the scrotum, and which disappears very early in the course of the disease before the tail actually alters in size.

Feeling for adhesions, popular with laymen, is not reliable as in many cases the adhesions between the tunicas are on the side of the scrotum and are often impossible to feel although extensive.

Culling cows for epivaginitis under our conditions, is not practical and is economically unsound, but the stud herd is examined by speculum and infected animals are culled.

Cows are branded for every calf, a different number for each year, and cows which have not calved for two consecutive years are examined for pregnancy, and the non-pregnant ones are culled. Three hundred rectal examinations a day is my limit. All culls are examined at the factory and vaginitis and metritis are found in most cases. Salpingitis is common and its cystic nature together with adhesions, and peritonitis points to epivaginitis. It is instructive to post mortem one's culls, but there is a snag in everything — the factory starts killing at 2.30 a.m.

I was proud of the sterile cows I had picked out until they started calving down. Fortunately for my reputation it was found that a mistake had been made with the branding.

I was looking forward to a little peace, when anthrax reared its

ugly head, and all stock grazing near the native reserve had to be inoculated, 12,000 in all. Crushes were improvised from mopani poles tied together with bark, and animals were inoculated by the stab method. A short needle about ¼ inch in length is used and the animal is stabbed and injected in one operation as it walks past in the crush, the plunger being pushed as the needle is withdrawn, thus pulling the skin away from the muscles. 40 c.c. syringes are used and the same needle is used until it breaks. After a little practice one can adjust the plunger accurately to 1 c.c. without looking.

About 0.5% develop abscesses, which cause no losses and abscesses develop more easily in animals injected in the rump, probably because this is always the dustiest part in cattle.

The worst casualties were among the operators, who were periodically winded by well placed kicks in the solar plexus.

Tuberculosis is rife, and although not many deaths occur, factory condemnations are high. Among steers the best conditioned in a bunch is often the tuberculous one. A pilot scheme involving 1,500 head was undertaken, with a view to testing the whole ranch later. Injections were done in the loose skin behind the shoulder, and although callipers were used, with a little practice it was possible to pick out reactors by palpation alone. Natives clipped the sites, and a doubtful reaction in a clean animal may be found where the skin has been scarified by scissors. A true reaction however can be felt to be more deeply embedded than the scarification cases. A special syringe was used which has a short needle, holds 18 doses, and automatically injects the exact tuberculin dose each time the plunger is pressed. Reactors were branded and isolated. A reactor was killed and showed a completely negative post mortem, which did not impress the spectators.

Five animals were selected at random from each herd, and tested for contagious abortion. In all about 850 cows and heifers were tested and the infection varied from 11% on one section to 31% on another. All weaner heifers (3,000) are to be tested every year, and when this year's heifers reach the cull cow age, all cows on the ranch will have been tested.. Another test at that stage should show an improvement.

Boss boys have been taught to make smears, and an extensive search shows a low incidence of anaplasmosis and babesiosis.

Poverty during the latter part of the winter is the second greatest cause of death next to heartwater, but is at present unavoidable as cattle have to walk miles to water and use up more energy that the grazing supplies. It is amazing how similar the post mortem signs of poverty are to those of heartwater, especially hyperaemia and oedema of the lungs, gelatinous fat and hydrothorax.

The cattle are inoculated against quarter evil, but sporadic cases occur. Internal parasites abound especially in weaners, but Tetram keeps them in check, and we aim ultimately at fencing the dams and leading the water into troughs.

Occasionally cases occur, which leave one baffled, and as there is no other opinion to consult the cause of the disease remains a mystery. Steers in one paddock only will show a stiffness in the hindquarters, which often disappears spontaneously after about two weeks. No poisonous plants can be found, and the cause remains unknown. Sporadic cases die showing acute gastro-enteritis and all symptom of poisoning — but the

causal poison remains undiscovered. With pigs it is worse. Pneumonia is the chief cause of death, but occasionally one shows nervous symptoms and dies, and a negative post mortem leaves one guessing. Ascaris infection which was extremely prevalent is being controlled with three weekly dosings of sodium fluoride, which is successfully fed as 1% of the wet mash in spite of overseas journals, stressing the danger of feeding in anything but dry mash.

Game abounds, and whenever possible post mortems are done including some on leopard and elephant, which were also sampled as steak. I can recommend neither.

It was hoped that some original work might be done in this line, until I visited a museum, and read that lions differ from cats in the shape of the pupil, and the hyoid bone.

In my most detailed post mortems I never dreamt of looking at the hyoid bone. Elephants carry their testicles posterior to the kidneys, and they never descend. The spleen is four feet long, and the lungs are embedded in areolar tissue. I pushed my clenched fist down the aorta.

They say ranching is a man's life. We often wish it was a girl's life too, and we might see more of them.

I anticipate another fifty bachelor years of rectal examinations and post-mortems, and eventually to expire under a mopani tree, my ears rescued from my chewed remains by a passing herd boy. My epitaph would be an entry in the ledger "To Carnivora".

Department of Agriculture,
P.O. Box 806,
Pretoria.

The Secretary,
South African Veterinary Medical Association,
Onderstepoort.

Dear Sir,

I have been instructed by the Veterinary Board to request you to kindly bring to the notice of the profession and in particular to Veterinary Students, through medium of your journal, my Board's disapproval at the indifference displayed by graduates concerning registration in terms of the provisions of the Veterinary Act, 1933.

Recently a Veterinarian who qualified in December, 1950, did not apply for registration until May, 1951, after having practised in the interim.

It is superfluous for me to indicate the implications of such irresponsible behaviour.

Graduates should not wait for the graduation ceremony to pass before applying for registration but should apply within thirty days of having been advised by the University authorities of the successful culmination of their studies.

The Veterinary Board will not tolerate any unwarranted departure from this procedure in future.

I will be pleased if you will publicise the fact that in terms of the provisions of the Veterinary Act, 1933, when a Veterinarian resigns from the Government Service and provided he was not registered prior to joining the Service, his registration lapses automatically three months after date of resignation in which case any application for registration will have to be considered anew by my Board.

You will no doubt be interested to know that the Veterinary Board recently ruled the maximum mileage fee chargeable under present conditions to be 1/6. Exceptional cases will of course be considered on their merits.

Yours faithfully,

Secretary/Registrar of Veterinarians.

November 27, 1951.

The Secretary,
Registrar of Veterinarians,
P.O. Box 806,
Pretoria.

Dear Sir,

Registration of Graduates.

I beg to acknowledge receipt of your letter V.1071/11 of the 9th instant, the contents of which have been brought to the notice of all final year students, qualifying at the end of this year. In addition your letter will be published in the next issue of the Journal of my Association.

Yours faithfully,

Honorary Secretary, S.A.V.M.A.

INDISCRIMINATE SALE OF DAIRY CATTLE

At the 46th Annual General Meeting of the South African Veterinary Medical Association held at Onderstepoort Laboratory on August 23rd, 1951, it was decided to bring to the notice of dairymen through various organizations such as the Fresh Milk Producers Union, Artificial Insemination Co-operative and the Dairy Industry Control Board, the dangers associated with the indiscriminate purchase of dairy cattle.

Diseases such as contagious abortion, tuberculosis, mastitis and infectious sterility are rife amongst dairy cattle and these animals are continuously changing hands through public sales. The result is that many dairymen are faced with ruin through the devastation caused by these diseases.

The dairymen should become more disease conscious and when buying dairy cattle should preferably purchase in-calf heifers in rural areas. The raising of the dairyman's own heifer calves is to be strongly recommended. This would necessitate decentralization of dairy herds to the peri-urban or rural areas and this should be encouraged.

BOOK REVIEWS

NOTES FOR INTRODUCTORY COURSES IN GENETICS by Charlotte Auerbach, Ph.D., D.Sc., Institute of Animal Genetics, University of Edinburgh. Published by Oliver and Boyd. Price 2/-.

The title of the booklet and its introduction, explain clearly its scope and usefulness. It is not intended to be a textbook. As the title states, the booklet contains *notes* on a series of lectures, which together constitute an introductory course to the subject of genetics.

To separate the notes from the explanatory lectures, will make them difficult to understand by the beginner. As the author clearly states in her introduction, "These printed *notes* should relieve the students of the necessity of taking their own notes on a subject, which requires great accuracy and clarity of terminology."

For this purpose, and for brushing up on the basal concepts and laws of theoretical genetics, this booklet serves an excellent purpose.

J.H.R.B.

PIPE DREAMS ABOUT LEATHER AND SADDLES by Leonard K. Mason (Simpkin Marshall Ltd., London, 1951: Price 8/6).

This book sets out concisely how leather is prepared and manufactured from the skins of various species of animals and the uses to which each type of leather is put. A number of trade terms are defined. The reader is told how to clean, preserve and look after leather and articles made from leather. The construction of riding, harness, pack and bicycle saddles is described. Short descriptions of various types of riding saddles are given. There is a chapter on horse controls which deals with bridles, bits, martingales, reins and spurs giving their actions and uses. There are clear illustrations at the end of the book of machinery used in leather manufacture, saddles, bridles, bits, harness, bicycle and pack saddles. The book will be found fascinating, informative and useful by those interested in horsemanship, leather work and manufacture.

G.D.S.

SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION

Extracts from the Minutes of a Council Meeting held on October 11th, 1951, at Sandown Veterinary Hospital.

Present: Drs. S. W. J. van Rensburg (President), J. G. Boswell, A. C. Kirkpatrick (Hon. Life Vice-President), W. D. Malherbe, G. P. Pfaff (Vice-President), M. C. Robinson, E. M. Robinson (Hon. Editor), G. D. Sutton (Hon. Treasurer), P. S. Snyman, H. P. Steyn, A. D. Thomas and M. de Lange (Hon. Sec.)

Apologies: Drs. R. A. Alexander, A. M. Diesel and P. J. du Toit.

Natal Veterinary Co-operative Society. This has now been registered and a Liaison Committee consisting of Drs. A. M. Diesel, A. D. Thomas and A. F. Tarr has been appointed to act in an advisory capacity to it.

Indiscriminate Sale of Dairy Cattle. This was fully discussed by Council and as no provision exists in the Stock Diseases Act for legislation in this matter it was felt that personal propaganda amongst their clientele would be the best way of dealing with the matter. Organizations such as the Fresh Milk Producers Union, Artificial Insemination Co-operative and the Dairy Industry Control Board should be approached to make the subject part of their continuous educational and propaganda schemes. Dr. Snyman agreed to arrange for propaganda in Farmers' Programmes on the radio.

Life Members. Drs. A. M. Diesel, G. Schmid and S. W. J. van Rensburg have become life members by virtue of thirty years continuous membership.

M. DE LANGE,
(Hon. Sec.)

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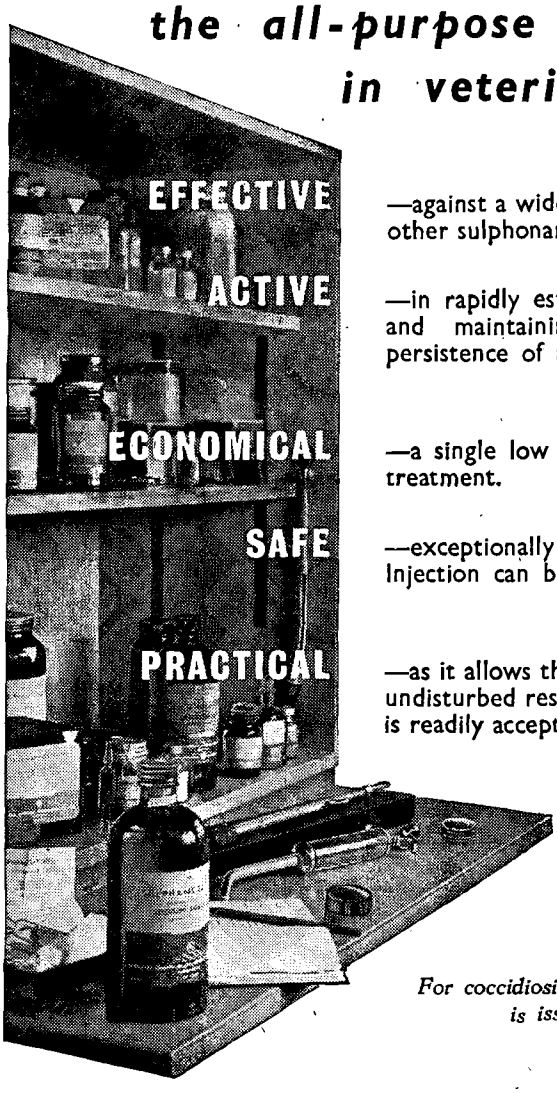

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