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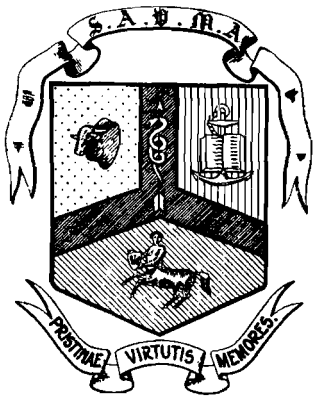

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CONTENTS.

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BILIARY FEVER OF DOGS IN EAST GRIQUALAND.

C. W. A. BELONJE,
Kokstad.

This disease is endemic in East Griqualand. It occurs mainly during summer and decreases in incidence during the cold winter months from May to August.

Invariably the dog is brought in with symptoms of anorexia and general malaise. Often the typical biliary fever syndrome is met with, — blanched mucous membranes, emaciation, general debility, a sharp but bounding pulse and a variable temperature ranging from 100°F to 105°F.

The variations of the symptoms shown in biliary fever in dogs in this area are so great that the only way to make a correct diagnosis is to examine blood smears. The temperature may be normal or only slightly elevated and symptoms of enteritis, gastritis with vomiting, and others as well may be present, but *B. canis* is almost constantly present in blood smears.

The symptoms which are regarded as typical of biliary fever in dogs are very similar to those seen in cases of chronic nephritis. In the absence of the parasites in the blood, palpation of the kidneys and a consideration of the age of the patient do not always enable one to make a definite diagnosis and it becomes necessary to make an examination of the urine.

Since December, 1939, a routine microscopic blood smear examination of all dogs submitted was instituted and a record kept. It was found that the typical syndrome only occurred in advanced cases of the disease.

Preparation and Staining of Smears.—The hair is clipped from the anterior edge of the ear and the skin is either scraped or a little bit is snipped off. An incision is never made, thus avoiding troublesome bleeding. A drop of blood is forced out by squeezing and the smear prepared in the usual way and dried.

Staining: (1) It has been found that unless the smear is covered with absolute alcohol for at least five minutes, diagnosis would be extremely difficult through the incomplete fixation and the resultant crenation of the red cells. The alcohol is then shaken off and the slide covered with concentrated Giemsa solution. After three minutes, ten to fifteen drops of distilled water are added and this mixture is allowed to stand for another three minutes, after which the slide is washed, dried and examined.

(2) Fix the dried smear with (a) absolute alcohol for five minutes or (b) May-Grunwald for one minute. Shake off and then stain with a one in three aqueous solution of Giemsa (Gurr) for three to four minutes.

Treatment.—Biliary fever is one of the diseases against which specific chemotherapy exists. After its application all that was found necessary in the line of additional therapy was to give a small amount of olive oil daily for four to six days, feeding on porridge and other milk-containing foods and the inclusion of minced raw liver in the diet. It was not found necessary to supplement the above diet.

Specific Treatment.—In the treatment of biliary fever in the cases recorded below the amount of the particular drug used was always calculated on the weight of the dog, with the object of determining whether relapses were or were not due to inaccuracies in dosage. The result has been to establish a definite scale of dosage for the various drugs selected for trial:

1. *Acaprin (Bayer):* This drug proved, according to my records, to be very unsatisfactory. However the doses used were considerably smaller than those of pirevan, which is supposed to have the same chemical composition. Two dogs treated with acaprin in doses of 1 cc. of a 0·5% solution per 30 lbs. body weight, and one with 1·4 cc. of a 0·25% solution developed relapses and were given a second injection. Two dogs required treatment with trypan blue after a single inoculation of acaprin, 1 cc. of 0·5% solution to 30 lbs. body weight. Three dogs required an injection of trypan blue after having been treated twice with acaprin in a dose of 1 cc. of a 0·5% solution per 40 lbs. body weight.

2. *Pirevan (Evans):* This drug is put on the market as a 5% solution and was diluted down to 0·25%. It was injected subcutaneously and the dose was standardized at 1·75 cc. per 10 lbs. body weight. The dose was thus very much greater than that of acaprin. Symptoms of anxiety, restlessness, defæcation and vomition occur, half to one hour after the injection. The 0·25% solution does not deteriorate when kept for long periods.

Of twenty dogs treated with the above dosage, only four relapsed and all the relapse cases recovered when the injection was repeated ten to seventy days later. Sixteen cases were treated by the subcutaneous administration of half the recommended dose of pirevan solution, followed by a full dose twenty-four hours later. Of these, two were in extremis on admission and died before the second dose could be given. Two required a third treatment with a dose two to three times the size of the first one. In one case, however, the second dose was smaller than the first. The percentage of recovery was 87½.

Trypan Blue (British Drug Houses): In the first series twenty cases were treated with trypan blue in 1% solution, in doses of 4 – 12

cc. Nineteen of these were given the drug intravenously, and one subcutaneously. Of the twenty cases six showed relapses. These recovered after being given a second similar or slightly increased dose of trypan blue or a dose of pirevan. The dosage was eventually standardized at 1/10 grain per 1 lb. body weight, dissolved in boiled water. For large dogs a 2% solution replaced the 1%, to reduce the volume of the dose. As the intravenous method of injection is a time-consuming procedure it was decided to use the subcutaneous route and attempt to eliminate the abscess formation which usually accompanies it. It was considered that the tendency to abscess formation might be due to decreased absorption at the site of injection as a result of part of the trypan blue not being in solution. In consequence all solutions were filtered through filter paper, and no cases of abscess formation occurred subsequently.

It is inadvisable to use stock trypan blue solutions on account of the danger of their having become contaminated, or changes having taken place, rendering them harmful to the patient.

It is advisable to use a fresh solution for each case, and it is recommended that trypan blue be kept in 3-grain packages. The manufacturers might be approached to put up the drug in 3-grain tablets.

In the second series of seven cases, the standardized dosage was employed and all the injections, using 2% trypan blue solution, were given subcutaneously on the inside of the thigh. All the dogs recovered without abscess formation.

Summary.

1. The incidence and diagnosis of biliary fever at Kokstad is discussed.

2. Pirevan used in a sterile 0·2% solution may be kept indefinitely. The dosage recommended is 1·75 cc. per 10 lbs. body weight, subcutaneously. One injection results in a very high percentage of recoveries. The double injection, giving a half dose first, followed by the full dose 24 hours later, is even more effective.

3. Trypan blue, according to the scale of one grain per 10 lb. body weight, in 1% or 2% solution, has given excellent results. For subcutaneous administration thorough filtration of the solution is necessary to avoid abscess formation.

Acknowledgment.

I wish to express my sincere appreciation to my colleagues, Messrs. Steenkamp and Snyders, for treating many of the cases quoted, according to the dosage advised and in recording their findings.

SARCOSPORIDIOSIS IN SHEEP, AND ITS RELATION TO CERTAIN FORMS OF MYOSITIS.

A. D. THOMAS,
Onderstepoort.

In most countries the incidence of sarcosporidiosis in herbivorous animals is generally accepted as high, and on account of the relative unimportance and low pathogenicity of this parasite, the trouble and expense of making further extensive surveys is not usually justified. In this country special studies have been carried out by Walker (1918) in sheep and horses, and by Viljoen (1918 and 1921) in cattle in connection with lamsiekte.

An opportunity to examine skeletal muscle from a fairly large number of sheep presented itself recently and was made use of to determine the degree of sarcocyst invasion in sheep from a known locality. The material used had been collected and prepared histologically for studying certain changes observed in muscle from bluetongue-infected animals.

Muscles from 60 merino sheep were examined in all. Nearly all these sheep had been purchased within the last six months from the districts of Carnarvon, Steynsburg and Beaufort West in the Karroo. Of these sheep 44 were killed or died of experimentally produced or natural bluetongue. Of the remaining 16, some were sacrificed controls and others had died of acute diseases such as heartwater, etc.

From the majority of these animals one section each was prepared from the following muscles taken at post mortem:— Diaphragm, trapezius, serratus thoracis, longissimus dorsi, psoas, biceps femoris, cutaneous, occasionally also the myocardium, gluteus, and others, but not the oesophagus. As great accuracy was not aimed at, an actual count of cysts found was not made. It was deemed sufficient to group the animals in three categories:—

a.	Those in which no cysts were seen	19
b.	Those with very few	37
c.	Those with fairly numerous cysts	4
	Total	60

Although named muscles were examined no site of predilection could be established. The cysts occurred apparently at random in any muscle. Only four sheep were placed in group (c) and yet in the worst case among these not more than 4 – 6 cysts were found per section (cf. up to 40 recorded by Walker). On the other hand several of those in group (b) showed only one cyst in the whole series of

sections examined. It is more than likely, therefore, that many if not all of those in group (a) were also lightly infected, but the small number of sections available failed to reveal the presence of such cysts.

Age did not seem to be an important factor in determining the degree of invasion. For instance, two sheep in group (c) were young (2-tooth) and the others were adult (full-mouth). In group (a) again about one-third of the sheep were full-mouthed, the other two-thirds being 2 and 4-tooth. It would seem thus that infestation with sarcosporidia is widespread but relatively light in sheep from the Karroo area.

The muscular lesion often seen in bluetongue, and mentioned above as the reason for undertaking this study, is of the nature of a degenerative myositis (myodegeneratio hyalinosa), which at times is complicated by intramuscular hæmorrhages. Such changes are by no means restricted to bluetongue only, but evidently occur under a wide variety of conditions in different species of animals, e.g. myoglobinæmia in the horse, " stiff lamb " disease of sheep and probably in many acute febrile diseases in which muscular stiffness is a symptom. It was interesting to note, therefore, that in affected cases this myodegeneration which sometimes progressed to necrosis of the muscle fibres, could actually cause the death of sarcosporidia involved. This death and disintegration is followed by a local inflammatory reaction (liberation of sarcocystin ?) quite distinct from the more general " fibrous replacement " or regenerative proliferation of sarcolemma nuclei and muscle fibres, consequent to the degeneration itself.

On account of the rarity of sarcocysts in the muscle of the sheep in which this was seen, the resultant reaction was focal, scattered, and almost negligible, but it is conceivable that similar and extensive myodegenerative changes when superimposed on a heavy sarcocystic invasion might give rise to a more or less severe chronic myositis such as has been described by Clark and Jackson (1942) in the horse and pig.

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EOSINOPHILIA IN A DOG.
(Case Report).

B. S. PARKIN,
Onderstepoort.

A pointer, a 4-years-old male, was presented for examination on 16th February, 1943, on account of poor condition and intermittent attacks of coughing. Its habitus was good, the dog being lively and attentive. It had a ravenous appetite. The temperatures recorded never exceeded 102·°F. The pulse was strong and of normal frequency and the visible mucous membranes showed a slight cyanosis. Palpation of the mandibular and prescapular lymph glands showed these to be slightly enlarged, non-sensitive, smooth surfaced, increased in consistency and not involving the skin. Moist râles were easily detected by auscultation. Percussion of the thorax gave increased resonance, possibly due, in part, to the poor condition. A very conspicuous symptom was the marked and continuous expiratory dyspnœa associated with an occasional very deep inspiration and a bulging of the anterior abdominal region due to an exaggerated backward excursion of the diaphragm. Coughing was intermittent and occurred in paroxysms. The material coughed up was mucoid and glistening and showed, on close examination, numerous small white specks resulting in a light greyish appearance. Retching frequently terminated the attack of coughing.

The tuberculin test was negative and only a few hookworm eggs were found on fæcal examination.

The examination of a stained blood smear and of the sputum showed numerous eosinophils to be present.

During the first six weeks of observation six pounds of meal-maize-milk ration was given daily but no improvement in condition was noted. The ration was increased on 1.4.43 to 9 lbs. This represented about three times the dog's maintenance ration. The dog was able to eat 6 lbs. of the ration in 80 seconds. The improvement in the dog's condition from this date was rapid and he was discharged a fortnight later in very good condition and practically free of the dyspnœa and the coughing.

On 18.8.43, i.e. six months after the first admittance of the dog, the owner returned him for re-examination. The symptoms originally noted, namely, dyspnœa, moist râles, coughing and ravenous appetite, had disappeared and the dog was to all intents and purposes normal.

Smear examination did, however, reveal that a certain degree of eosinophilia was still present.

As a result of the finding in the original smears made, an examination of the blood and differential counts were undertaken. The details are tabulated below for the time of admittance, of discharge and of re-examination.

	18.2.43.	12.4.43.	18.8.43.
Red cell count (millions per c.mm.)	5·79	6·39	5·31
White cell count (per c.mm.)	41,200	40,200	19,200
Red cell volume	31·5%	——	31%
Hæmoglobin (gm. %)	15·3	16·8	11·9
Blood sugar	normal	——	——
Non-protein	normal	——	——
Eosinophils (%)	63	50	16

Discussion.

The figures of the blood examination show that anæmia was not a factor and that the leucocytosis was due to an absolute increase in the number of eosinophils. Mention of eosinophilia in veterinary literature is meagre and is mainly in connection with parasitic conditions. Eosinophilia undoubtedly is at times due to trivial or unusual causes but such do not provide examples of persistency or of very high figures. The condition of eosinophilia is apparently symptomatic in a number of diseased states such as parasitic infestations, allergy, skin diseases and leukæmia. In the case under discussion the course of the disease and the marked improvement in the absence of any direct therapy of a specific nature incline one to the opinion that oesinophilia cannot be grouped under any of the above headings except possibly that of parasitic infestation, the dog then presumably making a spontaneous recovery which coincided with the increasing of the ration. The improvement in the dog was extremely rapid once the ration was increased and apparent normality was soon attained notwithstanding that the percentage of eosinophils was still very high.

Recently a number of cases of eosinophilia in human beings have been described in India under the title of Tropical Eosinophilia (Weingarten, R. J., *Lancet*, 23rd Jan., 1943). The blood smears in these cases showed a massive mature eosinophilia, the absolute number of nentrophils and lymphocytes being unchanged. The symptoms were very similar to those seen in the above dog. They were, in short, a dry, hacking, ineffective cough, long-continued expiratory dyspnœa, loss of condition, sibilant rhonchi, prolonged expiration and tenacious and glassy sputum. Success in treatment was attained with various arsenical preparations.

FOREIGN BODIES IN THE RETICULUM OF A COW. (Case Report).

V. R. KASCHULA,
Allerton Laboratory, Pietermaritzburg, Natal.

Since the *Journal of the S.A.V.M.A.* was first published in August, 1927, only two articles have appeared in its pages relative to foreign bodies in any of the stomachs of ruminants. The first was by Paine (1929), and it contained an account of foreign bodies, probably of vegetable origin, found in the abomasum of sheep. The next was an article by de Villiers (1939), who stated that at rumenotomy he removed 62 lbs. of stones from the rumen of an ox.

A third articles by Kind (1939) refers broadly to the various foreign bodies found in the rumen and reticulum and the pathological conditions caused by them. He then proceeds to a description of the operation of rumenotomy.

In Natal one often observes cattle chewing bones with as great a relish as they do in the lamsiekte areas of the Transvaal and Free State, and yet, strange to say, very few cases of this disease are brought to the notice of Natal veterinarians.

Foreign bodies in the reticulum of cattle are familiar to every veterinarian in the country. The case to be described was of a particularly severe nature. Its cause is ascribed to a mineral deficiency, probably phosphorus, which is known to be deficient in Natal soils and pastures.

The case occurred near Dargle on a sour-veld farm. This lies in an area of Natal, which, according to du Toit, *et al* (1940), contains less than 0·09% phosphorus in the pasture in winter and 0·11% – 0·14% phosphorus in summer. Due to the war-time difficulty in obtaining bone-meal no lick was supplied to the cattle running on the farm.

The subject in question was a Friesland heifer, four years old, and on the point of calving. She was well bred, and had been doing well, but with the onset of winter she began to lose condition. The owner stabled and nursed her and applied symptomatic treatment, but these efforts were of no avail, and the cow died. She was in very poor condition and latterly had been too weak to stand up.

On post-mortem examination the reticulum was found to be loaded with the following foreign bodies: 143 stones, 2 nails, 1 washer, 2 pieces of glass and 2 pieces of china, weighing in all 4 lbs. 12 ozs., the collection being shown in in the photograph (Fig. 1). Some of

the stones were about three inches in diameter. None of these objects penetrated the wall of the reticulum. The stones were of very hard material, and it is thought that they were picked up from a pile of crushed stones, to be used for concrete. It is assumed that the cow was suffering from pica, and, with the calf acting as a drain on her mineral reserves, she ingested these foreign bodies in an endeavour to overcome what was probably a phosphorus deficiency. Foreign bodies of a high specific gravity have a tendency to remain in the reticulum for long periods, so in this case they accumulated to this remarkable degree, leading to the death of the beast.

My thanks are due to the owner who brought the stones in and gave a description of the case, and to Mr. Hill, Senior Technical Assistant, for taking the photograph.

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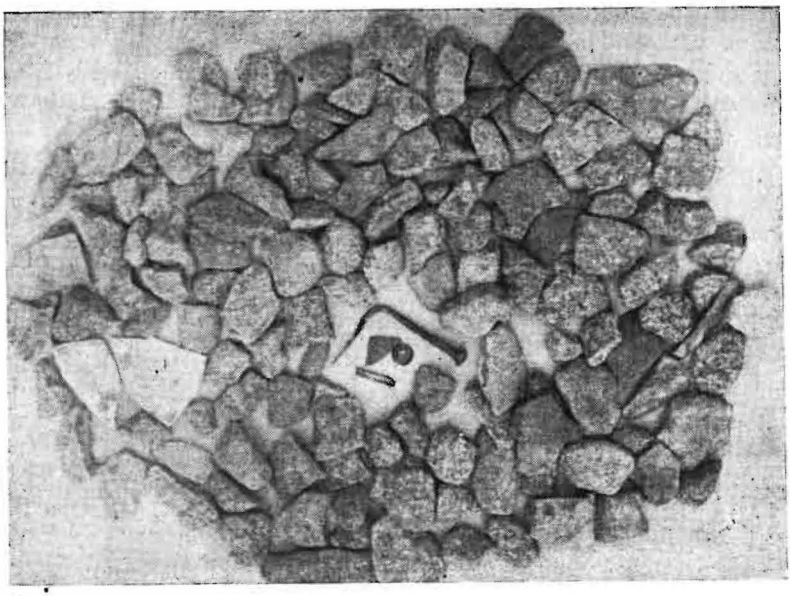

Fig. 1.—*Foreign bodies in the reticulum.*

PSITTACOSIS IN A BUDGERIGAR *(Melopsittacus undulatus).*

J. D. W. A. COLES,
Onderstepoort.

Although budgerigars, or love-birds as they are often called, are being kept on an ever-increasing scale in South Africa, no cases of psittacosis have hitherto been reported among them or in human beings. Indeed, the only definite evidence of the presence of the disease has been found in domestic pigeons.

Lest it be thought that our stocks of budgerigars are in some way insusceptible to psittacosis, the following outbreak is recorded. Most probably the infection is widespread, and veterinarians and medical officers should be on their guard, particularly when atypical pneumonias fail to respond to sulphonamide therapy. Even minor household epidemics of " influenza " should not be hastily overlooked.

The Transvaal Outbreak.

In March, 1943, a half-decomposed adult budgerigar was received for examination from a gold mine in the Heidelberg district. The spleen was about twice the normal size, but the material was unsatisfactory for mouse inoculation. In view of the suspicions aroused, the mine management later sent a love-bird that had just died. This second bird had slight enteritis, and the spleen was dark red, soft and three times the usual size. Lung smears, stained with Giemsa, revealed a few aggregations of granules, highly suggestive of the virus of psittacosis.

Bits of spleen, liver and kidney were pooled, macerated, mixed with a little normal saline and then injected intraperitoneally into six white mice. Four days later two mice died showing the typical viral granules in smears of the spleen and omentum. The following day the other four mice succumbed — also to psittacosis. This strain of the virus was thus very pathogenic for white mice infected by the intraperitoneal route.

Experiment on Domestic Pigeons.

In view of the fact that the author has described a case of conjunctivitis in a carrier pigeon that was probably due to psittacosis, an attempt was made to set up a similar state in the eyes of two pigeons by using this psittacine strain. For this purpose spleen and kidney material was collected from each of the last four mice dying. The animals had been dead for at most six hours. The organ material was pooled and macerated and afterwards smeared on a pledget of cotton

wool, which was then held in forceps and rubbed firmly over the right conjunctival membrane of each pigeon. The eyes remained normal in appearance and smears of conjunctival scrapings, stained with Giemsa, were negative after eight, fifteen, twenty-two, thirty and thirty-four days.

The pigeons were sacrificed immediately after the last examination and with the massive conjunctival scrapings from each bird, a group of six mice was inoculated intraperitoneally. These twelve mice remained well and were killed after eleven days. Some mice were then injected intraperitoneally, and others intracerebrally with the pooled splenic material from one group of six mice. Other mice were similarly treated with material from the second group of six mice. All these "second generation" mice failed to sicken.

In this experiment it was thus impossible to infect the conjunctival membranes of two pigeons with a psittacine strain of virus.

Destruction of Birds in the Mine Aviaries.

The mine was visited three days after confirmation of the diagnosis, when it was found that the two species of birds had been separated and removed to two roomy cages. Eight weeks before, a large aviary in hygienic surroundings had been stocked with about forty budgerigars and ten canaries, for possible use as gas detectors underground. The birds were acquired from two private breeders, as well as a pet shop in Johannesburg. At the time of the visit only twenty-seven budgerigars and six canaries remained, the others having died off at more or less regular intervals. One of each species was found to be sick, but material was not collected.

It was uncertain how best to dispose of the survivors. The birds had been purposely kept without water for a day, and so a solution of sodium arsenite was poured into the drinking vessels. The poison was at first partaken of readily, but within the space of a few minutes the birds shook their heads and brought up the crop contents. After an hour the attempt was abandoned, as no birds had died, though many looked sick. The cages were then enclosed with sacking and filled through a rubber pipe with exhaust gases from a car. After two minutes, the birds could be heard falling off the perches and all but one were dead within another three minutes. The solitary survivor lived only a minute or two more.

Poisoning with CO gas is undoubtedly the best way to dispose of birds on infected premises. It is quick and cheap. There is no pain. The gas is relatively safe to use. There is no need to enter the aviary and so stir up and inhale any dangerous dust. The owner cannot see what is happening behind the covering. The only equipment needed by the veterinarian is a length of rubber hose to connect the exhaust pipe of the car to the cage.

The mine management was advised to keep only canaries in future, for canaries are seldom carriers of psittacosis, even though they are highly susceptible to the disease. Budgerigars, on the other hand, are notorious carriers of the infection. Furthermore, the value of canaries as gas detectors is very well known, whereas love-birds have been utilised little, if at all, for this purpose.

Summary.

The first diagnosis has been made of psittacosis in a budgerigar in South Africa. The virus killed white mice in four to five days when injected intraperitoneally. Failure attended an attempt to infect the conjunctival mucosa of two domestic pigeons with the virus from the test mice. Using the exhaust gases from a car was found to be a most satisfactory way of destroying birds in an aviary.

Reference.

Coles, J. D. W. A. (1943). A review of psittacosis in domestic birds with a note on a case of conjunctivitis in a pigeon probably due to psittacosis. *Jl. S.A.V.M.A.* 14(2) : 47 - 58.

A SIMPLE METHOD OF OBTAINING LARGE AMOUNTS OF STERILE BLOOD FROM FOWLS.

D. A. HAIG and J. D. W. A. COLES,
Onderstepoort.

Fowl plasma is often required in quantity for tissue culture work, and sterile whole blood or serum may be needed for other purposes. It is customary to obtain such blood under aseptic conditions from the carotid arteries, and the operation involved is by no means easy. The method to be described here is very simple, and up to about 75 cc. of blood can be obtained within 10 minutes of administering the anæsthetic.

Apparatus.

A Mason tube (see Fig. 2) is excellent for the collection of the blood. The operator's right index finger fits into the notch and so a firm hold is possible. The snugly-fitting rubber cork is pierced by three glass tubes. Tubes (a) and (b) are sealed before use and have paper caps. Blood from the heart flows down through tube (b), and the Mason tube is afterwards emptied through tube (a). A slight vacuum, just sufficient to cause the blood to flow steadily into the Mason tube, is made possible by connecting the rubber tube, fitted with a cotton-wool filter (c), to a filter pump. As indicated in Fig. 2, tube (b) enters the Mason tube on a lower plane than the tube connected to the filter pump — for the obvious reason of precluding the suction of blood into the cotton-wool filter. Tubes (a) and (b) are fitted with paper caps, the anticoagulant is added to the Mason tube, and then the whole ensemble, wrapped in paper, is sterilised. If heparin is used it must be sterilised separately as it is destroyed by excessive heat. Then the heparin is poured into the Mason tube, after the rubber cork, with all the fittings, has been gently withdrawn. If the heparin is added carefully in this way, the danger of infection gaining entrance to the Mason tube is very remote.

Operation.

The fowl is anæsthetised with ether and is then placed on its back on a board about 70 cms. long and 35 cms. wide. The wings are stretched out and held down firmly with tape, which passes from one wing round the back of the board to the other wing. The legs are controlled in a like manner.

Commencing in the middle of the sternum, an incision is made posteriorly through the skin as far as the vent. From the same

starting point incisions are made through the skin, to right and left, to end in the lumbar region. The incisions now form a T, and the two flaps of skin are easily rolled off the abdomen and thighs by blunt dissection.

At this stage each hip joint is dislocated by pressing down on the thighs, and the tapes holding the legs are tightened.

The head end of the board is now raised about 10 cms. The abdominal cavity is opened from side to side by cutting through the muscles just behind the ribs and sternal cartilage. The xiphoid cartilage is taken between the left thumb and index finger and raised, and then the ligamentous fold passing between the right and left hepatic lobes to the sternum, is snipped with sterile scissors.

Fig. 1.— *The apparatus in position, just after tube (b) has been pushed into the heart.*

The apparatus is connected to the filter pump. The paper cap is removed from tube (b), after the tip of the tube has been broken off. The end of tube (b) is then pushed into the heart which is clearly visible. Blood begins to run through tube (b) and then the water tap is slowly opened, so that the filter pump begins to function. A continuous steady flow of blood into the Mason tube is all that is required. When sufficient blood has been collected the water tap is turned off and the apparatus disconnected from the filter pump, and then tube (b) is withdrawn. A small column of blood remains in tube (b), to form an efficient seal. The fowl is not permitted to recover consciousness.

As soon as it is desired the paper cap is removed from tube (a), after the tip of the tube has been broken off, and then the contents of the Mason tube are poured into the waxed sterile centrifuge tubes or other vessels.

By marking the Mason tube beforehand, it is possible to judge the amount of blood being collected almost to a cubic centimetre. No sterile cloths are necessary. In fact, the only sterile instrument wanted is the pair of scissors already mentioned.

If the rubber cork does not fit perfectly it may be tied in with string, the procedure being facilitated by the presence of the notch in the Mason tube. Sterile wax can also be applied to the junction between the cork and the Mason tube.

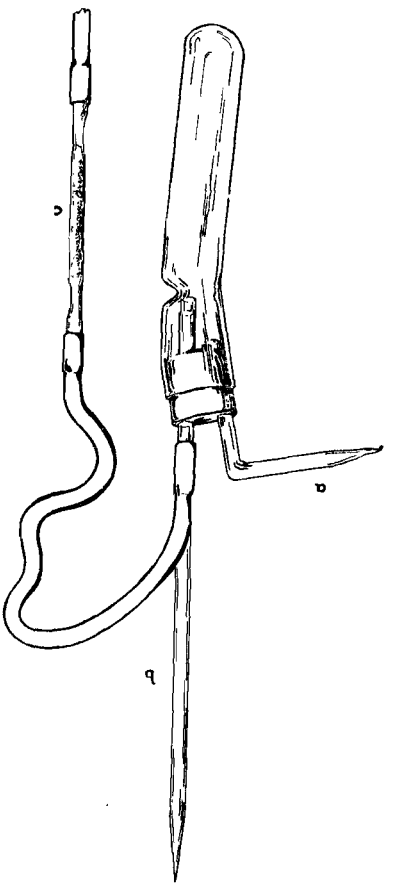

Fig. 2.—*Apparatus needed for collecting the blood; ⅓ normal size.*

A point worth mentioning is that it is never necessary to administer more anæsthetic after the abdominal cavity has been opened. Indeed, when the whole technique has been mastered, it is seldom required to give more ether after the fowl is once properly under anæsthesia.

The authors are indebted to Mr. T. Meyer for the photograph and to Miss D. Pringle for preparing the drawing.

GIEMSA STAINING OF LARGE NUMBERS OF SMEARS.

M. C. LAMBRECHTS,
Umtata.

At Umtata laboratory more than 200,000 smears are examined annually. The metal tank described below greatly facilitates the staining and handling of smears. The drawing (one-third natural size) is self-explanatory. It should be noticed that the tank is divided into a small and a large compartment in case only a few smears have to be stained.

The following are the main advantages of the bath:—

(1) It is simple, costs little and holds up to 120 smears.

(2) There is a saving of approximately 75% in the amount of stain used, compared with the usual method of staining.

(3) The smears are clearly and evenly stained and free from deposit.

(4) There is a great saving of space owing to the compactness of the bath, and the arrangement saves labour in the handling and recording of smears.

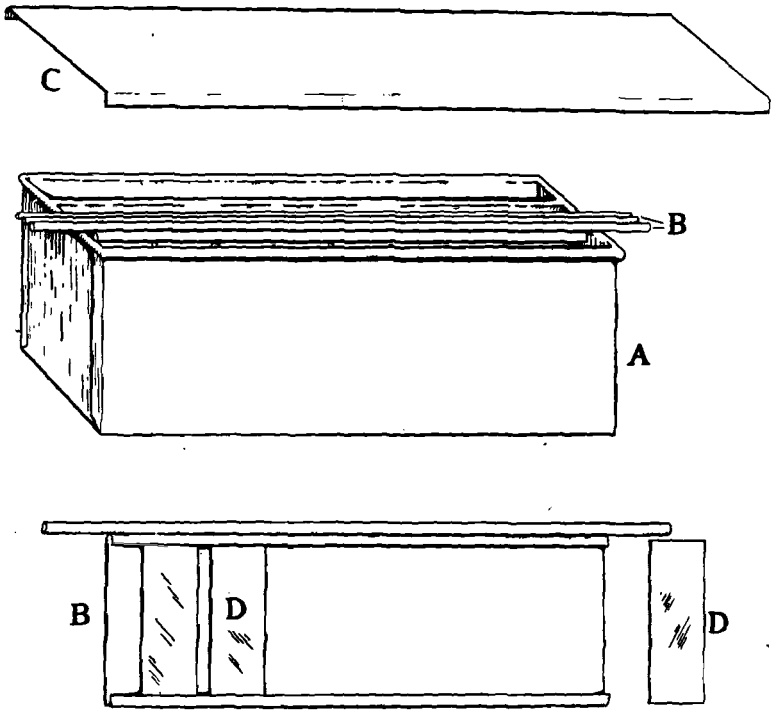

Fig. 1 (⅛ natural size).

A. *Tank.*
B. *Hanging smear racks.*
C. *Lid.*
D. *Glass slide.*

HISTORY OF THE S.A.V.C., 1910 – 1939.

(Continued from December, 1943, issue.)

Chapter III.

INTER-GREAT WARS PERIOD, 1918 – 1939.

(i) Comments on Regulations.

It is desirable that the position of the S.A.V.C., both P.F. and A.C.F., be considered in the light of regulations introduced during the above period.

Permanent Force.

(a) The regulations published under Government Notice No. 776 of 1915 were repealed so far as Part I — relating to the Veterinary Department P.F. (Staff) Section — was concerned. Entirely new regulations accompanied Proclamation No. 17 of 1923 which specified, among other things, that the re-constitution of the P.F. would date from 1.2.1923. One of the biggest changes involved was the disbandment of four S.A.M.R. regiments([46]).

(b) The S.A.V.C. continued to function and any reference to it was made in the new general regulations, e.g. the fact that the unit was thirteenth in the order of precedence([47]), and further, that provision was to be made for the maintenance of historical records (Para. 86, Chapter XI).

(c) In consequence of the replacement of the horse by motor power, the old regulations regarding horses, mules, saddlery, etc., were no longer present. One reference, however, exists, viz., the procedure regarding the watering of animals on manoeuvres (Para. 20, Chapter XIV).

(d) Paragraph 57, Chapter III, indicates that the Veterinary branch is one of the twenty-one branches mentioned as having provision made for reserve officers([48]).

(e) Nothing can be found in the regulations about the constitution of the S.A.V.C., but it is a fact that there was a Veterinary branch at D.H.Q. over which was the D.V.S., who, incidentally, was a member of the S.A. Staff Corps.

([46]) Another was the introduction of daily rates of pay with allowances instead of a consolidated rate plus local allowances applicable to a particular area.

([47]) Mounted Rifles (which are not now horsed) came fifth. See paragraph 66. Chapter X.

([48]) These are A.C.F. officers.

(f) Paragraph 12, Chapter V, lays down that a farrier belongs to Group B of the classification of trades for artisan rates of pay. Paragraph 78 specifies the daily rates of extra duty allowance for recognised trades([49]).

(g) Nothing is stated as to the rank of first appointments in the case of V.O.'s.

(h) Until the appointment of the present V.O. to the P.F. (Nov., 1939), the V.O. received his basic salary or substantive pay with the usual allowances for lodging, fuel and light, rations, uniform, etc., but no professional allowance, such as was paid to a medical officer.

It is convenient to remark here that unfortunately between 1931 and 1939 there existed a grievance on the part of the S.A. Veterinary Medical Association against the Department of Defence, as the latter was not prepared to appoint a successor to the recently retired D.V.S. with the rank of captain, or privilege of professional pay, such as received by medical officers. In 1933 the rank was granted, and in 1939 the principle of professional allowance was acknowledged. The allowance, however, was not identical with that enjoyed by the medical officer, but was a " balancing " amount corresponding to the difference between the scale of £800 – £900 and the salary pertaining to the ordinary rank of captain. It was, however, pensionable.

Active Citizen Force.

(a) The regulations appearing under Government Notice No. 776 of 1915 and referring to Part II — the Citizen Force Section, S.A.V.C. — were repealed as from 30.6.1926. Fresh regulations of a general character (not specifically S.A.V.C.) were published under Government Notice No. 1031 of 1926.

(b) The S.A.V.C. continued to exist, and as in the P.F. above described, provision was made for services such as the keeping of historical records (Para. 41, Chapter XIV).

(c) A special Chapter, No. IX, is devoted to horse registration, insurance and compensation.

(d) The paragraph relating to the Reserve of Officers (Ctapter III, paragraph 60) reads:— " Subject to being medically fit and otherwise eligible under the regulations for the Reserve of Officers, and officer may on retirement or subsequent thereto, be placed on the Reserve of Officers, with the approval of the C.G.S."

(e) Paragraph 6 of Chapter II states that the S.A.V.C. " shall comprise the veterinary units and veterinary details assigned to other

([49]) A departmental Commission of Enquiry was appointed in Oct., 1924, to investigate matters alleged to be discordant with good order and discipline and the welfare of the P.F. Among the subjects studied was the question of pay of farriers. The report of the Commission was published by the Government Printer (*U.G. 20, 1925*).

units of the A.C.F. according to the prescribed establishments laid down for that Force." Paragraph 13 of Chapter III provides for the appointment of A.D.V.S. and D.A.D.V.S. as may be required. Promotions in commissioned rank are made on the recommendation of the D.V.S.

(f) In regard to the extra duty allowance for farriers (depending on rank of detail) paragraph 78 of Chapter V of the *P.F. regulations* makes it clear that the allowances " shall not be paid to a recruit until from and after completion of three months, unless he has previously served in the R.A.V.C. or S.AV.C. (A.C.F.), in which case he shall receive the allowance from date of engagement."

(g) First appointments to commissioned rank will be made in the rank of lieutenant, unless a higher rank is recommended by the D.V.S. (Para. 12, Chapter III).

(h) Paragraph 11 of Chapter V provides for a professional allowance of 30/- per day, in addition to 12/6 per day for a captain.

A forage allowance or cash not exceeding 1/6 per day is payable for every authorised horse used during days of continuous training([50]).

(ii) Narrative.

The period 1919 – 1939 is characterised by a return to normal followed by the replacement of equines by motor transport and by the adoption of economic measures, e.g. the amalgamation of medical and veterinary base stores in 1921 and by the closing of the veterinary hospital at Roberts Heights in 1926. Retrenchment was particularly severe at the time of the universal financial depression commencing in 1930.

The more important events will be discussed briefly from year to year, beginning in 1921. As mentioned above, economy was effected by amalgamating the base medical and veterinary stores under an officer styled O.C. Central Medical and Base Veterinary Stores, and located at D.H.Q., where the stores were kept. Two years later arrangements were completed for all State institutions to be supplied from or through the Central Stores which fell under the immediate control of the D.M.S.([51]).

Distinctive service dress was introduced with provision for the various orders([52]).

([50]) See paragraph (h) relating to the P.F. The professional allowance of 30/- per day has been replaced by the modified allowance described thereunder.

([51]) The S.A. Military Command, so designated by the War Office, was abolished on 1.12.1921 and complete responsibility for the land defences of the Union was assumed by the Union Government.

([52]) In 1921 *Instructions for Dress U.D.F.* and *Officers' List U.D.F.* were published, the latter annually thereafter. In 1924 the *Official History of the Great War* appeared, and in 1930 a booklet on *Ceremonial* was issued. The *Union Military Discipline Code* was first published in 1913.

An Acting D.V.S. (Lt.-Col. J. G. Bush) was appointed during the year in place of the Staff Officer, Veterinary Services (Major J. B. Collyer) who retired on pension.

In March, 1922, there occurred an industrial upheaval during which thousands of burgers were mobilised. Most of their horses were unshod and quickly showed signs of footsoreness. Requisitioning was made on local civilian forges, but fortunately the disturbance was of short duration.

As from 1.10.1922 the designation Secretary for Defence had added to it the title Chief of the General Staff. General A. J. E. Brink became head of the department on the retirement on pension of Sir Roland Bourne.

In 1923 the S.A. Permanent Force was reorganised under Section 1 of the South African Defence Act Amendment Act, 1922, with effect from 1.2.1923.

Revised equipment scales were introduced for the S.A.V.C. resulting in improvements in the mobilisation stores, notably as regards a lighter pattern of field chest, which was obtained from oversea([53]).

In the same year, the veterinary inspection of meat and the care of dairy cows at Roberts Heights received special mention in the annual report.

In 1924 the work of the S.A.V.C. increased considerably owing to the institution of instructional courses for the farrier staff.

In 1925 attention was drawn to the difficulties under which a small unit, such as the S.A.V.C., laboured especially in times of financial stringency. As yet no provision had been made for a veterinary school. Reference was made to the establishment tables of the unit([54]).

The year 1926 was another period of marked reorganisation. Among the changes adopted was the reduction from 16 to 6 of the military districts of the Union, the artillery became Field (no longer Horse) Artillery and there was disbandment of the S.A.M.R. As a result of the reduced animal establishment, the veterinary hospital at Roberts Heights was closed on 31.3.1926 and the staff was attached to the S.A.S.C. for duty at the transport depôt. Sick animals were treated in unit lines.

In 1927 attention was paid to the creation of two A.C.F. units, the 1st Mobile Veterinary Section and No. 1 Veterinary Hospital. Their record is as follows:—

The *1st Mobile Veterinary Section,* with an establishment of one V.O. and ten other ranks, was formed in Maritzburg in May on

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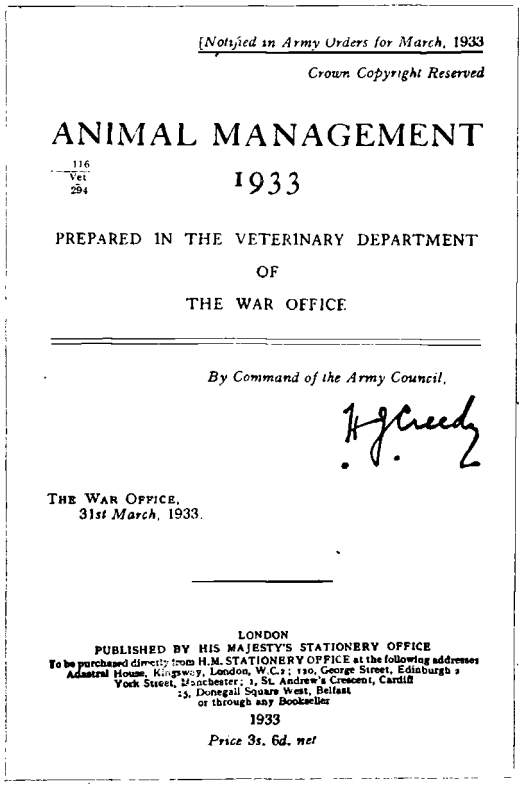
([53]) The D.V.S. in 1914 had placed orders *locally* for the manufacture of veterinary chests.

([54]) Establishment tables appeared in the regulations of the unit first published in 1915, then in 19918 (see Appendix), again in 1925, and obviously at the outbreak of the Second Great War.

the initiative of Capt. D. T. Mitchell. A year later the actual strength was 2 V.O's and 11 other ranks which figures were never exceeded. Other V.O.'s who were interested in the unit were Capts. R. A. Alexander, R. Clark, and P. Snyman, the last-named being transferred to the Reserve of Officers on 30.9.1933. The section through poor support ceased to function in Natal after 30.6.1931 when headquarters were transferred to Onderstepoort later in the year. It was hoped that at a large veterinary institution, with a big proportion of young

Fig. 30.



[Notified in Army Orders for March, 1933

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ANIMAL MANAGEMENT

116 Vet 294

1933

PREPARED IN THE VETERINARY DEPARTMENT

OF

THE WAR OFFICE

By Command of the Army Council,

THE WAR OFFICE,
31st March, 1933.

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men interested in veterinary work, the establishment might be attained. Unfortunately this was not realised and the section was finally disbanded on 30.6.1936* (*U.G.G.* 31.7.1936).

The 1st Mobile Veterinary Section was twice responsible for veterinary services at Ladysmith A.C.F. camp, the most noteworthy occasion being from 7th – 16th April, 1930, when No. 1 Veterinary Hospital from Pretoria also attended.

* It must also be remembered that at that time there was no enthusiasm for the Defence Department, primarily owing to the Clapham Case.

No. 1 Veterinary Hospital, with an establishment of two V.O.'s and 20 other ranks, was formed at Onderstepoort Veterinary Laboratories towards the end of 1927. Capt. J. I. Quin was O.C. and assisting him was Capt. J. H. R. Bisschop. The personnel was recruited from the lay staff and students of the Veterinary Faculty. The maximum strength was in 1932 with 3 V.O.'s and 25 other ranks.

The object of the Section was to provide veterinary services for a hospital of 250 horses.

Drill parades were held on Saturdays and camps were attended in 1929 (Potchefstroom), 1930 (Ladysmith) and 1931 (Pelindaba). Capt. Bisschop was O.C. from 1.12.1929 to 31.8.1930 and took the section to Ladysmith in April, 1930, where valuable experience was gained at an A.C.F. training camp.

Both Capt. Quin and Capt. Bisschop resigned on 11.5.1933 and were transferred to the Reserve of Officers, since when there was no further activity.

The unit was disbanded on 30.6.1936 (*U.G.G.* 31.7.1936).

The year 1928 was characterised by the realisation that there was a shortage of horses for military purposes, approximately 7% of animals offered for sale being suitable for remount purposes. The condition of the horses in the possession of mounted units of the A.C.F. was stated to be far from satisfactory(55).

A committee comprising Col. C. Brink, Q.M.C., Lt.-Col. A. Goodall (Dept. of Agriculture) and Lt..-Col. J. G. Bush, D.V.S., was appointed and its recommendations appeared in the annual report of the Dept. of Defence for the year ending 30.6.1929.

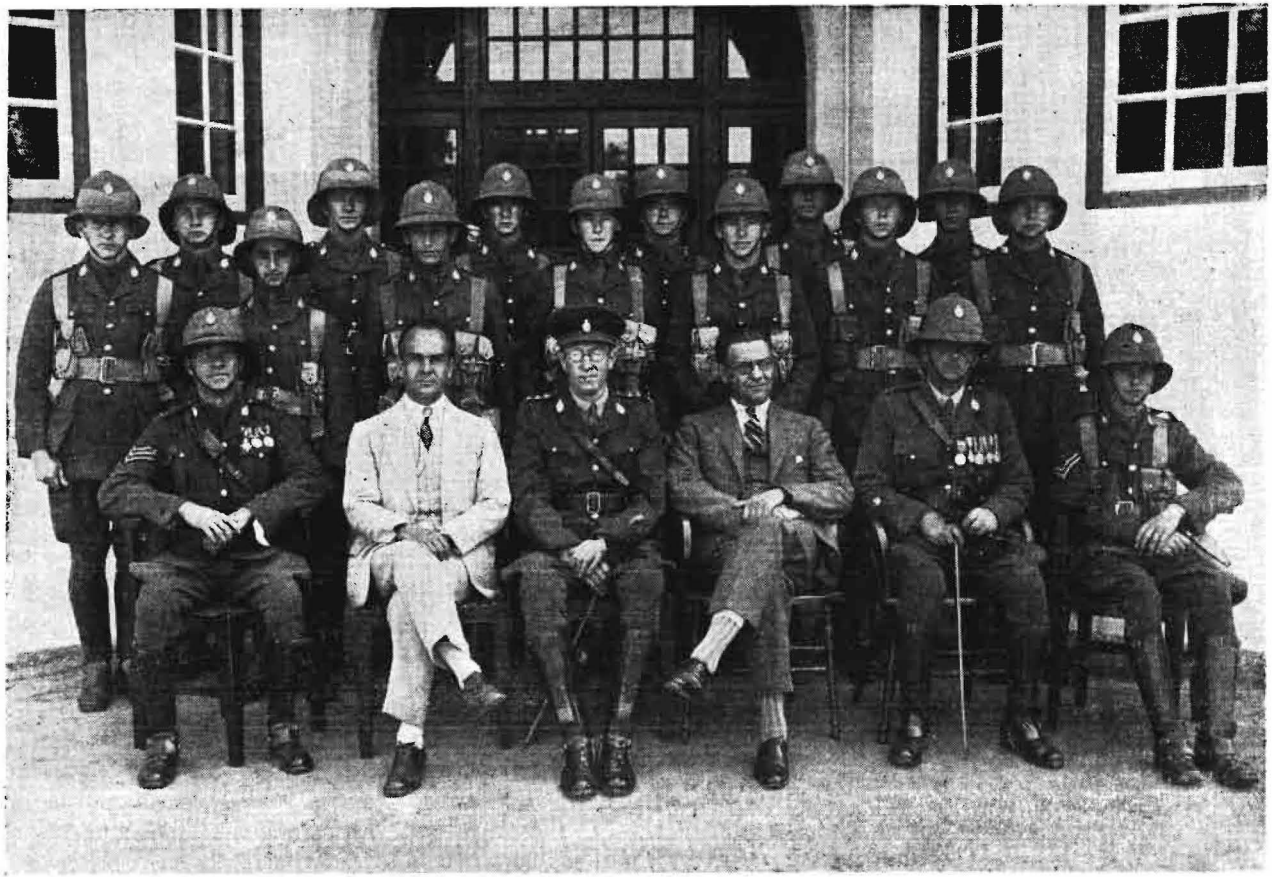
So low a value was placed on the services of the Department of Defence at this period that it is instructive to reproduce figures spent on the Department for the year ending 30.6.1928. Whereas in 1913 when the revenue of the country was £16,600,000, £1,345,031 was spent on the army, in 1928, with the revenue at £28,766,000 only £923,230 had been made available.

In the annual report for the year ended 30.6.1930 it is learned that certain A.C.F. units, mostly mounted, were disbanded "as there was no likelihood of (their) ... being required in the near future." As just explained, even if funds had been procurable for peace training, it is doubtful whether sufficient horses would have been available.

Lt.-Col. Bush who as D.V.S. had borne the heat and burden of a decade retired on 1.5.1931 and annual reports from this date give but little information on the veterinary position. During the period

(55) Lt.-Col. Bruce, of the Imperial Army Remount Department, who visited South Africa at this time, reported to his Government that, owing to the lack of interest in horse breeding, relatively few horses were suitable for Army requirements in India. See Report of Select Committee of Senate on Horse Breeding, 1927 - 1928.

Fig. 31.



Centre, front row:
Dr P. J. du Toit, Director of Vet. Services; Capt. J. I. Quin; Dr. P. R. Viljoen, Secretary for Agriculture.

described all routine work, e.g. inspection, purchases, marking([56]), malleining, immunisation, care and treatment of U.D.F. equines, had been controlled by the D.V.S. He submitted the customary annual veterinary reports to the Q.M.G., but for economy only extracts appeared in the published reports of the department. Data from these have been taken to prepare the table on statistics appearing at the end of this chapter. Obviously in the present circumstances, it would be difficult to trace the original typewritten annual reports submitted by the D.V.S.

The gap from 1931 to 1939 has been filled by Capt. W. S. B. Clapham (now Lt.-Col. 6th Regt., S.A.A.), who was appointed V.O. to the P.F. on 16.2.1933.

The new V.O., having obtained his " wings " while a veterinary student, was posted to the Aircraft Depôt, Roberts Heights (now Voortrekkerhoogte) as O.C. Mechanical Transport. The administration of the nucleus of " other ranks " of the S.A.V.C. (P.F.) was under Capt. McKay, S.A. Service Corps, who dealt with the Q.M.G. Only in special cases was Capt. Clapham summoned to give veterinary assistance.

In June, 1933, he was posted O.C., S.A.V.C., and transferred to the joint Transport, Supplies and Remounts depôt which had been established at the present Small Arms Branch in Quagga Road in 1926. F/S/M. Farndell, R. was Depôt S.M. and to assist him with his veterinary duties there was a farrier sergeant and a farrier corporal.

At the time of Clapham's appointment the 1st and 2nd batteries, S.A.F.A. at Roberts Heights were horsed and approximately 100 additional horses and mules were maintained at the combined depôt referred to above. Other horses attached to artillery sections were maintained at Bloemfontein and Bethlehem and at each centre was an N.C.O., S.A.V.C., to attend to shoeing and dressing.

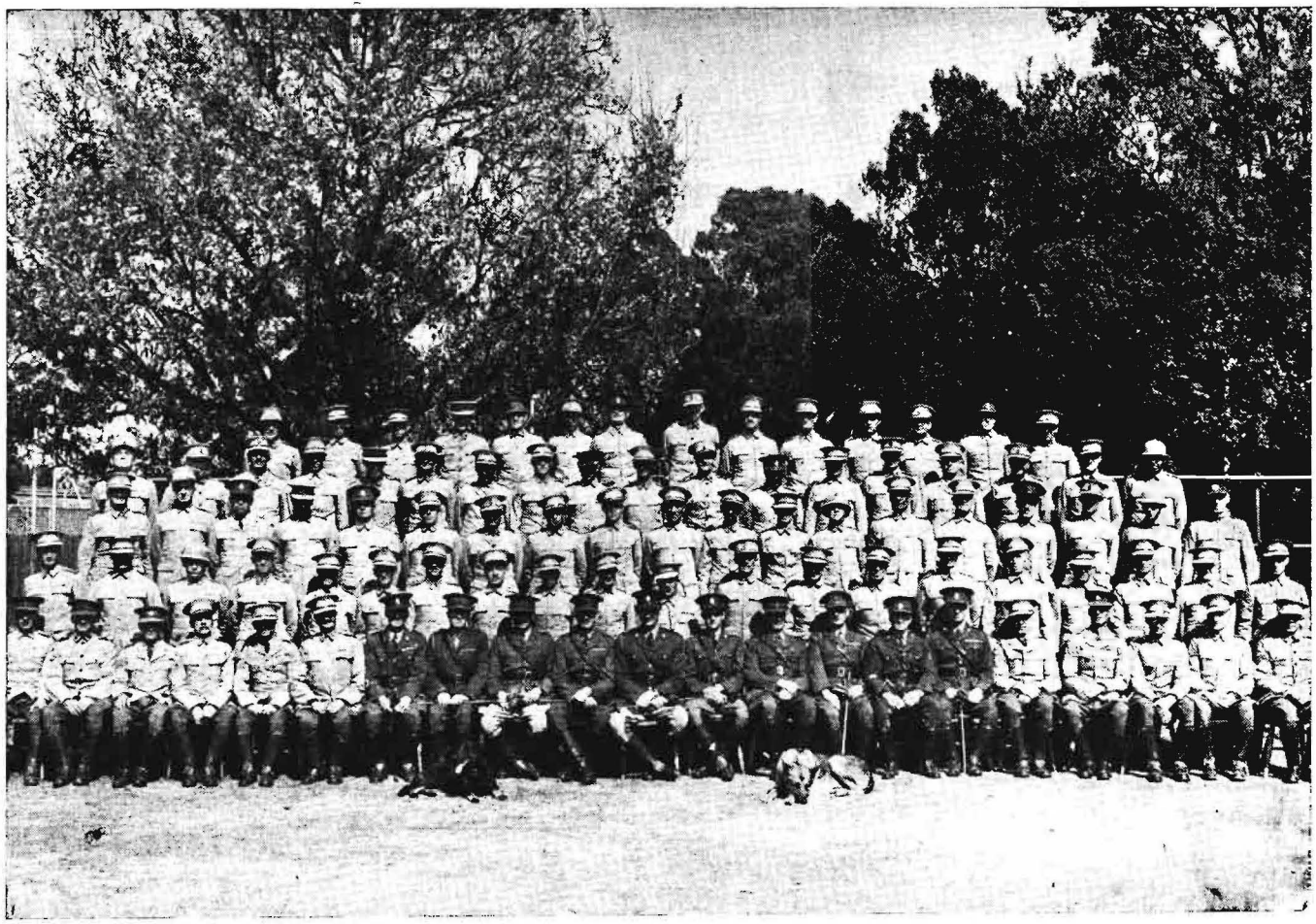
A small veterinary hospital with accommodation for about 12 horses was situated at the combined depôt. Each of the two batteries of field artillery, until it was dehorsed, had a " sick lines " of two loose boxes and several stalls attached to the battery forge, and in veterinary charge was a farrier sergeant with farrier corporal and shoeing smith to assist him.

The V.O., P.F. attended also to the animals of the Pretoria Garrison Institute, including the dairy, and to the mules belonging to the Hygiene Section, S.A.M.C.

From September, 1933, to August, 1934, the V.O. attended an equitation course in England, first with the 5th Inniskilling Dragoon Guards, Aldershot, and then at Weedon, Hants. In addition he studied

([56]) Apart from hoof brands and tattooing of the serial number on the upper gum, it is convenient to note that the rump brands are: ⅄ inside U denotes ownership, vertical <> inside U denotes sold, and c inside U denotes condemned.

Fig. 32. — South African Veterinary Corps, September, 1940.



Centre of front row (seated): Capt. I. P. Marais; Major A. M. Howie, O.B.E.: Lieut.-Col. C. J. van Heerden; Capt. A. R. Thiel; Capt. H. H. Curson.

Army veterinary methods at the Royal Army Veterinary School, Veterinary Hospital and School of Farriery, Aldershot, and at the R.A.V.C. Depôt, Woolwich. On his return to Roberts Heights he was appointed Equitation Officer, falling under the O.C., Military College, and in addition was O.C., S.A.V.C., P.F. (*F.O.* No. 279, Sept., 1934).

In September, 1934, the Artillery Depôt was established at Roberts Heights from the 1st and 2nd batteries, and Clapham was posted thereto as Equitation and V.O. (*F.O.* No. 280, 7.9.1934). The Equitation School was thereupon transferred from the Military College to the Artillery Depôt and the best of the horses from the 1st battery (dehorsed at that time) and the dehorsed sections at Bloemfontein and Bethlehem were transferred to the Equitation School. Other suitable horses were sold to State departments, e.g. South African Railways and Harbours or to municipalities.

The 1935 Live Shell practice camp at Potchefstroom saw the last horsed field battery, for thereafter mechanisation was adopted. Horses, however, are still used for range duties in connection with live shell practice.

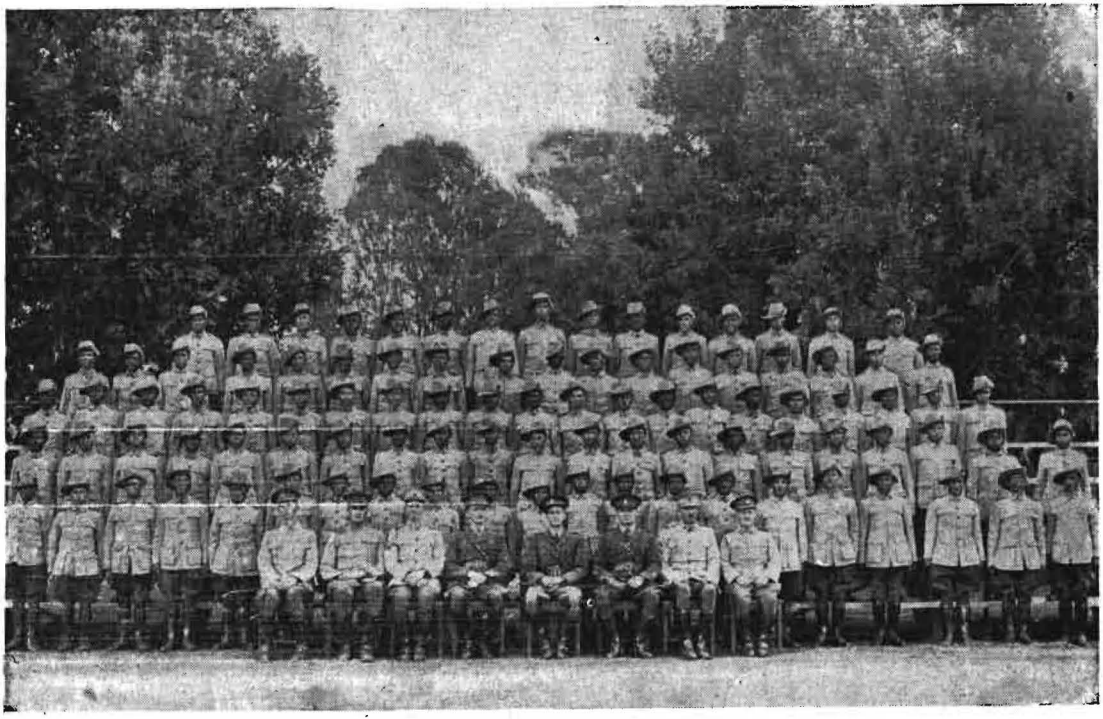
An establishment of approximately 120 horses was retained for equitation and other duties up to the outbreak of the Second Great War, but as prospects for promotion had been unsatisfactory for some years, the V.O. had studied and qualified in artillery subjects. Subsequently he was posted as battery commander, 1st Light Battery, and although transferred from the S.A.V.C., undertook what veterinary duties there were.

The annual trek of the artillery to Potchefstroom for practice provided good training for S.A.V.C. personnel as conditions approximated those seen under active service.

On 1.7.1939 the S.A.V.C. returned to its original depôt, the Veterinary Hospital, which had been established on its present site by the Imperial authorities during the Anglo-Boer War([57]). In September, 1939, Clapham, having received an appointment in the Basutoland Civil Service, transferred to the Reserve of Officers, Artillery Section.

([57]) The stables after being closed down in March, 1926, were used as a compound for natives, but subsequently the polo ponies belonging to the Defence Force were kept there.

Fig. 33.



Centre, front row:
Capt. H. H. Curson, O.C. Cape Corps; Capt. A. R. Thiel, O.C. Depot Co., S.A.V.C.

Veterinary statistics relating to the Permanent Force in general and to the Veterinary Hospital, Roberts Heights, in particular.

1920 – 1938.

Where it is clear that horses and mules are referred to, the figures are placed in the first and second sub-columns respectively, otherwise the single figure refers to equines.

	1920–1	1921–2	1922–3	1923–4	1924–5	1925–6
Permanent Force:						
Average Strength				764 247	689 240	385 185
Died or discharged				8 2	21 3	21 6
Cast				74 19	116 23	29 3
Purchases	117 55	267 12	240	114 26		17 104

	1926–7	1927–8	1928–9	1929–30	1930–1	1931–2
Permanent Force:						
Average Strength		359 184	357 162	359 160	345 160	331 158
Died or discharged	9 3	10 2	25 2	10 1	5 5	11 2
Cast	48 20	3 8	40 17	25 11	– 8	2 10
Purchases	52	16	67 8	34 10	27 18	44 27

1932–8: No data in annual reports of Department.

	1920–1	1921–2	1922–3	1923–4	1924–5	1925–6
Vet. Hospital:						
Admissions	1002	229 78	541	269 10	255 36	216 30
Died or destroyed	12	11 4	41			

	1920–1	1921–2	1922–3	1923–4	1924–5	1925–6
Other Sick Lines:						
Admissions		592	1018	960	890	850
Died or destroyed		5				

Chapter IV.

CONCLUSION.

(i) Second Great War, 1939, onwards.

The outbreak of the present conflict (3.9.1939) found the S.A.V.C. in a reduced state. The P.F. comprised a nucleus of 9 " other ranks " with a V.O. who had transferred to the Artillery as offering better chances of promotion. The A.C.F. branch had ceased to exist, although several officers were available on the Reserve of Officers.

On 5.8.1939 Dr. P. J. du Toit was appointed D.V.S. with the rank of Colonel (General List A.C.F.) under Government Notice No. 197 of 9.2.1940. Dr. G. de Kock became D.D.V.S. at the same time,

with the rank of Lt.-Col. On 16.9.1939 Capt. W. S. B. Clapham, who had been appointed to the Basutoland Civil Service, relinquished his post and was transferred to the Reserve of Officers, Artillery branch.

As Col. du Toit could not be spared from his civil duties, Capt. A. M. Howie of the Reserve of Officers was transferred on 5.11.1939 to the P.F. and posted to the Q.M.G.'s branch for duty as V.O., S.A.V.C., with the acting rank of Major (*Force Orders* No. 2202). Subsequently (*Force Orders* No. 2201) Lt.-Col. van Heerden was appointed D.D.V.S. in place of Lt.-Col. G. de Kock and Major Howie became A.D.V.S. These appointments date from 5.5.1940.

Executive officers, before appointment as captains, were obliged to attend a course for regimental officers for a month at the S.A. Military College, where an excellent background of Army organisation and methods was obtained([58]). At the end of 1940 sixteen such appointments had been made. "Other ranks," including the P.F. personnel, numbered 219 at the end of December, 1940.

Since the two A.C.F. units had ceased to exist in 1936 the first step taken by the authorities after the appointment of the D.V.S. was to create, originally from 1.9.1939, a company ("A" Company) of the S.A.V.C., with headquarters and four sections, the total establishment being 5 officers and 152 other ranks. Actually "A" Company was not formed until March, 1941, when Capts. R. A. Alexander and H. P. Steyn of Onderstepoort were appointed and personnel for one section recruited from among the students of the Veterinary Faculty([59]).

In the meantime, a Depôt Company, S.A.V.C. on voluntary full-time service had been formed as from 1.4.1940 at Voortrekkerhoogte (*Routine Order* No. 112, Government Notice No. 672 of 26.4.1940). The establishment was not to exceed the authorised key posts for the S.A.V.C., viz., 9 W.O.2, 15 sergeants, 27 corporals. These "other ranks" with two captains were to be appointed on a full-time basis.

Subsequently on 10.9.1940 authority was granted for the establishment of three hospital sections, and one mobile section. Two of the three hospital sections were stationed at Standerton in connection with the Remount Depôt and the third was located at Ladysmith for duty with the mounted regiments. The mobile section was to be stationed at Voortrekkerhoogte.

Owing to poor recruiting it was difficult to complete the establishments of the sections mentioned previously with European personnel. As a result, at the middle of September, 1940, authority was granted for the enrolment in a separate section of Cape shoeing smiths and dressers, the numbers being 72 and 50 respectively.

Further details will have to appear at the end of the war.

([58]) The syllabus comprised regimental organisation, company drill, guards and sentries, compliments and saluting, regimental duties, map reading, field sketching, military law, hygiene, march discipline, etc.

([59]) This A.C.F. unit (but wearing the P.F. flash) attends two parades weekly, and continuous training for a fortnight was carried out at Standerton in July, 1941.

(ii) General Conclusions.

The S.A.V.C. is the natural successor to the R.A.V.C. and the pre-Union veterinary units. Although formed at the outbreak of the First Great War it took part in the campaigns of German South West Africa and German East Africa where much valuable work was done.

In the former theatre of war the unit had an independent existence and having been under the immediate control of the Quartermaster-General, U.D.F., it has been possible to obtain his views on the work performed. Thanks to the first D.V.S. one is able to subjoin the Q.M.G.'s report([60]) on the unit, as follows:—

> "On the outbreak of war the organisation of the veterinary service was entrusted to Col. Irvine Smith, an officer of ability and experience, and he very rapidly formed veterinary sections, had them equipped, trained and despatched to the field as they were required. The veterinary service was well organised and administered by the Director and the assistants selected by him, and carried out its field and other work in highly successful and creditable manner. Its officers were professional men, some drawn from the Government service, but the majority were found by the Director. The subordinate personnel had to be recruited and trained in their special duties, and, in view of the rapidity of formation of sections, the efficiency of these men is a tribute to the Director. Veterinary equipment had to be provided at short notice and the special chests, designed by the Director and made locally, answered admirably. This service was most capably administered, and is one of which we have every reason to be proud."

In the latter campaign the S.A.V.C. came under the Imperial authorities and with one exception all the higher posts were filled by officers of the E.A.V.C. Unfortunately little is known of the difficult tasks carried out by the unit and even Collyer (1939) makes no mention of the services rendered by the S.A.V.C.

It is convenient at this stage to refer to some of the drawbacks of departmental service. When on the march the personnel must observe discipline as do those in combatant services, but at the end of the day when the others rest, the work of the humble dresser and shoeing smith begins. Not for them is the "glamour of the fighting line."

The experience of V.O. F. Duck, in the Zulu War, as given by Maj.-Gen. Sir Frederick Smith in the *History of the R.A.V.C.* (1927), is worth relating in this connection. During the retreat of the British from Hlobane on 28.3.1879, Duck "taking a dead man's rifle .... volunteered his services with the rearguard at a most critical moment."

([60]) Reference No. 19,807 of Administrative Report on the campaign placed on the table of the House of Assembly.

He was reported to Col. Redvers Buller for his gallantry and was recommended for the V.C., but his name was struck out by the Supreme Commander for the reason that as a non-combatant officer he had no right to be there!

It is some consolation to know that included among the names on the Roll of Honour (1914 – 1918) at St. Mary's Cathedral, Johannesburg, are those of the S.A.V.C. who gave their lives for King and Country.

It is unfortunate that, owing to limitations of space more attention has not been devoted to the disease aspect and to the duties of the V.O.'s. Nevertheless, a background has been created and further information may be gleaned from the references. In short, the South West African campaign was of short duration and fought chiefly by S.A. mounted units in healthy semi-desert terrain, whereas the East African campaign was a long drawn struggle in tropical jungle characterised by deadly diseases.

It is obvious that under existing conditions, little reference can be made to the present conflict.

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APPENDIX.

ESTABLISHMENT TABLES, 1918: S.A.V.C.

A(i)—A veterinary hospital for 500 sick animals.

Personnel:

Officers	4	Artificers	7
W.O.'s	1	Rank and file	44
Staff Sergts. and Sergts.	6	Natives	4
		Total	66

Animals:

Riding horses ... 8

Plus Horsekeepers not to exceed 1 per 4 horses.

A(ii)—Transport.

Detail.	Vehicles.	Native Drivers.	Horses.	Mules.
Trolley, spring G.S.	1	2	—	6
Cart, box body	1	1	—	2
Cart, Cape	1	1	2	—
Cart, water	1	1	—	4
Cart, ambulance	1	1	—	2
Trolley, spring GS	1	2	—	6
Wagon, GS	1	2	—	10
Totals	6	8	2	24

B(i)—A veterinary hospital for 250 sick animals.

Personnel:

Officers	2	Artificers	4
Staff Sergts.	2	Rank and file	16
Sergts.	4	Natives	2
		Total	30

Animals:

Riding horses 6

Plus Horsekeepers not to exceed 1 per 4 horses.

B(ii)—Transport.

The vehicles are the same for 500 animal hospital, except that no trolley, spring, GS is provided.

C(i)—Convalescent Horse Depôt for 500 animals.

Personnel:

Officers	1	Rank and file	6
Staff Sergts. and Sergts.	3	Natives	1
Artificers	3	Total	14

Animals:

Riding horses 2

Plus Horsekeepers not to exceed 1 per 8 animals.

C(ii)—Transport.

The vehicles are the same for the 250 animal hospital, except that no ambulance cart is provided.

D(i)—Mobile Veterinary Section.

Personnel:

Officers	1	Rank and file	5
Staff Sergts. and Sergts.	4	Natives	5
Artificers	1	Total	16

Animals:

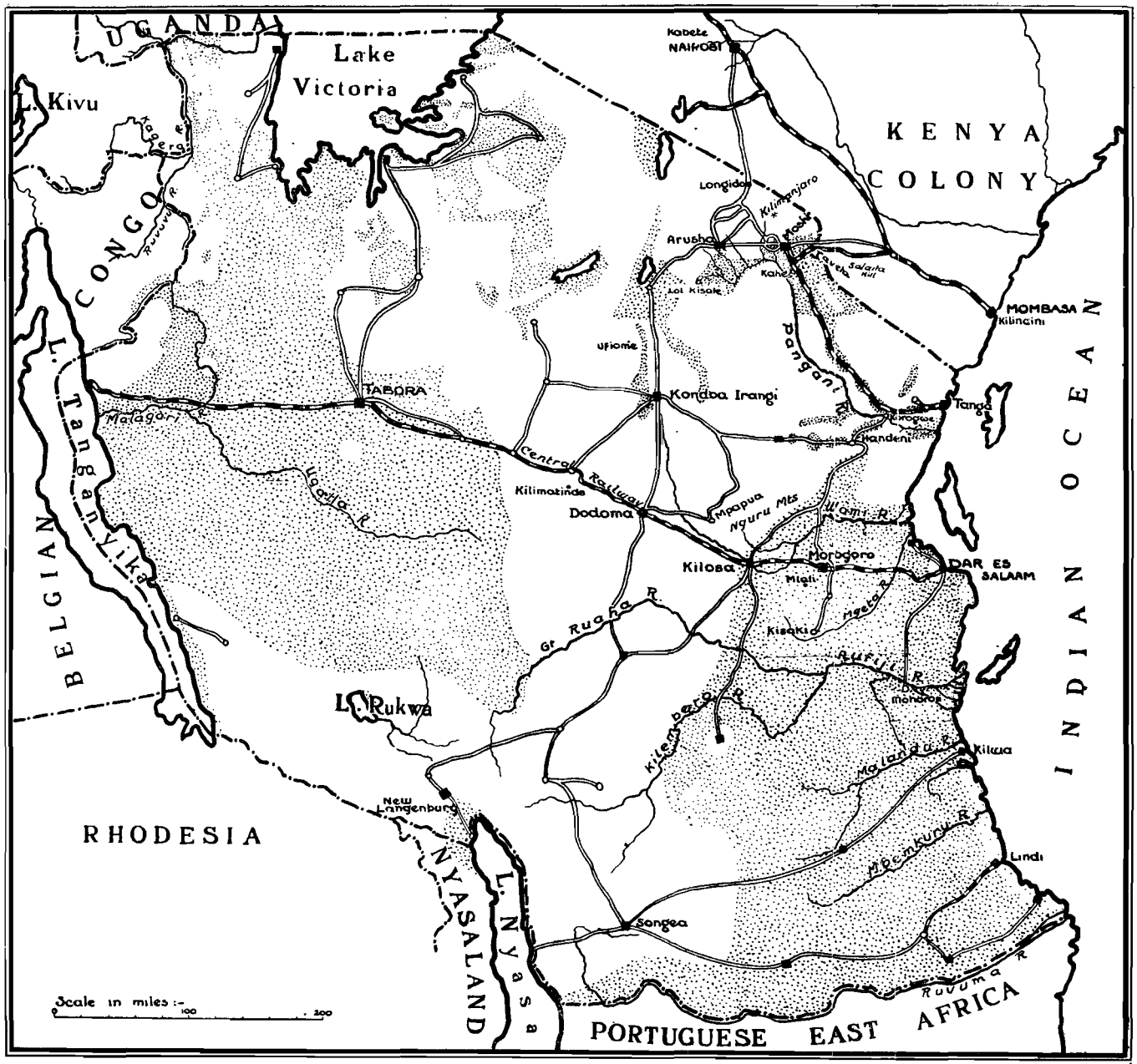
Riding horses 11

Plus additional natives on the scale of 1 per 8 animals.

D(ii)—Transport.

Detail.	Vehicle.	Native Driver.	Mules.
1st line			
Cart, water	1	1	4
Trolley, spring GS	1	2	6
2nd line			
Wagon, GS	1	2	10
Total	3	5	20

MAP II.



German East Africa showing Tsetse Fly areas.

E(i)—Base Depôt of Veterinary Stores.

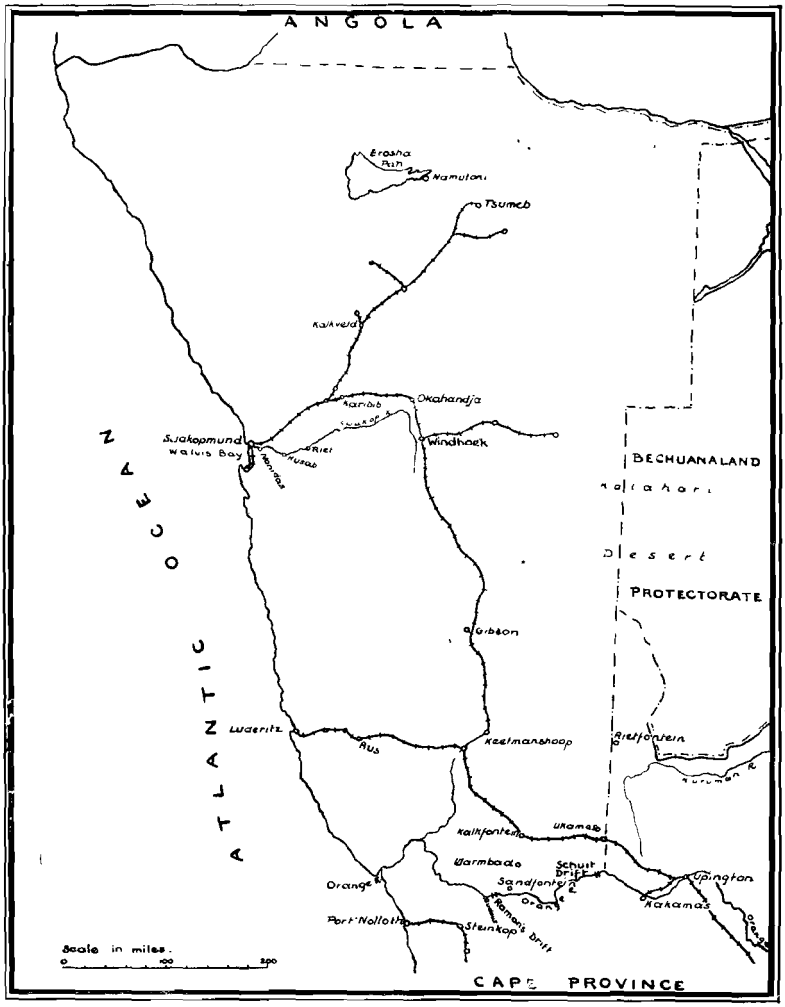
Officer (Q.M.)	1	Rank and file (packers)	2
Sergt. (storekeeper)	1	Natives	3
Corporal (clerk)	1	Total	8

This establishment will only be used when it has been decided not to establish a combined base depôt of medical and veterinary stores.

F(i)—Advanced Depôt of Veterinary Stores.

1 sergeant, 1 corporal and 2 privates.

MAP I.



German South West Africa.

NOTES.

The following students recently obtained the B.V.Sc. at Onderstepoort: H. M. Hodkin, D. J. Louw, T. A. T. Louw, C. M. T. Meldal Johnsen, J. R. van Blerk, K. van der Walt and K. E. Weiss.

Meldal Johnsen has joined the S.A. Veterinary Corps. The other six have all entered private practice in the following areas:—

H. M. Hodkin and D. J. Louw in Johannesburg.
T. A. T. Louw in the Eastern Free State.
J. R. van Blerk in Paarl.
K. van der Walt in Pretoria.
K. E. Weiss in Standerton.

Dr. P. R. B. Smith who has been stationed at Allerton Laboratory for some years has resigned from the service in order to take up private practice in Durban.

Mr. K. E. Weiss has been appointed Municipal Veterinary Officer for Standerton. By its decision to appoint a veterinarian for the inspection and control of meat and milk Standerton municipality has shown itself to be far more progressive and to display greater concern for the safety and cleanliness of the food supplies of that town than many of the larger municipalities, and has set an example which will undoubtedly be followed by many other towns.

Mr. J. H. N. Hobday, Principal Veterinary Officer of Bechuanaland, has been appointed to a similar post in Northern Rhodesia.

Major B. M. Horwitz has been appointed to the position of Veterinary Officer to the Municipality of Cape Town.

VOLUME XIV SUBJECT INDEX.

VOLUME XIV AUTHOR INDEX.

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S.A. Veterinary Corps.

TABLE OF CONTENTS.

PARAGRAPH 1: SURVEY OF EXISTING STRUCTURE OF THE INDUSTRY.

Section A: Control Bodies.

The milk industry has no definite organisation but is controlled by a number of independent bodies:—

1. Numerous Local Authorities acting on behalf of the Union Health Department and concerned primarily with the sanitary conditions under which milk is produced and handled.
2. The S.A. Federated Fresh Milk Producers' Association and the affiliated regional associations concerned largely with the interests of the producer.
3. Similar regional Distributors' Organisations.

4. Various commercial and co-operative combines handling milk and milk products.
5. The Department of Agriculture through the Division of Dairying.
6. The State Price-Control organisation.

Section B: Fluid and Factory Milk.

Under existing conditions the industry is divided into two supposedly watertight compartments for State Control purposes:—

1. Fluid Milk* That is milk intended for liquid consumption.
2. Factory Milk* That is milk for powdering, condensing, cheese and butter manufacture.

Section C: State Control of Fluid and Factory Milk.

Fluid milk production is controlled entirely by the Union Health Department operating through the health services of the various local authorities, and the Division of Dairying plays a negligible rôle in organising and controlling this section of the industry. The control of factory milk on the other hand falls almost entirely under the Department of Agriculture whilst the Health Department operates only to an insignificant extent. The outcome is that:—

1. The production of fluid milk is influenced by public health requirements to the exclusion of practical farming methods.
2. Factory milk production is influenced by agricultural requirements to the complete exclusion of public health safeguards.

This position might be justified if fluid and factory milk were separate entities, and if the manufacturing processes definitely destroyed disease-producing germs. In practice, milk produced under insanitary conditions frequently finds its way into the fluid milk market.

As regards milk products, these will only be safe if prepared from properly pasteurised milk or cream or if the manufacturing process involves heating equivalent to pasteurisation temperature. Records exist of enteric fever epidemics arising from contaminated butter and cheese, and diphtheria epidemics from butter (Hammer, 1938). Living tubercle bacilli have been found in butter and they may survive for some time in hard-cured cheese. Experience with fluid milk pasteurisation in South Africa (see Table 18) has been so disappointing that it has been considered necessary to check the efficiency of pasteurisation in various butter and cheese factories. This has been done by applying the Scharer Phosphatase Test to samples of cheese and butter. The results are recorded in Table 1.

* These terms are used in this sense throughout the report.

TABLE 1.

Efficiency of Pasteurisation of Cream and Milk used for the Manufacture of Butter and Cheese.

Class of Product.	No. of Samples.	No. of Factories in Survey.	EFFICIENCY OF PASTEURISATION. Percentage samples *Grossly* under-Pasteurised.	Percentage samples *Slightly* under-Pasteurised.	Percentage samples *Properly* Pasteurised.
1st Grade Butter .	10	84	58·3	3·57	38·13
Cheddar Cheese . .	?	27	87·5	Nil	12·5
Sweet Milk Cheese	?	22	86·5	Nil	13·5

The samples were picked up at random in shops, restaurants, private homes, supply depots and mess kitchens in order to get a random sampling. The inadequacy of pasteurisation is evident from the figures. Every factory produced " under-processed " butter.

The foregoing survey serves to stress the danger of a complete lack of public health control over factory milk and no further comment is required but it is necessary to examine more closely the effect of the absence of agricultural influence, and the exclusive Public Health control of fluid milk production.

PARAGRAPH 2: CRITICAL SURVEY OF EXISTING CONTROL OF FLUID MILK INDUSTRY.

Section A: Public Health Control.

Public Health Control is left almost entirely in the hands of the local authorities which grant permits and licences for the introduction and sale of milk. This gives the local authority effective jurisdiction over the production of milk within its boundaries, but jurisdiction over farms outside the boundaries is nominal. Control over a far-distant producer is confined to occasional visits by an inspector. Such visits may reveal gross failures in hygiene, but they serve little purpose in eliminating the danger of milk becoming contaminated with disease germs. Large cities like Johannesburg and Durban draw milk supplies from 100 to 200 miles away, and under such conditions an inspector whose headquarters are in the city is hopelessly placed to maintain effective control. Besides this he has no powers of coercion other than the extreme one of threatening to withdraw a permit or licence, a threat which is difficult to put into action.

Sub-section 1.—Licensing Requirements of Local Authorities:

The requirements demanded by local authorities differ in detail, but in general cover the building of specified premises, the installation of specified equipment and the provision of a satisfactory water

supply. If these specifications were standardised it would be much fairer to farmers; also other provisions should be included, viz.:—

1. The state of health of the farmer, his family, and his staff.
2. The suitability of the farmer as a potential milk producer.
3. The health of the farm stock.
4. The suitability of the farm and the district for profitable dairy farming.
5. Distance and transport facilities to market.
6. The suitability of the stock for profitable dairy farming.
7. The capacity of the equipment in relation to the volume of milk to be handled.
8. The size of the farm in relation to the size of the herd.

These and other points are of vital importance to hygienic and profitable dairying. Uneconomic dairying is disastrous to the production of pure, safe, rich milk.

Sub-section 2.—Maintenance of Standard of Production by Local Authority:

The attempt is made to maintain a standard almost entirely by inspecting dairies and sometimes with veterinary inspection of herds. Though of value if frequently carried out on nearby herds, inspection of far-distant farms is of little use, being too infrequently made and too widely publicised when in progress. Where bacteriological tests are used they are done too seldom, and are used as a basis for prosecuting rather than for educating the farmer. In any case, bacteriological standards should be laid down by the State, not by individual local authorities.

Veterinary herd inspection is largely ineffective through lack of power to take action in regard to chronic mastitis, contagious abortion, salmonella infection, mange, three day-sickness, pododermatitis, metritis, sterility, tick infestation, and poverty. In the absence of any State policy for dealing with these conditions the veterinary inspector can only educate, but his propaganda is wasted when converts hurry to sell all their mastitis-infected cows at the local stock sales. Uncontrolled stock sales are ruining dairy farming in South Africa.

Sub-section 3.—Control of the Distribution of Milk within the Boundaries of the Local Authority:

Distribution should be well controlled by local authorities, but in practice responsibility in this direction has often been ignored. Considerable emphasis is placed upon pure sanitation whilst too little attention has been paid to the psychology of the licensee, the health of milk handlers, and the efficiency of operation of plant.

Section B: Control by Federated Fresh Milk Producers' Association.

Progressive policies are developed mainly by the provincial branches, of which the Transvaal one shows up to the best advantage. Activities are directed towards:—

1. Representing the producers' interests at all times.
2. Regulating the flow of milk according to supply and demand.
3. Protecting its members from any form of exploitation.
4. Organisation and running of the surplus Milk Pool.
5. Refereeing in all controversies arising between producers and distributors.

Sub-section 1.—Ability of Association to Fulfil these Functions:

The Transvaal Branch has been of inestimable assistance to the dairy-farming community and it has also helped to protect the consumer from exploitation, but such a voluntary system of control has obvious shortcomings, viz.:—

(a) The effectiveness varies from province to province.
(b) Membership is voluntary and non-members may thrive to the detriment of members.
(c) The Association has no power to regulate production though it has to sell all surplus.
(d) The farmers' interests come first and public health or other requirements are inevitably subordinated to farming expediency.
(e) Being non-governmental, the Association can only make recommendations regarding milk policy, development of markets, etc.

Section C: Control by Fresh Milk Distributors' Associations.

These organisations have done very little for the milk industry beyond furthering their own interests. This failure has been due largely to a lack of true co-operative spirit within the Associations. The quota system for full-price milk is probably the most helpful contribution that has been made.

Section D: Control by Milk-handling Combines.

Generally speaking, such combines are concerned purely with commercial aspects, though certain firms have developed beyond this stage to become " safe-milk conscious ". These combines form powerful cliques within the regional distributors' association, commercial rivals generally forming the right and left wing of the Association with smaller firms adhering to one or other party, whilst the " Producer-Distributors " form a third distinct party.

Section E: Control by the Department of Agriculture.

The Department of Agriculture plays no active part in the fluid milk industry and this has had a disastrous outcome which will be

referred to in detail later, viz., the depreciation in quality of milk (see Tables 2 and 3) and the extensive spread of mastitis [see Para. 3D(1c) and Table 11] which are a direct result of a complete lack of agricultural influence in the fluid milk industry. In regard to factory milk the Department of Agriculture is the main controlling body, the lack of public health control being illustrated and emphasised by the data in Table 1. Unfortunately the control exercised by this Department has been confined largely to grading of cream and finished products and to the fixing of prices. Such factory inspection as is done has only a superficial effect on the hygiene of operation.

PARAGRAPH 3: SHORTCOMINGS OF THE PRESENT CONTROL SYSTEM.

The existing control system has been outlined and it is now proposed to indicate specifically the directions in which this control system has failed. Glaring examples of failure are cited which have been overlooked or tolerated under the existing system.

Section A: Economic Unsoundness of Production.

The whole process of production is fundamentally uneconomic, but for convenience, the question is discussed under the following sub-sections:—

Sub-section 1.—Farming with Inferior, Unhealthy and Underfed Cows.

Too many cows are carried in dairy herds as passengers and it is common to find farmers averaging one gallon per day per lactating cow, whilst it is rare to find farmers who are averaging three gallons per day per cow for a lactation period of 300 days. Thus, though cow feed is the heaviest expense of dairy farming, producers are allowed to waste food on animals which do not pay for their keep because they are of inferior type, or because fertility is low as a result of uncontrolled contagious abortion, metritis, vaginitis, etc. Furthermore, due to faulty feeding, to uncontrolled chronic mastitis, and to breeding errors, large quantities of sub-standard milk are produced which have to be brought up to the minimum standard by mixing with good milk. Some years ago the State reduced the minimum milk standards as follows:—

Solids-not-fat	from 8·5% to 8%
Butter Fat	from 3·5% to 3%

Since no reward is given to the producer of good milk, the farmers (and consequently the breeders) have lost interest and to-day very little milk is up to the old standards. Evidence of this is given in Table 2 and 3, from which can clearly be seen the disastrous deterioration in the quality of milk, particularly in respect of solids-not-fat. Outside South Africa 8·5 is considered the lowest acceptable percentage for solids-not-fat and 12·00 for total solids.

TABLE 2.

Average Chemical Composition of Pooled Milk of Approximately 200 Producers.

	August.	September	October.	November.	December.
Butter Fat:					
Average monthly percentage	3·37	3·20	3·26	3·31	3·41
Solids-not-Fat:					
Average monthly percentage	8·28	8·46	8·25	8·13	8·17

TABLE 3.

Chemical Composition of Incoming Farm Milk at the Pooling Depot quoted in Table 2.

CHEMICAL COMPOSITION.		MONTHLY PERCENTAGE OF SAMPLES GIVING RESULTS AS SHOWN.		
Constituent.	Quantity.	Sept. and Oct.	November.	December.
Butter Fat	Below 3·0%	4·37	3·20	1·67
	3·0 to 3·45%	43·85	51·60	38·22
	3·5% and over	51·78	45·20	60·11
	Total samples tested	985	626	539
Solids-not-Fat	Below 8·0%	12·00	5·90	10·70
	8·0 to 8·49%	58·17	73·50	73·50
	8·5% and over	29·83	20·60	15·80
	Total samples tested	985	626	539

Sub-section 2.—Dairying where no Cheap Source of Feed is available:

This includes dairying in built-up areas and on small-holdings where production costs are high due to land capitalisation, high feed and labour costs, rates, etc. The producer-retailers, who form the bulk of this class of farmer, produce only a very small proportion of the country's milk requirements, yet the retail milk price is maintained at an artificially high level partly to maintain such producers in business. Their system of operation is to offset high production cost with the profits of retail distribution. Some small-holders who have to buy their feed even sell their product at wholesale rates in competition with real farmers. It is difficult to see how such producers can get a reasonable return for their efforts unless, of course, the ordinary farmers' profits are excessively high.

Sub-section 3.—Unhygienic Dairying with heavy Souring Losses:

Dairy hygiene will be discussed more fully later, but it must be referred to here in connection with souring losses. In table 4 is given an analysis of the losses experienced by 139 farmers during the months of October to March.

TABLE 4.

Analysis of Souring Losses October to March inclusive.

Number of farmers included in survey	139
Total gallonage produced in six months	1,598,898
Average percentage loss as result of souring	4·4%
Highest percentage loss of an individual farmer	38%
Percentage of farmers having no sour milk	3·9%
Percentage of farmers losing less than 1·0% of their output	23%
Percentage of farmers losing more than 20·0% of their output	9%

The gravity of a 4·4% average summer loss is obvious. Other figures of souring losses are as follows:—

In October, 1943, the Producers' Pool lost 15,000 gallons of milk through souring, out of a total volume of 206,000 gallons handled. During that month 132,000 gallons of milk produced far from Johannesburg were diverted direct to factories and much of this milk would also have been sour had it been railed to Johannesburg. During the following November in the course of 4 days the Pool handled 14,000 gallons of sour milk at a time when 6,000 gallons of long-distance milk was diverted to factories.

These colossal losses are due to:—

(a) Unhygienic methods of production.

(b) Indifferent cooling and storage facilities.

(c) Delay in marketing the milk.

(d) Transportation over long distances.

(e) Transport failures.

(f) Failures on reception by the distributors.

The heading (a) will be discussed fully later under Paragraph 3D, Sub-section 3.

(b) *Indifferent cooling and storage facilities.* Two examples of this are quoted, but they represent what is going on all over the country. The facts are given in Tables 5 and 6.

TABLE 5.

Temperature and Bacterial Content of "Fresh" Milk on arrival at Market.

Farmer.	Approximate Age of Milk.	Distance of Farm from Market.	Average Temperature of Milk on arrival.	Bacterial Content (Breed count).
A	3 hours	10 miles	81°F.	1,500,000
B	3 hours	10 miles	80°F.	5,000,000
C	3 hours	3 miles	78°F.	900,000
D	3 hours	5 miles	82°F.	2,500,000
E	3 hours	8 miles	89°F.	5,000,000

The standard of dairying on these five municipally inspected farms is tragically low, the figures speaking for themselves and requiring no comment.

TABLE 6.

Temperature of Milk cooled and ready for a journey of 70 miles.

Farmer.	Temperature of Cooler Water.	Temperature of Stored Milk.*
A	68°F.	69°F.
B	75°F.	69°F.
C	68°F.	68°F.
D	66°F.	65°F.
E	80°F.	71°F.
F	72°F.	None in storage
G	79°F.	None in storage
H	78°F.	None in storage
I	72°F.	72°F.

* The stored milk had been cooled early in the morning.

The hopeless inadequacy of these cooling facilities for milk due to travel a long journey and not due to reach the distributor until 24 hours after milking is obvious.

(c) *Delay in marketing the milk.* As result of ill-planning of deliveries of milk from farms it may be unnecessarily old before delivery is taken by the distributing depot. The influence of age upon the souring of milk is obvious, but experimental data are given in Table 7 to show the improvement in the milk of 34 farmers when delivery was taken when the milk was 6 hours old instead of being a mixture of 12 and 24 hour old milk. The classification is based upon bacterial counts by a method described in Paragraph 3D (3). In the height of summer the ratio of good producers to bad producers changed from 1:4·6 to 2·6:1. The actual change-over to 6 hour delivery took place during the first week in November.

TABLE 7.

*Effect of taking delivery of Milk when 6 hours old instead of 12 - 24 hours old.**

Cleanliness Classification.	Farmers classified in each group monthly.		
	October.	November.	December.
Good	6	11	24
Bad	28	23	9
Good:Bad Ratio	1:4·6	1:2	2·6:1
No. Farmers Tested . .	34	34	33

* Change-over was made during the first week in November.

(d) *Transportation over long distances.* The effect of long journeys on souring losses have been analysed in Table 8 whilst similar figures are to be found in Table 12.

TABLE 8.

Correlation between souring losses and length of journey to market.

Distance from Market	Method of Transport	Number of Producers	Gallonage Transported	Percentage of Sour Milk
Below 30 miles .	Road (chiefly)	17	152,810	1·75
30 - 100 miles . .	Rail	107	1,183,495	4·9
100 - 250 miles . .	Rail	15	262,593	3·4

These figures show clearly that the length of the journey is not of great importance except where the journey is so long as to involve a very material increase in the age of the milk.

(e) *Transport failures.* An example of one type of transport failure is given in Table 9. Here the souring losses experienced on various railway systems are compared. The figures refer to milk railed to Johannesburg.

TABLE 9.

Correlation between souring losses on various railway systems.

Railway System	Number of Producers	Gallonage Transported	Percentage of Sour Milk
Johannesburg-Witbank	2	26,941	0·08
Johannesburg-Breyten	14	170,158	2·9
Johannesburg-Volksrust	50	738,909	3·4
Johannesburg-Fouriesburg . . .	10	100,453	9·4
Johannesburg-Bloemfontein . .	34	301,591	4·9
Johannesburg-Klerksdorp . . .	11	101,960	12·5
Johannesburg-Zeerust	1	6,076	4·1

It would be unreasonable to suppose that these differences in the percentages of sour milk are due entirely to the fault of farmers.

(f) *Failure on reception by distributors.* It is extremely difficult to collect comparative data on this subject, but the records of the following three farmers illustrate what is meant. Through no fault of their own these farmers were forced by their distributors to accept a different delivery system. In the first phase they stored their own milk overnight and delivered it to the distributors next morning. In the second phase they were forced to deliver at night, the distributors stored the milk overnight and took delivery next morning. Results are recorded in Table 10. From these results it is very evident that whilst these farmers were storing their milk satisfactorily, the distributors were definitely spoiling the milk when they stored it overnight during the second phase.

TABLE 10.

Spoilage of farmers' milk as result of faulty organisation by the distributor.

Farmer	Phase of night-storage on farm.	Monthly Bacterial count classification *	Good - Bad Ratio	Phase of night-storage at depot	Monthly Bacterial count classification	Good - Bad Ratio
A	Sept., '42 - Jan., 43	A, A, C, C, C	1:1·5	Sept., '43 - Jan., 44	C, C, C, D, D	0:5
B	ditto	C, D, C, B, B	1:1·5	ditto	C, C, D, D, D	0:5
C	Aug., '42 - Jan., '43	B, C, C, C, B, C	1:2·0	Aug., '43 - Jan., '44	B, D, D, D, D, D	1:5

* The meaning of this classification is explained in Para. 3D(3).

Sub-section 4.—Failure to Sell at the Nearest Market:

Innumerable examples of this could be quoted, but a striking example is the case of Kopjes, O.F.S. There is a powdered milk factory at that station and yet about 30 producers rail milk from that station to Johannesburg. The average sour milk losses from that section were 4·5% during summer months, one producer losing 29·0%, another 17% and another 11%. Another example is the large volume of milk that is produced in the midlands of Natal and is railed past the Pietermaritzburg market, past Umlaas Road pasteurising depot and on to Durban.

Sub-section 5.—Surplus Milk Problem:

Chiefly because no worth while incentive has ever been offered to farmers to encourage "level production" the average farmer produces very much more milk in flood periods than at other times. Large transient milk surpluses cannot be absorbed into the fluid milk market and much milk produced under fluid milk conditions has to be sold at factory price. The regional Fresh Milk Producers Associations have established Surplus Pools at strategic points to dispose

of surplus milk to best advantage. In October, 1943, the Transvaal Pool diverted 132,000 gallons of milk from the fluid milk market to the factories and this at a period when 500 gallons of sour milk were being received daily. This figure gives some idea of the gravity of this problem of fluctuating supply, a problem that will become worse in any time of economic depression. The solution to the surplus problem lies in:—

(a) Encouraging "level production."
(b) By organising production on a countrywide scale.
(c) By controlling the flow of milk to available markets on a countrywide scale.
(d) By removing the artificial distinction between fluid and factory milk.
(e) By making milk and milk products available to the poorer section of the community.
(f) By developing industries to operate on a seasonal basis to absorb surplus milk.

Sub-section 6.—Lack of Control over Production:

This refers to increased production by individual farmers and the starting up of new producers. The only limiting factors at present are the numbers of cows in the country and the amount of stock feed available. The feed position varies with the season, whilst the cow balance can be seriously upset by moving animals from factory milk herds to fluid milk herds. This movement is gaining impetus at present, because of the relatively favourable fluid and the relatively unfavourable factory milk price.

Section B: Economic unsoundness of Methods of Transportation to Market:

Milk and cream travels to market by rail and by road, consigned by the producers in 10 and 5 gallon cans in the case of milk and in one gallon cans (and smaller) in the case of cream. These products travel very long distances and for many hours are outside the control of both the producers and the distributors. Evidence of the failure of rail transportation has already been given in Table 9. Figures given in Table 7 stress the importance of the "age factor" on the quality of milk. Clearly the time has arrived when milk must be brought under control during transport. This can only be done if milk is accepted from producers in the farming districts, is graded, refrigerated and pooled immediately and is then transported to market in refrigerated tankers. Obviously such a system would have to be accompanied by strict grading, otherwise producers would tend to relax their efforts towards clean dairying.

Section C: Economic unsoundness of Distribution:

For convenience the many weaknesses of distribution have been divided under the following headings:—

Sub-section 1.—Mixing of Good and Bad Milk:

This is universally done, wherever a distributor buys milk from different sources. The underlying reasons are:—

(a) To bring substandard milk up to the legal minimum standard.
(b) Because no bonus is paid for retailing clean milk or rich milk.
(c) Sufficient supplies of good milk cannot be found.
(d) Some distributors neither know nor care whether their supplies are good or indifferent.
(e) Those who do care have no facilities and no official help in judging the quality of their supplies.

Sub-section 2.—Faulty Hygiene and Methods within the Distribution Depôt:

Errors of this type fall into the following main categories:—

(a) Inefficiency in taking delivery, milk being allowed to spoil when it should be cooled immediately and processed. One example of this was given in Table 10.
(b) Faulty hygiene within the factory and faulty handling. This subject is dealt with fully in Paragraph 3, Section D4. A concrete example is that of the milk of farmer A (see Table 5). This milk was bulked in a large balancing tank at the receiving depôt and a sample from this bulk had a bacterial count of 1,500,000. The milk was then pumped through a short pipeline and over a refrigerated cooler by which time the count had become innumerable (i.e. well over 5,000,000). Spoilage of this type is very commonplace.
(c) Returning farmers cans unwashed. This gives farmers an almost impossible task of cleansing, purifying and sterilising cans containing dregs of putrefying milk.

Sub-section 3.—Price-cutting:

This is done chiefly on "semiwholesale" sales but it even occurs with retail sales. Semi-wholesale prices have even been quoted at prices below the fixed price for farmers milk. Such business methods can only be profitable if —

(a) cheap milk is being smuggled in from unlicensed sources;
(b) producers are not getting their legal due either by open underpayment or by regular condemnation of sweet milk as sour;
(c) milk is adulterated to the legal minimum by skimming and watering;
(d) wage cutting occurs including the employment of rough labour for highly technical jobs.

Sub-section 4.—Excessive Distribution Costs:

The chief factor coming into play is the excessive overhead charges for delivery due to uneconomic competition between distributors. It

is common to find ten distributors delivering to a single street, some of the firms operating many miles from their central point.

Section D: Ineffectiveness of Public Health Control.

The aim of public health control has been towards the production of milk under clean conditions so as to eliminate the danger of contamination. "Clean conditions" has in practice been confined to sanitary considerations for the major part. Actually, it is illogical to separate safe milk and clean milk, and public health control should cover both aspects. In this case control should cover:—

1. The health of the farm stock.
2. The health of the dairy personnel.
3. The hygiene of production and marketing.
4. The hygiene of distribution.

Sub-section 1.—The Health of the Farm Stock:

Certain local authorities have appointed veterinary dairy inspectors, but these officers generally have too large an area to cover and they lack authority under the Stock Diseases Act and Public Health Act to take effective action when trouble arises. Effective powers are lacking for dealing with:—

(a) *Bovine tuberculosis.* Very limited action can be taken with "open tuberculosis," but with closed tuberculosis no practical policy exists.

(b) *Contagious Abortion.* This is a serious agricultural problem and is of public health importance because the disease may spread through milk to people, thus causing undulant fever. No real encouragement is given farmers to eradicate this disease and from a public health point of view the position is possibly being aggravated by the distribution of a living contagious abortion vaccine. The disease is known to be widespread, but no recent survey has been carried out. To fill this gap in some measure, herd milk samples have been tested for the presence of contagious abortion antibodies in the milk whey. This is a rough test which only reveals gross infection. Samples from 154 different herds were tested and 22·3 per cent. were found to contain antibodies, showing that the herds concerned were badly infected. This percentage should be taken as a minimal figure.

(c) *Mastitis* is a very grave disease which is spreading unrestricted and is ruining cows, turning them into unprofitable milkers and debasing the quality of the milk. No survey of the incidence of this disease has been made in South Africa, but in England only 2 out of 16 certified herds and only 2 out of 24 grade A(T.T.) herds were free from infection as demonstrable in composite milk samples. Rail-tank samples always

contained evidence of the disease. (Pullinger, 1935). To obtain some idea of the spread of infection in South Africa, herd samples from 152 producers have been examined regularly during the course of 10 months of routine testing for "keeping quality." Only 7·9% of the 152 herds have shown no gross signs of infection during their period. Some idea of the extent to which herds are infected is given in Table 11. This shows the results of testing all lactating cows in 16 herds. The test used was a slight modification of that applied by van Rensburg (1941).

TABLE 11.

Incidence of mastitis infection in lactating cows of dairy herds. Number of herds with percentage of infected cows as shown.

0 - 10 per cent. of cows infected	11 - 25 per cent. of cows infected	26 - 50 per cent. of cows infected	More than 50 per cent. of cows infected.
0	5	9	2

The incidence of infection amongst herds and the incidence of infection within herds is very high and the need for active control is obvious.

Normally, bovine mastitis is only a public health problem in so far as it affects the quality of the milk, but under certain circumstances, scarlet fever, septic sore throat, etc., may be spread by an infected udder, e.g. the Doncaster milk-born epidemic of scarlet fever. (Watson, 1937).

(d) *Bovine Paratyphoid fever* is an endemic disease in dairy herds, and serious human milk-borne outbreaks of "food-poisoning" have originated from infected cows, e.g. the Wilton outbreak (Conybeare and Thornton, 1938) and the one at Kensington, Johannesburg (unpublished).

(e) *Mange, tick-infestation, emaciation.* These conditions affect the quality of the milk.

Sub-section 2.—Health of Human Personnel:

No effective control exists over dairy personnel on farms outside municipal boundaries and yet a human carrier of disease is liable to contaminate milk on the best regulated farm. Some local authorities have introduced blood-testing of dairy personnel, but this can only be done efficiently if farms are situated fairly close to the local authority's area. In any case, Vi testing at infrequent intervals is a very limited effort towards controlling all common milk-borne diseases.

Sub-section 3.—Hygiene of Production:

Practically all local authorities have endeavoured to develop a high standard of hygiene of milk production by insisting that dairy-

men build and equip their premises according to certain plans. Unfortunately the specifications demanded vary from place to place. To maintain the standard, reliance is placed almost entirely upon the results of visits paid by dairy inspectors. Johannesburg employs two inspectors for 500 farms scattered over a circle of 250 miles radius. Durban had one inspector for 70 dairies within a semi-circle of 10 miles, whilst outlying dairies were not inspected. Capetown has two inspectors to cover a large number of dairies within a semi-circle of 70 miles. An inspector visiting an outlying district is well known and his progress through the district is broadcast in advance so that the conditions as he sees them are entirely artificial. A farm inspector's chief use is as an educator, but he can only educate if he knows the normal standards of the farm. These standards he can only know if he has information regarding the keeping quality of the milk delivered to town every day.

(a) *Investigation of the efficiency of the present control methods.* The efficiency of the existing methods can be judged from sour milk losses or by analysing bacterial counts, as either of these factors will show whether any degree of standardisation has resulted from municipal control.

TABLE 12.

Varying souring losses experienced by neighbouring farmers during six summer months.

Railway Station No.	Miles from Market.	Producer No.	Total gallonage consigned.	Percentage sour milk.
1	65	1	2713	7·6
		2	10504	7·8
		3	9810	17·8
		4	14120	9·5
		5	3939	4·0
		6	9871	4·4
2	79	1	7583	0·4
		2	23435	1·9
		3	9430	12·0
		4	9459	6·6
		5	11100	0·8
3	85	1	5052	4·2
		2	7522	14·4
		3	10820	3·4
		4	6568	2·1

TABLE 12 (Contd.)

4	92	1	56079	1·3
		2	23077	0·4
		3	15624	2·0
		4	29426	0
		5	23170	0·2
		6	3541	6·0
		7	13009	3·1
		8	9136	3·3
		9	10634	5·4
		10	41040	2·3
5	97	1	8135	12·1
		2	7441	21·5
		3	22026	8·3
		4	11595	1·2
		5	19916	2·4
		6	10107	7·1
6	102	1	7270	3·8
		2	9760	0·3
		3	18354	1·3
		4	13204	0·5
		5	3582	0·4
		6	23822	2·5
		7	4879	5·3
		9	10344	0·5
		10	38926	0·4
7	133	1	65813	0·18

Figures in Table 12 show very clearly that hygiene of production is far from standardised if judged on a basis of the keeping quality of milk delivered to market. The bacterial counts of incoming supplies have also been analysed in this connection, and to this end composite herd samples have been taken daily and submitted to Breed counting (Wilson *et alia* 1935). This procedure has been carried on on a growing scale for 22 months, involving to date a total of 50,000 tests and covering to-day upwards of 300 producers. This investigation has produced a mass of data too voluminous to reproduce, so for the purpose of analysis a method of classification has been developed which is applied monthly:—

Class A 80% of the months counts below 300,000 per c.c.
B 80% of the months counts below 1,000,000 per c.c.
C Less than 50% of months counts greater than 5,000,000 per c.c.
D 50% or more counts greater than 5,000,000 per c.c.

For further simplification, Classes A and B have been considered predominantly good and C and D predominantly bad, and the term good: bad ratio has been coined, meaning the ratio of good months

to bad months. Similarly individual counts can be classed as A, B, C, or D (in this case the 80% clause drops away) and the good: bad ratio of a series of tests can thus be ascertained.

The classification of a large group of farmers is given in Table 13,

TABLE 13.

Depreciation of the keeping quality of the milk with the onset of warm weather.

Date of Analysis.	Number of Farmers.	Percentage of farmers falling into each class.				Good:Bad Ratio i.e.
		A	B	C	D	A & B : C & D
June, 1943	240	57	25	13	5	5:1
July, 1943	227	43	31	20	6	3:1
August, 1943 . .	236	14	50	32	4	1·5:1
Sept., 1943 . . .	232	0·5	14·2	67·2	18·1	1:6
Oct., 1943 . . .	210	0·95	5·24	50·48	43·3	1:15
Nov., 1943 . . .	232	0·86	3·9	59·47	35·77	1:20
Dec., 1943 . . .	237	1·27	5·5	31·23	62·0	1:15

from which it will be seen that there was a very striking deterioration during October, after which the position became stabilised though the weather became increasingly hot. Apparently producers as a whole maintain a slack winter technique and a much more careful summer one. This winter slackness is unobserved under the existing control system. A similar picture is seen in Table 14 which covers a different series of tests from the previous year. That year the worst depreciation occurred in September.

TABLE 14.

Classification of dairy hygiene effort during 15 months' survey.

Date.	Number of Producers.	Percentage of farmers falling into each class.				Good:Bad Ratio i.e.
		A	B	C	D	A & B : C & D
Aug., 1942 . . .	116	44	36	19·2	0·8	4:1
Sept., 1942 . . .	119	6	24·2	69	0·8	1:2
Oct., 1942 . . .	127	2	19	71	8·0	1:4
Nov., 1942 . . .	122	0	17	56	27	1:5
Dec., 1942 . . .	113	3	21	43	32	1:3
Jan., 1943 . . .	132	2	15	28	55	1:5
Feb., 1943 . . .	129	0·8	14·2	42	43	1:6
March, 1943 .	137	10	10	39	41	1:4
April, 1943 . .	137	7	15	49	29	1:4
May, 1943 . . .	137	25	33	39	3	1:1
June, 1943 . . .	142	45	35	15	5	4:1
July, 1943 . . .	139	39	35	15	11	3:1
Aug., 1943 . . .	137	15	57	25	3	3:1
Sept., 1943 . .	132	0·7	19	62	18·3	1:4
Oct., 1943 . . .	113	0·9	7·1	46	46	1:12

Returning to the question of variation in standards of hygiene already referred to in connection with the figures in Table 12, similar examples are given in Tables 15, 16, and 17 of variations in the keeping quality of milk produced by farmers operating under similar conditions. Table 5 shows the tragic failure of local authority control over farmers operating under similar and what should be ideal conditions. Of the five farmers mentioned in the table, only one was as high as class B and he only just made the grade, although his milk was tested when only a few hours old.

TABLE 15.

Comparison of hygiene classification of three farmers railing from one station (70 miles).

Farmer.	Number of months under test.	Monthly Classification.															Good:Bad Ratio.
		Oct., 1942	Nov.	Dec.	Jan., 1943.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	
A	15	B	C	B	B	B	C	A	A	A	A	A	B	B	A	B	7·5:1
B	15	C	D	D	D	D	D	D	B	A	B	B	C	D	D	D	1:2·75
C	15	C	D	D	D	D	D	D	C	B	A	B	C	D	D	D	1:4

TABLE 16.

Analysis of Good:Bad ratios of 22 producers railing milk 100 miles.

	Good:Bad ratios — Period of Analysis Nov., 1942, to Oct., 1943.											
Number of Producers 22	1·5/ 1	1/ 1	1/ 1·2	1/ 1·5	1/ 2·3	1/ 2·5	1/ 2·6	1/ 3	1/ 4	1/ 6	1/ 9	0/ 9
Number of Producers with Good:Bad ratios as shown.	1	4	2	1	5	1	1	2	2	1	1	1
Producers predominantly good . . . 5			Producers predominantly bad . . . 17									

TABLE 17.

Analysis of Good:Bad ratios of 36 producers within 30 miles radius of market.

	Good:Bad ratios — Periods of Analysis Sept., 1942, to Oct., 1943.												
Number of Producers 36.	13/ 1	6/ 1	3·6/ 1	3/ 1	2·5/ 1	2/ 1	1·3/ 1	1/ 1	1/ 1·3	1/ 2·5	1/ 3·6	1/ 13	1/ 14
No. Producers with Good:Bad ratios as shown.	1	4	4	1	2	4	6	3	3	3	2	1	2
Producers predominantly good 25									Producers predominantly bad 11				

The gist of the information to be obtained from all these analyses is that under the present system of control no standardisation of hygiene of production is obtained and it is left entirely to individual farmers to maintain whatever standard they fancy.

Sub-section 4.—Hygiene of Distribution:

It should be well within the power of local authorities to control the hygiene of shops and factories within their boundaries.

(a) *Control of Construction and Equipment.* On the simple sanitation side this is generally good, but in the specialised planning for milk handling, and particularly for pasteurisation it is frequently bad. Endless examples could be quoted in support of this contention, but the following are picked at random.

Depôt A, handling thousands of gallons of fluid milk daily. Sweet milk and sour cream are received on the same platform and are weighed on adjacent scales. The sweet and sour product run alternately through the same piping and through the same regenerative preheater and cooler.

Depôt B, handling 500 gallons a day. Raw milk is received into a balancing tank and is pasteurised. It is then pumped with the *raw* milk pump over a cooler and back into the original *raw* milk tank. Finally it is pumped through 100 feet of galvanised piping and rubber hose to a storage tank. Subsequently, it gravitates back through 100 feet of similar piping to a discharge tap only 10 feet from the pasteuriser.

Depôt C, handling thousands of gallons of milk daily. The receiving platform where farm cans are opened and the milk is graded and weighed is an open bay exposed to driving sandstorms.

Depôt D, handling thousands of gallons of milk daily. Sweet milk and sour skim are discharged from taps only two feet apart.

A survey of 13 pasteurising plants in 3 towns showed the following:—

Plants fitted with automatic recording thermographs	2 only
Standardised thermometers	nil
Unstandardised thermometers unbroken	8
Broken thermometers, only.....	5

in other words, five plants were pasteurising without a thermometer.

(b) *Control of Operation.* On this aspect control is largely confined to a search for visible dirt whilst the invisible variety is ignored. One fault already referred to is the mixing of good and bad milk (see Para. 3C). Other serious faults are the entire lack of control of pasteurisation, and of the proper sterilisation of milk plant. During the preliminary survey of pasteurising plants already referred to in Sub-section 4(a) it became evident that in some cases at least, pasteurisation was a mere warming process. In one plant the tempera-

ture was judged by the " feel " of the delivery pipe and in actual fact varied in a single run between 55°C and 100°C whereas it should have been 72·5°C, as this was a short-time-high temperature plant. The two best plants were subjected to very frequent inspection for 10 weeks, whilst the others were left to their own devices. Thereafter phosphatase testing for efficiency of pasteurisation was started and has been carried on continuously for 20 months on the controlled plants. Before the other plants were subjected to any supervision, other than that normally exerted by the local authorities, samples were obtained from six of the plants. The results of this phosphatase testing are recorded in Table 18.

TABLE 18.

Efficiency of pasteurisation at controlled and uncontrolled depots.

Two pasteurising depots under strict daily control.		Six pasteurising depots under no special control.	
Number of samples phosphatase tested.	Percentage under-pasteurised.	Number of samples phosphatase tested.	Percentage under-pasteurised.
2030	0·59%	189	65%

These figures stress very forcibly the need for strict control of the actual process of pasteurisation, in addition to the mere control of sanitation. The six so-called uncontrolled depôts handled collectively thousands of gallons of milk a day and more than half of that milk was at the time of testing being underpasteurised. Some of these six plants have shown striking improvement when subjected to strict control.

The question of sterilising complex milk plant has also been studied with a view to finding an efficient test for adequate sterilisation. Total bacterial counts and thermophilic bacterial counts are valuable but clumsy tests, and the presumptive coliform test has been tried in their place. The value of this test is stressed by Barkworth and independent investigation has confirmed his findings. The two controlled pasteurising plants already referred to have been subjected to a careful trial on the basis of *Bacterium coli* being present or absent in 1·0 c.c. of all samples. The results of these trials are recorded in Tables 19 and 20.

TABLE 19.

Coliform testing of pasteurising circuit of Depot X.

Months.	Source of sample (approx. 1000 tests).			
	Cooler exit.	Storage tanks and discharge taps.	10-gallon cans.	Pint trade bottles.
	Percentage of tests coli present in 1·0 cc.	Percentage of tests coli present in 1·0 cc.	Percentage of tests coli present in 1·0 cc.	Percentage of tests coli present in 1·0 cc.
November, 1942 .	50	57	—	100
December	53	72	91	82
January, 1943 . . .	18	32	94	100
February	45	64	95	83
March	44	36	—	—
April	5	4	35	6
May	0	0	22	6
June	0	2	20	10
July	17	27	41	33
August	5	36	45	53
September	—	18	—	—
October	20	22	75	47
November	9	15	64	37
December	0	6	100	17

TABLE 20.

Coliform testing of pasteurising circuit of Depot Y.

Months.	Source of samples (approx. 800 tests).			
	Cooler exit.	Storage tanks and discharge taps.	10-gallon cans.	Pint trade bottles.
	Percentage of tests coli present in 1·0 cc.	Percentage of tests coli present in 1·0 cc.	Percentage of tests coli present in 1·0 cc.	Percentage of tests coli present in 1·0 cc.
November, 1942 .	0	60	74	
December	36	93	61	
January, 1943 . . .	43	78	92	
February	6	67	60	
March	—	—	—	
April	0	35	18	None tested
May	0	6	17	
June	0	16	19	
July	0	21	5	
August	5	10	18	
September	—	—	—	
October	24	79	94	
November	6	59	91	
December	7	58	83	

From these records it is evident that at the beginning little or nothing was known at Depôt X about cleaning the regenerative preheater-cooler unit. Once it was learnt how to clean and sterilise that unit the sterilising of the storage tanks, pipes and taps was fairly satisfactory. The results in May, June and December were excellent. At Depôt Y the cleaning and sterilising of the preheater unit was much more successful from the outset, but the cleaning of the subsequent circuit has been consistently unsatisfactory. The results of samples taken from 10 gallon cans from both depôts indicate that the processes of cleaning, sterilising and filling the cans is hopelessly unsatisfactory. The position with regard to trade bottles is better, but far from satisfactory. The following figures are useful for comparison. They are given by Barkworth and refer to three pasteurising plants somewhere in South East England.

Depot.	Cooler exit percentage samples coli present in 1·0 cc.	Trade bottle percentage samples coli present in 1·0 cc.
A	0·08%	5·6%
B	0·08%	2·7%
C	0·9%	1·0%

These figures indicate how far we have to go to catch up overseas efforts at plant cleansing and sterilisation.

PARAGRAPH 4: SUMMARY.

A. The scope of action of the various controlling organisations is outlined.

B. Experimental evidence is advanced to show the directions in which the existing control system is failing.

1. The dangers of underprocessing milk products are stressed and evidence is presented to show that a large proportion of S. African milk products are underprocessed. The figures given are butter 62%, hard cheese 87·5%, sweet milk cheese 86·5% underpasteurised.
2. During September to December, 3% of all farm milk samples had a butter-fat content below 3·0%, and 44% below 3·5%. During the same period 9·0% of all samples showed solids-not-fat below 8·0% and 68% below 8·5%. Pooled milk samples were correspondingly unsatisfactory.
3. Big souring losses are borne by farmers due to bad dairy hygiene, bad marketing and bad handling by the distributors. Experimental evidence is given in support of these contentions.
4. The significance of animal disease is stressed. Only 7·9% of 152 producers milk remained consistently free from signs of gross mastitis infection. Of 154 herds tested for con-

tagious abortion by whey tests 22·3% showed signs of gross infection. This is definitely a minimal figure.

5. The failure of the existing system to produce any standardisation of the hygiene of production, or to standardise the keeping quality of the milk is stressed and experimental evidence is given to support this contention.
6. Lack of control of pasteurisation, plant sterilisation, etc., is noted, experimental data being given in support of these contentions.

C. The economic unsoundness of the milk industry in South Africa is discussed.

PARAGRAPH 5: CONCLUSIONS.

1. The existing false distinction between fluid and factory milk should be abolished.
2. Milk should be bought from producers at prices based on its richness, purity, and safety, not according to the architectural splendour of the premises in which it is produced.
3. Milk and cream should be accepted from farmers as soon as possible after milking, and collecting depôts should be situated in the farming areas.
4. Milk and cream should be transported to market in bulk under refrigeration conditions.
5. Milk should be diverted to "fluid" or "factory" use on a basis of its suitability and the availability of markets.
6. Since the country-wide control of disease amongst dairy personnel is not practical, and since the eradication of certain stock diseases will take many years, as much milk and cream as possible should be pasteurised, except in special cases where it can be produced under conditions giving some certainty of freedom from contamination with disease.
7. All processing of milk and milk products should be subjected to the strictest degree of control with a view to producing a safe and pure final product. Subsequent retail distribution of these products should be similarly controlled.
8. The surplus milk problem should be controlled by regulating production, rationalising marketing on a country-wide scale, and by developing markets to absorb surplus milk.
9. The only way to achieve these requirements is for all milk and cream to be bought from producers by a single purchasing organisation. This organisation would become fully responsible for:—

   (a) Regulating production.

(b) Collecting and grading the products for richness and keeping quality.

(c) Diverting the products to appropriate markets.

(d) All transportation.

(e) Adequate processing and bottling of fluid milk.

(f) Controlling all stages of the processing of factory milk.

(g) Re-selling processed fluid milk to retail distributors.

(h) Controlling the hygiene of retail distribution of milk and milk products.

10. Retail distribution costs must be reduced considerably by zoning. Every zone must have a safe and reliable supply of milk.

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THE WILKE TEST FOR LOCATING LEAKS IN PLATE-HEATER MILK PASTEURISERS.

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The plate-heater is an integral part of most totally-enclosed pasteurising plants and in the case of the A.P.V. holder and short-time-high-temperatur e pasteurisers the pre-heating or so-called "Heat-Exchange" unit is always of the plate-heater type. This contrivance consists of two long tubular passages running parallel to each other and separated only by a thin metal sheet. Milk flows along the one passage whilst the warming or cooling fluid goes along the other passage, flowing in the opposite direction to the milk. These parallel passages are actually formed by taking two slabs of metal and cutting grooves in each so that they are exact mirror images of each other. When these slabs of metal are placed in opposition the two grooves coincide to form a complete tubular passage. By interposing a thin metal sheet between the two metal blocks the tubular passage is automatically sub-divided into two parallel passages each half the cross-section of the original one. A more detailed description of this unit with illustrations is to be found in the Bulletin issued by the Hannah Dairy Research Institute (Scott and Wright, 1935) on page 18. Any mixing of the milk and other fluid is prevented of course by the dividing metal plate, the edges of which are proofed with rubber washers and gaskets.

The A.P.V. "Heat-Exchange" unit consists of a block of plates subdivided into four sections:—

1. An initial heating section where hot milk returning from the pasteuriser warms the incoming raw milk and is itself cooled in the process.
2. The pre-heating section where raw milk is warmed to pasteurisation temperature by a thermostatically controlled steam and water mixture.
3. The cooling section where newly pasteurised milk, after giving up some of its heat to the oncoming raw milk in Section 1, is cooled by water.
4. The refrigerator section where the cooled pasteurised milk is refrigerated with brine.

The course taken by the milk through this unit is as follows:—

Primary heating by the returning hot milk, filtration whilst hot in an independent unit, final heating by steam-water mixture,

holder or flash pasteurisation, primary cooling against the oncoming raw milk, secondary cooling by water, and final cooling by refrigerated brine. Any leak in the system might therefore lead to pasteurised milk becoming contaminated with raw milk steam-water mixture, cold water or brine.

Situation and cause of Leaks.

External leaks, which can be seen, have no public health significance; internal leaks on the other hand result in contamination of the milk and consequently are of vital importance. These internal leaks are due to faulty gaskets or to breaks in the metal dividing plates. Flaws in the rubber gaskets can generally be located fairly easily and the trouble is rectifiable by inserting a new gasket. Breaks in the metal plates on the other hand are of microscopic dimensions in the early stages and may exist for a long while before their presence is suspected, and even then they are very difficult to locate because of being so small.

The first suggestion that such a break may exist is given by the "coliform" test. Normally milk samples taken from the cooler exit of an A.P.V. "Heat exchanger" show no signs of *Bact. coli* in 1·0 c.c. provided that plant is subjected to thorough cleansing and sterilisation. If therefore in spite of adequate sterilisation, *Bact. coli* persistently show up in cooler-exit samples, the presence of a leak may be suspected. As the leak gets larger the phosphatase test will in time indicate under-pasteurisation if the leak happens to develop in a plate separating raw from pasteurised milk, or if the cooling water happens to contain dissolved phenol (quite a common state of affairs). When a large leak develops in the water section, the plant manager will find his stock of milk growing instead of shrinking during pasteurisation, and ultimately evidence of adulteration will become apparent.

For four years no new "heat-exchanger" plates have been obtainable in South Africa and the plates now in use are comparatively old and the occurrence of breaks in the metal may be expected. These breaks are mainly due to rough handling during cleaning, to normal wear and tear, and to pressure variations. Of these the last-named is the most important cause and it operates chiefly on the water-cooling section. The plates are designed to withstand a pressure ratio of 15 lbs. per square inch on the milk side and 20 lbs. on the water side. Any material variation in this pressure ratio if oft repeated will subject the plate to a severe state of strain. Similarly comparatively small but oft-repeated fluctuations in the pressure ratio will keep the plate in a constant state of movement, buckling first one way and then the other. Either of these factors exaggerate the normal rate of wear very considerably. Errors in pressure usually arise from the introduction into the water circuit of a cooling tower. The height of the lift to the tower plus the resistance offered by the spray jets very materially

increases the water pressure unless a compensatory pump is introduced between the "heat-exchanger" and the water tower. If on the other hand the cooling water comes direct from the municipal mains, variations in the mains pressure will result in constant fluctuations of the milk: water pressure ratio which should be constant at 15:20.

It has become of vital importance to develop some simple method of locating internal leaks at the earliest possible moment and the credit is due to Mr. J. D. Wilke of the National Co-operative Dairies, Ltd., for having devised and developed the following test.

Technique of Test.

When the presence of a small invisible leak is suspected, the "heat-exchanger" should be opened up and washed and all the plates and gaskets should be inspected. If no flaw is to be found:—

1. Prepare a thin paste of starch using one quarter of a pound of starch to three pints of water. Sufficient of this paste should be made to cover all the plates that are to be tested. To prepare the paste, first work the starch into a paste with a little cold water, then gradually add the three pints of boiling water, stirring all the time. Boil the final mixture for 30 minutes in order to obtain the necessary gluey consistency. Allow it to cool. Just before using it, stir in 1 c.c. of a 1% solution of phenolphthalein to every 100 c.c. of paste, and paint this mixture over the pasteurised milk side of the plates that are under suspicion. If, when the phenolphthalein is added to the starch, a faint pink colour develops due to the mixture being alkaline this should be neutralised by stirring in weak acid until the pink colour disappears.
2. Close up the "heat-exchanger" as ready for operation.
3. Alkalinise a tank of water with sodium or potassium hydroxide so that it turns phenolphthalein red.
4. Circulate this water through the section of the "heat-exchanger" under test. The water should be under slight pressure and it should be passed along the passage not lined with starch paste.

The procedure described under paragraphs 3 and 4 will have to be adopted to suit different layouts of plant. Generally speaking it will be convenient and expeditious to utilise the standard cleansing equipment used for softening the "milk-stone." This equipment, consisting of a small tank, a pump, and hose connections, which is vital to the successful operation of all totally enclosed pasteurising plants, may conveniently be employed for circulating the alkaline solution in the above test.

In this way alkaline water under pressure is passed along the one surface of the suspected plate or plates whilst the other surface

of the plate is covered with starch paste containing phenol phthalein. Any break in the metal which allows the passage of liquid shows up as a red spot or a fine red line due to the action of the alkaline water oozing through the break and colouring the phenolphthalein.

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THE METABOLISM OF THE UNDER-NOURISHED BODY

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A diet may be adequate in most respects but deficient in some specific essential constituent such as a mineral, vitamin, protein in general or some particular essential amino-acid. Such a condition is usually spoken of as malnutrition. On the other hand a diet may be deficient in all respects including its calorific value, when we speak of undernutrition. It is with this latter state of affairs that this article will deal.

When we speak of a diet being inadequate we imply that it is insufficient to supply the demands of the particular animal under the circumstances of the moment. The nutritional requirements of the animal vary greatly with both intrinsic and extrinsic conditions. For instance, pregnancy, lactation and growth greatly increase the demands for food stuffs, as do also cold, exposure and exercise. It will be realized that the dietary needs of stock on the high-veld in winter will be greatly increased by the three last named factors, at a time when the food supply is at its lowest.

The only nutriment of any value to the body is that which is digested and absorbed. Any deterioration in the digestibility of the food, or any disturbance of the digestive organs, will therefore greatly reduce the value of the diet.

It is self evident that if an animal's diet is less than its requirements, it will gradually lose weight and eventually die of cachexia. What is not so generally realised is that the rapid mobilisation of the body reserves, in order to supplement an inadequate diet, may lead to grave metabolic disturbances which may cause symptoms and death before the state of cachexia has been reached.

The Source of Energy.

Energy is produced in the body by the breakdown of carbohydrate, fat, and protein. When the intake of these materials exceeds the requirements, the animal can lay up reserves which can again be mobilised in time of need. The mobilisation of this stored fat and protein is not a simple matter, however, and involves the production of certain by-products, which, if present in excess, are toxic.

The Carbohydrate Reserve.

This can be divided into the glucose of the blood and tissue fluids and the glycogen of the muscle and liver. The muscle glycogen is combusted for the production of mechanical work and heat, and is replaced from the blood glucose, which is also utilised direct by other organs. There is, therefore, a constant removal of glucose from the blood which is replaced by the liver from its glycogen. Unless the assimilation of new carbohydrate equals the amount used, the liver will become depleted of glycogen. The carbohydrate reserve of the body is not great, as has been shown by the fact that in well-nourished pregnant ewes a fall in the blood-sugar level may be seen after the animal has been on an inadequate diet for from three to seven days. (Groenewald *et al*, 1941). An adequate supply of glucose to the organs of the body is essential to life and, therefore, should the carbohydrate reserve become exhausted, the body has to manufacture new glucose from fats and proteins (glyconeogenesis).

The Fat Reserves.

There is some evidence that fat can be converted into glucose in the body, but this does not occur to any great extent. Starved sheep will show a marked drop in the blood-sugar level while there is still plenty of fat present in the depots.

In the oxidation of fatty acids, aceto-acetic and β hydroxybutyric acids are formed. These substances, known as the ketone bodies, do not accumulate in the blood under normal circumstances, but do so in the absence of sufficient simultaneous combustion of carbohydrate. The connection between the oxidation of fat and carbohydrate is, apparently, indirect but the antiketogenic effect of carbohydrate is well established. It is usually accepted that at least one molecule of carbohydrate must be burned for every two of fat in order to prevent ketosis. The ketone bodies, being acid, produce an acidosis. There is evidence that aceto-acetic acid is directly toxic and this substance is thought to be the cause of the coma of diabetes mellitus and domsiekte in sheep. Clark (1942) has shown that the development of ketosis in sheep on an inadequate diet is in direct proportion to the amount of fat in the body. Obese non-pregnant sheep placed suddenly on a poor diet succumbed in less than 30 days. They showed severe ketonaemia and hypoglycaemia despite the large amount of fat still available. Sheep in poorer condition, on the other hand,

gradually lost weight and survived on the same diet for nine months. Acute ketosis is, therefore, the result of a sudden mass metabolism of fat in the absence of sufficient carbohydrate combustion and examples of it may be seen in domsiekte of sheep, acetonaemia of cows, the so-called "transportation disease" of America, and starvation acetonaemia seen especially in obese individuals. In these cases the animal may die as a result of an inadequate carbohydrate assimilation because of, rather than in spite of, its good condition.

The Protein Reserves.

Protein can be converted into glucose. The amino-acid is deaminized and the nitrogen excreted, the rest of the molecule being converted into sugar. Where this reaction is taking place rapidly there is a marked accumulation of non-protein nitrogen in the blood, a phenomenon frequently described in connection with the last stages of starvation and known as "the pre-mortal rise in nitrogen." (See Lovatt Evans, 1941).

During the experiments on domsiekte at Onderstepoort (see Groenewald *et al,* 1941) it was frequently observed that a sheep on a poor diet, showing hypoglycaemia and hyperketonaemia, would suddenly exhibit a marked rise in the sugar and non-protein nitrogen of the blood, together with a simultaneous drop in the ketone bodies. Death followed in one or two days, the cause of which is not known but may be ascribed to either an auto-intoxication by nitrogenous compounds or the depletion of essential proteins.

The Speed of Mobilisation.

The mobilisation of fat and protein for the production of sugar and energy are normal physiological processes resulting in the well-known loss of condition and wasting of muscle on a poor diet, and only become harmful when the speed of the reaction exceeds the capabilities of the body to deal with the potentially toxic products. Too great a gap between "income" and "expenditure" may, therefore, lead to sudden disease and death, irrespective of the bodily condition of the animal.

The maintenance of Body Temperature.

In warm blooded animals the maintenance of body temperature is essential to life. In well conditioned animals the subcutaneous fat acts as an insulating mechanism but when this is lost the animal becomes very susceptible to cold. Shivering, which is involuntary muscular activity, has to be resorted to in order to produce heat, thereby greatly increasing the carbohydrate expenditure of those animals that can least afford it.

Summary.

It is pointed out that in times of great bodily stress, such as during bitter cold nights or long treks, where the food intake or assimilation

is below the requirements, death may take place in the absence of severe emaciation and yet be directly due to the dietary insufficiency.

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PHENOTHIAZINE — A BRIEF SUMMARY OF KNOWLEDGE TO DATE

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Phenothiazine or thio-diphenylamine is a pale-yellow powder which darkens on exposure to light. Commercial samples are usually slaty-grey. It is very slightly soluble in water (1 : 800,000) and is not readily suspended in water unless a wetting agent is added. It is administered to various animals in the form of (1) an aqueous suspension as a drench, (2) pills, tablets, capsules or boluses, or (3) a powder mixed with food. In the latter case mass treatment is sometimes carried out, but this is risky as some individuals may get an overdose.

Large doses are required and this may be due to the necessity for a high concentration in order that each worm shall swallow a sufficient quantity of the drug, or because successive small quantities which become dissolved in the digestive tract and so able to act on worms are also rapidly absorbed. In this connection it is interesting to note that a large part of the dose is often passed unaltered in the faeces and that 25 daily doses of 1 gm. are as effective as one dose of 25 gm. given to a horse.

In the blood the drug is transformed into colourless (leuco-) or hydroxy compounds which are excreted mainly in the urine and also in the milk and turn red on exposure to air, forming the fast dyes thionol and phenothiazone. As soon as the drug is wetted it also oxidises to form these red dyes and staining of wool or white hairs can therefore readily occur as a result of spilling during drenching or through the urine.

In interpreting the results of treatment it must be noted that the drug inhibits egg-production of worms for several days and re-examination should be done only about 14 days after treatment.

Doses and Efficacy

1. *Horses:* The dose for an adult is 25 - 30 gm. given as a bolus or in a bran mash in one dose or, preferably, in several daily doses of 5 gm. The percentage efficacy against various internal parasites is approximately: Strongyles 100, Ascaris 0 - 100, Oxyuris 25, Trichostrongylus axei 50, Habronema 0, tapeworms 0, Strongyloides 0, worms in aneurysms 0, bots 0.

2. *Sheep and Goats:* Dose 0·4 - 0·5 gm. per pound live weight or 20 - 50 gm. for an adult. Administered as pills or a drench. After bluestone stimulation (2·5 c.c. 10%) the dose can be reduced by one half if given as a drench, but the quantity is large and tedious to administer as a drench, apart from the danger of staining the wool. Pills can be rapidly given if a suitable pair of tongs is used. Efficacy: Haemonchus 100, Ostertagia 80 - 100, Trichostrongylus axei 80 - 100, Trichostrongylus in intestine 40 - 80, Bunostomum 60 - 100, Nematodirus 0 - 50, Strongyloides 0, Moniezia 0, Oesophagostomum 75 - 100, Chabertia 75 - 100, Trichuris 0, Fasciola 0.

Small daily doses (0·5 gm. per sheep) prevent the development of worm eggs passed in the faeces and so stop pasture infection. Salt licks containing about 10% of the drug (1:9 to 1:15) are effective but may lead to serious discolouration of wool.

3. *Cattle:* Dose 0·2 gm. per pound live weight or a dose of about 30 gm. for a full-grown animal. Administered as drench or pills. Efficacy: Haemonchus 80 - 100, Ostertagia 80, Trich. axei 80 - 100, Cooperia 50, Bunostomum 50 - 100, Moniezia 0, Oesophagostomum radiatum 75 - 100.

4. *Pigs:* Dose 0·2 - 0·25 gm. per pound or up to 25 lbs. 5 gm, 25 - 50 lbs. 8 gm, 50 - 100 lbs. 12 gm, 100 - 200 lbs. 20 gm, over 200 lbs. 30 gm. Given in food, as drench or pills. Efficacy: stomach worms 0, Ascaris (adults) 50, Oesophagostomum 80 - 100, trichuris 0, Macracanthorhynchus 0.

5. *Dogs:* Ineffective.

6. *Fowls:* Dose 0·5 gm. per bird, given as a pill. Efficacy: Ascaridia 50, Capillaria 0 - 50, Heterakis 90 - 100, Cheilospirura hamulosa 0, tapeworms 0.

Preparatory Treatment. No starvation is necessary and in horses it is contraindicated. Some authors recommend a fast of 18 - 24 h. for cattle. Constipation should be relieved before treatment, especially in horses.

Toxicity. Overdosing should be avoided, particularly in horses. Thoroughbreds appear to be more susceptible than other types. In

general there is a tendency to develop anaemia which often reaches its maximum 2 - 3 weeks after treatment and may last a few weeks longer. This is most pronounced in horses and man and is not important in other animals with ordinary doses. Quick relief is obtained by transfusion. In goats a temporary reduction in the milk yield was noted. The drug is apparently safe in pregnancy. Very young animals are distinctly more susceptible to poisoning than older animals.

Symptoms of Poisoning. In horses there is a rise of temperature, anorexia, weakness, dullness, in some cases colicy pains and staggering, frequently icterus, constipation with mucus-covered faeces, dyspnoea, weak pulse, sometimes albuminuria and haemoglobinuria, progressive anaemia.

In cattle similar symptoms have been noted.

In pigs incoordination and paralysis, especially of the hind quarters—but they feed and drink when held up to the trough—vomition, rectal prolapse and a transitory corneal opacity are the usual symptoms. Photosensitisation and dermatitis have also been noted.

Post mortem after poisoning. Horses show gastritis with erosions, slight enteritis, enlarged and congested liver, spleen and kidneys, ureteritis, enlarged heart with subendocardial haemorrhages.

Cattle—oedema and ulceration of abomasum, enteritis, congested liver and kidneys.

Pigs—lesions of digestive tract, liver and kidneys as above.

Contraindications. Extreme anaemia (especially horses), emaciation, severe constipation, diseases of heart, kidney and liver. Very young animals should not be treated, foals not under 9 months. From the literature it would appear that molasses in the food of horses during treatment is dangerous.

Costs and Time of Treatment. The price of Phenothiazine is at present about 5/- per pound of the loose powder. Pills, tablets, etc., are more expensive. At a dose rate of 25 gm., one pound will treat 18 horses or sheep. For horses this is economical and 2 - 3 treatments annually should suffice. For sheep and cattle it is not economical under conditions requiring regular and frequent treatments. It may be very useful to give sheep one large dose (50 gm. for 100% effect against nodular worm) annually at the end of winter, in the summer rainfall area, to prevent infection of the pasture the next spring. The cost of a Phenothiazine salt lick would be about 5/- p.d. for 900 sheep or £7.10.0 per month for the drug alone. Pigs suffer mainly from Ascaris infection in the Union and Oil of Chenopodium gives better results, but Phenothiazine could be used.

CASE REPORT.

JOINT-ILL IN PUPPIES

W. D. MALHERBE,
Onderstepoort.

Pyosepticaemia neonatorum, more commonly known as joint or navel-ill, has been extensively studied in foals, pigs, calves, and lambs, in which animals the condition is so well known as to need no description. Various organisms have been found to be responsible for the characteristic suppurations of the disease, notably various streptococcal strains and members of the colon typhoid group (e.g. Escherichia coli and a number of Salmonellas), quite a few of which, at least, are considered to be facultative parasites frequently present in the soil, in stables, and elsewhere. The main routes of infection have been variously held to be mostly intra-uterine, or mostly by post-partum primary infection through the umbilicus. The bulk of opinion in the literature, represented by that of M'Fadyean, is that the latter occurs in the majority of cases.

CASE REPORT.

Standard texts, such as that of Hutyra and Marek, and Udall, while describing this condition in the various animals, do not mention its occurrence in puppies. From the point of view of the differential diagnosis of mortality in very young puppies, it has been considered to be of interest to describe an instance where a whole litter of valuable pups was lost before they were a week old.

A purebred Rhodesian Ridgeback bitch, owned by the wife of a farmer in the Rustenburg district, whelped a litter of nine normal pups, and, as there were rather too many for her to manage, three were done away with immediately. On the second day after birth they all appeared to be healthy, but from the following day they started sickening and dying in quick succession, the last one at the age of seven days.

The trouble was not reported till the last one was moribund, and at the writer's request it was brought to him dead, for autopsy. The owner described intense colicky pains with howling and frothing at the mouth before death.

On external examination the navel appeared unhealthy, having an open hole in the centre and an area of 1 cm. radius, almost black in colour, surrounding it. The left tarsal joint was markedly distended and on incision exuded a lot of dirty coloured pus. The elbow

joint on the same side was similarly affected but not quite to the same extent. On opening the animal by median incision the inside of the umbilicus was seen to contain about 4 c.c. of pus and was considerably enlarged. For the rest there were the usual signs of septicaemia. This septicaemic condition, combined with purulent omphalophlebitis and arthritis made the diagnosis of joint-ill an obvious one.

As far as the mother was concerned, the two or three previous litters had been perfectly healthy, and, apart from some mammary discomfort, she was still in excellent health after the death of her pups. There was no question of abortion and intra-uterine infection seemed very unlikely, particularly since the pups had been normal for the first two days of life. It appeared that the bitch had whelped in the lounge in the absence of her mistress from the farm and that she and her pups were removed by the farm natives to a shed with a concrete floor and straw provided. There seems little doubt that the microorganisms had gained entrance through the navel and so set up the infection.

Pus from the affected joints was submitted to Onderstepoort for bacteriological examination and a pure culture of a short chained streptococcus was obtained. This organism was probably a facultative parasite or one with pathogenic potentialities. Its identification removed the possibility that the disease could have been caused by infection from straw or a floor contaminated by calves suffering from paratyphoid, a fairly prevalent disease in that district.

Summary.

1. The occurrence of navel or joint-ill in a whole litter of puppies is described.
2. The route of infection was without doubt by way of the umbilicus after birth.
3. The causal organism was found to be a short chained streptococcus.

References.

Hutyra, Marek, *et al.* (1938). Special Pathology and Therapeutics of the Diseases of Domestic Animals. Vol. 1. Bailliere, Tindall & Cox, London.

Udall, D. H. (1933). The Practice of Veterinary Medicine, pp. 182 - 185. Published by the Author, New York.

M'Fadyean, Sir J., and Sheather, A. L. (1923). Joint-Ill in Foals: Treatment with Vaccine. J. Comp. Path. and Ther. 36: 22 - 32.

CASES OF SUBMUCOSAL HAEMATOMA OF THE VAGINA IN THOROUGHBRED MARES

G. D. SUTTON
Middelburg (Cape).

A condition, characterised by swelling and collection of blood in and under folds of the mucous membrane of the vagina appearing shortly after foaling, has been encountered during the last few years in thoroughbred mares. It is being recorded in this article, as no reference to it can be found in the available literature.

Examination of the vaginas of thoroughbred mares, particularly those which have foaled a number of times, often reveals numerous folds inside. Generally the folds are situated near the cervix, but also occur close to the vulva and may be attached dorsally, ventrally, or laterally. They are flat, rounded projections, up to two inches in width and an inch or more in length, hanging loosely into the lumen of the vagina and appear to consist of the mucous membrane only without involving the muscular or fibrous coat of the vagina. Up to the present these projections have not been seen in Percheron mares or ordinary farm type mares. It is thought that during foaling, pressure and injury to these folds causes haemorrhage from the vascular corium of the vagina, the blood collecting and forming a haematoma under them and between the mucous membrane and muscular coats of the vagina. This blood clots, and a firm swelling, dark purplish-blue in colour, up to four inches in diameter forms. When the affected fold is close to the vulva, the haematoma protrudes, usually becomes injured by the tail and bleeds profusely. Gangrene of the surface sets in rapidly and by the time veterinary assistance is available an operation is necessary.

Diagnosis presents no difficulties except when the haematoma is situated in the floor of the vagina, when eversion or partial eversion of the bladder must be excluded.

During the last five years, six cases with protrusion have been encountered. One was situated ventrally, three laterally on the right and two laterally on the left. One of them had its base situated two inches within the vagina and was cured by smearing it with olive oil and returning it into the vagina each time it protruded. The others were all situated with their bases within an inch of the vulva, could not be returned into the vagina, and had to be removed surgically.

The operation was done with the mare standing in a crush or backed up against a low stable door or paddock railings, whichever was available. A twitch was applied to the upper lip. A local anaesthetic was injected round the base of the haematoma at points an inch apart. The site of the incision depends on the extent of the gangrene present and must be made in healthy tissue. As a rule an incision could be made in non-gangrenous tissue all round the base of the swelling about $\frac{1}{2}$ to $\frac{3}{4}$" away from the wall of the vagina. The cut was mapped out so as to leave sufficient mucous membrane for suturing together. Each case had to be judged according to its merits. The haematoma was removed completely by cutting it off across its base. Haemorrhage was profuse and troublesome. Bleeding points were stopped as far as possible with artery forceps. The loose edges of the mucous membrane were sutured together with interrupted catgut sutures. There was always slight haemorrhage after the operation had been completed, but this stopped spontaneously within about fifteen minutes. In all cases only the mucous membrane was involved and the rest of the vaginal wall was intact. No after treatment was necessary. Recovery was complete in one to two weeks. The mares were fit to be served at the second heat period after foaling. Fertility was not affected and all the mares, except one which died of horsesickness a few months later, produced foals the next season.

One other case was encountered which indicated that the same condition probably occurs inside the vagina without protrusion. The mare was served nine days after foaling and immediately showed colicky symptoms and discharged blood-stained fluid and blood clots. Unfortunately the case was only discussed with the owner over the telephone and an examination could not be made. It was assumed that one of these haematomas had been ruptured at service, but a definite diagnosis could not be made as the discharge could have had its origin elsewhere. This was unlikely, as no discharge had been seen prior to service. These cases probably occur, but would seldom be recognised as they would regress without showing any external signs.

Summary.

The occurrence, origin, and treatment of cases of vaginal haematomas in thoroughbred mares have been discussed and described.

BOOK REVIEW.

Practical Veterinary Pharmacology, Materia Medica and Therapeutics by H. J. Milks. 5th Edition. Bailliers, Tindall and Cox, London. 1943.

In this edition useful information concerning our knowledge of vitamins, sex hormones, deficiencies and sulphonamides has been brought up to date and the therapy in general has been improved. A few new remedies are described for the first time.

The doses of oil of chenopodium prescribed by Milks for pigs and dogs appear to be dangerously high. In the *Veterinary Record,* Vol. 49, 1937, p. 861, it is stated that the dose of 20 minims of oil of chenopodium recommended by Milks for dogs weighing 20 lb. and over is "considerably larger than that which we find both safe and effective."

According to our experience in South Africa, Milk's doses of carbon tetrachloride for sheep and cattle are very dangerous indeed. We have found 1·0 c.c. for sheep and 3·0 to 5·0 c.c. for cattle both effective and safe, provided the necessary and well-known precautions are taken. I find the above book very useful for students in veterinary science as its contents are very concise, clear and to the point.

D. G. STEYN.

5th April, 1944.

CORRESPONDENCE.

SOME THOUGHTS ON THE FUTURE OF THE VETERINARY PROFESSION IN SOUTH AFRICA.

The Editor,

In my position as secretary of the Committee on Post-war Reconstruction I have had the privilege of ascertaining what the profession feels is lacking in our organisation and in the services rendered to the community. Naturally all shades of opinion on a great variety of problems have been expressed, but, on the whole, one is greatly surprised to find a rather parochial outlook on veterinary affairs generally. The private practitioner has his views biassed in favour of private practice and clinical work, similarly the municipal veterinarian thinks mainly in terms of municipal work, and I regret to state, the government official is the worst sinner. This somewhat sectional outlook is natural and is only to be expected from a body of men who are engaged to the full by their work, are usually isolated, and lack contact with colleagues either because of their geographical situation or because of professional duties. There is no doubt that the total number of veterinary surgeons in the country is altogether inadequate for the duties which the profession must perform and consequently the men available are extremely hard worked in the majority of instances. This inadequacy in numbers is probably, more than any other factor, responsible for the shortcomings from which the profession has suffered. The probable reasons for this paucity in numbers will be mentioned later.

This effort to record some thoughts on the future of the profession through the medium of our Journal is prompted by a conviction that it will serve as a means of communion between isolated colleagues and for that reason the views expressed are not entirely my own, but, to some extent, an embodiment of the ideas of a number of individuals who have submitted memoranda to me. An effort is made to present the functions of the profession in perspective, in a way which seems to me to be logical; and also to express views upon a desirable balance between the functions of the State Veterinary Service and other veterinary duties. For these I must assume personal responsibility because opinions differ radically within the profession, but this difference of opinion is possibly mainly due to an absence of a proper consideration of all the implications of having a profession which is either entirely State controlled or mainly outside State control.

The most burning question seems to be in how far the profession should be controlled by the State! Proposals ranging from complete State control to an absolute minimum of State interference have been received. Both seem to be quite unjustified.

It seems strange that members of any profession should seriously propose to hand over their profession bag and baggage to the tender mercies of the Civil Service, for State control means no more nor less than this. The Civil Service in all democratic countries is a notoriously bad employer; this has been emphasised so often that one is left aghast at the mere prospect of any profession being administered entirely by civil servants. The first prerogative of a profession is that it is lawfully so constituted that it is able to administer its own affairs, maintain responsibility for its efficiency and take disciplinary action against its members. If a profession was to be administered by civil servants there would be no need for constituting it into a statutory body of members unless such action were taken as a sop. Are we now to take steps which would result in the moral undoing of the efforts and initiative which led to our profession being recognised by an Act of Parliament?

There are other good reasons why the Profession should not be entirely state controlled. In the first instance, why should the veterinary profession become entirely socialised in a community which is otherwise based on the principles of competitive enterprise and private initiative?

As a guide we have the example of no less an authority than Mr. Churchill himself, when he said: "We must beware of trying to build a society in which nobody counts for anything, except a politician or an official, a society where enterprise gains no reward and thrift no privilege."

Secondly, there can be no doubt that the veterinary profession in this country is just beginning to shake off its swaddling-clothes as a responsible body of professional men who are capable and unafraid of expressing their opinions. This healthy state of affairs cannot but degenerate should the growth of the profession outside the Civil Service be checked. It may be argued that the main contribution to the status of the profession has come from a state organisation, namely Onderstepoort, but I submit that we are indebted to

the ability and the sense of duty of the staff to the profession, and not at all to State control. Given the financial backing from any source, which happens to have been provided by the State, it is a safe bet that the achievements of Onderstepoort would have been greater and not smaller; and, remember, the State has made this investment because it was a sound financial undertaking, and not for any altruistic reason.

No, there can be no doubt that as a profession we would be composing our own swan song by encouraging complete State control. This, however, does not mean that we should aim at reducing the size or the scope of the profession within the State service, provided a parallel increase may be attained without.

In explaining the balance between State and non-State veterinary services which appears to me to be desirable, it is necessary to review briefly the essential functions of the profession.

In his presidential address to the N.V.M.A. last year Professor Woolridge gave a very clear exposition of the duties of the profession. He indicated that our first duty is "to improve animal health and control their diseases in the mass." Thereafter came attention to individual animals and control over the fitness of animal products for human consumption. In this country the control over animal health "in the mass" is a function of the State Veterinarian. That, and that alone, has been the prerogative of the Veterinary Division, and it should remain so. Any attempt by the State to encroach upon the domain of the clinician must be opposed by the profession. Surely the farming community receive sufficient free service without the State having to go to the expense of providing free veterinary attention to individual animals, thus competing with the means of livelihood of a growing body of professional men.

Another function which the State service provides is that of training recruits to the profession.

The control of animal health "in the mass" and veterinary education provide such a vast field of activities that a large number of professional men are required for the purpose and the number is likely to increase, provided candidates who are prepared to enter the Civil Service are available. Suitable candidates are, however, only likely to become available if the conditions of employment are sufficiently attractive or if there is no other more attractive avenue of employment outside the Civil Service.

The two remaining functions of the profession are performed by municipal veterinarians and private practitioners, and fortunately the value of the services rendered is being more and more appreciated; and, let us remember, this appreciation is contributing in no small measure to the establishment of the status of the profession.

This brings me to the contentious point that municipal veterinary services should be State controlled. The authors of this scheme advance the argument that although the control of meat and milk supplies to prevent disease being transmitted to humans is laid down by Statute, the application and interpretation of the law and regulations is left to local authorities and consequently there is no uniformity. This lack

of uniformity is said to be due to the absence of a single central control, yet it is admitted that this applies mainly to milk, whereas the position as regards meat is somewhat better, although the control of both is administered under authority of the same Act. A more logical explanation of this lack of uniformity and inadequacy of control would appear to me to be that the veterinary profession has no direct authority vested in it by the Act. If the control of meat and milk hygiene, and indeed of all animal products intended for human consumption, was placed in the hands of the veterinary profession—where it rightly belongs—these complaints would disappear. If they were not remedied the profession would take the necessary action. However, I fail to see how anything but a fairly uniform system could result with this control in the hands of men, all of whom would have had the same basic training at one institute (Onderstepoort) and who would be attending the same conferences as colleagues. The request for State control in this sphere is surely caused by our own lack of confidence in our professional organisation, or an ingrained habit of viewing all matters primarily as State officials.

The laws relating to the control of the fitness of foods of animal origin for human consumption place this control in the hands of the medical officer, and the medical profession of Great Britain has, through the British Medical Journal of 17th April, 1937, had the good sense to acknowledge that it is not suited for these duties, in the following passages:—

"The greatest hope for increasing the consumption of milk lies in providing the public with safe, clean milk as it comes fresh from healthy cows. . . . . The production of clean milk and the eradication of disease in cattle are problems for the agriculturist and the veterinarian. . . . . Sooner or later we shall be forced to take the control of milk production out of the hands of the public health authorities and transfer it completely to our agricultural and veterinary colleagues to whom it rightly belongs."

Let us then, if we wish to see an improvement in those aspects of public health which fall within our domain, take steps to get our rightful recognition by adequate legislation. This may not be easy, but I believe that, provided the profession tackles the matter in collaboration with the medical profession, it will not be as difficult as many maintain. The biggest obstacle which must be overcome is our own inertia. A great deal has been said and written about the matter, but I am not aware of any concerted action having been taken. The suggestion to get State control over these problems is merely following the course of least resistance.

There is only one sound argument in favour of State control. It is that a large number of smaller municipalities would not be able to afford the appointment of veterinary officials. This difficulty could be overcome by the central or provincial government subsidising these smaller centres or by part-time appointments of the same man to neighbouring municipalities. In this connection it appears to me to be quite obvious that the profession has a duty to itself to create as many avenues of employment as possible and to have these as competitive as possible. By this means the demand for veterinarians must increase, their com-

mercial value appreciate and consequently the profession be made more attractive to the best type of recruit. The attraction of better men to the profession in turn must result in better service to the nation. There can be no doubt that the apparently selfish object of creating as big a demand as possible for veterinarians and hence increasing their value, must result in attracting more ambitious and energetic individuals; and who would deny the wisdom of such a policy?

I have now explained my views about state and municipal employment and, as I see it, these two spheres if properly developed, should provide an ever increasing scope for veterinarians and result in improved service to the community. If these principles of employment for the profession are accepted, the demand for private practitioners will increase as the value of the services which can be rendered to the individual animal becomes appreciated. Anyone who has had some experience of clinical work will not deny that this appreciation has been growing like a mushroom during the last decade or more, and it should be encouraged by competitive practice as this is the panacea for inefficiency. Applying State control to clinical work must have the reverse effect, as it is not, and never has been, the function of the State to take care of the individual, man or animal, and consequently attention to the individual must be subservient to care of the community in any State scheme.

It is not my object to submit the various proposals for improving the services of the profession to the nation during the years ahead. These proposals will in due course be submitted to you in some appropriate form by the Committee on Post-war Reconstruction, but one more very important problem deserves attention. This is the number of graduates who have been qualifying and are likely to qualify.

I intimated earlier in this discussion that our lack of numbers has probably been one of the main reasons for many of our past difficiencies. This, in my opinion, has been caused by the very fact that up to a few years ago the only obvious channel of employment for students was the Civil Service. The conditions of employment are not attractive and the number of posts available has been limited. This was no incentive to young men to undertake a long and arduous course. If the profession wishes to gain its rightful place in the sun it must strain every nerve to find attractive employment for as many graduates as possible. In addition, better facilities for more thorough training in both under-graduate and post-graduate courses are essential if the standard of professional services is to be improved. The creation of facilities for post-graduate courses are however dependent upon the demand. Such a demand, one regrets to have to state, has never been made by aspirants and one wonders whether there would be any entrants should facilities for post-graduate courses be created. A number of colleagues may say that they have spoken to this or that individual about the institution of post-graduate courses. This is not enough! The correct body to approach is the Veterinary Faculty, and if satisfaction is not forthcoming, Council should be consulted through the Secretary of the S.A.V.M.A. Only an insistent demand by members of the profession through the medium of the organisation at their disposal is likely to yield results within a reasonable time.

I do not wish to create the impression that I advocate a sudden and tremendous increase in the number of graduates qualifying annually.

The growth of the profession must be proportionate to the demand and it is better that this evolution take place gradually.

There are a number of members who express the sentiment that State salaries for members of the veterinary profession should at least equal medical scales. There are sound enough reasons for this and it may in time materialize provided we handle our professional responsibilities wisely, but let us not lose our sense of proportion. The relations and respective values of the two professions to the community have been very ably set out by Dr. du Toit in an address to the Associated Scientific and Technical Societies of South Africa, delivered in Johannesburg in August, 1941. In this lecture he clearly indicated that in human illnesses sentiment and not the economic value of the individual is the ruling consideration, whereas when one deals with sick animals sentiment is only applied in the case of pets and the economic aspect is the essential factor. It is not likely, therefore, that the earning capacity of the veterinarian outside State employment can ever equal that of the medical practitioner and the State cannot be expected to pay salaries which are not proportionate to the earning capacity of any group.

It must be remembered, too, that the medical course takes six years to complete and if we reach an earning capacity comparable to that of the sister profession it will become necessary to lengthen the veterinary course. This may be desirable in any case, but the length of the existing course must be determined in the first instance by the likelihood of obtaining sufficient recruits and from this point of view it is questionable whether any change would be wise within the near future. The matter might have been different if there had been any sound reason to believe that the present B.V.Sc. course was in any way inadequate in scope and that such inadequacy could be remedied by lengthening the period of training. This, I maintain, is not the case and the improvements which are necessary can be attained within the present curriculum. If any specialisation is necessary this could be provided by post-graduate courses.

One final comment seems to be indicated. There is a tendency among us to criticize freely and to offer advice and suggestions all too readily and then, at a time like the present, to pass resolutions at an annual meeting and sit back to wait and see what happens. This is a convenient method of shelving the matter so that nobody assumes responsibility, and we leave the conference room patting ourselves on the back about our importance and wisdom. A programme of reconstruction cannot be brought to fruition in this way. We must assume responsibility as individuals and collectively, and cultivate the habit of analysis and discussion. Only thus can schemes become crystallized and eventually materialize. Few proposals which we may make are likely of immediate execution, but if we can set ourselves a goal and strive for that we may expect to see it attained over a period of years.

H. P. Steyn.

Note.

At the last meeting of the Council on 21st June, 1944, it was decided to appeal to members who wished to express their views on post war reconstruction and had not yet done so, to communicate with the Secretary before the next meeting of Council to be held towards the end of August.

CORRIGENDA.

Journal S.A.V.M.A. Vol. XIII. (4). December, 1942: Introduction.

(i.) pp. 87 and 88, Footnotes: Owing to paper shortage no reprints were made.
(ii.) p. 88: When reading Chapter II note that the numbering of figures 25, 26, and 27 has been transposed.
(iii.) p. 90, line 7: 1913 instead of 1923.
(vi.) p. 102, line 21: S.A.V.D. instead of Z.A.V.D.
(iv.) p. 97, line 30: right shoulder instead of shoulder.
(v.) p. 99, line 2: faces instead of facing.
(vii.) p. 104, line 16: Fig. 15 instead of Fig. 15 a.

Journal S.A.V.M.A. Vol. XIV (1). March, 1943. Chapter I.

(viii.) p. 19, line 15: 9186 instead of 9168.
(ix.) p. 22, line 36: middle instead of middel.
(x.) p. 25, line 29: disappointment instead of dissapointment.
(xi.) p. 26, line 2: seize instead of sieze.

Journal S.A.V.M.A. Vol. XIV (3). September, 1943 Chapter I (cont.).

(xii.) p. 103, line 13: insert "and" between surprise and seizure.
(xiii.) p. 108, lines 42 and 44: V.O. instead of O.V.
(xiv.) p. 111: Title (IV) Post-Campaign period to be in Roman letters.
(xv.) p. 114, line 27: Papkuil instead of Papkine.
(xvi.) p. 116, footnote: Gavin instead of Cavin.
(xvii.) p. 117, line 3: Lt. Col. G. W. Lee instead of Major G. W. Lee.
(xviii.) p. 117, line 11: Add 178 to blank.
(xix.) p. 168., Table I. Fate of Engines, etc. Reference to Durban

Journal S.A.V.M.A. Vol. XIV (4). December, 1943. Chapter II.

(above Roberts Heights) omitted, the totals as they stand thus being wrong. Kindly insert, giving figures.
(xx.) p. 172, line 25: Hannynton's instead of Hannygson's.
(xxi.) p. 174, line 7: leaving instead of leading.
(xxii.) p. 174, line 27: Kahe instead of Kabe.
(xxiii.) p. 176. Title to Figure 29: 1919 in brackets should be deleted.
(xxiv.) p. 177, line 6: G. R. McCall instead of E. R. McCall.
(xxv.) p. 178, line 13: New Kondoa instead of New Kondos.
(xxvi.) p. 178, line 18: No. 469 instead of No. 649.
(xxvii.) p. 178, line 31: Delete Dresser.

Journal S.A.V.M.A. Vol. XV (1). March, 1944. Chapter III.

(xxvii.) p. 18, line 34: Chapter instead of Ctapter.
(xxix.) p. 20, line 29: 15 instead of 16.
(xxx.) p. 20, footnote, line 4: 1918 instead of 19918.
(xxxi.) p. 28, line 9 (column 1925-6): 358 instead of 385.
(xxxll.) p. 31, last line: *Vet. Rec.* Vol. XI instead of Vol. VI.
(xxxlll) p. 33, Table A(11), Transport: Delete one Trolley, spring G.S.

FIG. 25.

Standing: H. H. Curson, G. C. Hooper Sharpe, G. Garden.
Sitting: H. E. Hornby, C. E. Gray, G. C. Webster.

FIG 26.

Standing: F. J. McCall, R. C. Wheeler, W. Kearney, W. W. Henderson, R. L. Hart.
Sitting: Capt. H. Brassey Edwards, Maj. W. Kennedy, Col. R. J. Stordy, Maj. Montgomery, Capt. A. G. Doherty.

FIG. 34.

SITTING (IN CENTRE): CAPT. G. MCCALL, MAJOR S. T. AMOS.

SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION.

COUNCIL MEETING HELD AT VELRA HOUSE, PRETORIA, ON 21ST JUNE, 1944, AT 5 P.M.

Present: S. T. Amos (President), C. J. van Heerden, R. Alexander, M. H. V. Brown, A. C. Kirkpatrick, J. H. Mason, E. M. Robinson, H. P. Steyn, A. D. Thomas and S. W. J. van Rensburg (Hon. Sec.-Treas.).

Apologies for absence: J. G. Boswell, P. J. du Toit, D. G. Steyn, and P. S. Snyman.

(1) Minutes of meeting held on 21st September, 1943, and of special meeting held on 2nd December, 1943, were confirmed.

(2) Arising from these minutes:—

(a) *Tuberculosis*: Two minutes (Nos. 2.1046 of 4.1.44 from the Secretary for Agriculture, and V.133 of 3.3.44 from the Director of Veterinary Services) were submitted. It was decided that the Department be asked before the next General Meeting whether it is in a position to supply a more definite reply to the original resolutions adopted at the last general meeting.

(b) *Hormone Treatment*: Minute V.1071 of 12.6.44 from the Registrar of Veterinarians was read. This intimated that the Veterinary Board had not yet met to consider the charge of unprofessional conduct against a veterinarian. This matter was accordingly left over till the next meeting.

(c) *Veterinarians on Active Service*: It was decided to again approach the Department for a definite assurance on the conditions of appointment of veterinarians who are at present on active service.

(d) *Veterinary Services*: The Secretary read minute S.3/15362 dated 22.10.1943 from the Controller of Food Supplies. This expressed the hope that a number of Government Veterinary Officers would be appointed at an early date.

(3) *Finance*: (a) *Students Loans*: The recommendation of Finance Committee to grant loans of £30 per annum for two years to each of two students was approved.

(b) *Assistance to a Widow*: Finance Committee recommended that a loan of £84 per annum be advanced to the widow of a colleague, who is in poor health and straitened circumstances, the total amount advanced plus accrued interest to be recovered from the estate and the loan to be secured by a mortgage on a house valued at £2,000. Approval was given to this and also to the action of the Committee in advancing £21 to cover immediate and nursing expenses during her recent illness.

(c) *Life Members*: The Secretary reported that some difficulty was experienced in the practical application of Rule 3 (b) as amended by the last General Meeting, in that the records of the old affiliated Associations were not available. Proof has however been provided that the following were members of one of the Associations prior to 1915 and it was decided that they be made life members as from 1944 - 45, namely: S. T. Amos, J. G. Bush, J. Chalmers, J. W. Crowhurst, G. de Kock, F. J. Dunning, R. S. Garraway, F. C. Gavin, A. C. Kirkpatrick, J. H. L.

Lyons, A. McNae, R. Paine, J. Quinlan, E. M. Robinson, J. Spreull, C. M. Sharpe, and C. H. Wadlow.

The Finance Committee was also authorised to add to this list the names of other members who may, subsequent to this meeting, produce evidence of membership prior to 1915 of one of the provincial Associations.

(d) *Reprints*: In recommending the refusal of a request for reprints to be obtained at a cost of £23.15.0 of the series of articles on "The History of the S.A.V.C." Finance Committee pointed out that one of the conditions on which these articles were accepted for publication was that no reprints were to be supplied. After discussion Council decided that the request could not be acceded to.

(4) *Arrears*: Council agreed to recommend to the next General Meeting that the name of one member be deleted from the membership roll. The Secretary was instructed to approach other members concerned with a view to getting outstanding fees reduced before the General Meeting.

(5) *State Expenditure on Veterinary Services*: Copies of a letter by Dr. de Kock to the "South African Medical Journal" and of editorials by that Journal dated 13.5.1944 and "The Farmers Weekly" of 14.6.1944 were submitted, and it was resolved that these be recorded.

(6) *Post War Reconstruction*: An interim report by the relative sub-committee, consisting of the President and Messrs. Kirkpatrick and H. P. Steyn, was read by the latter. It was decided that copies of this report be supplied to members of Council and that the matter be fully considered by a meeting of the Council to be held at an early date. Votes of thanks were passed to Mr. Steyn, the Secretary of the Committee, and to the Director of Veterinary Services for placing the official file on this subject at the disposal of the Committee. It was also agreed that the General Purposes Committee should deal with prospective posts for veterinarians and that, where considered necessary, bodies that are regarded as potential employers of veterinarians should be interviewed.

(7) *Public Service Inquiry*: A Committee consisting of Drs. Parkin and Thomas and Mr. H. P. Steyn and the Secretary, was appointed to collect evidence and draw up a memorandum for submission to the Commission on behalf of veterinarians in the State Service. The Committee was given power to co-opt such other members as may be considered necessary.

(8) *Publicity*: A proposal by Mr. G. C. van Drimmelen for the appointment of a publicity and propaganda committee was left over for consideration when the report on post war reconstruction is discussed.

(9) *Anti-Vivisection*: Dr. Mason outlined the developments that led up to the adoption of an anti-vivisection policy by the Johannesburg branch of the S.P.C.A. After discussion Council authorised the Witwatersrand branch of the Association to give publicity to the memorandum which was drawn up to present the other side of this question.

(10) *Annual General Meeting*: It was decided that the approximate date and subjects for discussion at the next General Meeting be considered at the next Council Meeting.

(11) *General*: (a) *New Members*: The following were proposed and their acceptance will be recommended to the next General Meeting, namely: P. de la Harpe, H. M. Hodkin, D. J. Louw, T. A. T. Louw, J. MacKinnon, C. M. T. Meldal-Johnson, A. H. Milne, W. Orr, J. G. Townsend, J. R. van Blerk, K. van der Walt, and K. Weiss.

(b) *National Nutritional Council*: It was agreed that a proposal that the Association should have a representative on this Council be left over for consideration at the next meeting.

The meeting concluded at 10.45 p.m.

S. W. J. VAN RENSBURG,
Hon. Secr.-Treas., S.A.V.M.A.

NOTES.

In the June examinations Messrs. P. de la Harpe and J. G. Townsend obtained the B.VSc. degree. The former is taking up private practice, and Mr. Townsend has joined the S.A. Veterinary Corps.

Mr. H. P. Steyn, Veterinary Research Officer and Lecturer in Surgery and Obstetrics, has resigned in order to take up private practice in Johannesburg.

Dr. C. C. Wessels, Veterinary Research Officer, has resigned, and will start in private practice in Krugersdorp. He has also obtained a part-time appointment from the Krugersdorp municipality.

Mr. J. H. Schoeman is now in practice in Springs with headquarters in Osterloh Road, Cassendale, and Dr. R. E. Hartig has entered the ranks of practitioners in Pretoria. His address is Orion Buildings, Voortrekker Road.

The S.A.V.M.A. Book Fund prize for 1943 has been awarded to students W. E. Pearson and J. P. van der Merwe.

The following veterinarians visited Onderstepoort in June: Mr. William Orr, lately of the veterinary department of the Federated Malay States, who made a remarkable escape from Singapore and before arriving in Australia, had a series of adventures which make a fascinating story. He has spent the last eighteen months in the Palestine veterinary service and is now on his way to England.

Mr. M. A. Molloy who is a veterinary officer in the Tanganyika service.

Mr. Williamson, assistant veterinary research officer at the laboratory in Salisbury, Southern Rhodesia, and at present in the Royal Air Force.

NOTES ON FIELD SLAUGHTERING AS EXPERIENCED WITH A MOBILE SLAUGHTERING UNIT. *

By J. S. WATT, Johannesburg. J. H. B. VILJOEN, and R. J. HEYDENRYCH, Vryheid.

The following notes have been abstracted from three separate articles written by the authors on their individual experiences during the winter of 1943 when attached to the mobile slaughtering units employed by the Food Controller to dispose of cattle which were slaughtered during the campaign against East Coast Fever in the Vryheid district.

At the time there was an acute shortage of meat in the country, and as the quarantine regulations prevented the movement of cattle from the area the Department of Agriculture instituted mobile abattoirs in which cattle could be slaughtered on farms and the meat transported by lorry and rail to Durban for distribution.

Two field abattoirs or slaughtering units were in operation during the later part of the time. They were erected at suitable places in areas where a large number of cattle were available. As the slaughtering was on a voluntary basis it was only done where the owners agreed to it, and they were paid the full market value for their beef on a grade weight basis as laid down by the Controller of Food Supplies. At first the Government decided to slaughter cattle only from those farms where the owners agreed to total slaughter, but eventually partial slaughter was permitted of cattle from in-contact farms in order to reduce the stock on such farms and to assist the owners financially.

The first field abattoir was erected at Grovedale in the Vryheid district and the veterinary supervision was carried out by Mr. J. S. Watt, one of the authors. Naturally many difficulties were encountered in the first operations which were put right later. In order to avoid unnecessary repetition the abattoir construction as used at the subsequent operations is described in detail first, with some comments on the first slaughtering unit at Grovedale later to show how improvements were made in the course of the work.

1. Abattoir Construction.

(a) *The Floor.* For this purpose concrete slabs were first laid down. The original object was to use these slabs for all the different sites in order to conserve material. The idea was discarded and a

* Owing to the fact that the three articles had to be condensed into one, a certain amount of repetition has been unavoidable.

qualified man was kept solely for the construction of the abattoirs' floors. The floor was so constructed that it had a gentle slope to assist in the cleaning. It was neither rough nor slippery and was therefore excellent for the purpose; steel sleeves were built in to receive the main posts of the superstructure.

(b) *The Superstructure.* Full praise must be given to the engineering firm which designed and constructed the steel framework and the electrical fittings of the abattoir. In addition, the plans they provided made the erection and dismantling easy to follow, so much so that the whole abattoir could be taken down and fitted together again in about half a day. The twelve main posts were of steel tubing, 4" in diameter, and the framework was made of tubing 2" in diameter. Steel rails, ¾" thick and 5-6" wide were supplied for the rollers. A slight improvement could have been made by having more than

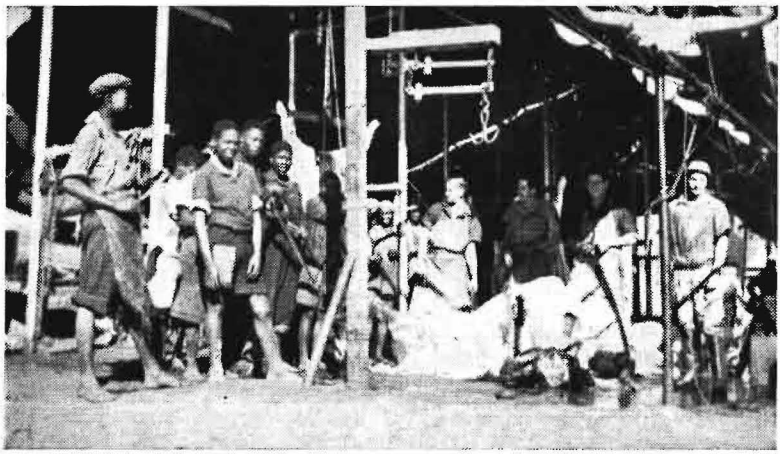

FIG. 1.

A glimpse of the abattoir from the front.

three bolts for attachment to the framework, as it was sometimes found that they could not hold the weight. The rollers were smaller than those used at modern abattoirs and were built for single rails. Whenever heavy carcases were handled these would get stuck at the joints, but with more experience gained at putting up the superstructure, these difficulties were minimised. A hundred rollers were supplied to each unit. The only complaint about them was that they were insufficient in number, especially during the last six weeks of the campaign when everybody was anxious to get the job done.

Six 1-ton pulleys were supplied to each unit. These were very useful and of a good type. A "tree," as used in all abattoirs, was attached to each for hooking on to the carcase.

Very efficient hooks were also supplied. These were so constructed as to fit snugly on to steel girders between the main tubes.

Steel trays, consisting of steel uprights and steel cross-bars, were supplied for the drying off of the tongues, livers and tails.

Together with this magnificent steel superstructure a very efficient 100 volt electrical plant was supplied. It had a petrol machine, economic and simple to handle. A fully equipped electrical chest with fittings, etc., was part of the equipment. The whole superstructure was covered with tarpaulins, which were fastened on to the steel tubing.

(c) *Receiving Kraal.* This was built near the superstructure. Usually wattle poles were used and they were secured by bolts, not wire. At the most convenient corner was the gateway to the crushpen. At all corners, stumps and protruding portions of wood were cut off and rounded off to minimise bruising.

(d) *The Crush-pen.* This was made of the same material as the receiving kraal and the same care was taken to obviate bruising. The crush-pen was triangular in shape with the one side leading straight on to the crush.

(e) *The Crush and Trolley.* As was indicated above, the crush led from the crushpen with one side straight, the height and dimensions complying with those recommended in construction of approved dipping tanks. Towards the end there was a gentle slope which ended abruptly to form a platform, the height of this platform being the same as that of the trolley which fitted on to the crush. The animal stepped on to this and was then stunned with the humane killer, fell down on the trolley and was pulled away by natives.

(f) *Disposal Pits.* These were dug about 20 yards from the abattoir with furrows leading from it to them. One unit had concrete gutters which were used to line these furrows. The other unit was sadly neglected through want of these essentials for proper hygienic purposes. These disposal pits were made so as to hold approximately the condemnations and waste for not more than 3 days, to obviate the breeding of flies. The hides were sold to a produce firm, which had to dip them according to Government Regulations before removing them from the infected farm. The contents of these tanks were also periodically emptied into some of the pits to help in the prevention of the appearance of flies, especially when the hot weather set in.

The tanks used for this purpose by this firm were made of ordinary galvanized roofing iron.

(g) *Water.* The units were each supplied with a highly efficient water pump, in addition to the one on the water tanker. This pump was a 1½ h.p. petrol driven machine. A sufficient length of suitable hose piping was part of the water pump's equipment. A water tanker, as used by the Defence Force, was available, and is certainly a most useful adjunct to a slaughtering unit of this type.

If in any future slaughtering of this kind a 500 gallon galvanized iron tank could be supplied, the water problem would be minimised and petrol could be saved. The camp site was usually chosen so as to be near some convenient water supply. Water was pumped into the tanker and brought to the abattoir and was boiled in a number of boilers. The hot water supply was a source of great worry to the veterinarian. More rows developed as a result of it than anything else. A close watch had to be kept on the boilers as natives, who were very slack, operated them.

2. Additional Organisation.

(a) A transport unit of the army was used, whose duty it was to cart the meat to the Vryheid railway station, move the abattoirs where and when required, and to supply water to the abattoir during the killing. The transport unit consisted of 10 three ton trucks, a water tanker, two water trailers, a panel van, troop carrier and a 1 ton truck. The vehicles were driven by natives and there were two European N.C.O.'s in charge.

(b) A mess run by the military with a European sergeant in charge.

(c) A meat grader whose duty it was to grade the meat, weigh it and load it on to the trucks.

(d) A Government Veterinary Surgeon who had to do the ante- and post-mortem examination of the carcases, see to the general hygiene of the abattoir, disposal of the waste products and the dipping and salting of the hides.

(e) A Captain of the army who did the books and office work generally and attended to the paying out of the native owners. The European owners were paid from Pretoria. Besides these there were three Europeans who attended to the killing of the cattle and supervised the work in general. They were assisted by about 60 native labourers, each of whom had his special duties to perform. The slaughtering itself i.e. skinning, etc., was done by professional slaughtermen at No. 2 unit and native slaughtermen at No. 1. Each European was supplied with a tent, bed and blankets and various other articles which he required such as a chair, lantern, etc.

3. Slaughtering Procedure.

The actual slaughtering was done by driving the animals into a crush pen which was so constructed that a trolley could be pushed in, in front. The foremost animal was driven on to this trolley and was then shot with a captive bolt pistol. It dropped on to the trolley, which was pulled out and taken to a convenient spot on the floor where the animal was off-loaded and bled. It was skinned, drawn up by pulleys and hung on to the roller hooks after having been dressed

and divided. The carcase was then moved along the rail to wherever it was required.

The batch of cattle for the day's slaughtering was collected in the receiving kraal and then a thorough ante-mortem examination was carried out. Animals suspected of any disease were isolated, temperatured and blood and gland smears taken. While the healthy animals were being slaughtered these smears were examined. If any animal showed a temperature, it was held back for a few days and if it did not improve it was killed and buried without any compensation to the farmer.

"No animal must be shot until the order is received from the veterinarian." This rule was strictly enforced.

It sometimes happened that when the veterinarian isolated a beast a string of farmers would appear on the scene and try to persuade him that the animal was healthy or that its condition was natural to it.

No beast was allowed to be stunned unless it had been examined. Here a warning note must be sounded. Occasionally it was found that a beast had been killed without having been examined and if the veterinarian were not careful this might happen frequently. The ante-mortem examination was done either in the kraal or before the animals were in the kraal. According to the nature of the disease if present, the animal was either allowed through the abattoir or shot outside and skinned there.

4. Organisation.

Killing. As previously mentioned the method adopted was stunning with the humane killer (captive bolt pistol) and bleeding by severing the jugular veins and carotid arteries. When the animal was stunned it dropped on to the trolley and was pulled on to the floor where it was rolled off and bled. The veterinary surgeon had to impress upon the slaughtermen the results of over-sticking especially in hot weather and where the carcases had to be carted a long way to the railroad.

(b) *Slaughtering and Skinning.* At first this job was done by native slaughtermen from Pietermaritzburg. These people had to be got rid of and European slaughtermen from Johannesburg were employed. This resulted in quicker slaughtering and a better finished carcase and there was greater cleanliness. Calves sent to the Johannesburg and Pretoria abattoirs were pumped up prior to skinning. Those sent to Durban abattoir were not pumped up as it was preferred that they should not be.

(c) *Cleaning.* This was the veterinarian's greatest worry. He had constantly to be on the look out to see whether hot water was available and that it was used, and that the carcases were washed immediately. The washing cloths have to be clean, and they should

be boiled and properly dried at the end of each day. With almost 100% native labour this had to be supervised every day. These men were not trustworthy and if the orders were not repeated daily, the cloths would certainly not have been handled and treated as they should have been. The constant cleaning of the floor was another point that was a continual source of trouble. One had to wage a never-ending war to keep the floor in a reasonably good, clean condition.

The overalls supplied to the natives were wholly inadequate. Each native should have a clean overall every day. To ensure this there should be at least 3 overalls to each native. He can clean his own overall every day.

FIG. 2.
A view from the back.

5. INSPECTION.

(a) *Routine.* The routine inspection consisted of a thorough examination of the head, tongue, pluck, liver and intestines. The routine cuts were also performed on the carcase.

As the percentage of measles was very high the routine examination was done as thoroughly as possible. The glands were also thoroughly examined.

(b) *Special Inspection.* The special inspection was done in the case of measles where all the special cuts as laid down in the Public Health Regulations, were made. In cases where disease was suspected, blood, gland and spleen smears were made and examined.

Those carcases having measles but passed for freezing according to specifications laid down in the Regulations, were marked and sent

to the various abattoirs. Those condemned for measles were buried. The veterinary surgeon had to see that these were treated before burial otherwise natives would dig them out again. A very good plan is to spray them with paraffin before burial as the odour and taste cannot be washed off. If sprayed with Little's or other dip they will still dig them up and wash the dip off.

At No. 2 Unit 3,284 cattle were slaughtered, of which 560 had measles. Of these 560 carcases, 184 were condemned, i.e. the total percentage measles was found to be 17.05%. The measles infection was indeed high on most farms. Out of the 3,284 carcases 292 were condemned for emaciation, i.e. 8.9%. Occasionally a carcase was condemned for East Coast Fever. Only 2 carcases were condemned for East Coast Fever at No. 2 Unit.

6. Diseases found on Inspection.

Measles infection has been mentioned above. This will be a serious cause of loss to both the farmer and the public in the future.

On certain farms liver fluke infection was very high, the bile ducts of some livers being packed full of these flatworms. Although no special effort was made to determine what species of Fasciola was encountered, judging by the size one got the impression that Fasciola gigantica was the more prevalent.

Quite a large number of carcases were found to be infected with Echinococcus cysts. Renal cysts were found in a very large number of kidneys.

A small number of various types of tumour were found, especially in the female genitalia. These varied in size from that of an egg to enormously big ones, one being so big as to more than fill a 4 gallon paraffin tin. Adhesions of the pleurae were frequently met with, and were thought to be due to pneumonia and pleuritis resulting from aspiration of foreign material, especially dipping fluid.

Although Anthrax is present in this district it was luckily never encountered at any of the Units.

7. Grading and Weighing.

After inspection, the carcases were graded by Official Graders of the Agricultural Department. As farmers were paid out according to the grade and weight, they were especially interested in this part of the proceedings. Super-primes were never seen. Primes were encountered occasionally while 2nd, 3rd and 4th grade and inferiors were most commonly met with.

After grading the carcases were quartered, and the quarters were weighed, the grade and weight being labelled on each quarter. The farmers were paid out according to the grade and "cold weight" i.e. 3% of the weight was subtracted and the farmer paid for the what is then known as "cold weight."

Whenever farmers from "Contact Farms" slaughtered, a deduction of 8/- per 100 lbs. was made for slaughtering fees.

8. Transport to Railhead.

From the scale the quarters were loaded on to 3-ton trucks supplied by the Union Defence Force.

These were all-steel trucks and before any meat was loaded on to them they were washed out thoroughly. Then a thoroughly clean tarpaulin was put in as an inside cover. The meat was then loaded on to this and covered by a clean tarpaulin. Immediately after the loading process the trucks left with their cargoes for the railhead.

It was found, however, that things never ran as smoothly as described above. One had to attend all the time to the cleanliness of the trucks and tarpaulins. Not infrequently was one awakened in the middle of a well-earned sleep to inspect a truck load of beef that had been overturned on the way to the station. How could such a truck load of beef be saved for human consumption? This was a practical impossibility. What was done was to clean the beef with a moist cloth and then again with a clean dry cloth. Invariably one's efforts met with hopeless failure as judged from reports in the press.

If attempts are made at this kind of slaughtering in the future, provision should be made to prevent loss of this nature due to accidents. The drivers of these trucks were natives of the U.D.F. and generally were good, but somehow or other accidents would happen.

An improvement would be to obtain vehicles with steel sides and hood to convey the meat to the railhead. These should have double doors at the back that could be locked. For ventilation, squares could be made in the top and sides with guards to prevent dust getting to the inside. This sort of truck would also prevent water from getting on to the beef during rain.

9. Transport on Rail.

This was done in refrigerator trucks. They had ample space for sufficient ice to cool the trucks efficiently. The carcases were hung on hooks inside the trucks.

One of our greatest difficulties was to find enough ice, for some of the trucks from some abattoirs were insufficiently iced. This led to some unpleasantness.

The rule was that the abattoir requiring the beef should send fully iced trucks to the station from where the beef was railed. It was found in some instances, on arriving at the station with the cargo of beef, that there were one or two wet patches in the bunks but no ice. Ice was unobtainable at Vryheid so the only thing to do was to try and get room for some of the beef at the small and over-full local

Cold Storage. The rest was despatched to the abattoir with the resultant complaint of "Carcases condemned due to decomposition."

The organisation relating to this matter should be rigorously controlled in the future. Slackness in this respect leads to a very high loss to the country, which is more severely felt during a time of national need.

10. Difficulties Encountered.

(a) *Heat and Humidity.* This area, having a very hot and humid climate, naturally caused a lot of trouble as far as keeping perishable foodstuffs in a proper state of ventilation and cooling is concerned. That is partly the reason why slaughtering was not undertaken during the summer months.

The abattoir had to be so erected so that what little wind was available was allowed to create a draught through the structure. More often than not even this was insufficient, so slaughtering during the night was resorted to. This led to quite a lot of inconvenience, e.g. the ante-mortem examination and the supervision of the natives. Also one had to regulate the slaughtering so that the trucks could travel during the cool part of the day, i.e. prior to sunrise.

(b) *Wind.* Having erected the abattoir in such a way as to get the best ventilation, one also got the prevailing winds through it. These winds would be near gales sometimes and whatever protection was given to the meat was ripped to pieces five minutes afterwards. Then the carcases would be covered by dust and fine manure. What hope had one then of delivering a clean supply of beef? One has to think of all these things in the field and whatever makeshift arrangements that come to one's mind must be adopted and very often they will be found inadequate. When such a gale strikes the convoy taking beef to the station the tarpaulins are ripped off and with 10 or more trucks in a dusty road it can well be imagined what the beef looks like when it arrives at the station.

(c) *Rain.* Rain was not a great problem during the actual slaughtering, but it played a prominent part when the convoying took place. The roads were not macadamised and never very good. When half an inch of rain had fallen the roads and rivers were impassable, and there was only one thing that awaited one, decomposition of a few trucks of beef. Even when the convoy did manage to get through it would be found that the tarpaulin covering was insufficient with the result that the meat had got wet and again the same report—"meat decomposed"—came back. To obviate these difficulties it should seriously be attempted to obtain trucks of the type described.

Detailed Post Mortem Inspection.

The post-mortem examination was done according to the "public health regulations." Various diseases encountered will be dealt with.

Measles. This was the most common disease encountered at post mortem examination. The severity of the infection varied a lot from farm to farm and was especially heavy amongst native stock. The average for the Vryheid district is 16.5% measles. The figures are as follows:—

	No. Slaughtered.	(M.C.)	%	(M.D.)	%
Unit No. 1	5,107	365	7.15	486	9.5

(M.C. - measles condemned. M.D. - measles detained).

Emaciation. A large number of animals were condemned for this condition. These were mostly old animals and animals on very heavily stocked farms. A large number of milch cows were also condemned on account of it.

East Coast Fever. Quite a number of animals were killed which showed typical East Coast Fever lesions at post mortem without any clinical symptoms. These animals, however, might have shown a temperature before death if they had been noticed.

FIG. 3.

A distant view of the abattoir.

Tuberculosis. One cow showed lesions of tuberculosis in the bronchial and mediastinal glands, and as she was very emaciated as well, the whole carcase was condemned.

Actinomycosis. One animal suffering from this condition was killed. The tongue as well as the jaw, being badly affected.

Peritonitis. A few animals suffering from peritonitis had to be condemned, the condition in the majority of cases being due to external injuries or foreign bodies in the reticulum.

Fasciola Hepatica. A lot of livers were condemned owing to very heavy infestation with liver fluke. This infestation varied a lot from farm to farm.

Jaundice. Only one animal was condemned for this condition.

Miscellaneous. Portions of carcases and quarters had to be condemned on various occasions for localised conditions such as abscesses, bruising, etc.

At the end of the day the carcases were graded by the government grader, weighed and then loaded on to the three ton trucks to be carted to Vryheid railway station, where they were loaded on to railway trucks to be sent to Johannesburg or Durban as the case might be. At various times meat was also supplied to the military camp at Piet Retief.

All totally condemned carcases were buried in pits in the ground, together with the heads, intestines, etc. The livers, tongues, tails and hearts were the only sundries used and these were packed into bags and sent off with the carcases in the same trucks. A large proportion of the legs were skinned and sent to Durban for the production of fertilizers. The hides were dipped in a 0.16% As_2O_3 solution for ½ hour and then put into salt for 7 days, after which they were moved to the nearest railway station under permit and sent to various tanneries.

In spite of every attempt to cut down wastage to a minimum, there was a lot of it and it was a pity to see some beautiful measly carcases being dumped into the pit, whereas under more favourable conditions, they could have been put to good use as fertiliser, bone or meat meal. The carcases detained for measles were sent either to Johannesburg or Durban, where they underwent the freezing process to destroy the measles.

SUMMARY OF DISEASE CONDITIONS ENCOUNTERED.

UNIT No. 1.

Total number of cattle slaughtered.....	5,107
,, ,, ,, Measles condemned	365
,, ,, ,, Measles detained	486
,, ,, ,, Emaciated carcases	90
,, ,, ,, Fevered carcases	2
,, ,, ,, East Coast Fever	10
,, ,, ,, Peritonitis	3
,, ,, ,, Pneumonia	1
,, ,, ,, Jaundice	1
,, ,, ,, Actinomycosis	1

COMMENTS ON THE ABATTOIR CONSTRUCTION AT GROVEDALE.

It was originally the intention that slaughtering and dressing would take place on one side of the floor and that the carcases would

then be conveyed by means of the rails round the end of the centre columns to the other side where the grading, weighing and loading would take place. Unfortunately, the rails and roller hooks supplied did not match and during the whole period that the author (J.S.W.) was there it was not possible to make full use of the rails. To begin with it was not possible to move the roller hooks past the posts, so that carcases which were being dressed had to be hoisted alongside carcases which were already dressed and, by the time three or four carcases were on the rails in each section, the congestion was so great that it was almost impossible to carry out an effective inspection. At this stage it was usual to fill the rail on one side of the floor first and then fill the other, but by the time this had been done it was impossible to handle the carcases freely and the light was excluded by the two rows of carcases from the area between them.

At the end of about a week alterations to the brackets supporting the rails permitted the movement of carcases along the rails on both sides, but it was still impossible to move them round from one side to the other. However, the increased freedom of movement greatly relieved the congestion and facilitated inspection.

The method of attaching the brackets supporting the rails to the uprights was not very satisfactory, and on more than one occasion, when a number of carcases were concentrated at one point, the brackets slipped, causing sagging of the rails. Apart from interference with the work, this presented a very dangerous state of affairs.

The site for the kraal was not well chosen and an old road deeply worn out and with steeply sloping sides ran through the middle of it. During the wet weather which prevailed at that time, this became a watercourse, was always muddy and the cattle while milling round in the kraal frequently slipped on the sloping sides and fell full length in the mud. Furthermore, the race was left without a concrete floor and when the animals were shot they dropped into slushy mud and were thus in a very dirty state before reaching the abattoir floor. When the carcases were dragged along the floor to the most convenient position for dressing, this mud was spread along the floor and, as it was of a very tenacious consistency, it became difficult to remove it from the rough floor surface.

The intention had been to have a little light hand trolley fitting into the end of the race. The animal would be shot while standing on the trolley on to which it would collapse. In this way it could be moved to any part of the floor without damage to the hide or unnecessary soiling of the floor. This trolley was not delivered until shortly before the author left and then it was found that it did not conform to specifications.

Hoisting was all done by portable metal blocks and tackle which, generally speaking, gave satisfactory service.

All waste material was disposed of in pits into which the floor washings also drained. Treatment of these pits in order to prevent the creation of a nuisance, provided a difficult task with the limited facilities available.

A few points worthy of consideration in any future undertaking of this kind are:—

1. The kraal site should be selected with greater care and should be such that the animals can be kept reasonably dry and clean while awaiting slaughter.
2. The race should have a hard—preferably concrete—floor throughout to prevent, as far as possible, the conveyance of mud and dirt into the abattoir proper.
3. Facilities should be provided, either by means of a bleeding rail along the side of the abattoir, or a suitable light hand trolley, for the conveyance of carcases to their appropriate position on the dressing floor. The provision of a bleeding rail, while keeping the carcases cleaner, would provide more effective bleeding. This was later effected.
4. Instead of parallel longitudinal rails a series of transverse rails leading from the dressing side of the floor to a longitudinal rail on the opposite side of the floor should be provided. In this way the stunned animal would be raised to the bleeding rail by block and tackle and conveyed to the desired dressing bay. Another block and tackle situated at the end of each dressing rail would serve for lowering the carcase from the bleeding rail and subsequently hoisting it again to the dressing rail. From then onwards each carcase, at each successive stage, would be moving farther away from the dressing side of the floor and possible contamination.

   (At Grovedale much of the soiling was due to dressed carcases coming into contact with half dressed ones or with animals lying kicking on the floor).

   In this way too, the dressing floor could always be kept clear and the work of the slaughtermen would be facilitated.
5. A smaller floor adjoining the main one, should be provided for the handling of the offal and sundries. At Grovedale these had to be dealt with on the ground alongside the abattoir and even when the greatest care was exercised it was difficult to keep the flies away.
6. All drainage channels about the abattoir and leading to the pits should be constructed of impervious material.

Organisation.

Many of the pitfalls encountered could have been avoided if a veterinarian had been allowed to play a more intimate part in the

planning and organising of the undertaking, a fact which should be borne in mind in case of future requirements.

The duties which devolved upon the veterinarian in charge included the following:—

1. Checking of the cattle—ownership, number to be slaughtered, etc.
2. Ante-mortem examination of the animals to be slaughtered.
3. Routine post-mortem inspection.
4. Recording of numbers slaughtered, ownership, condemnations, etc.
5. General supervision of slaughtering and dressing processes and handling of meat.

FIG. 4.

The type of country where the slaughtering took place.

6. Accounting for and suitable disposal of all possibly infective material, e.g. feet, heads and other tick bearing portions.
7. Supervision of loading and despatch of meat.
8. Dipping of hides.
9. Supervision of the cleaning of the abattoir.
10. Supervision of the treatment of the pits and drainage channels.
11. Reports, returns, and correspondence.

During the whole of the period of operations at Grovedale, no lay meat inspector was provided and the routine meat inspection and supervision of the handling of the carcases fully occupied the services of the veterinary officer during the time that slaughtering was taking place. It was, therefore, rarely possible to get to bed before 4 a.m., but it was necessary to be up again not later than 8 or 9 a.m. to ensure

that the pits had been closed over and the drainage channels treated in order to prevent fly breeding. The rest of the day was taken up by attention to the many other details.

It is essential, if justice is to be done to the many duties of a supervisory nature, that a meat inspector should be provided in such cases to relieve the veterinary officer of the routine meat inspection.

Climatic Difficulties.

The only difficulties encountered under this heading were due to rain. As mentioned earlier, the wet weather contributed in no small measure to the soiling of the animals before they entered the abattoir and the results were manifest at every subsequent stage in the operations.

The animals became covered in mud when they slipped and fell in the kraals; this was added to when they dropped in the race and it then spread all over the floor as the carcases were dragged to the dressing bays. The hands, aprons, and even the other clothing of the natives became dirty from handling the undressed carcases and unless, by constant remonstrance, they could be made to wash themselves frequently, the dirt was eventually transferred to the dressed meat.

The amount of mud on the floor was also added to by the feet of people entering the abattoir from the muddy surroundings. Frequent flushing of the floor was necessary to overcome this.

The rain again made its effects evident when the meat was being loaded on to the lorries for conveyance to the railway, and again when it was being transferred from the lorries to the refrigerator trucks at the station. The only two consignments to arrive at their destination in a spoilt condition, were loaded under these circumstances and became wet during loading. Unless the exigencies of the situation render it unavoidable, it is considered that operations should always be suspended during *very* wet weather.

These comments refer to the slaughtering at Grovedale. Later on improvements were introduced and the slaughtering put on a better basis as described in the first portion of this article. It was thought that in order to do justice to the subject matter of the three articles which have been condensed into one, it would be better to give the description of the improved abattoir construction and organization first.

PSITTACOSIS IN A PARROT AND IN DOMESTIC PIGEONS.

Case Reports.

J. D. W. A. COLES,
Onderstepoort.

Parrot.

Psittacosis has never before been diagnosed in parrots in Southern Africa, so it is worth while recording an outbreak in Johannesburg in March 1944. An elderly woman bought an adult female African Grey parrot (Psittacus erithacus) from a pet shop. It was kept in the house. Within a week it developed a very severe diarrhoea and lost its appetite. It was left to a servant to clean the cage out daily. After three or four days the bird looked better, but it died within another seventy-two hours.

Examination revealed a very severe fibrinous perihepatitis and a similar pericarditis. The spleen was three times the normal size. There was catarrh of the intestines.

Smears were made from the surface of the liver and epicardium and stained with Giemsa, and very numerous L.C.L. bodies were found. Thus this parrot showed an overwhelming infection of the psittacotic virus, which produced extensive lesions.

The owner and her servant were kept under observation, but both remained well.

Pigeons.

When psittacosis was first diagnosed in pigeons in Johannesburg, the strain killed a few mice that were inoculated intraperitoneally. Had it not been for this fortunate circumstance, the diagnosis would probably have been missed, because it was not realised then that columbidian strains usually fail to kill mice injected intraperitoneally. It is only when mice are infected by the intracerebral route that they can generally be relied on to succumb to a pigeon virus.

In June 1943, a pigeon fancier of Beaufort West in the Cape Province observed a non-fatal disease in some fantails returned from shows. A black fantail male, manifesting symptoms of the unknown condition, was killed and wrapped in cotton wool moistened with 10% formalin and sent for examination. It arrived three days later. No clue to the symptoms could be found, but Haemoproteus columbae was present in the blood, and lung smears revealed a few foam cells harbouring the viral granules of psittacosis.

The lofts were visited and placed in quarantine by the Government Veterinary Officer. He found all 80 birds looking well, except for five which appeared to be slightly off colour and were isolated. No other birds or poultry had been in contact with the pigeons. A fortnight later two of these five birds, all of which had completely recovered, were sent for examination.

The two pigeons looked healthy on arrival. They were killed and the organs seemed to be normal. Lung smears were negative. Portions of the liver, spleen and kidneys of each were pooled and macerated and mixed with a little sterile saline. Six white mice were injected intraperitoneally with the organ emulsion and remained healthy. After four weeks they were sacrificed and their spleens pooled; with this splenic material another six mice were similarly injected intraperitoneally and suffered no visible harm. These second generation mice were killed at the end of a month and an emulsion of their pooled spleens (none of which were abnormally large) was inoculated intracerebrally into eight young white mice. Four mice died on the fifth day and four on the sixth, from psittacotic meningo-encephalitis. Levinthal-Coles-Lillie bodies were abundant in the brain smears. Thus the typical columbidian strain, which has been found in England and so often in North America, occurs in South Africa too.

The remaining pigeons in the lofts were slaughtered after reasonable compensation had been paid to the owner.

Summary.

Psittacosis has been diagnosed for the first time in a parrot in Southern Africa. The infection proved to be fatal, and enormous masses of L.C.L. bodies were found in smears made from the surface of the liver and of the heart.

The characteristic columbidian strain of the virus has been isolated from fantail pigeons in the Cape Province. It is doubtful if the infection actually killed any of the birds. As so often happens, the presence of this focus of the disease was suspected only through viral granules being observed in macrophages in lung smears.

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CLINICAL ARTICLE.

ONCHOCERCIASIS OF THE PENIS IN A THOROUGHBRED STALLION.

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Onderstepoort.

The subject was a thoroughbred stallion, 18 years old. He had been used successfully at stud for 12 years. After the 1943 season a new-growth was observed on the glans penis, close to the urethal opening.

The horse was sent to Onderstepoort by Mr. K. E. Weiss, B.V.Sc. He arrived in the clinic on 17/5/44. He was in excellent condition, in fact that condition in which one would like to see a sire.

The animal was difficult to handle so that a minute examination could not be made until he was anaesthetised.

Anaesthesia: Weight, 1,030 lb.; Chloral Hydrate, 10 per cent., 40 grams intrajugularly; Chloroform by open inhalation, 90 cc.; Duration, 1 hour.

The fossa glandis was completely filled with a new-growth which was circular in outline, with a depression in its centre. The tumour was greyish white in colour at its periphery, smooth and firm. Its centre was reddish, uneven, granulating, and bled easily. The depression in the centre led into the urethra. The growth involved the free margin of the processus urethrae, filling the fossa glandis and its diverticulum. It was ring shaped, about 4 cm. in diameter and 2 cm. in depth. There was some constriction of the urethral opening, the anterior portion of the mucosa was involved in the tumour and granulated for approximately 1 cm.; otherwise there was no indication of tissue invasion. The growth appeared to be localised.

The tumour was divided on its mid-ventral aspect, and the incision was continued through the urethra to a depth of 2 cm. The mucosa of the divided urethral wall was sutured to the skin. A row of mattress sutures was then placed on healthy tissue around the urethra, posterior to the collar-like tumour, attaching the mucosa and the skin. The growth was removed with the knife, controlled by placing a finger in the urethra. The operation was completed by a series of interrupted cat-gut sutures, uniting the mucosa to the skin. After-treatment by daily injections of oil and iodoform (25:1) into the sheath was carried out for two weeks.

Recovery was uneventful.

Microscopic diagnosis was made by Dr. C. Jackson, whose report was as follows:—

" Suspected tumour penis acanthotic."

"Epithelium covers the greatly fibrosed corium, which contains numerous " worm nests "—necrotic centres containing occasionally sections through a parasite having a serrated cuticle. Sometimes foreign body giant cells surround this; then there is a fibrous capsule and a heavy infiltration of eosinophiles in the surrounding tissue."

Diagnosis: Onchocerciasis.

FRIBOPLASTIC SARCOMA IN A BUDGERIGAR.

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Onderstepoort.

In 1933 Ratcliffe published a report on the occurrence and nature of the tumours found in captive wild mammals and birds in the Philadelphia Zoological Gardens. Of the 1,175 birds of the order Psittaciformes examined, 1,125 were representatives of the family, Psittacidae; this family included all the tumour bearers, of which there were 42. Twenty-eight of the tumours were discovered in 177 budgerigars (Melopsittacus undulatus) that were autopsied, an incidence of 15.81%. This frequency for a species was unparalleled among either birds or mammals in the Philadelphia Zoo. Among the budgerigars 3♀s and 2♂s had adenoma of the kidney; 3♀s and 4♂s had adenocarcinoma of the kidney; 1♀ had adenocarcinoma of the oviduct; 1♀ had adeno carcinoma of the ovary; 1♀ had adenocarcinoma of the adrenal; 1♂ had hypernephroma of the adrenal; 1♂ had carcinoma simplex of the liver; 1♀ had carcinoma simplex of the liver with metastatic lesions in the spleen; 2♂s had fibrosarcoma of the spleen, with metastatic lesions in the liver; 1♂ had fibrosarcoma of the cloaca, with metastatic lesions in the liver and spleen; 1♀ had fibrosarcoma of the intestinal wall; 1♂ had fibrosarcoma of the intestinal wall, with metastatic lesions in the liver; 1♀ and one other bird had lipomata in the body wall; 1♂ had glioma of the brain, with metastatic lesions in the liver; 1♂ had generalised lymphosarcoma; 1♂ had carcinomatoid embryoma of the testis. The average exhibition period for the genus, Melopsittacus, was 25.5 months, and the tumour-bearing birds had been exhibited for an average of 29.8 months. Ratcliffe thought that age alone could not explain the high percentage of tumour-bearing budgerigars and considered that these birds might be abnormally susceptible to neoplastic growth.

Gray, in 1935, said that budgerigars were so prone to cancer that they took second place only to poultry. He felt that this might be due to breeding the birds for so many years in confinement and consanguineously.

A female lovebird over two years old was described by Jármai in 1939. Nodules as big as millet seeds had appeared under a wing and the owner noticed that they were increasing in size. The bird died during an operation. Five rounded and elevated nodules, as large as peas, were situated on the inner aspect of the proximal end of the right humerus. These growths were firm and lay in the subcutis and were covered by healthy skin. Under the left wing were a few nodules,

the size of millet seeds, which could be seen only after plucking of the feathers. The bird exhibited a general anaemia due to a complicating erythroleucotic state. The subcutaneous nodules were sharply circumscribed and were of two types. The first sort were very cellular and dense and the cells were predominantly spindle-shaped and closely packed in thick bundles; only a few compressed capillaries were present.The second kind had a more open structure with fewer cells, which were polymorphic and comprised spindle-shaped, stellate, round, small and large cell types. In this second type the cells were lying fairly widely separated, so as to present a myxomatoid appearance; the periphery of each tumour, however, was denser and consisted mainly of spindle-shaped elements. A small secondary sarcomatous lesion was found in a lung. Thus Jármai's bird suffered from both erythroleucosis and fibrosarcomatosis. Twelve healthy birds were injected intramuscularly with unfiltered organ and tumour material, but none developed leucosis or sarcomatosis.

The Present Case.

In October 1943, a four year old female budgerigar was brought for examination. A firm, well-defined and freely movable tumour, with a slightly ulcerating surface, and a diameter of 7 mm. involved the cutis and subcutis over the sternum. Apart from this, the bird looked very well. The growth was known to have been present for a month and had bled once or twice. The owner would not agree to an operation before the end of December, by which time the tumour had increased to 15 m.ms. in diameter.

A piece of cotton-wool was slightly moistened with ether and then dropped into a small glass jar. After fifteen minutes the bird was put in the jar and it was seen to be unconscious within 30 seconds. The budgerigar was then tied, back downwards and with its legs and wings stretched outwards, on a small piece of wood. Additional anaesthetic was administered by inserting the beak into a small test-tube containing a couple of drops of ether on a pledget of cotton-wool. The tumour was removed and it was evident that the underlying pectoral muscles had not been invaded. No blood vessel was sufficiently large to require ligation. The wound was closed with six silk stitches, which were removed after a week. Recovery was uneventful. The bird is still in excellent health after eight months.

The fibrous, pinkish-grey tumour was examined histologically. It consisted of bundles and sheets of closely packed spindle-shaped cells coursing in all directions. Three small areas in a complete cross-section were of more open texture. They represented sites of oedema; there was no evidence of myxomatous transformation.

The tissue was highly cellular. However, the mitotic index was not high ($\pm$ 1); and the number of dividing cells varied considerably in the different fields. Similarly the degree of anaplasia was not great,

though subject to variation. The nucleolar: nuclear ratio was increased, and varied approximately between 1 : 15 to 1 : 25; occasionally ratios of 1 : 9 were encountered, rarely as large as 1 : 5.

The cytoplasm of some of the neoplastic cells contained one or more large vacuoles disposed at the one nuclear pole. When numerous, they sometimes compressed the nucleus to one side, or the whole cell might have a bloated appearance, the centrally situated nucleus being pale and vesicular, and the cell body markedly enlarged and consisting of a cytoplasmic network enmeshing the vacuolar spaces. The vacuoles did not react for mucin (toluidine blue, and Southgate's modification of Mayer's mucicarmine), or for fat (Scharlach R.). Collagen was being produced, albeit scantily.

A definite stroma was lacking, although broad bundles of neoplastic tissue, disposed at right angles to one another, superficially simulated a framework. Bloodvessels were fairly numerous for such a dense structure. They were represented by thin-walled vessels of capillary and venular dimensions. Only two small arterioles, lying peripherally, were seen in a complete cross-section of the tumour. Of the other vessels only the endothelium, often hypertrophied, was distinguishable. In one instance definite invasion of a vessel by tumour tissue was observed.

Occasional pseudo-eosinophiles and macrophages occurred throughout the tissue of the tumour. None of these cells exhibited any neoplastic tendency; the macrophages especially were scrutinized for possible malignant tendencies.

There was no distinct encapsulation; the peripheral bundles of the growth were denser and gradually merged into the surrounding connective tissue. Signs of invasion were limited to the vascular penetration mentioned above.

The subcutis and cutis of the overlying skin were condensed; the epidermis was acanthotic and revealed an area of ulceration. The connective tissue to one side of the tumour mass was markedly oedematous, the neighbouring lymphatics were distended, and a fair degree of histiocytic activity was seen.

Diagnosis: Fibroplastic sarcoma.

Summary.

A fibroplastic sarcoma, involving the cutis and subcutis over the sternum of a budgerigar, has been described. The tumour was surgically removed, apparently with complete success.

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A METHOD OF PRESERVING MILK FOR USE IN MASTITIS TESTS.

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A simple technique has been described by van Rensburg (1941) for the rapid and accurate laboratory diagnosis of mastitis in cows, whilst in a subsequent publication van Rensburg and Thorburn (1941) have described how the test may be applied on a farm situated far from any laboratory. The test which was originally described by Hucker, Trudell and Jennings (1932) consists of collecting udder samples or quarter samples in as sterile a manner as possible. These samples are incubated overnight at 37°C. and a smear is made next morning from the incubated milk. A diagnosis is based upon the presence or absence of mastitis-type streptococci.

The test is easy to carry out but the collection of samples presents difficulties if a large dairy herd is being examined. Collecting samples in a sterile manner implies cleansing the tip of every teat with alcohol and arranging for each sample to be taken by a really skilled milker. In practice in a large dairy herd upwards of 20 natives may be milking simultaneously in different stables and all this routine work must be held up whilst samples are being collected. It is far better if the samples can be collected by the routine milkers as they start each fresh cow and after the udder has received normal preparation. Done this way sampling causes no delay and does not disturb the animals themselves. The milkers must of course wash their hands after milking each cow, but since this should be a normal dairy practice the introduction of such an innovation is all to the good. In any case even when samples are taken with the greatest of care contaminants are liable to get in and ruin the test.

To bring this test on to a really practical footing it is desirable to modify it in such a way that the ordinary farmer can collect samples himself and despatch them to the laboratory, and in bringing this into the realms of practical politics the problem of bacterial contaminants must be faced.

In an attempt to reduce the interference due to these contaminants bacterostatic dyes have been added to the samples. Numbers of dyes have been tried out and according to Bryan and Huber (1935) brilliant green gives the best results. For general cultural purposes, however, Edwards (1933) found a special batch of purified crystal violet to be most useful, and since some of this dye was available it has been put into use in the present investigation.

It was found that if samples, collected in the ordinary way by the usual milkers, were hurried back to the laboratory and crystal violet was added to give a final concentration of about 1 : 200,000 the problem of saprophytic contaminants became of small importance due to the selective bacteriostatic action of the dye.

Whilst this was a useful step forward, the difficulty of getting samples back to the laboratory quickly enough still remained. Adding a solution of dye to sample bottles before-hand is of no use because dye particles are absorbed on to the glass and remain fixed there.

Finally it was decided to try and incorporate the required amount of dye into easily soluble tablets, one of which could be added to each sample bottle in advance.

Preparation of Tablets.

In order to give a suitable bulk to the tablet without causing excessive frothing on the addition of milk, an effervescent mixture with a large excess of sodium bicarbonate was used.

Tartaric acid .... 0.5 grams
Sodium bicarbonate .... 5.0 grams

were mixed together whilst dry. Then a solution of 5.0 milligrams of crystal violet in absolute alcohol was worked into this mixed powder. More alcohol was added to give a suitable consistency to the paste. The mixing had to be carried out very carefully to ensure proper distribution of the dye throughout the paste.

A glass tube and a glass rod of good sliding fit were chosen. The glass tube was drawn out to a constricted end which was ground down to give a sharp orifice about one-eighth of an inch diameter. The mixture was extruded through this orifice by pressure on the glass rod, and short lengths were cut off. After weighing a few lengths it was possible to establish the length necessary to give 0.05 milligrams of dye per pellet. Such a pellet would give a final concentration of 1 : 200,000 in 10 c.c. of milk.

The foregoing description gives a simple procedure for preparing tablets of approximately correct strength. For manufacture on a larger scale a tablet press would be required. The dye concentration need not be particularly accurate because crystal violet is bacteriostatic over a wide range of concentration. This is fortunate because when collecting milk samples under practical conditions, it is quite impossible to fill all sample bottles to the same level because of the interference of milk froth.

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THE ROLE OF AN ADEQUATE WATER SUPPLY IN THE PREVENTION OF RUMINAL IMPACTION IN CATTLE

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Introduction.

Impaction of the rumen is very common among cattle in South Africa during the winter, especially where the animals are grazed on dry grass veld or old mealie lands. It is often called by the somewhat vague term "Dry Gallsickness." The rapid maturation of the grass, which usually takes place about January, is accompanied by the transfer of much of the nutritional matter of the plant to the seeds, which are dispersed and lost as feed. At the same time there is a marked increase in the cellulose and lignin content of the plant, together with desiccation and encrustation with silica. Not only is there a very high proportion of cellulose and indigestible lignin in the winter grazing, but the other nutrients are enclosed in cellulose cell walls which must be broken down before the cell contents becomes available to the animal. As there is no enzyme excreted by the alimentary tract which is capable of breaking down cellulose, the whole of this essential process must devolve on the micro-organisms of the rumen. In order to function, these organisms must be supplied with a suitable environment. For this reason it is intended to survey our present knowledge of the physiology of the rumen and to attempt to deduce rational methods for the prevention and treatment of such conditions as Dry Gallsickness.

The Mechanics of the Rumen.

The following description of the mechanics of the rumen is largely taken from the work of Schalk and Amadon (1928). These authors followed the working of the fore-stomachs of cattle by direct observation through fistulae and give an excellent report of their findings, the summary of which given here is for the benefit of those to whom the original text is not available.

Before proceeding to the actual mechanics of the rumen a short description of its anatomical structure, as it affects the following argument, must be given. The reticulum and rumen can be looked upon as one functional unit. The rumen has an average capacity in the mature animal of 20 gallons and is partially divided into compartments by strong muscular ridges or pillars the contractions of which cause great alterations in the shape and size of the various compartments. The following anatomical features must be borne in mind.

(1) The oesophagus opens into the anterior *dorsal* wall of the rumen.

(2) There is no sphincter between the rumen and reticulum. The two compartments are only divided by the rumino-reticular fold which lies ventrally.

(3) The reticulo-omasal opening is normally closed except for short periods when ingested material is being passed through.

The contents of the rumen are normally fluid and ruminal contractions are continually taking place with the object of mixing the ingesta. When eating, cattle only masticate the food sufficiently to mould it into a bolus and cover it with saliva so that it may be swal-

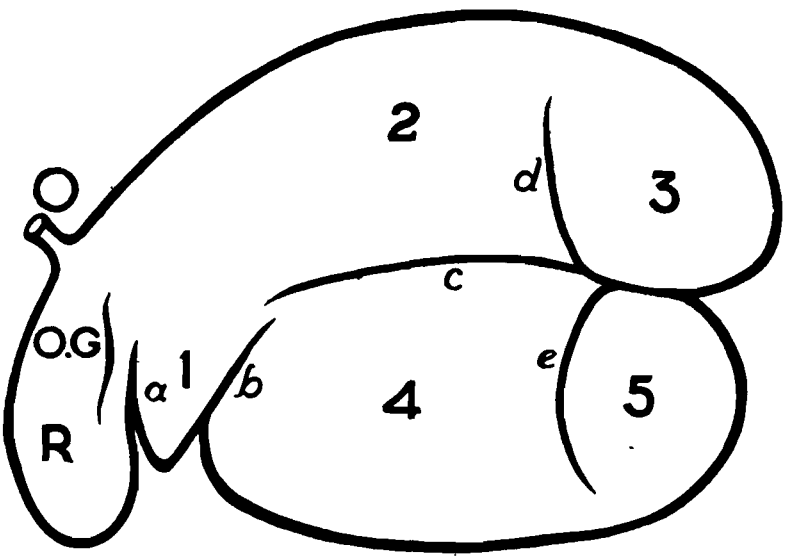

FIG. I.

R. *Reticulum.*
O. *Oesophagus.*
O.G. *Oesophogeal groove.*
1. *Anterior dorsal sac.*
2. *Dorsal sac.*
3. *Posterior dorsal sac.*
4. *Ventral sac.*
5. *Posterior ventral sac.*
a. *Reticulo-ruminal fold.*
b. *Anterior pillar.*
c. *Longitudinal pillar.*
d. *Dorsal coronary pillar.*
e. *Ventral coronary pillar.*

lowed. The bolus is deposited in the anterior dorsal sac of the rumen, and if it consists of dry grass it floats in the ruminal ingesta. Boluses of heavy material, such as grain, tend to sink into the reticulum or on to the floor of the rumen.

The ruminal movement is a peristaltic wave of relaxation followed by contraction which is initiated in the base of the reticulum, the contents of which is a thin fluid porridge. At the same time the reticulo-ruminal fold and the anterior pillar contract, projecting further upwards and directing the surge of material from the reticulum up over the cardia and dorsal wall of the rumen. Thus any recently

swallowed boluses are transported into the posterior part of the rumen. The peristaltic wave then passes over the dorsal and finally the ventral parts of the ruminal wall. The contents are therefore forced out of the dorsal sac into the ventral and finally over the now relaxed anterior pillar into the anterior portion of the rumen. Thus there is a constant circulation and mixing of the ruminal contents which is essential for the following purposes, viz.:—

(1) To keep the cardiac region from becoming clogged with recently swallowed boluses.

(2) To thoroughly mix the ruminal contents and allow of complete maceration of the food particles, especially of the fibre.

(3) To transport the fully macerated ingesta back to the reticulum for passage to the omasum.

It is obvious that this circulation cannot take place unless the ruminal mass is fluid. That sufficient liquid is essential for ruminal function is the main argument of this article and will be discussed again later.

Rumination.

For the maceration of the food, and especially of highly fibrous material such as dry grass, rumination is essential. Schalk and Amadon (1928) have shown that the regurgitated material is not a firm bolus but a watery suspension. When rumination sets in, an extra reticular contraction takes place. This forces a wave of material up over the cardia. At the same time the glottis is fixed and the diaphragm contracts sharply. The negative pressure so created in the thorax aspirates the material into the distended oesophagus up which it is carried by retroperistalsis. When this mass of semi-liquid arrives in the mouth the extra fluid is squeezed out and reswallowed. The more solid particles are then chewed. No special ruminal contractions take place during regurgitation. The material chewed during rumination is food which has already been macerated to a considerable extent. When cattle ruminate soon after feeding they are not rechewing the food recently eaten but that from some previous meal.

It will be seen that a sufficiently fluid state of the ruminal contents is also essential in maintaining rumination.

The Omasum.

There is very little definite knowledge about the functions of the omasum. It would appear to act in regulating the flow of ingesta from the reticulum and as a filter, allowing only the finer macerated particles and fluid material to pass through. If the maceration process in the rumen becomes retarded through an insufficiency of fluid, it is reasonable to suppose that such a filter will become clogged with coarse dry material. Contraction of the omasal wall squeezes water

from the ingesta caught up between the leaves and this fluid passes into the abomasum. There is also a certain amount of absorption of water by the omasum itself. The contents of this organ will therefore tend to become excessively dry and impacted unless there is a constant passage of fluid through it. The hard distended omasum which is typical of dry gallsickness, may well be brought about by an insufficiency of fluid in the ruminal contents.

Bio-Chemical Changes within the Rumen.

As has been previously pointed out the ruminant is entirely dependent on the micro-organisms of the rumen for the break down of cellulose. This is mainly done by the cellulose splitting bacteria which require an environment suitable to their needs as regards moisture, temperature, reaction, aeration and the presence of other nutrient materials. As regards the last named necessity it is true that many of these organisms show a predilection for the more easily digested carbohydrates, so that the addition of starch and sugars may reduce the digestion of cellulose. On the other hand the bacteria cannot live on cellulose alone as is shown by the greatly enhanced fermentation which takes place in a compost heap on the addition of nitrogen. A poor diet taken in by the host animal reacts unfavourably on the ruminal flora. van der Wath (1942) states: "A sudden unfavourable change in diet rapidly alters the nature of the ingesta. At the same time the bacterial count drops from about 1900 to about 500 million per c.c. and all signs of fermentation and gas production disappear. Thus the reduction in the nutritive value of the ingesta, normally forming the substrate of the ruminal flora, is responsible for the death of vast numbers of organisms. This is also attended by a complete change in the composition of the flora, associated to some extent with progressively increased anaerobic conditions within the fore-stomachs."

The question of oxygen tension within the rumen is of great importance as the cellulose splitters are mainly aerobic. It is probable that besides the mechanical breaking down of foodstuffs, rumination plays an important part in aerating the ruminal mass. Cessation of rumination would tend to cause anaerobic conditions in the rumen with a consequent cessation of cellulose splitting.

Moisture Requirements.

We have seen that for all the processes in the rumen, mechanical as well as bio-chemical, a sufficient supply of water is essential. Schalk and Amadon (1928) enumerate the functions of water as follows:—

a. To soften dry hard food materials.
b. To facilitate fermentation.
c. Make possible the transfer of ingesta from one portion of the rumino-reticular cavity to another and from the reticulum to the omasum and abomasum.
d. Make possible the regurgitation of ingesta for rumination.

The Source of Ruminal Moisture.

The water content of the rumen is derived from the moisture in the feed, the water drunk and the saliva. In typical South African grass land winter grazing the first named source will be very low. Supplementary feeding of succulents not only supplies extra moisture but also mucilages, which affect the physical state of the ruminal ingesta, as well as additional nutritional requirements, especially vitamin A, to both the host animal and the ruminal flora. The beneficial effects of such succulent feeds may be out of all proportion to the calorific value of the amount given. The saliva is water that can be said to be already in circulation in the body, so that cattle on dry grazing will have to obtain all their water requirements from drinking. It must also be remembered that the expired air is saturated with water vapour and this means a considerable loss in a dry atmosphere. Lactation also naturally increases the demand for water.

This heavy demand for water is often not provided for under South African winter conditions. It is not sufficient that the animals should have access to even unlimited water once every twenty-four hours. The intervals between watering may be too long and impaction have already set in. It has been noted that when cattle that are thirsty are allowed to drink, the water passes rapidly through the anterior portion of the rumen and the reticulum without entering the main cavity of the rumen.

It may also be that the condition of the water offered plays an important role. Very cold water for instance may by itself suppress ruminal motility, or the cattle may not tend to drink sufficient of it to supply their needs. These factors may be of importance where the animals only have access to water in the early morning. Although cattle appear to drink foul muddy water readily and often with no apparent ill effects, we do not know whether the continued consumption of such water may not affect the physical or biological state of the rumen. These are questions under investigation but in the present state of our knowledge we can only aim at the ideal of an adequate supply of clean water to be always available.

It may be asked why sheep and goats are well known to be able to remain healthy when only watered very intermittently. The answer is that these animals are very much more economical than cattle in their use of water, there being a much greater reabsorption in the large intestine, as is shown by the dryness of the normal faeces of these species.

The Importance of Ruminal Moisture.

I make no apology for again quoting from Schalk and Amadon (1928) as follows:—

a. "The great importance of liquids in connection with ruminal digestion has been demonstrated throughout our study and this fact

should constantly be borne in mind by the clinician in his treatment of gastric impaction in the ox."

b. "A large percentage of so-called cases of suppressed rumination (lost cud) are the direct result of insufficient moisture. Supplying liberal quantities of water via stomach tube or other means readily restores this lost function in most cases."

c. "As the ruminal and reticular ingesta undergo desiccation (in water deprivation) the maceration process is progressively inhibited and finally is completely suppressed. The doughy masses of food material fill the various cul-de-sacs of the rumen and fail to be transported along the usual route traversed by the ingesta under normal conditions. This state of affairs, if allowed to continue for any length of time, will eventually result in complete exhaustion of the muscularis. The vital importance of a plentiful moisture supply can be readily comprehended if opportunity is afforded for the direct visual inspection of a desiccated rumino-reticular cavity. The feeble motility fails to do more than mould the drying food material into firmer masses. *The utter impracticability of merely administrating nerve or muscle stimulants for the relief of impaction is fully realised following such an inspection.* Water should be the first therapeutic measure applied and later drug administration may aid in the restoration of muscular activity."

Sequelae to Ruminal Impaction.

The typical case of dry gallsickness consists of ruminal impaction and constipation. But sometimes diarrhoea is seen, possibly due to coarse non-macerated particles of food entering the abomasum and small intestine. In such cases the disease is referred to as Wet Gallsickness (Natgalsiekte). The diarrhoea may be black from admixture with blood, when the term Black Gallsickness may be used (Swartgalsiekte). In the opinion of the author all these "diseases" are merely different manifestations of the same primary state, namely ruminal impaction and atony.

The second portion of these popular names, gallsickness, is derived from the distended gall bladder usually seen by farmers at post-mortem. It must be remembered that the physiological stimulation for the emptying of the gall bladder is the passage of abomasal contents into the duodenum. The distended gall bladder is probably due to the fact that no ingesta has been entering the duodenum for a considerable time, another direct result of the ruminal impaction.

Summary.

It is argued that dry gallsickness is primarily an impaction of the rumen and occurs mainly on dry grass grazing where water is scarce.

Attention is drawn to the work of Schalk and Amadon (1928) with regard to the mechanics of the bovine fore-stomachs and espec-

ially to their emphasis of the essential part that sufficient moisture plays in the function of those organs.

The supply of adequate drinking water, which should be constantly available or at least offered at frequent intervals, would probably be a very potent safeguard against Dry Gallsickness.

In the treatment of the disease the dosing of large amounts of water per stomach tube should be the first measure.

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MEDICAL EDUCATION.

In view of the publicity given to schemes for reconstruction in medical and veterinary education in some of the leading journals recently, the following abstract from an address by Thomas Henry Huxley at John Hopkins University, Baltimore, U.S.A., in 1876 should be of interest to our readers. It was sent to me by Dr. J. H. Mason of the South African Institute for Medical Research, Rietfontein, Johannesburg. Although the address was given nearly seventy years ago, the views expressed have a freshness that is very stimulating.—Editor.

"My own feeling is distinctly against any absolute and defined preliminary examination, the passing of which shall be an essential condition of admission to the university. I would admit to the university any one who could be reasonably expected to profit by the instruction offered to him; and I should be inclined, on the whole, to test the fitness of the student, not by examination before he enters the university, but at the end of his first term of study. If, on examination in the branches of knowledge to which he has devoted himself, he shows himself deficient in industry or in capacity, it will be best for the university and best for himself, to prevent him from pursuing a vocation for which he is obviously unfit. And I hardly know of any other method than this by which his fitness or unfitness can be safely ascertained, though no doubt a good deal may be done, not by formal cut and dried examination, but by judicious questioning, at the outset of his career."

"The important points to bear in mind, I think, are that there should not be too many subjects in the curriculum, and that the aim should be the attainment of thorough and sound knowledge of each."

"What is the object of medical education? It is to enable the practitioner, on the one hand, to prevent disease by his knowledge of hygiene; on the other hand, to divine its nature, and to alleviate

or cure it, by his knowledge of pathology, therapeutics, and practical medicine. That is his business in life, and if he has not a thorough and practical knowledge of the conditions of health, of the causes which tend to the establishment of disease, of the meaning of symptoms, and of the uses of medicines and operative appliances, he is incompetent, even if he were the best anatomist, or physiologist, or chemist, that ever took a gold medal or won a prize certificate. This is one great truth respecting medical education. Another is, that all practice in medicine is based upon theory of some sort or other; and therefore, that it is desirable to have such theory in the closest possible accordance with fact. The veriest empiric who gives a drug in one case because he has seen it do good in another of apparently the same sort, acts upon the theory that similarity of superficial symptoms means similarity of lesions; which, by the way, is perhaps as wild an hypothesis as could be invented. To understand the nature of disease we must understand health, and the understanding of the healthy body means the having a knowledge of its structure and of the way in which its manifold actions are performed, which is what is technically termed human anatomy and human physiology. The physiologist again must needs possess an acquaintance with physics and chemistry, inasmuch as physiology is, to a great extent, applied physics and chemistry. For ordinary purposes a limited amount of such knowledge is all that is needful; but for the pursuit of the higher branches of physiology no knowledge of these branches of science can be too extensive, or too profound."

"Those who are acquainted with the existing systems of medical education will observe that, long as is the catalogue of studies which I have enumerated, I have omitted to mention several that enter into the usual medical curriculum of the present day. I have said not a word about zoology, comparative anatomy, botany, or materia medica. Assuredly this is from no light estimate of the value or importance of such studies in themselves. It may be taken for granted that I should be the last person in the world to object to the teaching of zoology, or comparative anatomy, in themselves; but I have the strongest feeling that, considering the number and the gravity of those studies through which a medical man must pass, if he is to be competent to discharge the serious duties which devolve upon him, subjects which lie so remote as these do from his practical pursuits should be rigorously excluded. The young man, who has enough to do in order to acquire such familiarity with the structure of the human body as will enable him to perform the operations of surgery, ought not, in my judgment, to be occupied with investigations into the anatomy of crabs and starfishes. Undoubtedly the doctor should know the common poisonous plants of his own country when he sees them; but that knowledge may be obtained by a few hours devoted to the examination of specimens of such plants, and the desirableness of such knowledge is no justification, to my mind, for spending three months

over the study of systematic botany. Again, materia medica, so far as it is a knowledge of drugs, is the business of the druggist. In all other callings the necessity of the division of labour is fully recognised, and it is absurd to require of the medical man that he should not avail himself of the special knowledge of those whose business it is to deal in the drugs which he uses. It is all very well that the physician should know that castor oil comes from a plant, and castoreum from an animal, and how they are to be prepared; but for all the practical purposes of his profession that knowledge is not of one whit more value, has no more relevancy than the knowledge of how the steel of his scalpel is made."

"All knowledge is good. It is impossible to say that any fragment of knowledge, however insignificant or remote from one's ordinary pursuits, may not some day be turned to account. But in medical education, above all things, it is to be recollected that, in order to know a little well, one must be content to be ignorant of a great deal."

"Let it not be supposed that I am proposing to narrow medical education, or, as the cry is, to lower the standard of the profession. Depend upon it there is only one way of really ennobling any calling, and that is to make those who pursue it real masters of their craft, men who can truly do that which they profess to be able to do, and which they are credited with being able to do by the public. And there is no position so ignoble as that of the so-called 'liberally-educated practitioner,' who, as Talleyrand said of his physician, 'knows everything, even a little physic'; who may be able to read Galen in the original; who knows all the plants, from the cedar of Lebanon to the hyssop upon the wall; but who finds himself, with the issues of life and death in his hands, ignorant, blundering, and bewildered, because of his ignorance of the essential and fundamental truths upon which practice must be based. Moreover, I venture to say, that any man who has seriously studied all the essential branches of medical knowledge; who has the needful acquaintance with the elements of physical science; who has been brought by medical jurisprudence into contact with law; whose study of insanity has taken him into the fields of psychology; has *ipso facto* received a liberal education."

"Up to this point I have considered only the teaching aspect of your great foundation, that function of the university in virtue of which it plays the part of a reservoir of ascertained truth, so far as our symbols can ever interpret nature. All can learn; all can drink of this lake. It is given to few to add to the store of knowledge, to strike new springs of thought, or to shape new forms of beauty. But so sure as it is that men live not by bread, but by ideas, so sure is it that the future of the world lies in the hands of those who are able to carry the interpretation of nature a step further than their predecessors; so certain is it that the highest function of a

university is to seek out those men, cherish them, and give their ability to serve their kind full play."

"If I may venture to give advice in a matter which lies out of my proper competency, I would say that whenever you do build, get an honest bricklayer, and make him build you just such rooms as you really want, leaving ample space for expansion. And a century hence, when the Baltimore and Ohio shares are at one thousand premium, and you have endowed all the professors you need, and built all the laboratories that are wanted, and have the best museum and the finest library that can be imagined; then, if you have a few hundred thousand dollars you don't know what to do with, send for an architect and tell him to put up a facade. If American is similar to English experience, any other course will probably lead you into having some stately structure, good for your architect's fame, but not in the least what you want."

"You have enunciated the principle that 'the glory of the university should rest upon the character of the teachers and scholars, and not upon their numbers or buildings constructed for their use'."

IN MEMORIAM.

B. J. VAN DER VYVER.

Barend (Barnie) Jakobus van der Vyver is gebore op die 2de Maart 1892, en op Pretoria oorlede op die 24ste Julie 1944. Hy het sy M.R.C.V.S. aan die veeartsenykollege, Edenburg, Skotland, in Julie 1914 behaal en is op die 14de Augustus, 1914, as staatsveearts deur die Unie Goewerment aangestel. Vanaf Mei, 1916 to Februarie, 1918 was hy op aktiewe dines in die Oosafrika kampanje gedurende „Die Wereldoorlog", en was staatsveearts op die volgende plekke : Umtata, Pretoria, Piet Retief en Vryheid. Hy was agerende senior veearts, Kaapstad, vanaf April tot Oktober, 1930. Die laaste veertien jaar van sy lewe was hy staatsveearts op Pretoria. Hy het met etlike uitbreke van ooskuskoors te doen gehad en het baie waardevolle dienste op hierdie gebied gelewer. Hy was altyd vriendelik en het nooit gehuiwer om sy dienste gewilligheid aan sy kollegas en aan boere te lewer nie. Hy was baie gewild by die boere en het as staatsveearts uitmuntende dienste aan hulle en ons land gelewer. Ek het die geleentheid gehad om in die loop van die laaste tien jaar baie keer met die oorledene uitbrekings van veesiektes te ondersoek. Hy was altyd baie prakties in alles wat hy gedoen het en baie opmerksaam en ek het baie van hom in hierdie opsig geleer. Sy tak en vriendelikheid met boere was ook vir menigeen van ons 'n voorbeeld.

Aan sy weduwee en twee kindertjies wens ons ons innige meegevoel te betuig.

D.G.S.

All members will join us in extending our hearty congratulations to our Vice President, Col. C. J. van Heerden, on his promotion to the post of Under Secretary for Agriculture.

Our President, Mr. S. T. Amos, has been elected unopposed as a representative of the Association on the Veterinary Board.

The following have recently resigned from the Division of Veterinary Services in order to take up private practice, namely : W. B. Allchurch, J. L. Doré, and W. J. B. de Villiers.

The most recent transfers of Government Veterinary Officers include the following :—

J. J. van der Westhuizen ..... Calvinia to Ermelo.
M. J. N. Meeser ..... Oudtshoorn to Calvinia.
G. D. Sutton ..... Middelburg (Cape) to Onderstepoort.
M. de Lange ..... Ermelo to Onderstepoort.
P. P. Hugo ..... Upington to Worcester.
J. H. B. Viljoen ..... Vryheid to Ixopo.

Major C. S. Bassett visited Onderstepoort from Egypt in October. He is a veterinary officer in the army in Egypt and was previously in the Tank Corps in Libya for three years. His visit was made to obtain information about the preparation and production of horsesickness vaccine.

THE VETERINARY OFFICER OF HEALTH.

By H. NELSON, M.A., M.D., D.P.H., D.T.M., Lt.-Colonel, S.A.M.C., M.O.H., Pretoria.

This paper deals with the work of the veterinary officer in the sphere of public health and preventive medicine, the need for a post-graduate course in public health for veterinary officers, and a syllabus for a veterinary diploma in public health.

Scientific discoveries in the last century have taken away the mysteries of most of the known diseases of man and the domesticated animals. Of communicable diseases in particular the advance of our knowledge has been most remarkable, and very little indeed about their etiology, methods of spread and methods of control remains unknown. Similar progress has been made in the whole field of sanitary science and public health engineering.

The results of the application of knowledge gained in scientific research are reflected in the improvements in the control of preventable diseases, and in the vital statistics of the civilized world.

We have nevertheless not been able to make full use of the knowledge at our disposal. There is still a great deal of unnecessary ill-health and mortality, about which we know much, but have been able to do little, chiefly because there has been an unwillingness to spend money on purely preventive medicine.

The reasons for this are manifold. The work of the public health official is so unspectacular and unobtrusive that in the past it has not impressed itself sufficiently upon the minds of most people.

If an engineer builds a bridge or an electrician lights up a city, the fruits of his labour are concrete and visible attainments and the value for expenditure incurred can be *seen* by all. If, however, preventive medicine in the last 50 years has been the main factor in the reduction of the infantile mortality rate from 150 deaths per 1,000 births per annum to about 50, and in some instances to as low as under 40, it goes by almost unnoticed. The process has been so gradual, so unspectacular and so "abstract" that very few people are even aware of it. Perhaps the health workers themselves are to be blamed for not advertising their achievements sufficiently. Nevertheless the fact remains that there are still many who doubt the wisdom of spending money on preventive medicine. Indeed in some municipalities the health committee and the health department remain the cinderella administrations.

In a publication on the vital statistics of Montreal, Canada, dated April, 1944, some interesting figures are given, dealing with general

death rates and death rates from infantile diseases, enteric and diphtheria. In the case of the latter disease prophylactic immunization has been thoroughly applied whereas here it has not.

Examination of the figures for the period under review shows that the general death rate in Montreal has come down from 22·8 to 10·7 per 1,000 births and in South Africa from 10·79 to 9·72. Infantile mortality rates have come down from 247 to 69·9 in Montreal and from 91·24 to 47·79 in the Union. Enteric death rates in Montreal have been reduced from 25·05 to 1·0 and in South Africa from 25·05 to 5·56, and diphtheria from 30·4 to 2·8 in Montreal and from 13·41 to 7·22 in South Africa. This general downward trend does not appear to be so striking in South Africa, because here one is only dealing with Europeans, that is, a selected and better situated section of the population.

These then are some of the reductions in preventable diseases in Montreal and the Union of South Africa. Similar figures have been recorded in all countries where preventive medicine is practised, and are among the high-lights of the health officials' attainments. They are, however, not concrete structures which can be seen. They are intangible, invisible and ethereal manifestations — such as life, well-being and happiness, and cannot be measured in dimensions or pounds, shillings and pence. The health department is therefore not considered to be a "productive concern" in the meaning of the word as used by the Treasury. It is, they say, a purely money-spending section, and is unpopular with those who are responsible for its finances.

It costs about £40 to treat one case of enteric in hospital, and this every local authority is bound to do by Act of Parliament in the case of those who cannot afford to pay. In 1920, when the European population of the Union was 1,500,000, there were 3,036 cases of enteric fever, while in 1943, when the population was 2,265,000, there were only 901 cases. Notifications and diagnosis were not nearly so accurate in 1920 as they are to-day and there was even less medical control over the native population. It is quite possible, therefore, that the incidence in the old days was actually higher than the records indicated. Now assuming that there had been no decrease in the incidence of enteric since 1920, then, based on the figures for that year, the number of cases in 1943 would have been 4,684. At the rate of £40 for treating one case of enteric, this represents a figure of £187,360, instead of 901 cases at £36,040 — a saving of £151,320 for one year alone! This applies to all infectious diseases to a greater or lesser extent. Even then we do not take into consideration the prevention of unhappiness connected with illness or death, the loss of income during illness and convalescence or the subsequent maiming, which may be permanent, nor do we include the loss of manpower to the nation. But a case of typhoid which does not occur, is not *seen* and therefore is not taken into account. Surely when viewed in its correct perspective the health

department is even more than an " ordinary productive concern," but the public will take a lot of convincing! There is this anomalous position in health work: if there are no high death rates or high disease rates, the man in the street wonders whether all the fuss made by the health department is really worth while. Should there be an epidemic, however — the very thing it strives to prevent — its existence is regarded as justified! There are never more funds readily available for health work than when things go wrong!

Times are changing, however, and people are beginning to see the light, and are asking for " positive health " or " health with a polish on it." And they are looking to the health worker for this amenity of life.

South Africa has never been so public health conscious as it is to-day. Slum elimination, re-housing, health control of foodstuffs and hospitalisation are on everybody's lips. The newspapers are full of them, and politicians use them as planks in their platforms. And that is how it should be, because on the crest of this wave we may in the very near future progress beyond imagination.

In this great development veterinary science has played no mean part. But it must be admitted that very few people even associate the veterinarian with public health work. The public is not entirely blameworthy, because veterinarians themselves have not, outside laboratories, taken any great part in preventive medicine.

In the Union to-day we have 41 full-time and 82 part-time M.O.H's., whereas there are only 11 full-time and about 6 part-time veterinary officers in municipal employ.

This can hardly be called an adequate representation of a highly scientific body of men, whose teaching renders them eminently suited to this important branch of work. The teaching of veterinary science lays an excellent foundation for an efficient public health superstructure; but the building has never been completed. The veterinary officer has the most detailed knowledge of milk in its production, but he is not taught very much about the manifestation of milk-borne diseases in man, or the legislation and administration governing diseases spread from animals to man.

Nor is he taught how to bring to bear his knowledge on the preventive side of medicine. There is no such emphasis in his teaching. And that is why so valuable an ally is partially lost to public health. The few veterinarians who have been interested have done excellent work. Any M.O.H. who has had an enthusiastic veterinary officer in his team knows this very well.

The South African Medical Corps has had an excellent opportunity for close collaboration with veterinarians in the Union Defence Forces. This has been a great adjunct to military preventive medicine, and has had a beneficial effect on the health of the soldiers, and incidentally, the public in general. Let us consider milk supplies alone and see what this public health team has done in the past two years.

Milk and milk-borne diseases are amongst the most important and pressing public health problems. The literature is full of descriptions of milk-borne outbreaks of infectious disease. The Bulletin of Health Organisation (League of Nations) of June, 1937, devotes almost an entire publication to this world-wide problem. South Africa in the past few years has had no less than four severe outbreaks of typhoid fever, with high mortality rates, due to milk. These outbreaks have been so striking that the public demanded to know the cause, and called for a thorough investigation. But what about the other group of intestinal diseases: gastro-enteritis, the dysenteries, and the so-called summer diarrhœas?

What part does milk play in the infantile mortality rates, which are very largely associated with gastro-intestinal infections? There is no doubt that very many of these diseases are spread by infected milk, and enteritis in babies is so common that it has almost been accepted as inevitable!

Undulant fever is more prevalent in South Africa than is generally known, and cows' milk is the chief source of infection. Septic sore throat, scarlatina and even diphtheria cases may have their origin in infected milk. All this has been proved over and over again. It is obvious that there is a great deal of work to be done if we are to make use of the available knowledge. And it is also obvious that the work can only be done by a combined team of medical and veterinary officers and health inspectors.

For this reason, early in the war the Defence Medical and Veterinary Departments together initiated a campaign for 'safe milk." This included every aspect of production and distribution, from the clinical examination of cows to the supervision of the delivery of the milk to the consumers. Pasteurisation plants were inspected and supervised. The programme had as its basis, education and propaganda amongst producers of milk, distributors of milk and managers of pasteurising plants. Very extensive Breed clump counts were undertaken, and a survey of a cross-section of the Union's milk supply in terms of Breed clump count values has now become available.

These figures are so interesting that an analysis of the counts of six of the larger municipalities has been made for recording here. The municipalities chosen are Johannesburg, Cape Town, Durban, Pretoria, Port Elizabeth and Bloemfontein.

The period under review is from February, 1942, to June–July, 1944. An average of 20 samples daily from twenty different dairies from each area was taken.

To avoid distortion of the figures only counts up to 5,000,000 bacteria per c.c. were added to the totals. Figures over 5,000,000 were counted as 5,000,000.

From this the monthly averages were calculated, giving the following results of pasteurised and unpasteurised milk.

BREED CLUMP COUNTS U.D.F. MILK SUPPLIES.

From February, 1943, to July, 1944.

Month and Year.	Pretoria.		Johannesburg.		Cape Town.		Durban.		Port Elizabeth.		Bloemfontein.	
	Raw.	Pasteurized.	Raw.	Pasteurized.	Raw.	Pasteurized.	Raw.	Pasteurized.	Raw.	Pasteurized.	Raw.	Pasteurized.
February 1943 . .	1,602,000	76,000	——	435,000	——	——	860,000	——	1,709,000	2,128,000	2,063,000	——
March 1943	1,543,000	219,000	2,483,000	269,000	——	——	744,000	138,000	600,000	500,000	1,937,000	1,311,000
April 1943	1,581,000	615,000	2,501,000	516,000	——	——	583,000	106,000	503,000	433,000	1,731,000	896,000
May 1943	781,000	46,000	1,198,000	180,000	518,000	——	364,000	106,000	905,000	640,000	2,009,000	1,082,000
June 1943	533,000	60,000	689,000	848,000	377,000	——	319,000	104,000	390,000	310,000	1,610,000	1,113,000
July 1943	590,000	49,000	1,024,000	842,000	——	——	327,000	102,000	386,000	490,000	1,381,000	992,000
August 1943 . . .	531,000	48,000	639,000	636,000	511,000	——	530,000	102,000	235,000	447,000	1,460,000	1,010,000
September 1943 . .	860,000	385,000	2,081,000	1,139,000	411,000	——	840,000	——	705,000	410,000	1,732,000	1,463,000
October 1943 . . .	1,363,000	266,000	2,870,000	660,000	——	——	330,000	32,000	635,000	355,000	1,305,000	1,659,000
November 1943 . .	1,935,000	209,000	2,895,000	1,069,000	——	——	1,311,000	75,000	1,735,000	760,000	1,645,000	906,000
December 1943 . .	2,036,000	351,000	2,263,000	178,000	——	——	647,000	69,000	1,300,000	500,000	1,624,000	636,000
January 1944 . . .	2,117,000	——	3,930,000	1,350,000	——	——	890,000	——	900,000	460,000	2,054,000	1,067,000
February 1944 . .	1,697,000	235,000	3,090,000	206,000	——	——	——	116,000	1,055,000	497,000	1,634,000	1,126,000
March 1944	1,776,000	320,000	2,854,000	638,000	712,000	——	567,000	——	400,000	——	1,117,000	707,000
April 1944	1,424,000	389,000	1,791,000	58,000	1,174,000	——	722,000	——	383,000	3,000	1,440,000	1,236,000
May 1944	722,000	47,000	——	——	740,000	——	731,000	——	112,000	——	994,000	709,000
June 1944	487,000	43,000	1,075,000	197,000	741,000	——	267,000	——	350,000	——	1,012,000	792,000
July 1944	——	——	1,148,000	152,000	——	——	383,000	48,000	310,000	——	1,180,000	878,000

NOTE. — Where no figures are shown none were received from these centres.

It is not intended to discuss in detail the value of the Breed clump count as such or to compare its value with that of plate counts. These recordings have been made to show how necessary it is for veterinary officers to collect and collate material of this nature, as by this means alone can we ever attempt to make scientific assessments of this and similar public health problems.

The figures show, for instance, the difference between counts in summer and winter and what great variations we can expect in the Union owing to climatic conditions. Variations between different parts of the Union are indicated. Are these differences due to different methods of making smears and counting, or can the Breed clump count be standardised so as to avoid gross inaccuracies owing to different methods and interpretations? Time factors, of course, could not be eliminated, but should average out over so large a number of counts over so many months.

From the recordings, however, it is quite clear that wherever it has been possible to exercise control, it has also been possible to bring about improvements. In Johannesburg and Pretoria, and to a lesser extent Durban, where very large quantities of milk are dealt with and where the milk comes from distant farms, in some cases a few hundred miles away, it has, with the limited staff available, been impossible to exercise satisfactory control. Nor has it been possible to procure transport with proper cooling facilities to deal with milk from a distance. The result is that the average counts at these places remain very high.

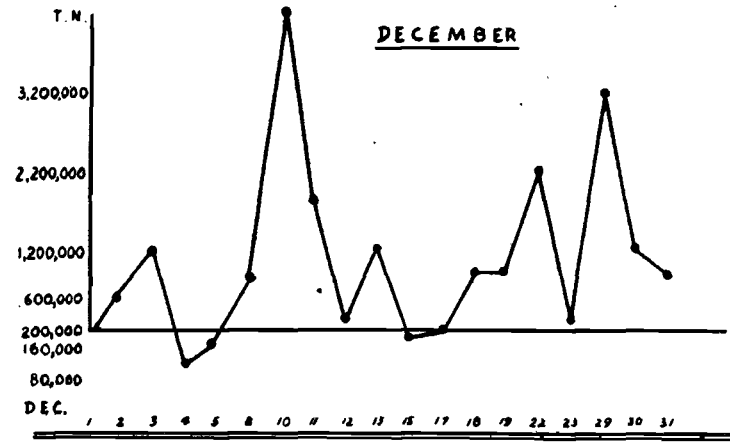
In areas like Bloemfontein and Port Elizabeth, where smaller quantities of milk are handled and where the dairy farms are nearer to the towns, it has been possible to exercise much better supervision with corresponding reductions in the bacterial counts.

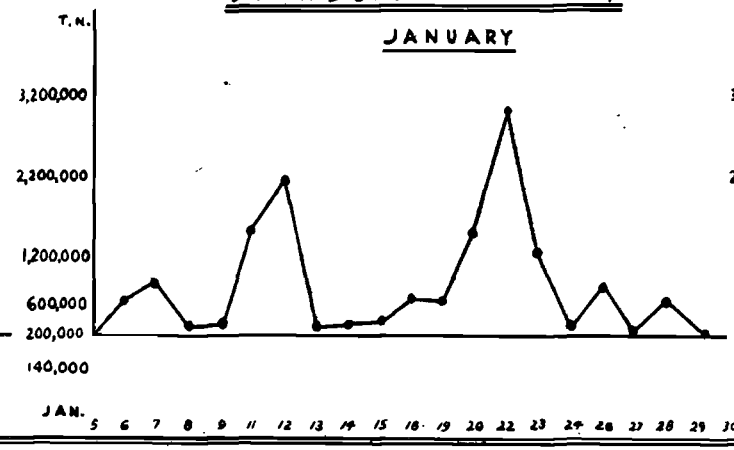
The value of adequate control becomes more obvious when the figures for pasteurised milk are examined, and the general reduction in counts is noted.

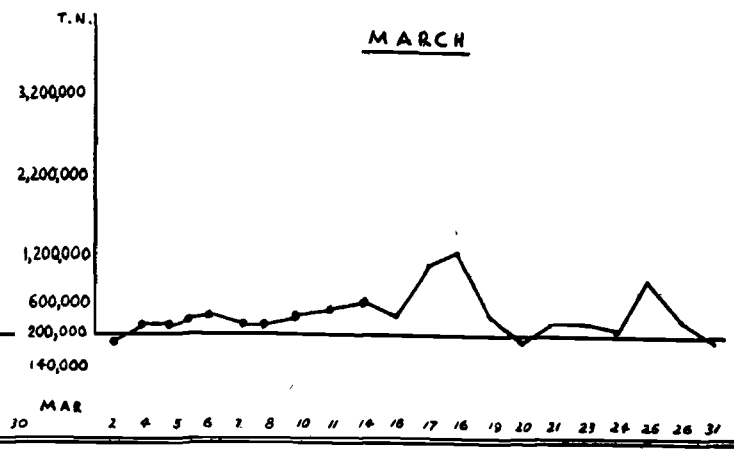
In still smaller places it has been possible to bring about very quick and satisfactory improvement by careful supervision, and control by Breed clump counts. To illustrate this we have reproduced a series of graphs for Standerton, Middelburg and Vereeniging, taken from the annual report of the Director of Veterinary and Remount Services.

At individual dairy farms, the Breed clump count is regarded as a direct indication of the supervision of utensils and the conditions under which the cows are milked; it can be said to take the place of a daily visit to the dairy farm at the most important time, that is, during milking hours. A sudden rise in the count is an indication of something having gone wrong, and calls for an immediate inspection. The cause is often traceable to some simple matter like the

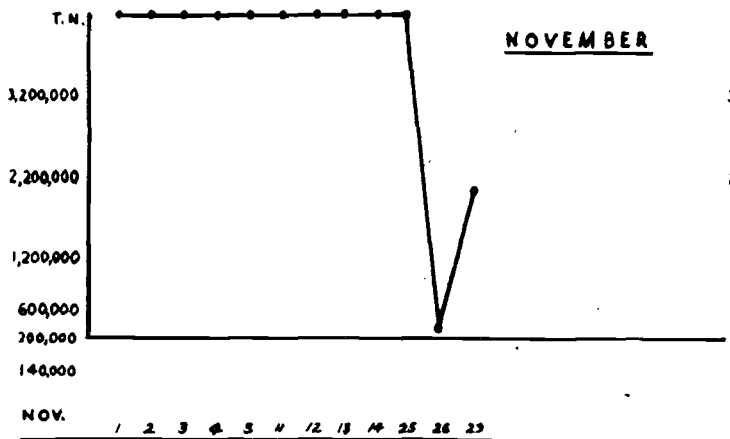
STANDERTON CAMP

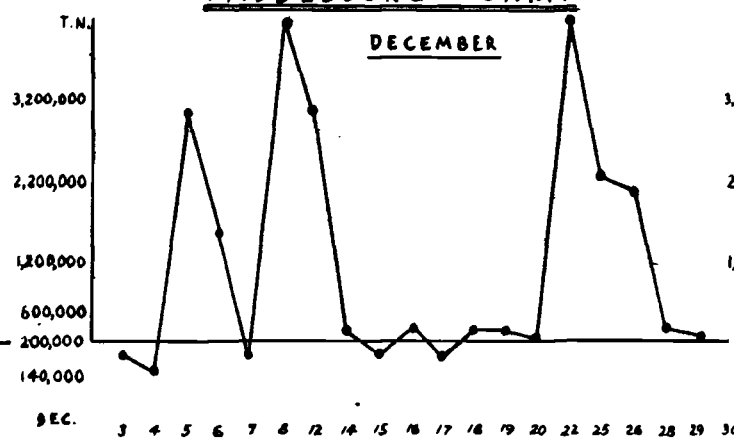


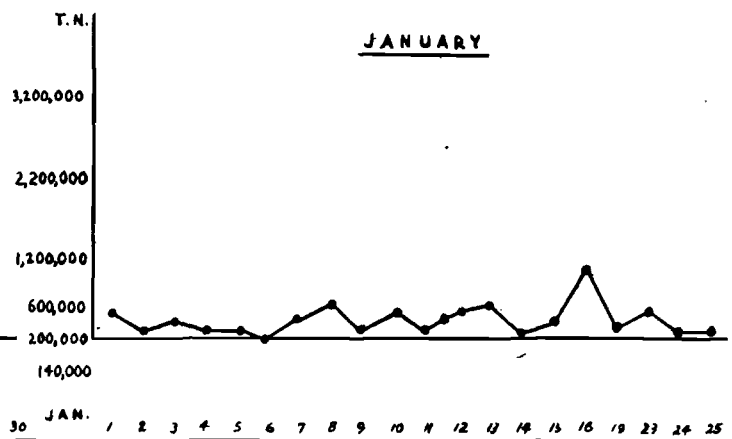




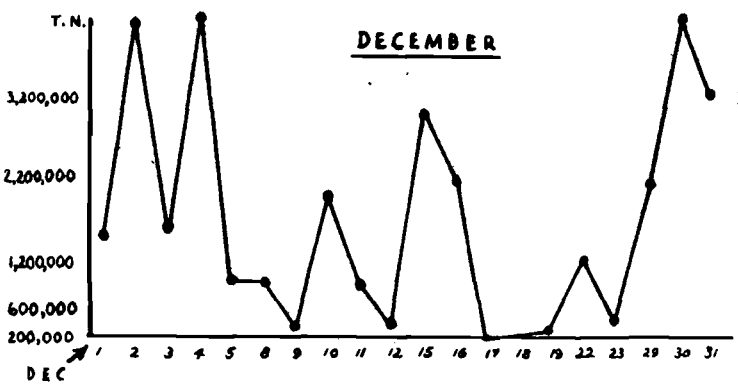
MIDDELBURG CAMP

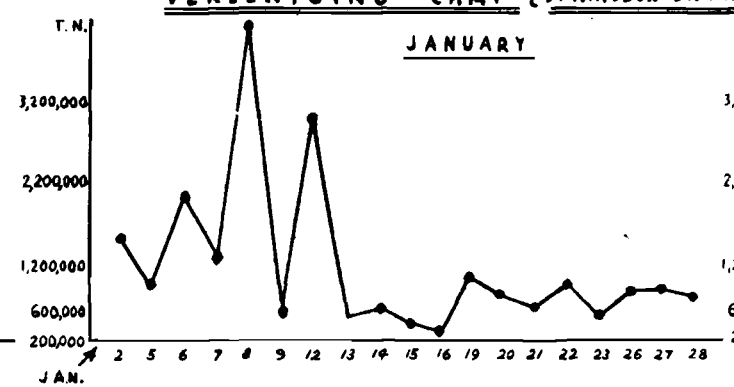


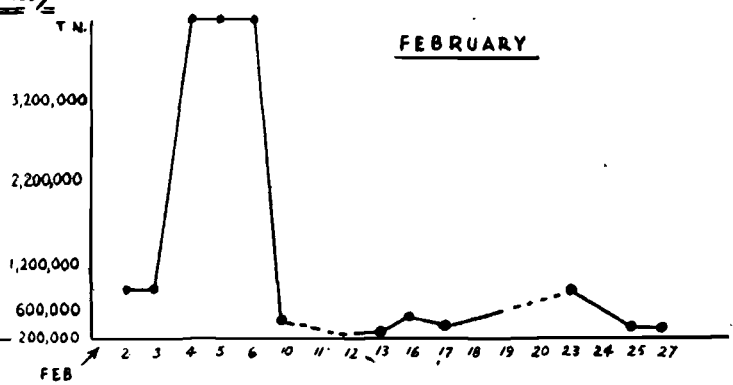




VEREENIGING CAMP (SPRINGBOK DAIRIES)







NOTE - T. N. = TOO NUMEROUS TO COUNT.

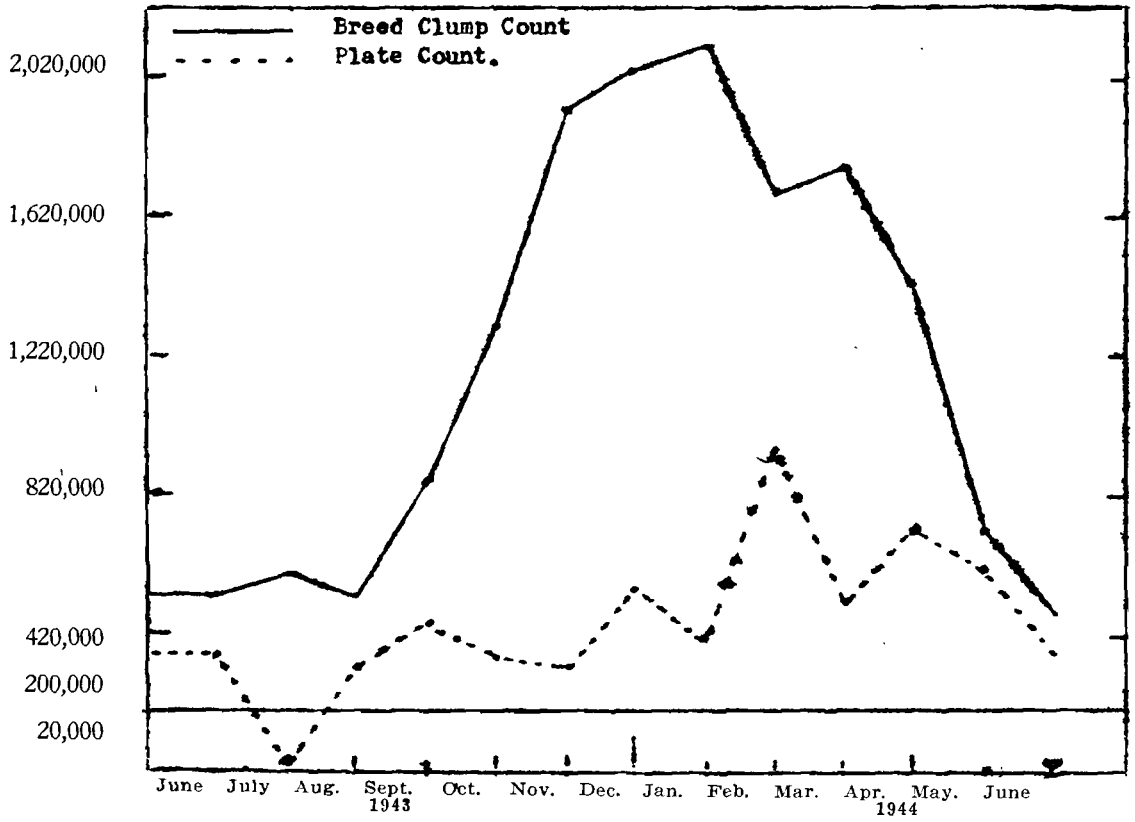
breaking down of the sterilising apparatus or lack of supervision owing to the absence of the manager on leave or on account of illness.

The average Breed clump counts which we can, under existing conditions, expect in summer and winter are also shown. The Defence Department has laid down an arbitrary figure of not more than 200,000 bact. per c.c. in winter and 500,000 in summer as the standard which it expects from suppliers. Are these figures reasonable, and if so, what must be done to bring the quality of our milk supplies up to these requirements? Or are we aiming at an unattainable standard? The figures also show the differences between pasteurised and raw milk, and on the face of it, a further very strong argument seems to have been established for pasteurisation.

We have also been able to obtain plate counts for raw milk from Pretoria for the period June, 1943, to June, 1944. These figures have been compared with the Breed clump counts for raw milk from Pretoria dairies supplying the Military. They have been compiled in a manner similar to the figures in the Breed clump counts mentioned earlier on, excepting that the plate counts for Pretoria are from a smaller number of samples, and are as follows:—

	Military Breed Clump Counts. Raw Milk.	*Civilian Plate Counts. Raw Milk.*
1943:		
June	533,000	345,000
July	590,000	37,000
August	531,000	330,000
September	860,000	446,000
October	1,863,000	358,000
November	1,935,000	335,000
December	2,036,000	544,000
1944:		
January	2,117,000	406,000
February	1,697,000	972,000
March	1,776,000	506,000
April	1,424,000	720,000
May	722,000	615,000
June	487,000	377,000

Comparison of Breed clump counts of raw milk (military) with Plate counts of raw milk (civilian) for Pretoria. June 1943 to June 1944.



These figures show the difference between plate counts and Breed clump counts. The plate count is obviously much lower than the Breed clump. But much more will have to be done before we can arrive at any definite conclusions.

The main value of these statistics in so far as this paper is concerned is that they indicate the large field for scientific investigation there is in this branch of work alone. But is can never be undertaken without the closest collaboration between veterinary and medical officers and health inspectors.

The same co-operative effort in the U.D.F. was brought to bear on the control of meat and meat products before delivery to the various camps.

Wherever possible veterinary officers carried out ante- and post-mortem examinations of animals slaughtered for military use. In addition, public health education and propaganda were brought to a number of new areas in the Union, so much so that many public health improvements were effected in abattoir construction and butchers' shops throughout the country. In some places completely new and up-to-date abattoirs were erected under the guidance of veterinarians.

In various other ways, from the supervision over canning, canned products and fresh perishables, to the grading of other foodstuffs, the veterinary officer has played his part in the war.

In civil life, in public health departments the field of the veterinarian has so far been very limited. In most instances he is just employed at the abattoirs, but he also is sometimes in charge of milk supplies.

There can be nothing more soul-destroying for a scientifically trained individual than to spend all his time at an abattoir making regulation cuts into carcasses, or watching others making them. Nor is there much relief in the monotony of the life of a veterinary officer who day in and day out spends his time on purely dairy work.

There is a far greater field of activity for the veterinarian. There is a place for him in the public health world, for without his services no health department can function properly. He will always, truly enough, be the specialist on meat, meat products and dairying. He will naturally be the only person who is in a position to deal with the clinical examination of animals. His scope must, however, extend beyond this. He should be able to take charge of the public health side of markets and marketing schemes, and the control of many other perishable products. He should have an extensive knowledge of food values and dietetics. Indeed, from municipal veterinary officers in various parts of the Union, in collaboration with medical officers and agriculturists, should come the lead to this country as to what we should and could grow or produce most economically.

The veterinary officer should not confine himself only to *disease* in animals. Part of his work should be directed towards the general improvement of the breeding of animals for human food and the production of better grade beef, mutton and bacon. The production of eggs — one of the most important articles in our dietary — requires very much more attention.

The food value of milk products is undisputed, and yet most of the foodstuffs prepared from milk have received very little public health attention in regard to methods of preparation from the " food value " aspect. The manufacturing of cheese, for instance, results in a product far short in quality and palatability of that produced in most European countries. The making of ice cream, a very popular food particularly with children, needs much more supervision. The manufacturing of dried milk to provide for times when there are milk shortages or for use in areas where fresh milk is unobtainable, such as in tsetse-fly areas, has almost escaped the attention of the veterinarian.

Fresh vegetables and fruit, which are so essential to health are, on account of their scarcity, beyond the means of those who need them most. In fact, these commodities are so expensive that they are beyond the purchasing power of most people. And yet, in spite of a great deal of recent propaganda for compost making, there is still a great deal of waste manure and animal and vegetable waste products. If we are to get the best out of the soil and produce the fruit and vegetables we need at prices within the reach of all, there is much to be done.

Malnutrition is a very serious problem in South Africa and veterinarians can do a great deal to assist in combating it.

The veterinary officer should be the adviser to the housing manageresses in regard to co-operative buying of foodstuffs on a wholesale basis. He should take a very live and active interest in this socio-economic problem, which deals with the rehabilitation of the less fortunate.

Assistance in the control of infectious diseases should be part of his duties, and he should have daily information of all communicable illnesses occurring in his area. With his basic knowledge of bacteriology, entomology and parasitology, he should not require much further study to equip himself to be the most suitable person to deal with the *sources of infection* of diseases such as malaria, plague, bilharzia, typhus, dengue, sleeping sickness and relapsing fever. He should be aware, from day to day, of the incidence of typhoid, dysenteries, scarlet fever, septic sore throats and diphtheria, which might be spread by milk. He should know much more about the manifestations of these diseases in man, and he should have a thorough knowledge of their etiology and bacteriology, so that he can do his share in combating them. He could and should take an active part in all public health propaganda work.

Tuberculosis in cattle is a serious veterinary and public health problem. We know that large numbers of animals are condemned daily at abattoirs on account of tuberculosis. A large number of dairy cows, particularly in the coastal areas, are infected. We do not know how much milk with live tubercle bacilli is sold to the public. We do know, however, that this does happen. The incidence rate of tuberculosis per 100,000 population has risen from 23·27 in 1920 to 73·54 in 1943. True enough, this increase is probably due to better means of diagnosis and better notfication, and it is very likely that only a small percentage has been contracted from animal sources. We are nevertheless aware of this source of infection and we know how to combat it, but we are doing very little about it. There is also no doubt that the actual incidence of tuberculosis amongst human beings is far higher than the recorded figures. From my own experience of notification in Pretoria, most cases are only brought to the notice of the health department at death. This is not due to slackness on the part of doctors, but because so many patients do not consult medical men until the disease is very far advanced.

The training of health inspectors for the Royal Sanitary Institute Certificate, which deals with instructions on the examination of meat, milk and food products, should be undertaken by the veterinary officer. Candidates for the " Meat and Other Foods " examination should be almost entirely trained by veterinarians. This aspect of training for health inspectors is very much in need of revision and supervision. The fact is, however, that there is not a single veterinary officer outside abattoirs who lectures on these subjects at any of the technical colleges where the courses are conducted. The same applies to the teaching of medical men for the D.P.H. The present arrangements provide for very little instruction by veterinarians apart from a few demonstrations at the abattoirs. The teaching of this important branch of the work should be outlined and undertaken by veterinarians at the universities. The amount of instruction given at present is totally inadequate, and is the one part of the D.P.H. course which is sadly neglected at most institutions.

In short, the veterinary officer should become as much a member of the public health team as the medical officer of health.

In this new public health development to which we all look forward, theer will be far greater scope for the establishment of veterinary sections in Health Departments. Many new posts will be created with, it is trusted, adequate emoluments, to make them attractive enough for the right type of candidate.

The big stumbling block, however, is that the veterinary officer, like the medical man who has not taken a post-graduate course in public health, knows only a fraction, and a very small fraction at that, of what is required for this work.

Health inspectors know this only too well and it leads to difficulties in administration and inspections. Some medical officers of health have gone so far as to prohibit the veterinary officer from reporting on matters at dairies which deal with sanitation on account of conflicting reports between the veterinary officer and the dairy health inspectors.

Without adequate public health knowledge the veterinary officer cannot have the correct public health background and he is therefore unable to do his part with confidence. But this difficulty can be overcome by the institution of a post-graduate course in public health for veterinarians.

This should be a full-time course lasting at least one year, and the successful candidate should be given a diploma which could be called the Diploma in Veterinary Public Health (D.V.P.H.), and a veterinarian so qualified and occupying a public health post should have the designation, which we have coined in this paper, of the Veterinary Officer of Health.

The course which is visualised is one similar to the D.P.H. for medical men. It should, however, leave out subjects which are purely "medical," like diagnosis and treatment of human beings. On the other hand it should make provision for more extensive studies in other directions, such as milk, food control, diseases which are transmissible from animal to man, control of insect-borne diseases, and entomology.

Onderstepoort has for so many years given the lead to the scientific world in so many directions, that there can be no place more suited for the establishment of such a course. With its dignity and traditional high standards of learning it could equip the veterinary officer to take his place in the public health team, and with willingness and co-operation we can, to quote the President of the Rockefeller Foundation: "look forward to the future with confidence, but we must be fearless in our devising, ready to cast out intolerance and partisan advocacy, unafraid of new plans for co-operative action, even when they run counter to traditions and techniques which have long been cherished."

I wish to thank the Director-General of Medical Services, Brigadier A. J. Orenstein, C.B., C.M.G., C.B.E., for permission to read this paper, and Major A. Gordon, S.A.M.C., for so kindly preparing the graphs.

THE "LATENT DEFECT" FACTOR IN MILK.

THE INFLUENCE OF THIS FACTOR ON MILK STANDARDS.

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S.A. Veterinary Corps and the Municipal Chemical Laboratory, Johannesburg.

The term "latent defect" has been coined to describe those factors to be found in milk which, though they do not necessarily show up when the milk is freshly drawn, nevertheless cause the milk to deteriorate rapidly. Theoretically, such factors can easily be explained. A milk having a bacterial count of 20,000 organisms per c.c. would be classed as an excellent sample, but obviously that sample would have a poor keeping quality if the bacteria were predominantly active milk spoilers.

The only investigators who have paid serious attention to the possible existence of "latent defects" are Wilson and his co-workers (Wilson *et alia* 1935) who in their special report on milk grading state on page 31: "Except in extreme instances, examination of milk shortly after production does not enable a satisfactory differentiation to be made between clean and dirty milk." They then suggest that all samples should be stored for 12 to 18 hours after milking before being tested, and that since the storage is to be done at atmospheric temperature, different standards would have to be adopted for the winter and summer seasons. These statements were based upon existing knowledge regarding the lag phase of growth of bacteria, and regarding the length of time after milking that the natural bactericidal action of milk continues to operate. It is unfortunate that these points were not strongly emphasised and supported by experimental data for because of this lack, Wilson's recommendations are largely overlooked. In South Africa, at any rate, when samples are collected for bacteriological testing, they are either tested when the milk is fresh or are refrigerated prior to testing. It might be suggested that this procedure is the fair way of testing, from the producer's point of view, because it places at an advantage the nearby producer who is in other ways handicapped by heavy production costs. This contention would be valid if all milk was consumed soon after purchase, but under present-day conditions milk produced after 10 a.m. does not reach the consumer until next day at the earliest, and the

consumer then has to make that milk last for a further 24 hours. The "keeping quality" of milk is therefore of vital importance, and in judging the hygiene of production, keeping quality should be given full consideration.

Since the custom is to test milk when it is as fresh as possible, it is desirable to ascertain whether in practice this system does give a true picture of the keeping quality of the milk, or whether by grading it when freshly produced, certain defects remain cloaked so that some samples are graded higher than is warranted by their ultimate keeping quality. The answer to this point can be obtained from direct and from indirect investigation.

Direct investigation consists of doing bacterial counts shortly after milking and repeating the counts after the milk has been stored about 12 hours at atmospheric temperature. The method gives clear-cut results, but unfortunately it would be difficult to collect a large series of results in this way because the experiment falls outside the range of the normal working day and thus could only be undertaken by an adequately staffed research laboratory, where the staff is not overloaded with a number of routine duties.

Indirect investigation offers various approaches and in the present report two of these have been followed.

(a) The comparison of bacterial counts and methylene blue reductase results done on identical samples. In the reductase test milk samples were incubated at 37° C which procedure stimulates bacterial metabolism and might be expected to uncloak latent defects quickly.

(b) The comparison of the bacterial count classification shown by producers when their milk is graded at different ages. For various periods certain producers have delivered their milk twice a day in which case tests were done when milk was eight hours old. The method of delivery would then be changed to once a day when samples would contain a mixture of milk some of which was eight hours old and some twenty hours old.

EXPERIMENTAL RESULTS.

1. *Direct Investigation.*

Though it was impossible to carry out a full-term direct experiment, i.e. testing milk when very fresh and retesting it after 12 hours' storage, a modified inquiry was made in which the storage time was only 4 hours, this being done at a time when the weather was cool.

For counting the bacteria the Breed technique was used (Wilson *et alia* 1935) because this work was merely part of a large-scale investigation on milk grading, and the number of samples under test was so great as to render plate counting quite impracticable. Actually the Breed count has been used extensively in South Africa in an attempt to grade milk, one survey covering about 300 producers and involving the testing of over 50,000 samples (*vide* Pullinger, 1944). From this and other similar surveys it has been found that if milk is about 8 hours old when tested and has during that time travelled to market and been held at atmospheric temperature until testing, then a Breed clump count of 200,000 per c.c. is good. Any producer who day in and day out can maintain his Breed count below this level is an excellent dairyman, but in practice most good producers exceed this level in about 20 per cent. of tests, whilst average dairymen cannot regularly achieve that level except in cold weather.

For the purpose of the present investigation only good samples, that is those having an initial count of 200,000 or under, have been considered. Counts were done " immediately," that is when 3–5 hours old, and again 4 hours later. In all, 56 suitable duplicate sets of counts were obtained from 26 dairies under test, duplicate counts being done on 4 different days. Between tests the milk was stored at laboratory temperature. Space is not available to set out these counts in detail, but an abstract of the important data is given in Table 1.

From this table it will be seen that 66 samples appeared as high grade when tested immediately (i.e. 3–5 hours old). When stored for the comparatively short space of 4 hours, 17 of these samples had deteriorated to such an extent that they could no longer be classed as high grade. If this deterioration had been due to some chance factor one would expect these 17 samples to be evenly distributed amongst producers, but in actual fact one producer, No. 20, showed this type of deterioration at all four tests, No. 7 showed it at three tests, and Nos. 2 and 8 at two out of four tests. When it is remembered that eight dairymen never showed this marked deterioration during four successive tests, it will be admitted that the milk of the four, Nos. 20, 7, 2 and 8 differed in keeping quality from that of the eight. It is reasonable therefore to state that these four dairymen would have received an undeservedly high grading from the initial test, and a grading that in no way reflected the true keeping quality of the milk.

TABLE 1.

Analysis of duplicate Breed counts of apparently high-grade milk, counts being done on milk 3–5 hours old and again 4 hours later.

a. Number of samples with immediate count below 200,000	66
b. Number of samples with delayed count still below 200,000	49
c. Number of samples showing material deterioration (i.e. a—b)	17

Distribution of deteriorated samples amongst producers.

Samples showing deterioration 17.	4 out of 4 tests.	3 out of 4 tests.	2 out of 4 tests.	1 out of 4 tests.
	Producer No. 20	Producer No. 7	Producer Nos. 2 & 8	Producer Nos 1, 9, 14, 15, 18, 21
TOTAL PRODUCERS . . .	1	1	2	6

Distribution of non-deteriorated samples amongst producers.

Samples not showing deterioration 49.	4 out of 4 tests.	3 out of 4 tests.	2 out of 4 tests.	1 out of 4 tests.
	Producer Nos. 11, 13, 16, 17, 23, 24, 25, 26	Producer Nos. 5 & 21	Producer Nos. 3, 10, 14, 15	Producer Nos. 1, 4 and 8
TOTAL PRODUCERS . . .	8	2	4	3

It is of interest to note that five producers, viz. Nos. 1, 8, 14, 15 and 21, feature on both halves of Table 1. This is very typical of many dairymen who on certain days achieve a high level of hygiene, but cannot maintain this high level regularly.

Though reasons have been given for choosing 200,000 as the dividing line between ordinary and high-grade milk, it must be admitted that this is a purely arbitrary figure, and it might be thought that in the 17 samples referred to in Table 1, bacterial counts had developed from below to above the figure 200,000 without showing a numerically significant increase. To meet this possible objection the actual counts

are listed in Table 2, from which it will be seen that the minimum increase was a twofold one whilst some increased tenfold. Bearing in mind the short time of storage, the cool conditions of storage and the fact that the Breed count is least inaccurate over the hundred-thousand range (*vide* Wilson, 1935), it is contended that the numerical increases listed are significant.

TABLE 2.

Increase of Breed clump counts of 17 samples stored for four hours at room temperature.

Sample No.	Breed Count.	Identity of Producer (Number).				
		20	7	8	2	21
1.	Immediate	120,000	80,000	120,000	80,000	160,000
	Delayed	240,000	280,000	240,000	320,000	320,000
2.	Immediate	120,000	80,000	40,000	200,000	
	Delayed	960,000	600,000	400,000	680,000	
3.	Immediate	120,000	40,000			
	Delayed	2,080,000	320,000			
4.	Immediate	120,000				
	Delayed	1,240,000				

Sample No.	Breed Count.	Identity of Producer (Number).				
		14	18	15	1	9
1.	Immediate	160,000	200,000	20,000	100,000	80,000
	Delayed	320,000	1,040,000	240,000	240,000	320,000
2.	Immediate					
	Delayed					
3.	Immediate					
	Delayed					
4.	Immediate					
	Delayed					

2. *Indirect Investigation.*

(a) Comparison of Bacterial Counts and Methylene Blue Reductase Results.

The results recorded have been extracted from routine test records that have been carried out over a 12-month period. The counts are Breed clump counts and the reductase technique was standardised according to Wilson's recommendations (Wilson *et alia*, 1935) except that the incubation temperature was 37° C.

Comparable tests were done on samples of milk 3 to 5 hours old which had been produced near to town. These results are recorded in Table 3. A further series was done on samples about 8 hours old which had travelled upwards of 30 miles to market, the results of these tests being given in Table 4. The data in these two tables are combined in Table 5.

The method of tabulating has been to group bacterial counts into four key groups, viz., below 200,000; 200,000 to 1,000,000; 1,000,000 to 4,000,000; above 4,000,000. Reduction times are recorded in half-hour periods. Referring to Table 3, 639 samples showed bacterial counts below 200,000 per c.c. and of these 606 took 4 hours or more to reduce, whereas only 20 were reduced in 3½ hours. The percentage figues are the percentages of all counts that fell into that particular count group, thus 606 is 94·8% of the total for the group, namely 639.

TABLE 3.

Correlation between Breed count and Methylene Blue Reductase time.

Near-by milk 3–5 hours old when tested. 1275 samples tested.

Breed Counts	REDUCTION TIME IN HOURS.							
	4	3½	3	2½	2	1½	1	½
Below 200,000	606 94·8%*	20 3·2%	8 1·2%	2 0·3%	1 0·2%	0	0	2 0·3%
200,000 to 1,000,000	225 68·2%	39 11·8%	38 11·5%	17 5·1%	2 0·7%	8 2·4%	0	1 0·3%
1,000,000 to 4,000,000	48 27·8%	17 9·9%	36 21·9%	34 19·9%	10 5·8%	15 8·7%	7 4·1%	5 2·9%
Above 4,000,000	6 4·0%	0	4 2·7%	18 12·3%	7 4·8%	13 9·0%	33 23·5%	63 43·7%

* Percentage of all counts in the group (i.e. below 200,000, or 200,000 to 1,000,000, etc.).

TABLE 4.

Correlation between Breed Count and Methylene Blue Reductase Time.

Milk transported 30 miles. 8 hours old when tested. 2721 samples tested.

Breed Counts	REDUCTION TIME IN HOURS.							
	4	3½	3	2½	2	1½	1	½
Below 200,000	112 94·0%	4 3·4%	0	2 1·0%	0	1 0·9%	0	0
200,000 to 1,000,000	127 79·3%	14 8·8%	3 1·9%	9 5·6%	1 0·6%	5 3·2%	1 0·6%	0
1,000,000 to 4,000,000	42 21·2%	20 10·7%	5 2·4%	38 19·2%	18 9·2%	49 24·7%	16 8·1%	9 4·5%
Above 4,000,000	1 0·5%	3 1·2%	1 0·5%	11 4·6%	3 1·2%	47 19·2%	39 15·9%	140 57%

TABLE 5.

Combined data from Tables 3 and 4. 2006 samples recorded.

Breed Counts	REDUCTION TIME IN HOURS.							
	4	3½	3	2½	2	1½	1	½
Below 200,000	718 94·8%	24 3·16%	8 1·2%	4 0·5%	1 0·1%	1 0·1%	0	2 0·2%
200,000 to 1,000,000	352 72·0%	53 10·5%	41 8·4%	26 5·3%	3 0·6%	13 2·6%	1 0·2%	1 0·2%
1,000,000 to 4,000,000	90 24·4%	37 10·0%	41 11·1%	72 19·4%	28 7·6%	64 17·4%	23 6·2%	14 3·9%
Above 4,000,000	7 1·8%	3 0·8%	5 1·3%	29 7·4%	10 2·54%	60 15·4%	72 18·5%	203 52·3%

Comparison of the distribution of percentages in Tables 3 and 4 shows how similar the distribution is for the two classes of milk. Such differences as occur would probably have been smoothed out had more samples been done. In view of this similarity of distribution it is justifiable to combine the results as has been done in Table 5, and the distribution in Table 5 may be taken as the normal degree of agreement between the Breed count and the Reductase test that may be expected under South African high-veld conditions.

It will be seen that with high-grade and fairly good milk the agreement between the tests is close, with bad milk it is fairly close, but with the intermediate class of milk there is no agreement at all. In the present investigation attention must be focussed upon the first two groups of milk, that is the comparatively clean milk. In the case of milk samples having bacterial counts below 200,000, just under 6% showed a surprisingly short reduction time of 3½ hours or less, which can only be explained if it is admitted that certain samples of low count milk may contain latent or cloaked defects. Once this principle is conceded, rapid reduction by low count milk may be explained on the grounds —

(a) that the predominant bacteria though few in number are active growers and produce a high reduction potential in milk. Such bacteria are generally active milk spoilers;

(b) that bad hygiene has been cloaked by thorough refrigeration;

(c) that reasonable hygiene has been offset by inefficient cooling so that such milk-spoiling bacteria as are present have passed through their lag phase of growth and are ready to multiply actively.

Any of these factors are obviously detrimental to good keeping quality.

If the latent defect explanation is not accepted, then the cases of low count milk reducing rapidly must be explained by the operation of some unknown factor of chance, in which case it would be reasonable to expect that such samples would be evenly distributed amongst producers. To check this point the distribution of such instances amongst producers has been ascertained. For this purpose it has arbitrarily been assumed that in Table 5 the figure of 6% represents the maximum range of disagreement between the two tests that might reasonably be anticipated, and that where smaller percentages appear, the rapid reduction time is to be considered unexpected and due to the operation of some special factor. Thus when a milk has a count of 200,000 and reduces in 3½ hours the result is classed as unexpected. Only the count grades below 200,000 and 200,000 to 1,000,000 have been analysed in this way.

The distribution of these unexpected results amongst the various producers involved in this particular survey is recorded in Table 6. The identification numbers of the dairymen is similar to those in Tables 1 and 2, but the surveys cover different periods of time and the results cannot be compared.

TABLE 6.

Distribution of unexpected results amongst producers.

Producer No.	*Number of Tests.*	*Percentage having Reduction time unexpectedly short.*	*Producer No.*	*Number of Tests.*	*Percentage having Reduction time unexpectedly short.*
1	42	14·25	13	41	4·6
2	65	10·8	14	65	4·6
3	64	9·4	15	65	4·6
22	48	8·4	23	72	4·2
4	63	7·7	16	73	4·1
5	42	7·14	21	48	2·8
6	74	6·75	17	42	2·38
7	65	6·15	18	65	1·54
8	73	5·5	19	42	—
9	40	5·0	20	72	—
10	41	4·88	—	—	—
11	42	4·75	—	—	—
12	42	4·75	—	—	—

From this table is will be seen that whilst two producers showed no unexpected results, three showed small percentages of unexpected results, ten showed from 4 to 5·5% of unexpected results, whilst eight showed between 6 and 15%. This uneven distribution weighs heavily against chance factors, and the latent defect explanation is far more convincing.

(*b*) *Comparison of Bacterial Count Classification of Producers when milk was graded at different ages.*

Records are available of bacterial counts which have been made regularly on the milk of a small group of producers whose method of delivery has periodically changed so that for certain periods the samples were tested when 8 hours old, and for other periods the milk was a mixture 8 hours and 20 hours old. The analysis of these figures is recorded in Table 7, but it is necessary to explain how these figures are set out. Samples from these producers have been tested regularly for many months, testing generally being done on five days of each week. As a result a mass of figures have been accumulated which are quite unintelligible until they have been analysed. To render the figures understandable, each producer's counts are classified monthly into one of four groups. Of necessity the grouping is somewhat arbitrary, but broadly speaking is as follows:—

Group A = at least 80% of counts below 200,000.
B = at least 80% of counts below 1,000,000
C = at least 50% of counts below 4,000,000.
D = more than 50% of counts above 4,000,000.

[This system of classification has been explained more fully by Pullinger (1944).]

To make the picture clearer Groups A and B are classed as predominantly good and C and D as predominantly bad. It can then be said that a producer has had so many good and so many bad months as regards bacterial counts. Over a series of months it is then possible to state the ratio of good months to bad months. This is spoken of as the Good : Bad ratio.

Obviously in a survey extending over many months, change of weather introduces another variable factor into the picture. To show the influence of the weather during each phase, the Good : Bad ratio of a very reliable producer is inserted as a control. This producer rails his milk 70 miles and it was always a mixture containing milk 28 hours old when tested. The condition of such milk serves as a good index of weather conditions.

TABLE 7.

Effect on Bacterial Count Classification resulting from testing milk sometimes when 8 and sometimes 20 hours old.

7A. 1942. *April to Nov.* 8 hrs. to 20 hrs.			7B. 1942-43. *Aug. to Jan.* 20 hrs. to 8 hrs.			7C. 1942-43. *Dec. to May.* 8 hrs. to 20 hrs.			7D. 1943-44. *Nov. to April.* 20 hrs. to 8 hrs.		
Producer No.	Good:Bad ratio at 8 hours.	Good:Bad ratio at 20 hours.	Producer No.	Good:Bad ratio at 20 hours.	Good:Bad ratio at 8 hours.	Producer No.	Good:Bad ratio at 8 hours.	Good:Bad ratio at 20 hours.	Producer No.	Good:Bad ratio at 20 hours.	Good:Bad ratio at 8 hours.
4	4:0	3:1	4	3:1	3:0	1	3:0	3:0	19	2:1	3:0
14	4:0	3:1	18	2:2	3:0	2	3:0	3:0	1	1:2	3:0
17	3:0	2:1	1	2:2	3:0	4	3:0	3:0			
1	4:0	2:2	2	2:2	3:0	5	3:0	3:0	9	0:3	3:0
7	4:0	2:2	5	2:2	3:0	6	3:0	3:0	15	0:3	3:0
8	4:0	2:2	7	2:2	3:0	7	3:0	3:0	18	0:3	3:0
20	4:0	2:2	8	2:2	3:0	8	3:0	3:0	8	0:3	3:0
18	3:0	2:2	20	2:2	3:0	20	3:0	3:0	12	0:3	2:1
12	4:0	1:3	6	1:3	3:0	9	3:0	2:1	13	0:3	2:1
15	4:0	1:3	9	1:3	3:0	18	3:0	1:2	14	0:3	2:0
16	3:0	1:3							17	0:3	2:1
Control Producer 28 days old.		Pro-duced hrs.	Control Producer 28 days old.		Pro-duced hrs.	Control Producer 28 days old.		Pro-duced hrs.	Control Producer 28 days old.		Pro-duced hrs.
	3:0	3:0		3:0	0:3		0:3	3:0		0:3	0:3
Climate mild.			Climate severe in second half.			Climate mild.			Climate severe.		

In Table 7A three producers showed very little depreciation in quality when they changed to once a day delivery, five showed considerable depreciation, whilst three became hopelessly unsatisfactory, yet all these producers appeared as very satisfactory when milk was tested at 8 hours. In Table 7B only two producers made a reasonable showing with 20-hour milk, but when the time was reduced to 8 hours ten producers featured as good. In Table 7C is shown the results when the switch back to 20-hour milk was made. Of the ten producers who at 8 hours were featuring as good, eight remained good

on the 20-hour system because the weather, as judged by the performance of the control producer, was mild. At the final change-over detailed in Table 7D, one producer only was satisfactory on the 20-hour system, but when a change-over was made to 8-hour delivery six producers were good and the remainder fairly good.

The information to be gained from Table 7 is that whilst many producers can make a good showing when their milk is comparatively fresh, grading at that age does not give a true picture of the keeping quality of the milk. The grading of milk when it is too fresh can therefore give a false impression that the milk is of good quality.

DISCUSSION.

Approaching the problem from three different angles a considerable amount of experimental data has been presented to show that a low bacterial count which has been obtained from comparatively fresh milk is no criterion that the milk has been produced hygienically or that it has a high keeping quality. This is a point that should hardly need proof and yet it is a point that is consistently ignored; and in spite of the very clear warning given by Wilson (Wilson *et alia,* 1935) it is customary to test milk when it is as fresh as possible and where delays are unavoidable it is customary to store samples in ice-boxes.

Actually it is extremely difficult to devise a way of testing which takes into account a 12 to 18-hour period of storage and which can still be fitted into normal working hours. The problem is one that affects nearby milk only, because the milk that travels 50 to 250 miles by rail is many hours old before it reaches the market.

For nearby milk, average milking times are 4 a.m. and 4 p.m. for twice-a-day milking, and where three milkings a day is practised average times are 1 a.m., 8 a.m. and 4 p.m., or alternatively 4 a.m., 12 noon and 8 p.m. If samples are collected on the farm by inspectors the certainty exists as to the exact age of the milk. If, however, the sample is collected at a shop or from a delivery boy the milk collected may have been produced a few hours beforehand or on the previous day. Then again uncertainty may exist as to whether the milk has been stored at atmospheric or at refrigeration temperature since milking.

In view of these problems the temptation is to collect samples and test immediately, using the argument that the test will show the condition of the milk as available for sale. Unfortunately comparatively few consumers have their milk delivered before breakfast and so milk has to keep sweet under the consumers' rather indifferent storage conditions for 24 hours. What matters to the consumer therefore is not the bacterial count on receipt, but whether or not the milk will remain sweet until the next day. The duty of the controlling authority is to raise the standard of dairy hygiene so that all milk has this high keeping quality.

The problem can be solved, as Wilson recommends, by storing milk 12 to 18 hours before testing it, provided the age of the sample is known. Steps must be taken to ascertain the age and method of storage prior to sampling. Unfortunately it is not feasible to start plating milk or doing reductase tests at 4 o'clock in the afternoon, nor is it feasible to collect samples regularly from the afternoon or evening milking and arrange for them to be put in a refrigerator early next morning. If a period of about 16 to 18 hours was chosen it would be possible to collect afternoon samples and store them overnight. In practice, however, the afternoon milking is usually the "show' one, and the true low level of hygiene is reached at the midnight or early morning milking. Moreover, it is very doubtful if under South African weather conditions "nearby" milk and producer–retailer milk would keep at atmospheric temperature for 18 hours. Long-distance milk will keep that length of time except in very hot weather, but it will not often show a count below 200,000 organisms per c.c.

It would seem that we are not yet in a position in South Africa to lay down standardised conditions for the testing of milk, and a good deal of fundamental investigation remains to be done. The following are points on which we lack necessary information:—

1. Is the collection of afternoon samples and the testing of them after 18 hours storage feasible? Will producers be able to maintain reasonable standards, and if so, will their results be a true index of their hygiene?

2. Would 8-hour storage be sufficient to uncloak latent defects? The records in Table 1 of this report suggest that the 8-hour period is somewhat short but might be sufficient.

3. Is the incubation of the reductase test sufficient to uncloak latent defects in comparatively fresh milk so that no period of storage is necessary prior to this test?

4. Is it possible to reduce the storage time by storing at a fixed temperature of 27° C or 37° C without impairing the usefulness of the test? By storing at an enhanced temperature the danger would exist of encouraging the development of certain bacteria and discouraging others. This might impair the usefulness of the ultimate test as an index of keeping quality at or below atmospheric temperature.

CONCLUSION.

Evidence is presented to show that under practical conditions, the examination of milk shortly after production does not enable a satisfactory differentiation to be made between clean and dirty milk (*vide* Wilson *et alia*, 1935). When examined comparatively fresh, milk samples may show bacterial counts which bear little relation to the hygiene of production or the keeping quality of the milk.

These latent defects are revealed only after some hours of storage at atmospheric temperature. The problem is discussed of devising a test which, whilst making allowance for these latent defects, can still be fitted into normal working hours. Certain problems are listed, the answers to which will have to be obtained before a satisfactory method of testing milk can be laid down.

ACKNOWLEDGMENTS.

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CONTROL OF MILITARY MILK SUPPLIES IN SOUTH AFRICA.

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The military purchase pasteurised milk where it is available. If not, raw milk is accepted. Both types of milk must conform to the specifications laid down by the Department of Defence.

Raw Milk. — The requirements are that milk shall be delivered daily or twice daily as required by the requisitioning officer, and at the hour or hours stipulated.

The milk shall be mixed milk drawn from a herd of cows, and in no case shall the milk from a single cow be supplied. The milk from the individual cows of the herd shall be efficiently mixed and at once properly strained and efficiently cooled. The temperature of the milk after being cooled, and until time of delivery, shall at no time rise above 60° F. The milk shall contain not less than 3·2 per cent. of fat and not less than 8·5 per cent. of non-fatty solids. No preservative shall be added to the milk. No addition of any kind shall be made to the milk. No fat shall be abstracted from the milk as naturally produced. During the eight months September to April inclusive, a sample of the raw milk shall give a Breed clump count of not more than 500,000 bacteria per ml. and during the four months May to August inclusive, a Breed clump count of not more than 200,0000 per ml., the above counts to apply to samples held at atmospheric temperature for 8 hours after production.

The milk shall be free from harmful contamination. No milk shall be supplied from the dairy at which any employee is suffering from an infectious disease, or is a "carrier" of an infectious disease. The milk shall be produced at a dairy which is conducted under recognised sanitary conditions and the dairy shall be open for inspection at any time during the running of the contract. The supplier may be required to produce a satisfactory certificate that all the cows of the herd are free from tuberculosis as shown by the proper application of the tuberculin test. If required, the milk shall be delivered in locked receptacles, the property of the supplier.

Pasteurised Milk. — Pasteurised milk shall be milk every particle of which has been heated to from 145° to 148° F. and held at that temperature for 30 minutes in an approved pasteurising apparatus, or in a flash pasteuriser of approved type and performance, and then immediately cooled to a temperature of not more than 45° F. The

milk so treated shall not be heated more than once and shall be delivered within 24 hours of pasteurisation. Pasteurised milk which is not intended for immediate delivery shall be stored in approved refrigerators or cold-storage rooms at a temperature not exceeding 45° F.

A sample of the pasteurised milk *at the time of delivery* shall contain not more than 50,000 bacteria per ml. as judged by the " Plate Count."

Time and temperature record charts shall be compiled, dated and retained for the information of an inspecting officer.

The requirements given above in regard to raw milk shall, wherever applicable, apply to milk used for pasteurisation.

Organisation. — The S.A. Veterinary Corps concerns itself with the control of milk supplies until delivered into the Supply Depôt of the camp in which it is to be consumed, i.e. the Veterinary Corps controls the methods of production including the health of the dairy animals and the handling and transport to Supply Depôts. Once in the Supply Depôt, control is taken over by the Hygiene Section of the S.A.M.C.

Full-time army Veterinary Officers assisted by one or more lay assistants have been stationed at those centres of the Union where the volume of work necessitates a full-time man. In other centres milk supplies of camps are controlled by the nearest civilian Government Veterinary Officer assisted by the Hygiene personnel of the camps. Where no Government Veterinary Officer is available, camps are controlled by the nearest Army Veterinary Officer by means of periodic visits, the necessary milk sampling, preparations of Breed smears, etc., being carried out by the Hygiene staff of the camps in question.

METHODS OF CONTROL.

A. Raw Milk. — Control consists essentially of:—

(1) The periodic inspection of producers' farms, at milking time if possible.

(2) The veterinary examination of dairy cows.

(3) Supervision of the methods of milking.

(4) Supervision of the handling and transport to contractor's premises and supply depôts.

5. Frequent chemical analyses of representative milk samples for butter-fat and solids-not-fat content.

(6) A daily bacterial test — the method used being the Breed smear method and the results expressed as the Breed clump count per ml.

In addition, the ' Vi " testing of all dairy employees for the carrier state of typhoid fever is insisted upon — this is carried out either by the local municipal authorities or by the hygiene section of the S.A.M.C.

This method of control has provided the army with a clean raw milk of good nutritive quality and has lessened considerably the danger of the raw milk supplies spreading disease, but unfortunately it cannot be claimed that the supervision exercised has produced a 100% " safe " raw milk. The constant examination of dairy animals and the " Vi " testing of dairy employees has undoubtedly been instrumental in removing many reservoirs of infection that might have contaminated the milk, but the refusal or the inability of most producers to recognise the danger of employing untested labour together with the impossibility of controlling the shifting type of labour found on most dairy farms, has negatived this part of the work to a great extent.

The tests on the raw milk mentioned above under the methods of control are as follows:—

(a) Test for butter-fat content. — The ordinary Gerber method or Babcock method described in standard text books is used, depending on the apparatus available.

(b) Test for solids-not-fat. — Only the approximate total solids is obtained and is calculated by means of the formula $S=0{\cdot}25L+1{\cdot}2F$ in which S=total solids, L=lactometer reading at 15·6° C, and F=the percentage of fat in the milk.

(c) Bacterial test. — The Breed smear method.

The almost total lack of laboratory facilities, the widely scattered situation of camps and the very small number of trained personnel available necessitated the adoption of a test that, while giving the fullest information, could be carried out in the field by laymen with the minimum of training, could be preserved so that readings could be made during the periodic visits of the Veterinary Officer and in addition only took a very short time to carry out, in that it had to be performed daily. The Breed smear method fulfilled all these conditions and had the advantage that experience had already been gained in it, as a method for the control of milk supplies, by the author in Port Elizabeth since July, 1937. The Breed smear has also an advantage over other tests in that it often reveals the presence of mastitis and, with experience, it is possible to differentiate between high count milks in which the majority of organisms are derived from unsterilised utensils and those in which defective cooling is responsible.

Since the test itself, together with the method of defatting and staining has been modified to some considerable extent, a description of it as carried out by army personnel is warranted.

1. *Taking of milk samples.*

Samples must be taken in the bottles provided, from cans on arrival at camp. Milk must be thoroughly stirred before taking samples. If possible, only samples of the morning milking should be taken and all samples must be kept for eight hours at room temperature, i.e. if the morning milk is milked at 06·00 hours it should be kept at room temperature until 14·00 hours.

2. *Breed smears.*

(a) *Apparatus required:*

(1) Pipette calibrated to deliver 0·01 Ml.

(2) Clean glass slides.

(3) Platinum wire.

(4) Guide card on which is marked 1 sq. cm.

(5) Spirit lamp.

(6) Stain — consists of Methylene Blue ... ... 1 gm.
Glacial Acetic Acid ... ... 6 ml.
Spirits Vini Rect. ... ... 94 ml.

(b) *Technique:*

(1) Shake sample bottle of milk ten times (the shaking breaks down the bacterial clumps — therefore if all samples are shaken the same number of times a more accurate comparison of counts can be made).

(2) The milk to be examined is drawn up in the capillary pipette and then 0·01 ml. is delivered on to a clean glass slide and spread over an area of 1 sq. cm. by means of the platinum wire and the guide card. Dry rapidly over flame — on no account must the slide be made too hot otherwise the milk will cake and be difficult to de-fat.

3. *Staining:*

(a) Stand in xylol for 5 minutes.

(b) Stand in a bath containing equal parts of xylol and methylated spirits for approximately 5 minutes.

(c) Remove and allow to dry thoroughly.

(d) Dip in stain — 5 to 10 seconds — drain and *allow to dry in air.*

(e) Wash very gently in beaker of water and dry over flame.

Important:

(1) When drying milk on the slide do *not* overheat.

(2) After fixing with xylol-alcohol allow slide to dry *before* adding stain.

(3) Wash out pipette with *warm* water immediately after use.

(4) After staining allow slide to dry thoroughly before washing.

4. *Count:*

Examine film under oil immersion objective. Always use the same objective, eye-piece and tube length. With your standard combination work out area of field as follows:—

Using a stained blood film, focus a cell at the very edge of the field at 9 o'clock. Take the reading of the Vernier scale — move slide so that cell passes across to the very edge of field at 3 o'clock — take reading of Vernier scale and obtain diameter of field. With this diameter work out area of field as a fraction of a sq. cm. and alter to nearest 1/1000th of a sq. cm., e.g. if 1/3241 sq. cm. call it 1/3000 sq. cm. If area is 1/3000 of sq. cm. each organism seen per field will correspond to 3000 organisms in the 0·01 ml. of milk on slide and to 300,000 in 1 ml. of milk.

The count is a "*Clump*" count, i.e. if a large number of organisms form a single clump they should be counted as one, since, if the clump was grown on an agar plate, it would probably form only one colony. An unbroken chain of organisms is also regarded as one. The count therefore comprises individual organisms, pairs, chains and clumps. Any aggregation of organisms, whether of the same or different species, any aggregation of organisms whether of the same or different species must be called a 'clump" and should be counted as one. If the organisms are removed from a "clump" by more than their longest diameter they must be counted *separately*.

Fields should be counted at various parts of the film. Make a regular routine of counting 20 fields for every sample and take the average.

If the area of the field is 1/3000 sq. cm. and the average is 3 per field then the number in 1 ml. of milk is $3 \times 300{,}000 = 900{,}000$ per ml.

Breed clump count. — If less than 100,000, refer to nearest 1000. If from 100,000 – 1,000,000 per ml., refer to nearest 10,000. Over 1,000,000 per ml., refer to nearest 100,000.

The daily counts must be plotted to form a graph.

The method of making the smear was taught to lay personnel of the Veterinary Corps or Hygiene Section of the S.A.M.C. stationed in the camp. Smears were taken daily and at the end of each week sent to the nearest Veterinary Officer for examination and report.

The Breed smear took the place of a daily visit to the dairy farm at milking time. Any lack of supervision of the methods of production and of the cleaning and sterilising of utensils would lead to an increase in the number of bacteria entering the milk. Provided that the milk

is always examined at the same definite time after milking and cognizance is taken of the average temperature at that time of the year, the number of bacteria present can be taken as a rough indication of any slackness in production methods. The period, 8 hours after milking, during which samples were held at room temperature was found to be the most suitable from a practical point of view and was adopted for the examination of the milk of most suppliers. In order to compensate for the changes in temperature during different times of the year, two standards were adopted, a winter standard of a Breed clump count of 200,000 per ml. for the months of May, June, July and August, and a summer standard of a Breed clump count of 500,000 per ml. for the months of September to April. These standards were only arrived at after taking into consideration the counts obtained during the first year of control by the army and the counts carried out in Port Elizabeth from 1937 to 1940.

Producers whose milks are more than eight hours old at the time of testing are judged differently. They are grouped into "hour" groups and their counts compared, i.e. if samples from producers A, B and C, etc., are 16 hours old at the time of testing and producer A can supply a milk with a fairly low count, then the others of that group must have similar low counts, if not there must be some fault in their methods of production or transport.

The attached graphs of the milk supplies of producers to two camps in the Union is an illustration of the improvement that can be brought about by this method of control.

B. Pasteurised Milk. — Since it is impossible to obtain large amounts of "safe" raw milk, the military authorities have insisted on obtaining pasteurised milk wherever possible in preference to raw milk.

Pasteurised milk was obtainable in the following areas: Pretoria area, Witwatersrand area, Cape Town (partly), Port Elizabeth, Bloemfontein, Kimberley, Pietermaritzburg, Ladysmith and Durban.

Pasteurisation does not change a "dirty" milk into a "clean" one. The same check is kept on raw milk intended for pasteurisation as on the raw milk delivered to camps.

Experience overseas and in this country in the Port Elizabeth area has proved that the mere presence of a pasteurisation plant, never mind how impressive, is no guarantee that a properly pasteurised milk will be produced. The operation of a pasteurisation plant requires the conscientious supervision of trained personnel of whom very few are available in South Africa.

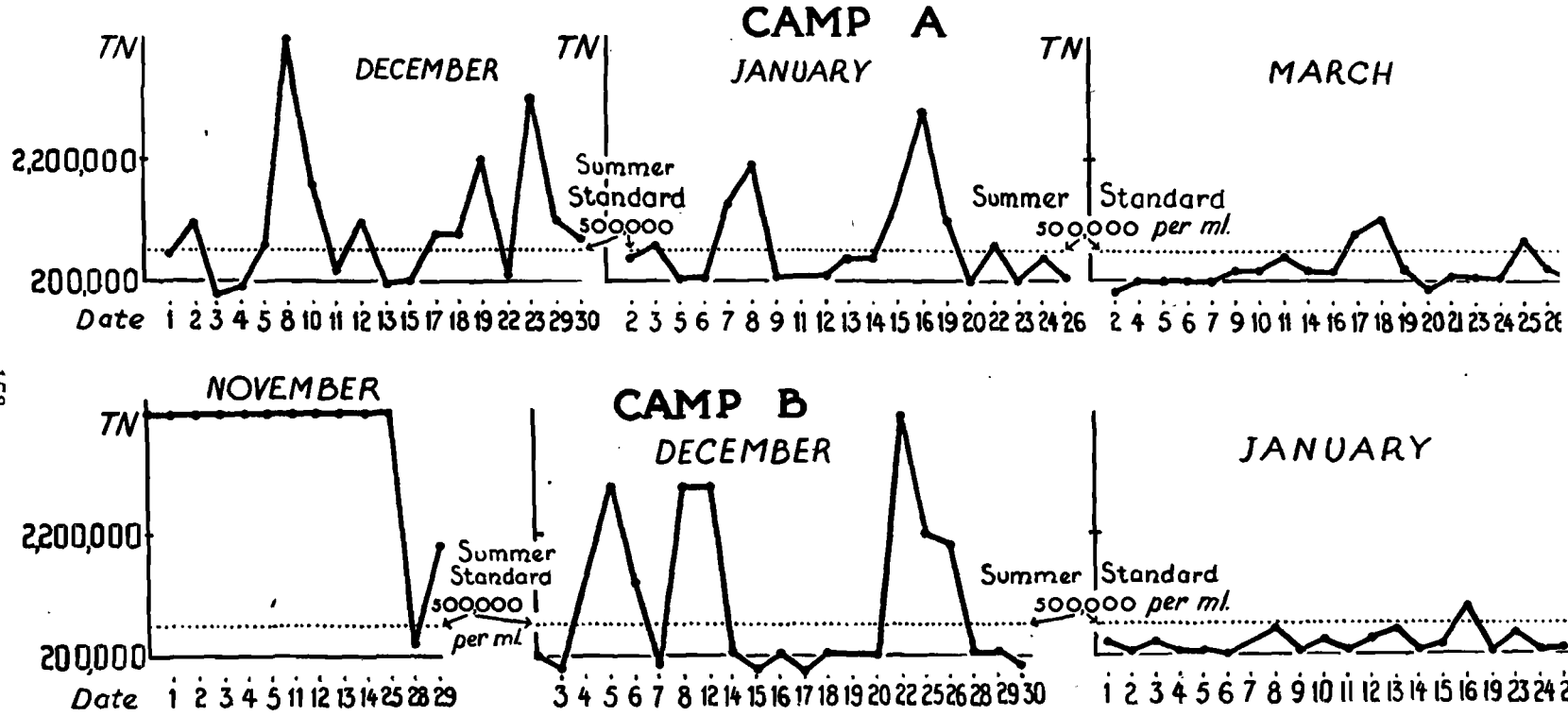
Fortunately a very sensitive chemical test is available for checking the efficiency of pasteurisation. The following extract taken from the publication "Standard Methods for the Examination of Dairy Products" gives a short explanation of the test.

The phosphatase test is based on the property of the heat-sensitive enzyme phosphatase, always present in raw milk, to liberate phenol from phosphoric-phenyl esters. When milk is heated, this enzyme becomes progressively inactivated. When heated at 143° F. for 30 minutes, 96 per cent. of the enzyme is destroyed, and heating above 145° F. for 30 minutes ensures complete inactivation. When the milk has been under-heated (in temperature and/or time) or when there is an admixture of raw milk, the enzyme will be present in larger amounts than when the milk was properly processed and handled. The amount of phosphatase present is measured calorimetrically, and the quantitative determination reveals the degree of faulty pasteurisation or subsequent contamination with raw milk. Over all ranges of temperature and times, mycobacterium tuberculosis is destroyed more quickly than phosphatase so that a heat treatment adequate to inactivate the enzyme to the degree called for by the standard likewise kills this organism and all other common pathogenic bacteria. A sample of milk that does not have more phosphatase present than the standard allows can be regarded as safely pasteurised and free from subsequent contamination with raw milk.

Frequent inspections helped by daily phosphatase tests are necessary to ensure that a plant is being operated efficiently.

The lack of laboratory facilities coupled with the shortage of the necessary reagents made it impossible to carry out more than a very few phosphatase tests on pasteurised milk. At that time (1940) the only phosphatase test used was Neave's modification of the Kay-Graham phosphatase test. This is a fairly complicated test which must be carried out by a trained laboratory technician and calling for full laboratory facilities. The only laboratories carrying small stocks of the necessary chemicals were in Johannesburg and Port Elizabeth and only very limited numbers of tests could be carried out. In December, 1942, the necessary chemicals and colour standards were obtained from America for the carrying out of Schrarer's rapid (Field) phosphatase test. This test has the great advantage of being simple to carry out: it does not require laboratory facilities and can be carried out under field conditions in under 30 minutes. Work in America and in this country showed that the test was as sensitive as the longer Kay-Graham method. It is claimed that it will show small but significant deficiencies in pasteurisation, a small drop in holding temperatures, a shortage of holding time or the presence of as little as 0·1% of raw milk.

This test is now in use at all centres at which pasteurised milk is being supplied to the military. Daily tests are taken of each batch and this continual check has been instrumental in bringing about a vast improvement in the efficiency of pasteurisation. When this work was first started the only area receiving a milk that was efficiently pasteurised was Port Elizabeth, where the phosphatase test had already been in use for over two years. To-day, it is rare to obtain an under-pasteurised result from pasteurised milk delivered to the military.



For captions see opposite page.

CAMP A. — *December graph shows that very little supervision has been exercised over production — only a few counts during the month being below the summer standard of a Breed clump count of 500,000 per ml.*

In January there is a definite improvement, 12 out of 19 counts being within the standard. By March it could be termed a clean milk supply, since out of 20 counts only three were slightly above the standard.

CAMP B. — *Shows a more rapid improvement. In November practically no supervision was exercised until the 28th day of the month — the counts before this being all too numerous to count. During December his milking technique improved to the extent that out of 20 counts only seven proved to be above the standard. By January his technique of production had improved to such an extent that out of 20 counts only one proved to be above the summer standard.*

A description of the Rapid (Field) Phosphatase Test is given in *Standard Methods for the Examination of Dairy Products,* 8th Edition, 1941, page 274, published by the American Public Health Association.

Control of the process of pasteurisation alone is not sufficient. The whole effect of pasteurisation will be negatived if the pasteurised milk passes through unsterilised plant, storage tanks, and cans. A daily check is necessary.

Wilson in his publication *The Bacteriological Grading of Milk* states that B. Coli is a very common contaminant of unsterilised milk plant. In this report he quotes Slack and Maddeford as having found that milk pasteurised for 30 minutes at 143° to 145° F. gives a negative B. Coli result in 10 ml. and concludes that the presence of coliform organisms in pasteurised milk indicates some fault in the processing, cooling or bottling of milk. Other workers came to similar conclusions.

Based on this the presumptive B. Coli test was used as the most convenient check for post-pasteurisation contamination. The test is simple and in practice has proved to be excellent as a check on the effectiveness or otherwise of the cleaning and sterilisation of pasteurising plant and equipment.

Samples are taken daily from the following parts of the plant:— (1) holder outlet, (2) cooler outlet, (3) inlet to storage tank, (4) outlet of storage tank, i.e. can-filling tap, (5) from can.

Tubes containing 10 cc's. of MacConkey broth (as supplied by Onderstepoort) and a Durham tube are inoculated with 1 ml. of a sample (1 tube to each sample) and incubated for 48 hours — the presence of acid and gas is an indication of the presence of B. Coli in the sample.

As a further precaution, Breed smears are made of samples of the pasteurised milk taken on arrival at camp — a higher count (100,000 per ml. or more), in the absence of a positive B. Coli test, is taken as a rough indication of storage at too high a temperature for too long a time.

It can safely be said that the S.A.V.C. has been able to ensure, as far as it is possible, that the military receives an efficiently pasteurised milk, free from post-pasteurisation contamination. This portion of the military milk supply can be looked on as being safe in that it contains no living pathogenic organisms.

REFERENCES.

WILSON, G. S. (1935): *The Bacteriological Grading of Milk,* His Majesty's Stationery Office, London.

Standard Methods for the Examination of Dairy Products (1943): Eighth Edition. Published by the American Public Health Association.

OBITUARY.

JOAN ALISON ROBINSON (nee MORICE).

Mrs. Robinson, perhaps better known to many of her contemporaries as Joan Morice, died in Johannesburg on November 24, 1944. The veterinary profession in South Africa, few in numbers, can ill afford to lose any member so that the loss of a comparatively young, keen, progressive colleague is felt very acutely.

Mrs. Robinson was born in Barberton, received her scholastic education in England, and returned to South Africa in 1922. She had the distinction of being the first woman to graduate as a veterinary surgeon in this country and obtained the B.V.Sc. degree in 1927. She practised in Johannesburg from 1928 until 1935, for the first two years alone and then, on her marriage to Dr. M. C. Robinson in 1930, in partnership with him.

On retiring from practice, she did not lose touch either with her colleagues or with animals. She was a regular attender at the meetings of the Rand Branch of the S.A.V.M.A., and devoted no inconsiderable part of her spare time to animal welfare work with the S.P.C.A. and the Bantu Animal Welfare Association.

All who came in contact with Mrs. Robinson were impressed with her ability as a veterinary surgeon and only a short acquaintance was necessary for her kindness, competence, and common sense to be apparent. Her passing has left a gap in the profession's ranks that will be difficult to fill.

To Dr. Robinson and his son and daughter, the profession tenders its most sincere sympathy.

J.H.M.

NOTES.

The following students were successful in obtaining the B.V.Sc. degree in the December examinations, namely: B. C. Jansen, P. G. Joubert, L. W. van der Heever and T. C. Wessels.

Mr. A. M. Diesel succeeds Col. C. J. van Heerden as Assistant Deputy Director of Veterinary Services, while Maj. L. L. Daly becomes Senior Veterinary Officer, Natal.

Mr. V. Cooper has been promoted to succeed Maj. J. J. G. Keppel as Senior Veterinary Officer, Cape West.

The following have recently resigned from the Division of Veterinary Services in order to take up private practice, namely: C. J. Erasmus, A. F. Tarr and S. G. Turner.

A donation of £5 towards the Benevolent Fund from Mr. G. J. de Wet, of Mariental, S.W.A., is gratefully acknowledged.

SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION.

39th General Meeting held at Onderstepoort on 10th and 11th October, 1944.

Present: S. T. Amos (President), C. J. van Heerden, P. J. du Toit, A. M. Diesel, M. M. Neser, P. J. J. Fourie, Ph. S. Snyman, J. Quin, M. Sterne, R. Clark, S. W. de Villiers, O. T. de Villiers, H. O. Mönnig, H. Theiler, W. D. Malherbe, H. P. Steyn, M. W. Henning, G. C. van Drimmelen, A. D. Thomas, (Miss) R. Datnow, M. C. Robinson, A. F. Tarr, S. G. Turner, H. P. A. de Boom, P. R. Mansvelt, C. W. Belonje, A. A. Albertyn, C. F. B. Hofmeyr, J. Nicol, J. M. de Wet, E. B. Kluge, R. du Toit, W. O. Neitz, W. G. van Aswegen, G. Watt, F. Hempstead, J. R. Frean, J. A. Thorburn, P. J. Meara, S. Jackson, C. H. Flight, J. S. Watt, J. H. B. Viljoen, J. J. van der Westhuizen, M. de Lange, N. Barrie, N. Starke, N. T. van der Linde, J. Quinlan, R. Alexander, D. E. Faulkner, J. R. Scheuber, C. V. Mare, V. Cooper, P. Robertson, D. G. Steyn, J. Zwarenstein, W. G. Barnard, John L. Dickson, H. H. Curson, J. J. G. Keppel, E. M. Robinson, L. L. Stonier, J. G. Williams, M. Zschokke, G. de Kock, R. Hartig, B. S. Parkin, T. F. Adelaar, C. Jackson, G. Martinaglia, J. H. Mason, S. W. J. van Rensburg (Hon. Sec.-Treas.)

Apology for Absence: W. J. Rijksen.

Obituary: The President referred to the death during the past year of three members, namely, W. S. B. Clapham, J. W. Crowhurst and B. J. van der Vijver. He said he wished to add the name of the late Mrs. S. W. J. van Rensburg to these, and asked the meeting to signify its sympathy in the usual manner.

(1) *Minutes of meeting* held on the 22nd September, 1943, were confirmed.

(2) *Arising* from these: Nil.

(3) *New Members:* The following new members were elected: P. de la Harpe, H. M. Hodgkin, D. J. Louw, T. A. T. Louw, J. MacKinnon, C. M. T. Meldal-Johnsen, A. H. Milne, W. Orr, G. D. Shaw, J. G. Townsend, J. R. van Blerk, K. van der Walt and K. Weiss.

(4) *Election of Council:* The following were declared elected to Council for 1944-45: President: S. T. Amos; Vice-President, C. J. van Heerden; Hon. Sec.-Treas., S. W. J. van Rensburg; Members, R. Alexander, J. G. Boswell, P. J. du Toit, A. C. Kirkpatrick, J. H. Mason, P. S. Snyman, D. G. Steyn, A. D. Thomas, and E. M. Robinson (Editor of the Journal).

(5) *Presidential Address:* This stressed the necessity for greater veterinary supervision over meat and milk production and distribution. Reference was made to the alarming outbreaks of various milk-borne diseases which still occur in our municipal areas from time to time, and a strong plea was put forward for the pasteurisation under veterinary supervision of all milk supplies. The President also referred to the

recommendation by a recent Government Commission for the training of native veterinary assistants. The use of such assistants would result in a greatly increased demand for laboratory products.

(6) *Reports:* The reports of Standing Committee for 1943-44 were submitted and approved.

(7) *Arrear Subscriptions:* On a recommendation of Council it was unanimously agreed to delete the name of A. J. McGilvray from the list of members.

(8) *Eradication of Vermin:* The following proposal by Dr. D. G. Steyn, seconded by Mr. A. Mathew, was unanimously adopted:

> "That since prussic acid capsules are practically unobtainable, the Minister of Agriculture and Forestry be requested to take the necessary action to ensure the manufacture of these capsules for the eradication of vermin."

A suggestion by Dr. Thomas that this resolution be submitted to the Press was approved.

(9) *General:* (a) The President, on behalf of the Association, extended congratulations to the Vice-President, Col. C. J. van Heerden, on his recent promotion to the post of Under-Secretary for Agriculture.

(b) After the tea interval the President welcomed the Minister of Agriculture and the Secretary for Agriculture. In a short address to the meeting the Minister expressed his pleasure at the opportunity to meet so many veterinarians and indicated that he was giving consideration to the appointment of a Commission to inquire into the question of veterinary services in the Union.

Post-war Reconstruction: A memorandum on this subject and a summary of the memorandum prepared for submission to the Public Service Inquiry Commission having been distributed among members before the meeting, it was decided to consider the two together. The summary was explained in detail by Dr. Alexander. In the subsequent discussion the following additional points were raised:—

H. P. STEYN: Other aspects to be considered are veterinary education, post-graduate courses, the role of the veterinary profession in the control of foods of animal origin, development of avenues of employment, part-time employment by the Government.

P. J. J. FOURIE: The Division of Animal Husbandry should be consulted in any reorganisation of the Veterinary Division.

J. NICOL: The proposed commencing salary of £500 per annum is insufficient. This should be £600 per annum.

J. QUIN: The profession is changing from being largely a State concern to private and municipal work. The profession should play a greater part in other national problems like soil and veld conservation, which are of importance from the aspect of animal nutrition.

M. W. HENNING: Housing should be provided for field officers. Pensions should be granted on the basis of a provident fund. Consideration should be given for promotion of people doing research work and who are not keen on administration work.

J. THORBURN: What provisions are made for medical services? A scale of charges for clinical work done by State veterinarians should be drawn up.

J. L. DICKSON: The public is not paying sufficient on the present basis. There should be a charge for service as well as for mileage.

C. W. BELONJE: The earning capacity of the Veterinary Division should be increased.

S. G. TURNER: Provision should be made for local research in certain areas.

After discussion it was resolved that a mandate be given to the Committee to work out the details and to present the memorandum to the Public Service Inquiry Commission.

Afer lunch the following papers and demonstrations were delivered: Modern therapeutics: D. G. Steyn and H. O. Mönnig. Filaria osleri infection in a dog: R. J. Ortlepp and H. P. Steyn. Recent contributions to the problem of the transmission of bluetongue and horsesickness: R. du Toit.

Wednesday, 11th October.

The registration of veterinary medicines and dips: H. O. Mönnig. The "Veterinary Officer of Health": Col. H. Nelson (Medical Officer of Health, Pretoria). Anæmia of suckling pigs: W. D. Malherbe. Experiences in the lungsickness campaign in the Kaokoveld: J. S. Watt. Ticks as an etiological factor in diseases of unknown origin: G. de Kock. Experiences during a recent tour through India: C. J. van Heerden.

Resolutions: The following were unanimously adopted:—

(1) Proposed by R. Alexander and seconded by J. Nicol: "This meeting of the S.A.V.M.A. is aware that steps are being taken by the Faculty of Veterinary Science to reorganise its curriculum and wishes to stress: (a) the desirability of improving the course for the basic degree, and (b) the urgent necessity for instituting immediately suitable post-graduate courses in anticipation of the demands of post-war reconstruction."

(2) Proposed by J. L. Dickson and seconded by C. J. van Heerden: "This meeting of the S.A.V.M.A. expresses its appreciation of the intention of the Honourable the Minister of Agriculture and Forestry to institute an inquiry into all aspects of veterinary services in the Union, and it offers the full support and co-operation of this Association."

A suggestion by O. T. de Villiers that the General Meeting be held earlier in the year, before 15th September, was referred to Council.

The meeting closed at 4.30 p.m. with a vote of thanks to the President.

S. W. J. van Rensburg,
HON. SEC.-TREAS, S.A.V.M.A.

SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION.

Council Meeting held at Onderstepoort on 9th October, 1944, at 2 p.m.

Present: S. T. Amos (President), C. J. van Heerden, P. S. Snyman, J. G. Boswell, A. D. Thomas, J. H. Mason, P. J. du Toit, A. C. Kirkpatrick, D. G. Steyn, R. Alexander, H. P. Steyn, E. M. Robinson and S. W. J. van Rensburg (Hon. Secretary-Treasurer).

(1) *Minutes of meeting* held on 14th August, 1944, were confirmed.

(2) *Arising from these minutes:*

(a) *Hormone treatment:* It was reported that the Veterinary Board was investigating a charge of unprofessional conduct against a veterinarian and that no further information could be supplied at this stage.

(b) *Finance*: Assistance to a widow: The Secretary submitted a letter dated 18th September, 1944, from the attorneys which indicated that it was necessary for the Council to pass certain resolutions before a bond in favour of the Association could be passed. The necessary resolutions were accordingly adopted unanimously.

Finance Committee was authorised to make the advances agreed upon pending the completion of the legal formalities.

(3) *New Members:* The election of Mr. G. D. Shaw was to be recommended to the general meeting.

(4) *Post-war Reconstruction:* Dr. Alexander explained the summary prepared by the relative committee. In the discussion which followed Mr. H. P. Steyn suggested that future appointments to the Faculty of Veterinary Science should not be limited to veterinarians in the State service, and also emphasized the need for veterinary control of meat and milk hygiene.

It was resolved that the reports be submitted to the General Meeting.

(5) *General:* (a) *Anæsthesia:* A letter from the S.P.C.A., Pietermaritzburg, was considered. This asked whether the Association would support it in an endeavour to get legislation passed to make the use of anæsthetics compulsory for major operations on animals. It was decided to support the S.P.C.A., provided a united effort is made by all its branches and provided they did not adopt a narrow-minded attitude on this question. The General Purposes Committee was authorised to deal with this matter.

(b) *Unprofessional Conduct:* Correspondence that passed between the Secretary and a Medical Officer of Health was submitted. In this allegations of touting were made against a veterinarian. It was resolved that a breach of the rules of etiquette might have been committed, but the available evidence was not sufficient to warrant further action.

(c) *Complaint:* A letter from a members alleging touting by another veterinarian was read. It was decided that Drs. Alexander and Thomas should investigate this complaint and submit it to the Veterinary Board.

(d) *Standing Committees*: The following were elected for 1944-45:—

Editorial: E. M. Robinson, P. J. du Toit, C. Jackson, H. P. Steyn and R. Clark.

Finance: R. Alexander, B. S. Parkin and A. D. Thomas.

Library: E. M. Robinson, D. G. Steyn, G. de Kock, A. D. Thomas and C. Jackson.

General Purposes: R. Alexander, C. J. van Heerden, A. C. Kirkpatrick, P. J. J. Fourie and P. S. Snyman.

Book Fund: A. D. Thomas, D. Haig and W. D. Malherbe.

(e) *Secretariat:* It was agreed that the Finance Committee should consider ways and means whereby the duties of the Honorary Secretary could be allocated in such a manner as not to devolve solely on one individual. It was decided that the Hon. Secretary-Treasurer be granted an honorarium of fifty guineas.

(f) *B.V.Sc. Diploma:* It was decided that the Pretoria University be asked to revert to the old system of issuing the diploma in Latin with English and Afrikaans translations, or failing that to grant the diploma in the language (Afrikaans or English) desired by the candidate concerned.

The meeting concluded at 5 p.m.

S. W. J. van Rensburg,
HON. SEC.-TREAS.

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