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OF

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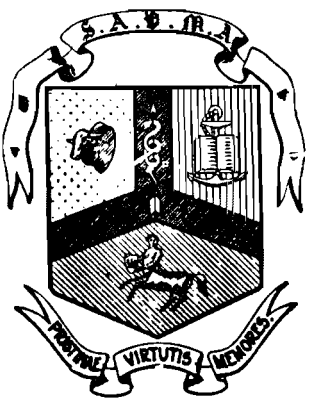

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EDITORIAL

BRINGING SCIENCE TO THE CITIZEN

During February, 1963, a United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas, was held in Geneva. Here, approximately 2,500 delegates representing many different countries, met and competent men from various specialized fields delivered papers on the problems encountered by developing nations. The proceedings of this Conference engendered the conviction that science and technology have become mighty factors in the existence of man. To quote the words of a prominent delegate: "Vast conceptual changes, new terms for the understanding and definition of nature, have gone hand in hand with spectacular technological results. Man is now clothed with a power which he never previously held — to generate and control energy; to fructify land; to conserve and utilize water; to combat disease; and to draw mankind together in close and constant accessibility."

There seems to be no doubt that the degree of development of science and the technology of a country influences its social and economic structure and its claim on world leadership. This condition will be accentuated when more and more countries become developed.

At present scientific and technological development is the privilege of a relatively small percentage of people who have been fortunate enough to receive a higher education. But all the nations of the world are determined to eradicate illiteracy and promote the education and development of all social strata.

There are two conditions, apart from the availability of financial resources, essential for the penetration of scientific development to all layers of a population.

(1) The people must possess the urge to assimilate science and technology. The will to improve must come from the heart of the people itself.

(2) Centres must exist where science and technology are practised on a high level and where men can be trained to convey their knowledge to the individual members of the population.

This second condition concerns us as a veterinary profession most intimately. We belong to a cadre of highly qualified scientists, competent to educate our fellow countrymen in the application of sound veterinary principles in their farming practices. In the performance of our daily task we are often so pre-occupied with our problems of controlling disease outbreaks, attending to sick animals or research projects, that we are inclined to forget the noble task to which we are also called. We must, however, realize our responsibility in this respect and apply ourselves to a conditioning of animal owners, to the adoption of a scientific approach to their problems. The mystic influence of a group of scientists on the

population can have far reaching effects. As a reward, we shall enjoy the satisfaction of having employed our scientific knowledge not only as a means of earning a livelihood, but in addition, as an instrument to aid the development of our country.

B.C.J.

THE INTERPRETATION OF CONCENTRATIONS OF BLOOD CONSTITUENTS

The present availability of relatively simple procedures for the quantitative determination of various blood constituents has stimulated interest in their use. This is all to the good but the difficulty of interpretation of the figures so obtained is not always fully realized. The following points may assist in this regard.

Firstly, it must be remembered that all blood constituents are being constantly removed and replaced. The concentration at any given time therefore reflects the balance between these two processes and any alteration may be due to changes in either or both. A high blood figure is just as likely to be due to poor utilisation as excessive intake or mobilisation e.g. blood sugar in diabetes mellitus.

Secondly, only concentration is measured. Where significant alterations in volume can be expected, alterations in concentration may be purely secondary.

Thirdly, the concentration of most blood constitutents is regulated within a physiological range. Mechanisms for the restoration of the concentration come into play only when the level has passed above or below the limits of this range, which may be wide, e.g. blood sugar and inorganic phosphorous, or narrow, e.g. plasma potassium. There is a tendency to regard the average of the range as "normal" and any variations from that average as varying degrees of "abnormality". Actually any figure within the range may be more "normal" than the average, when circumstances are taken into account. For example, the blood sugar of normal humans ranges from 80 to 120 mg per cent, before and after meals. The "normal average" figure of 100 mg per cent would be abnormally high after a prolonged fast and abnormally low after a heavy meal.

The accuracy or repeatability of the technique used must also be taken into account. The usual methods for the determination of blood sugar based on reduction of copper salts are subject to an error of some $\pm$ 10 per cent under ideal conditions. Surveys carried out by sending identical samples to several reputable large laboratories for a variety of determinations and comparing the results have revealed surprising variations.

One of the pre-requisites for accuracy is constant repetition. Any technician performing a particular determination daily will be more accurate than a man of equal ability doing it sporadically. Furthermore, many of the reagents used have a limited keeping period and have to be made up at short intervals. Each new batch must be standardised.

Sporadically performed determinations are therefore wasteful of time and materials. When a particular determination has to be performed on a large number of samples for comparative purposes, it is far more satisfactory to carry out the test on the samples as a batch simultaneously, where possible. Apparent variations between samples are then much more likely to be real than due to variations in pipettes, reagents, colorimeter bulbs and the innumerable other factors, human and gremlin, with which one has to contend. All this adds up to the conclusion that centralisation of clinical pathology is highly desirable provided (1) the samples can be received in a suitable condition and (2) the results can reach the sender with adequate promptitude.

The interpretation of the concentration of any one constituent is often impossible without knowing the concentration of several other constituents. For example, a high haematocrit value may equally be due to haemoconcentration or polycythaemia. A knowledge of the total plasma protein figure will help one to decide. Similarly a low plasma calcium figure may be secondary to a low plasma protein concentration and not indicate any functional hypocalcaemia. All samples should therefore be subjected to a series of tests designed to give the information required. In the initial stages of a research investigation the tests should be as comprehensive as possible. This necessitates considerable equipment and staff.

A great difficulty in the interpretation of figures obtained from animals is the paucity of "normal ranges" available. In other words we must first know the figures shown by the majority of a large number of "apparently healthy" animals of the same species, breed, sex, age and kept under similar conditions to that from which the sample was taken. This difficulty can only be overcome by hard work and meticulous recording over a long period.

It is hoped that veterinary clinical chemical pathology will make great strides in South Africa. Without it we cannot hope to clarify the pathogenesis of the numerous metabolic and nutritional disturbances with which we have to contend, nor can we explain the symptoms and cause of death from infections and parasitic diseases. An animal does not die of horsesickness, it dies of the effects of horsesickness on its vital physiological processes. Specific chemotherapy may be aimed at the pathogenic agent but supportive therapy must be designed to restore body functions. On the other hand it must be realised that laboratory findings are meaningless unless correlated to clinical findings on the animals themselves. Only the clinician in the field can define the problems. The clinical pathologist, together with specialists in other fields, may help him to solve them.

R.C.

THE MODERN SYNTHETIC PESTICIDES

The advent of the new synthetic chlorinated hydrocarbon insecticides during and shortly after the second world war, of which DDT, BHC,

Toxaphene and a host of others are today commonly used throughout the world, seemed at the time to herald the dawn of a possible new era in which man would at last be in a position to rid himself of many, if not all of the arthropod pests which have plagued him and even severely retarded his development since pleistocene times, roughly a million years ago.

These were followed by the ever increasing group of organic phosphate insecticides of which the extremely toxic parathion was amongst the first to be produced. This was soon followed in its turn by safer substances, which nevertheless retained a wide spectrum of potency for a diversity of pests, of which malathion is a good example. Chemical ingenuity has certainly not rested on its laurels and many intricate combinations are receiving the closest scrutiny thus leading to the synthetization of ever more substances, e.g. the carbamates such as sevin, to swell the arsenal in combating the insect and arthropod hordes which surround us.

However, in spite of the impressive list of potent pesticides, which now number many hundreds, readily available to us, progress in the control and eradication of our invertebrate enemies has by no means met with the success hoped for. In many instances it can be said that the results have been vastly different to what was expected; in fact even embarrassing. In the horticultural field for instance, the elimination of one pest has given rise to another, due to the eradication or suppression of predators which normally kept it in check.

In our own country, spectacular success has been achieved by the use of the chlorinated hydrocarbon insecticides, in such instances as the eradication of malaria over vast areas by the elimination of the vector mosquitoes. Nagana and its eradication in Zululand affords another excellent example where, by the use of BHC, the tsetse fly was totally eliminated.

There are dangers, however, attendant upon such campaigns which must not be lost sight of, as for instance the observation that one of the hyperparasites of *Glossina pallidipes*, namely *Thyridanthrax brevifacies*, of which good evidence exists that this parasite of the pupae of tsetse flies exerts a controlling influence on the breeding potential of the fly at certain times, tends to disappear in such a campaign even before the tsetse fly. If, therefore, the tsetse fly is not totally eradicated and its hyperparasite is, one may be faced with the situation that a build up of tsetse flies will occur again in time, unimpeded by parasitism and a more serious situation than was previously the case, may arise.

On the other hand the widespread use of BHC for the control of keds and lice on sheep shortly after the war had a most salutary effect upon these parasites but was quite ineffective against the itch mite, *Psorergatis ovis*, which previously had been kept in check by arsenic, and soon manifested itself to an alarming extent, and at a time when wool was in great demand and commanded a high price.

Two other disturbing features, which are associated with the wholesale use of the synthetic insecticides, must be mentioned. These are the development of resistance by insects to such insecticides, and the question of accumulations of such insecticides in the bodies of both insects and

mammals, in concentrations which may affect the animal directly or render it potentially dangerous, in the food chain ending with man himself.

So serious a view of this latter aspect has been taken overseas, that it has inspired Rachel Carson, the author of the best seller "The Sea Around us", to bring out a book recently entitled "Silent Spring", in which an alarming account is given of the indiscriminate use of the synthetic insecticides in the hands of people totally unschooled in their use, namely, the general public. The authoress ultimately arrives at the conclusion "As things are now we are little better off than guests of the Borgias". This is no doubt exaggerating the issue but the fact remains that the alarming increase in the occurrence of leukaemia and cancer of recent years may be associated in the minds of clear thinking individuals, with the widepsread use of the modern synthetic insecticides, which in itself, appears to justify a careful investigation of the whole question, and certainly does not make for complacency in their uncontrolled use.

R. M. du T.

Eggs in their thousands are used for research and testing the potency of Canilep. Many potency and safety tests are carried out before Canilep is released to do its job of providing all-in protection against the four major canine diseases.

the research behind Canilep

Glaxo research into the problems of canine protection has been intensive and productive. It resulted first in the production of separate and combined vaccines (Canilin-D, Canilin-H and Lepsolin) against the four major canine diseases and, more recently, in the introduction of Canilep. This is the first British vaccine to combine a living egg-adapted distemper virus vaccine with a killed hepatitis vaccine and a killed bacterial vaccine against the two forms of leptospirosis. Only two injections of Canilep are needed to give all-in protection against four diseases.

The making of Canilep

The making of Canilep is a considerable technical achievement involving the manufacture and blending of four components, each of which needs to be carefully balanced to ensure a high level of immunity to each disease. The testing of this vaccine requires experience, skill and knowledge of a high order and is a long and arduous process.

Proving the potency of Canilep

An example of the tests carried out on Canilep, which go beyond the normal requirements, is that used to determine the potency of the distemper component. A blood sample is taken from an animal previously vaccinated with Canilep. This sample is prepared in a series of dilutions, and injected, with distemper virus, into fertile hens' eggs. After a period of time, the eggs are opened and the chorio allantoic membranes are examined for virus growth. In this way, it is possible to determine the dilution of serum at which growth of the virus is inhibited. This indicates the level of immunity achieved. Each examination needs many eggs and this is only one of many tests carried out by Glaxo workers to prove the safety and efficiency of Canilep.

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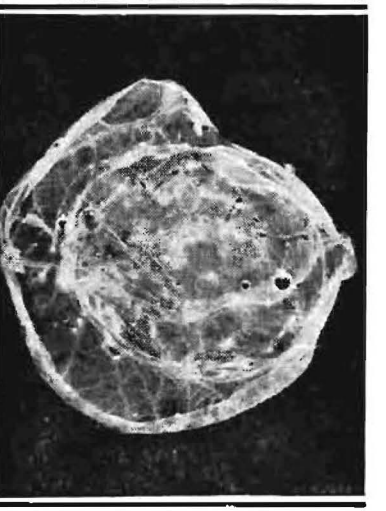

Chorio allantoic membrane showing effect of virus growth

Harvesting of infected chorio allantoic membrane after virus growth

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*SYMPOSIUM: GERIATRICS OF SMALL ANIMALS

CARDIO-VASCULAR CHANGES IN THE AGING DOG

CAMPBELL DICKSON, 147 Oxford Road, Johannesburg

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INTRODUCTION

The cardio-vascular system, despite a resilience which is almost unique in a highly specialised organ, is the one system in the body where the accumulated effects of senescence and pathological changes elsewhere are liable to produce irreversible damage which inevitably leads to death.

Physiological aging is a natural process which is unrelated to any one specific cause and affects the entire organism as a whole. The effect of aging on the health of the animal depends on the degree of physiological change which may occur in any particular organ or system in the body and the degree of specialisation of that organ. In general, in those organs or systems with highly specialised functional roles, the effects of physiological aging are likely to be greater and more far reaching than in less highly specialised ones.

Pathological aging on the other hand may be termed an abnormally early involution, degeneration or breakdown of one or more organs or systems, and again, the effects of pathological aging are likely to be relatively more far reaching, the more highly specialised that organ is.

While physiological senescence is a gradual process, it is inexorable and, in the light of present knowledge, little can be done to halt or delay those changes which eventually lead to breakdown of function in the organ or system. Pathological senescent changes however, may lend themselves to treatment and, to varying degrees, restoration of function may be brought about, but since senile changes are irreversible, physiological aging must eventually become pathological.

Significant signs of senescence in the organism may not be apparent until comparatively late in life, and even marked senile changes in the structure and function of some organs and systems, may not produce symptoms of disease until pathological conditions occur elsewhere. In age, the maintenance of the organism in a state of health depends on the efficiency of individual systems or organs, and the temporary dysfunction or a relatively mild impairment of these, are more likely to be fraught with serious consequences than in earlier life.

SENESCENCE WITHOUT PATHOLOGICAL CHANGE

The onset of senescent cardio-vascular changes without apparent well marked pathological symptoms, has been noted as early as 4–5 years.

* To be presented at the forthcoming scientific conference of the Association, at Onderstepoort from 24-27 September, 1963.

In general, however, signs of aging make their appearance from 7 years onwards and may be delayed until 10–12 years. In the larger breeds where the expectation of life, with exceptions, rarely exceeds 10 years, cardiovascular changes may begin at 5 years, from which time involutionary changes unaccompanied by pathological manifestations in the heart and blood vessels, have already been established. From this point onwards with increasing age, the incidence of pathological aging can be expected to rise and complete senile changes, with degeneration and collapse of the cardiac system, become a hazard. The comparable point in smaller breeds of dogs is probably much later, although senescent signs in the form of cardiac murmurs, which are not productive of pathological symptoms, may be noted at 7–8 years.

During the pre-pathological stage cardio-vascular changes may pass unnoticed or may be recognised purely fortuitously during examination. Careful observation however, may have already detected the onset of cardiac murmur, an alteration in the compressibility of the pulse suggestive of hypertension, a tendency to earlier fatigue and slight breathlessness brought on by exertion: the owner may report that the animal appears lazy and its alertness may be blunted due possibly to a loss of acuity in vision.

In the larger breeds, especially, some inco-ordination in gait or even clumsiness may be noted, together with a swaying motion in turning. Such signs may be almost imperceptible and are not always constant but repeated examination may confirm that changes are taking place.

The Aging Process in the Cardiovascular System

Hypertension.—Not all authorities are agreed that arterial hypertension, whether essential or spontaneous, is in fact, one of the signs of senescence in dogs. During the past 20 years, however, with improved methods of pressure reading, evidence has accumulated to suggest that arterial hypertension does occur and American workers have shown the close relationship that exists between nephritic change and blood pressure. If, as yet, essential hypertension is not to be regarded as a symptom of senescence, spontaneous hypertension of nephrogenic origin is fairly firmly established.

Moreover, renal hypertension has been associated with the secretion into the blood stream by the kidney of a pressor proteolytic enzyme, renin, which by hydrolysis is converted into hypertensin. The latter probably plays a pathogenetic role even in dogs not showing evidence of established renal disease. The frequency with which cardio-vascular disease and nephritic changes occur in later life in the dog would appear to indicate that the kidney may initiate cardio-vascular degenerative processes apart from any toxic or mechanical factors and may also, in normal health, exert a controlling effect on blood pressure.

Blood pressure tends to rise or fall with body weight and obese animals consistently fed on a rich fat diet are probably suffering from elevated blood pressures which may rise to 200:160 compared with an average of 140:110 in non sick animals.

Coronary and Myocardial Vascular Changes

Senescent changes in the vascular system must, of necessity, affect the coronary and intra mural vessels of the heart. The changes, again, are probably insidious and may commence at 6-8 years of age when the character of the walls of the intima undergoes a degeneration from the previous part elastic — part collagen nature to become almost predominantly collagen.

Myocardial infarcts resulting from such vascular changes may be expected and, in a number of post-mortem examinations, distinct signs of coronary vascular disease with myocardial involvement have been seen, especially where renal disease has been well established.

Degenerative changes in the myocardium can, therefore, be correlated with vascular disease of the coronary vessels but it has been suggested that these myocardial degenerations together with endocardial changes may primarily have originated in degrees of myocarditis and endocarditis set up by infecting organisms in earlier life.

In this connection the role of the common canine infections may be important; widespread viral infections including distemper and infectious hepatitis together with an increasing incidence of tonsillar infection of streptococcal or staphylococcal origin may well lead to the setting up of cardio-vascular disease as distinct from physiological senescence.

Pathological Senescence Affecting the Heart

Physiological aging apart, heart disease and, in particular, chronic valvular disease is probably one of the commonest conditions which affect the aging dog. In veterinary terms, chronic endocarditis or chronic valvular endocarditis with valvular insufficiency or incompetence designate those conditions which frequently result in congestive or non compensated heart failure.

The incidence in dogs is high and may reach 70 per cent in all dogs over the age of 7 years with heart lesions. The incidence increases with age and, although a true sex relationship has not been proved, the condition is probably more common in the male than the female.

Chronic Valvular Endocarditis

Two or more main possible causes of chronic endocarditis may be cited and, as previously stated, the condition may arise purely as an involutionary senile change associated with an exaggerated physiological senescence. Against this is the fact that dogs are under exposure to a number of pathogenic organisms during life which organisms are capable of causing myocarditis and endocarditis with subsequent degenerative changes appearing only later in life.

Thirdly, chronic valvular disease and an accompanying left sided cardiac hypertrophy are frequently associated with renal changes and are almost constant concomitants of pathological renal degenerative processes which themselves may participate in the setting up of chronic valvular disease by the elaboration of toxic products or by mechanical resistance to the blood flow from the heart.

Valvular Lesions

The valves most commonly affected in chronic endocarditis are (i) the left A–V or mitral; (ii) the right A–V or tricuspid; (iii) the aortic; and (iv) the pulmonary. The lesions present themselves as wart like, verrucose thickenings with nodular folds along the free borders which produce deformities and loss of elasticity. Rarely do they become stenosed but the altered shapes of the valvular orifices give rise to cardiac murmurs which are added to or replace the systolic or less commonly, the diastolic sounds.

Altered Heart Sounds

Mitral Insufficiency. The heart beat on the right side may appear to be intensified while on the left side the systolic sound carries a definite murmur at its point of maximum intensity.

Tricuspid Insufficiency. The characteristic murmur of tricuspid insufficiency may be picked up on the right 4th intercostal space but since right sided A–V insufficiency almost invariably accompanies mitral valve changes, the murmur may frequently not be differentiated from that of left sided insufficiency.

Signs and Symptoms of Chronic Valvular Disease

In mitral insufficiency dilatation and hypertrophy of the left auricle and ventricle arise from the regurgitation of blood which results in an increased output from both chambers in an effort to compensate. Auscultation reveals a loud, harsh systolic murmur and physical examination may show a rather soft pulse. The history of a developing mitral insufficiency discloses an increasing breathlessness and frequent bouts of paroxysmal coughing brought on by excitement or exertion. Respirations may be laboured and evidence of pulmonary congestion accompanied by rales may be seen.

Right sided or tricuspid insufficiency gives rise to typical symptoms of venous congestion which tends to become progressively worse. Respirations are laboured and emphysema and bronchitis may be noted as well as a chronic soft cough. Venous stasis occurs noticeably in the scleral blood vessels and in severe cases, a jugular pulse may appear.

The liver shows progressive enlargement due to passive venous congestion and ascites is common. In advanced and non compensating cases, gastro-intestinal disturbances and generalised oedema may be expected.

In addition to the above symptoms muscular wasting particularly affecting the temporal, masseter, shoulder and back muscles is common and progressive weakness ensues. The animal is unable or reluctant to move and slight exertion produces marked dyspnoea. The appetite is variable but tends to become progressively capricious and diarrhoea may be continuous when dropsical changes are present.

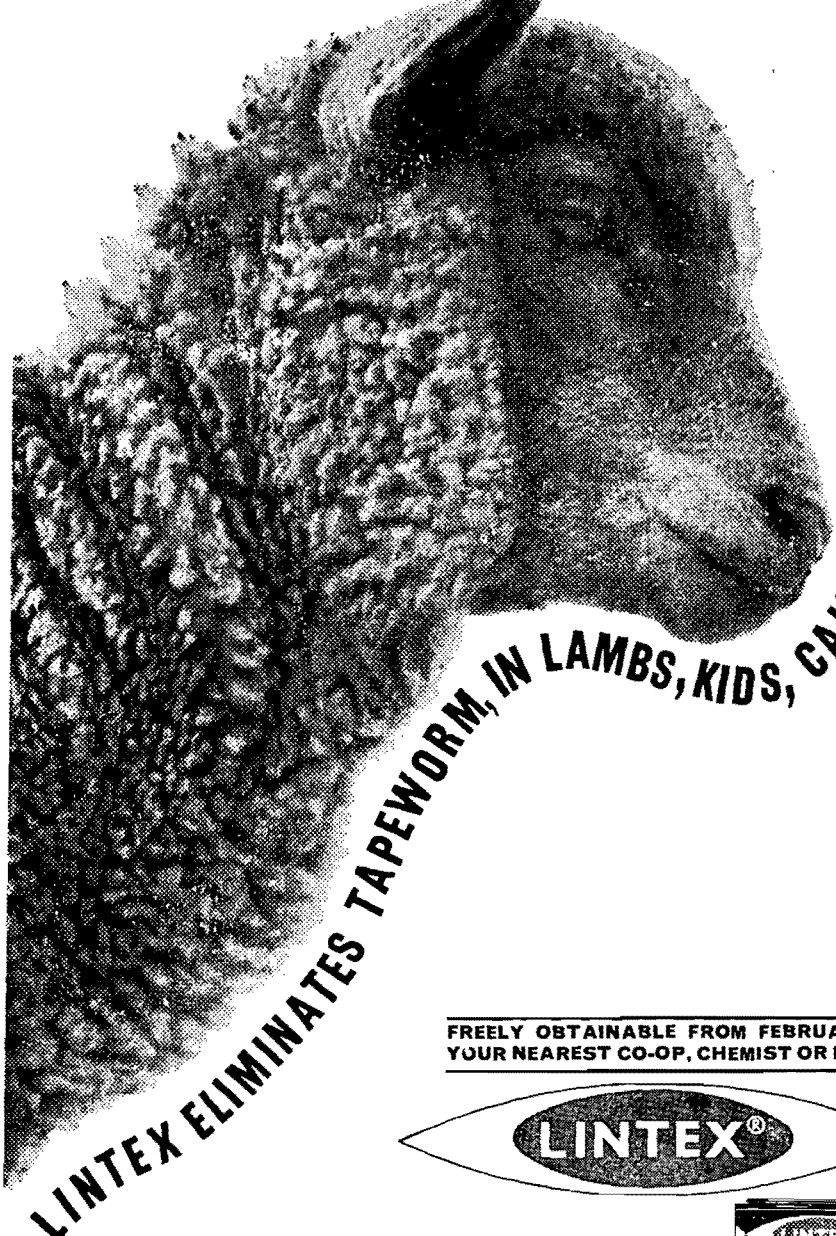
The onset of congestive heart failure may be sudden and may follow upon any superimposed strain or illness. Sudden weather changes, prolonged exposure and stresses in general may precipitate the condition.

Malnutrition, anaemia or prolonged inappetence due to other causes together with osteo-arthritic symptoms may convert a chronic heart condition to congestive heart failure.

Treatment

Where the signs and symptoms of pathological aging are mild, e.g. in the early presystolic murmur case with intermittent cough, treatment designed to compensate may be successful for a considerable time. Rest and the avoidance of excitement and strain are essential as is a non bulky nutritious diet given in divided meals.

Similar precautions apply to the more advanced case where pathological changes are considerably greater. Digitalisation to provide compensation must be given and where dropsy is present the oral administration of the newer non-mercurial diuretics may afford some relief. Once established, however, chronic endocarditis tends to become progressively worse and treatment at best remains palliative.



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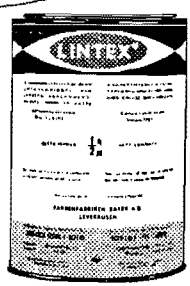

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SYMPOSIUM: GERIATRICS OF SMALL ANIMALS

EYE CONDITIONS IN AGED DOGS

J. L. DORE — 348 Berea Road, Durban

Received for publication, April, 1963

SUMMARY

The senile conditions encountered in the eye and eyelids of the dog are discussed in the following order:
Nuclear sclerosis of the lens.
Cataract.
Pigmentary Keratitis.
Chronic Conjunctivitis.
New growths of the eyelids.

Nuclear Sclerosis of the Lens

In most aged dogs an examination of the pupil of the eye will reveal a blue-grey discolouration which has often been termed a cataract. This is usually found in dogs from the age of seven or eight years onwards, and seems to cause very little impairment of the sight of the dog. In fact some dogs are still able to catch a ball in flight with this condition. More careful examination will show that this is not a true cataract as the lens is quite translucent, and because the lens and capsule has increased in density, particularly the deeper cortical layers of the lens, all the rays are not refracted, but some are reflected back and this gives the impression that the lens has become opaque. This increase in density has been termed nuclear sclerosis of the lens.

Cataract

True senile cataract as seen in man is not common in dogs. Nevertheless, cataracts are found quite frequently in dogs ten years and over, and are probably as a result of a number of causes.

There seems to be a breed predisposition towards cataracts, and these breeds are Miniature and Toy Poodles, Cocker Spaniels and small terriers.

The cause of cataract are traumatic, such as from perforated corneal ulcers, (and this is probably the only cause of cataracts in cats), virus infections especially distemper, and toxic conditions especially chronic nephritis with a low grade uraemia, and this is probably responsible for most of the cataracts of the older dogs. Although diabetes has been listed as a cause, in practice it occurs only very occasionally. Cataract can be produced by injecting rabbits with naphthalene or even when naphthalene is fed per os. It appears within ten hours and is reversible if the naphthalene is discontinued.

Cataracts are either static or progressive. When progressive it is a matter of time before the whole lens becomes opaque and there is complete loss of the vision. Frequently the lens becomes calcareous, which indicates a long standing cataract. The term "mature" or "ripe" is used when the whole of the lens has become opaque, and then becomes a consideration for surgical intervention.

There is no medical treatment for cataract, and the only aid the veterinarian can give the dog is the removal of the lens. The operation, even when performed by the most skilled and experienced, gives only low success rates. In comparison with human beings the anatomical differences from the point of view of the surgeon are that the lens is relatively larger in the dog, requiring a bigger corneal incision, the iris is more vascular in the dog and if injured will bleed freely, obscuring completely the field of operation, and, if this blood cannot be washed away, it will eventuate in a corneal opacity. The zonule of Zinn, the suspensory ligament of the lens, is tougher in the dog; this requires the zonular fibres to be severed with Snellen's vectis, and the technique of "lens rocking" often employed in human surgery cannot be applied to dogs.

Furthermore, humans often see quite well after the removal of a lens, because the cornea has a higher refractive index than the lens, whereas in dogs and other domestic animals the reverse is the case. In any case humans are able to wear glasses for any correction required. When goggles have been fitted to dogs they tend to look at the lens of the goggles rather than through the lens. This often causes a state of panic.

Pigmentary Keratitis

In all breeds, but particularly in Pekes and Pugs, and occurring in one or both eyes, age often produces a pigmentary keratitis. It is a chronic and progressive condition, and a brown-black melanosis creeps over the whole of the cornea to impede the sight until vision becomes nil.

In many cases the cause is some continuous form of irritation such as distichiasis or entropion or in the brachicephalic where there is a large nose wrinkle, the hairs from this wrinkle often impinge on the cornea and cause an irritation. In the exophthalmic type of dog with the prominent eyes, more of the cornea is exposed to the desiccating and cooling effects of the wind. Also in these breeds the actinic effect of sunlight must have a greater effect on the cornea than other breeds. In addition, it has been found that the exophthalmic type of dog has a reduced sensitivity of the cornea, and therefore a reduced protective mechanism. This is verified by the fact that Pekes often carry a corneal ulcer with little evidence of photophobia, blepharospasm or other symptoms of pain.

Another factor which may cause a persistent irritation of the cornea is the heavy brow in some breeds such as the Cocker Spaniel and Bulldog. The weight of the brow is sufficient to force the eyelashes against the eyeballs. Wherever it is possible to relieve the patient of the irritant agent, progress of the pigmentary keratitis may be halted for a while. Distichiasis and entropion can both be relieved by an entropion operation, and it has been found effective to perform a cosmetic operation to the brow by excising a large portion of skin. In the case of a nose wrinkle many ofthe irritating hairs can be smoothed down with a daily application of vaseline.

Supportive treatment of ophthalmic instillations of broad spectrum antibiotics and cortico-steroids may help to slow down the progressive keratitis, but it is optimistic to hope for resolution of the melanosis.

Chronic Conjunctivitis

Apart from the cases of chronic keratitis, the practioner is often asked to treat cases of chronic conjunctivitis in old dogs. There is usually a mucopurulent discharge from the eyes with blood vessels of the sclera prominent, and the sclera and conjunctiva very reddened. It also frequently happens that the tear ducts are blocked, and the discharges run down the muzzle to form a red brown stripe from the medial canthus of both eyes.

The condition is usually very resistant to treatment because the cause of the trouble lies in a general drop in the systemic resistance. Chronic nephritis or chronic hepatitis, severe verminosis or septic foci such as bad teeth are examples likely to drop the resistance, and the first line of defence becomes subject to catarrhal or mucopurulent inflammatory conditions. No useful purpose will be served if the condition alone is treated; it is imperative to look elsewhere for the cause and alleviate that before any hope of success can be achieved with the eyes.

New Growths of the Eyelids

Papillomata, pigmented or unpigmented are frequently encountered in the senescent dog, especially along the free borders of the lids. When they impinge on the eyeball they will cause a mild chronic keratitis or conjunctivitis, and, as a rule, show no tendency towards malignancy. They should be removed and thermo-cautery applied to their bases.

In a like fashion Meibomian cysts should be squeezed out and curetted or cauterised.

All the above conditions apply to dogs. Cats, on the other hand, have eyes better protected, more sensitive, and less subject to trauma than dogs, and are therefore more fortunate in having almost no senile eye conditions to worry them in the twilight of their lives.

SYMPOSIUM: GERIATRICS OF SMALL ANIMALS

SKIN DISEASE IN THE AGING DOG AND CAT

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SUMMARY

Skin diseases of the aging dog and cat are discussed. Various known etiological factors are listed. Stress has been placed on thorough clinical investigation, including blood, urine and stool tests, skin biopsies and cultures.

INTRODUCTION

Skin cases are generally among the most unsatisfactory of our daily work. The owners of our patients seldom give us the time to investigate such cases as thoroughly as we would like to do. If no marked improvement is forthcoming after two or three consulations he is ready to move on to another practitioner and any eliminative evidence is lost unless consultation takes place between the old and the new practitioner. This unfortunately seldom happens.

However, these cases are a challenge to us and particularly a challenge to the care and extent of our clinical examinations. I would stress that it is no less important to have a complete clinical check up of our skin patient than in any other obscure clinical entity.

Since this paper is aimed essentially at covering the skin diseases of the older patient, we may briefly dismiss the ectoparasites and fungus infections.

Remember, however, that these may still be present as a primary or complicating factor. A striking example was a recent cross bred Alsatian of 12 years of age presented to us with generalised demodectic mange.

DIET

Diet merits a few words. It is my opinion that an animal requires extra care with his diet during two phases of his life — namely — those of growing up and growing old.

Protein should be of good quality and easily digestible. The amount depends on the individual and on disease processes which may be present (e.g. nephritis).

Carbohydrate should be present preferably as brown bread or oatmeal but in fat, sterilized animals this may be minimal.

Vegetables if acceptable to the patient provide useful bulk and may supply vitamins and mineral salts.

Vitamins. A supply of Vitamins A and B Complex should be assured and there is evidence to suggest that Vitamin C should be added in skin cases.

Minerals. Calcium and phosphorus preferably as dicalcium phosphate should be present. Deficiency of magnesium has been implicated in skin erythemas. Trace elements in known deficient areas may help.

Iodine deficiency has caused poor hair growth and a tendency to retain dead coat. Its association with thyroid function alone merits the addition of one drop of Lugol's iodine daily in water.

Fats. Deficiency of fat is recognised more and more as a comparatively common cause of skin lesions. The regular addition of a teaspoonful of sunflower seed oil, margarine, linseed oil or, according to some authors, lard, will satisfy the daily requirement of a 20–25 lb dog.

Water should be in free supply.

Skin Lesions

If we assume, then, that in our older patients the diet is as nearly perfect as we can make it, and that external parasites or irritants are not present, we are ready to tackle the complex etiology.

Degenerative changes in various organs; hypo or hyper function of any of the endocrine glands; internal tumours; or dysfunctions of the digestive or excretory systems — may lead to a chemical imbalance or toxic state producing a reaction on the surface of the body. This reaction is our skin lesion.

Lesions on the skin may be further complicated by self-inflicted trauma (rubbing, biting, licking, scratching) and by secondary bacterial or fungus invasion.

Enlarging on this, we have the following internal conditions which have produced skin lesions:

Biliary Obstruction

This gives rise to defective digestion of fats, and, in addition, consequent defective absorption of the fat soluble vitamins.

Claycoloured stool with free fat on microscopic examination, plus blood and urine tests should assist in diagnosis.

Diabetes Mellitus

This produces the obvious upset in carbohydrate metabolism. The usually ravenous appetite, great thirst, wasting and eye lesions should produce suspicious symptoms, with confirmation by blood and urine tests.

Diet adjustment plus insulin produces consequent rapid skin improvement. ('Rastinon', the oral anti-diabetic, has produced poor results in my few true diabetes cases).

Enteritis—Colitis (chronic) may produce defective digestion and food

absorption and a degree of toxaemia. Routine treatment plus injected Vitamins of B. Complex usually alleviate the parallel skin eczema.

Hypothyroidism

No gross thyroid changes may be palpable but the fat, sluggish dog with areas of alopecia of almost identical bilateral appearance should be suspect. (This bilateral "butterfly" appearance is also seen in spayed bitches and neutered cats of both sexes). The skin is seldom irritable.

Thyroid extract at the dose of 1 grain per 10 lb plus 1 or 2 drops of Lugol's iodine in water daily usually results in new hair growth.

Liver. (Chronic inflammation. Cirrhosis. Tumours.)

It has been my unfortunate experience that, in many cases of intractable skin diseases of the old dog and cat, the probable cause was only discovered at post mortem, and was found to be grossly enlarged liver, cirrhosis or carcinoma.

Liver function tests may assist in some of these cases but the skin disease resulting from such cases would be of academic importance in the main. Methionine choline, bile salts and B group Vitamins would assist in such cases.

Nephritis (chronic)

Clinical diagnosis is not difficult and urine tests should confirm.

Here, skin disease is the result of a toxic state or perhaps represents an attempt by the skin to function as an accessory excretory organ.

The lesions themselves are usually thickened and crusty and exude a urinous odour.

Treatment of kidney disease per se, reducing protein, balancing other dietetic factors and local treatment of skin secondaries should improve the skin providing the kidney disease is controllable.

Pancreatic duct obstruction also leads to defective fat metabolism or a fat gassy, bubbling stool (steatorrhea). "Panteric Co." (Parke Davis) assists greatly.

Septic States

Bad teeth, septic mouth, chronic tonsillitis and abcesses, metritis — to name a few — once treated medically or surgically, produce a marked improvement in many chronic skin conditions.

Sex Hormones

The removal of sex hormones by sterilisation or their over or under production has a considerable but variable result on the skin.

Castration and spaying frequently lead to alopecia in the dog and the cat in later life.

On the other hand, dogs of both sexes have been sterilized as a last resort in intractable eczema and have responded. Could this be a hyperfunction?

Similarly, large doses of stilboestrol in apparently hopeless cases of eczema in dogs has had a spectacular effect.

In old unspayed females of fat, hypogonadic appearance stilboestrol helps the skin lesions usually in conjunction with thyroid extract.

I should like to say a special word here about cryptorchids. In old age most of these have skin troubles and removal of the abdominal testis (testes), usually grossly swollen — produces a rapid recovery.

It is convenient here to discuss the Sertoli cell tumour of the testis. This produces chronic skin disease, teat enlargement and pendulous prepuce reputedly due to excessive oestrogen production by the tumour. Surgical removal brings about rapid clearing of skin lesions and new growth of hair.

Uncommon Endocrine Disorders

Pituitary and adrenal tumours and dysfunctions have been described as causes of skin disease in dogs or cats similar to Cushing's syndrome in man (pituitary tumour and related adrenal changes).

Signs reported were bilateral loss of hair; remaining hair was down-like and easily plucked out. Marked pigmentation occurred. Animals were weak and lethargic and polyuria and great thirst were present.

Internal Parasites

In spite of the assumption that worms are mainly the young dogs' enemy I make no apology for including them as a cause of old dog's skin trouble. They may be only a contributing cause but, on many occasions, gross infestations have been found on stool examination.

On treating — usually for hook or tape worm, improvement has been marked. Needless to say not only one of these states may be present and in the old dog or cat, two or more frequently exist.

Breed Susceptibility or Hereditary Predisposition

The following breeds of dog show a susceptibility to skin disease; some throughout life but mostly appearing or becoming worse after middle age. Part of this may be due to the process of aging plus some of the preceding internal predisposing factors, but the high incidence in these breeds is suggestive of an hereditary factor.

Dachshund: Alopecia. Frictional Acanthoses. Thickened skin of legs and chest and ventral abdomen.

Chow: Scaly eczema of the loins, and lower back, tail and upper hind legs.

Scottish Terriers and Wire Haired: Thickened crusty lumbar eczema extending down the hind legs occasionally pigmented in Wire haired terriers.

Corgi: An eczema similar to that of terriers bur frequently pigmented (*Acanthoses migricans*).

Labradors: Peculiar tendency to indolent raw ulcer on dorsum of carpus or tarsus. So-called *lichenification.*

White Bull Terriers and White Bulldogs: Chronic eczema of head and lower back frequently with pustules.

Dalmatians: Generalised eczema similar to that of white bull terriers. The possibility of lack of skin pigment and skin sensitisation to sunlight might be an additional factor in these breeds.

Pointers: The majority have skin papillomata and cystic tumours of the skin later in life.

Miscellaneous Conditions

Allergies

These occur at all ages. Skin reactions may vary from urticaria to acute moist eczema. Usually a diet change is incriminated and dietetic juggling plus anti-histaminics and local treatment produce a quick response.

External allergies may occur to grasses, drugs and even fleas.

Mental Cause (neurosis)

An old Dachshund with intractable urticaria recovered after close on two years treatment and frustrating diet changes when the Alsatian next door was transferred with its owners up country. This happened some years ago. Similar cases occur with nervous dogs of all ages coming to one's surgery, if observed carefully.

Sedation plus atropine is the treatment of choice if such a neurosis continues.

B.O. or Foul odour from Skin

This is a lesion-less skin condition. The skin may look in excellent condition. The foul smell given off is undescribably bad.

Dogs are usually brought because no one can stand their presence and the owner has my sympathy. The smell is purely from the skin. The breath may be sweet, teeth and mouth clean, digestion and kidney function normal — yet the odour persists. It may be that these cases have overdeveloped or overactive apocrine type glands.

Chlorophyll and perfumed talc have been my only weapons and I invite suggestions from my colleagues.

Skin Lesions and Their Sites

Head

The most common aging lesions are:

(1) Ulceration of the nasal alae. This is very resistant to treatment and often invades backwards, appearing to be cancerous.
(2) Flaky dry eczema on the nose. This occurs on unpigmented skin and is frequently seen in Collies. Also photo-sensitisation.
(3) Furunculosis of the nose and chin. This is also troublesome to treat. It is usually staphylococcal and prostaphyllin parenterally has recently given good results combined with local treatment.

Mouth-Prepuce or *Mouth-Vulvar syndrome*

This is a most resistant condition, mouth-prepuce lesions being most

common. When presented, both lesions are usually present—flat, slightly swollen and moist, depigmented, indolent ulcers on the lips and corners of the mouth (occasionally crusting and bleeding occurs here) and an identical lesion surrounds the preputial orifice. Biopsies and cultures have been unsatisfactory so far. Treatments of every type are, in the main, unsatisfactory.

In one bad case of this nature in a seven year old Alsatian Dog I was fortunate in having the assistance of Dr. G. de Kock then at Liesbeek Cancer Clinic. Biopsies from mouth and prepuce suggested malignancy. A course of intravenous mustine (nitrogen mustard) produced a temporary improvement. X-ray treatment under anaesthesia was undertaken with no great benefit. Radio active thorium was tried with, again, little success.

In desperation, 20 mg. stilboestrol was given orally for two weeks. Healing was complete and remained so for one year. A slight recurrence was controlled rapidly with repeat of stilboestrol. I apologise for dealing particularly with this case but the intractibility merits a full airing.

I must add that stilboestrol has not been the answer to later cases. Some have benefited from large doses of vit. B complex and vit. A by injection daily for 10 days; some have responded to antibiotics — some to arsenic; but the percentage of success has been small.

Chronic Otitis Externa

Needs little description. Suffice it to say that if medical treatment is not producing a rapid result, a drainage operation offers the best solution.

Periorbital Eczema

Often accompanied by apparent semi-paralysis of the eyelids—frequently in old Spaniels.

Usually responds to cortico steroid and antibiotics treatment locally.

"Fold" eczema

A wet condition of the skin associated with folds of the nose, and mouth in Pekes, Bulldogs, Spaniels, Bull Mastiffs — often with secondary infection.

Lesions of the Body

Eczemas of all types may be present, particularly in the lumbar, sacral and coccygeal areas.

More specifically the anus may show hyperplasia of the perineal glands or septic sinuses in them.

Again, the anal sacs frequently become septic after occlusion and ulcerate outwards.

The scrotum may become ulcerated or affected by haemangiomatoses.

Dachshunds and the occasional Corgi or low-slung Scottie seem to monopolise the condition of frictional acanthosis — a thickened black elephant-like skin lesion under the forearms and occasionally across the chest and inside the hind legs — presumably caused by the rubbing of the skin surfaces in contact.

Lesions of the Legs and Feet

Chronic induration of hocks and elbows is frequent often with secondary infection.

Interdigital eczema and cysts are common problems.

Septic nailbeds resulting from overgrown nails and hyperkeratosis of the pads again are frequent.

Trophic ulcers on the feet and pads present a problem. These result from nerve damage and refuse to heal. Excision — electro-desiccation, etc. have only increased their size.

Tumours of the Skin

A wide range of tumours has been identified from multiple small papillomata, melanomata, haemangiomata, sarcomata and carcinomata. Pathologically they are of great interest but clinically we can only shrivel the small growths with electro-desiccation or where practicable, remove the larger ones surgically.

CAT

The cat appears to have been neglected up to this point but it has been convenient to deal with this problem separately.

Generally speaking the origin of skin trouble in the cat is similar to that of the dog but the rasp-like quality of its tongue is an aggravating factor in self trauma.

Dietetically it is not surprising that most cats which only have meat or fish and milk, develop chronic skin troubles. Hence the almost magical properties of certain proprietary tablets and powders.

Diet, therefore, should be gone into carefully.

So-called "fish eczema" possibly exists but probably this was a convenient scapegoat in the past.

Jennings suggests that a fish diet requires fleas to produce the eczematous lesions.

Some Particular Skin Conditions in the Cat

Ulceration of, and with, carcinoma of the nose

Treatment has been tried unsuccessfully and the frequent haemorrhages bring rapid requests for euthanasia.

Rodent ulcer of the upper lip

Frequent applications of Gentian violet appear to control this. A recent report held that betamethasone was successful parenterally. Cautery has also been successful.

Photosensitisation

These lesions occur along the line of the tip of the ear, below the eye; on the eyelids in white cats or in multicoloured cats with white ears and/or face. A slight reddening is followed by an ash-like deposit and this progresses to crusty excrescences, which rapidly destroy the ear flap. Biopsies at this stage confirm carcinoma.

Prevention is by artificially pigmenting ear — giving large doses of Vitamin A ("sylvasun") and keeping out of the sun if possible.

Treatment has been tried but, once established, amputation of the ear offers the only hope.

Miliary eczema

The appearance presented is of seedlike crusts throughout the coat with areas of alopecia and coalescence of crusts to form larger lesions.

It occurs in old neutered male cats.

Testosterone implants

Long acting testosterone injections, corticosteroids, and thyroid iodine treatment have all been successful in conjunction with diet balancing.

Alopecia

Of neutered males or females — responds to thyroid extract iodine and diet.

In eczema

Of neutered females — vitamins and corticosteroids offer the best hope.

Stilboestrol is difficult to use in small enough doses and usually if used makes the cat excessively popular in contra-distinction to the veterinarian who prescribes it!

Wet eczema of the flanks

This almost invariably occurs in cats with spinal arthritis. It appears to produce an almost maniacal desire to lick the flanks — due to nervous irritation. Cortisone or one of the derivatives will cure this if it can alleviate the spinal condition.

Intractable skin disease

I wish to place on record that, as in the dog, many of these have been associated with chronic liver damage or tumour.

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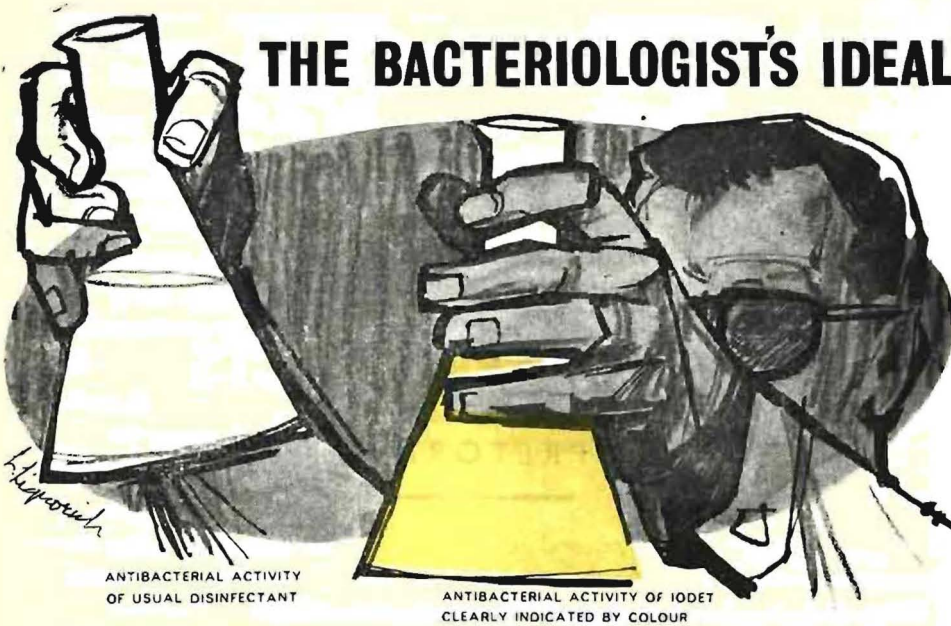

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SYMPOSIUM: GERIATRICS OF SMALL ANIMALS

THE URINARY SYSTEM IN THE AGED DOG

W. E. J. WARNES — 181 Queen Street, Kensington, Johannesburg

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KIDNEYS

INTRODUCTION

Renal insufficiency is a very common condition in the aged canine. There is no particular breed incidence and the sexes are equally affected. Some animals can be affected at a very early age, depending upon any infections the individual may have had during its lifetime.

CAUSE

Primary

Bacterial infections — Bacteraemia-Leptospirosis. L. canicola (not confirmed in South Africa).

Secondary

Secondary infections following cases of distemper and biliary fever. In cases of anaemia due to biliary fever or haemorrhage it is possible that the renal shunt mechanism comes into operation and so starves the renal cortex of blood, causing damage.

Irritants and Irritant Poisons

Injudicious Treatment

Injudicious treatment—certain drugs causing renal damage.

Accidents

Accidents causing severe renal trauma accompanied by haemorrhage and eventual fibrosis.

PATHOLOGY

The most common form of nephritis encountered in the old dog is chronic interstitial nephritis. The increase of fibrous tissue between the tubules gradually leads to impairment of tubular function, particularly reabsorption.

The kidney itself is well pitted, smaller and pale. The capsule generally strips with difficulty. The cortex is white or pale in colour. There is an increase in fibrous tissue. Some of the renal tubules have degenerated and others have become hyperplastic.

In dogs with renal insufficiency there is a state of chronic interstitial nephritis. This state can continue for long periods, but in some cases the climax is hastened by an acute or sub-acute attack of nephritis.

Briefly the symptoms of these attacks are as follows:—

Acute

The animal invariably has a high temperature, very injected mucous membranes and in some cases a secondary tonsillitis. The animal walks with difficulty, showing signs of pain. Abdominal palpation is resented, particularly in the upper lumbar region. Pulse is accelerated and hypertensive. In some cases the urine may contain blood cells and there is a marked albuminuria and anuria. Due to this albumin loss the normal balance between blood and the tissues is deranged and excessive amounts of fluid (and secondarily of salt) flow into the tissue spaces and are retained there. Owing to the fluid retention in the tissues, the urinary output is decreased.

Sub-acute

Symptoms not as marked as acute; lower temperature; animal does not show the same amount of pain, invariably no blood cells in the urine; albuminuria; hypertensive pulse.

Chronic

This form can vary considerably from a slight renal insufficiency, to a complete collapse of renal function.

In the milder forms the animal appears to be losing weight, the coat is dull, smelly and hair loss excessive. The skin is dry and scurvy. The gait is often stilted and the dog gets up and lies down with caution. The eyes have a mucous-pus discharge and may be sunken; the conjunctiva is injected. This is often accompanied by a nasal discharge, frequently dry and crusty and even a mucous-pus discharge resembling distemper.

The appetite is poor and the dog may vomit frequently after eating. Thirst is increased. The dog prefers meat to other foods, but eventually food is refused. In some cases vomiting becomes more frequent, often within minutes of drinking large quantities of water. There may be a marked smell to a slight trace of uraemia in the breath. The cause of these uraemic symptoms is uncertain.

There is little evidence that the accumulation of the end products of protein metabolism is harmful. It is true that excessive amounts of urea fed to humans is toxic, but an important factor may be the increased diuresis and resultant dehydration.

Nitrogenous retention without water loss can be achieved by implanting the ureters into the small intestine, the nitrogenous bodies being reabsorbed.

When their concentration rises markedly, there are no obvious symptoms. There is no close relationship in cases of latent uraemia between blood urea and degree of intoxication.

In uraemic cases, urea is present in high concentration in the intestinal mucosa and it is thought to decompose locally to form ammonia, which

is highly irritating and may be responsible for the gastro-intestinal disturbance. A urease capable of splitting urea and releasing ammonia has been demonstrated in normal gastric mucosa.

Uraemia

The case has now progressed to a high degree of renal insufficiency. The tongue is often copper-coloured. The parietal muscles are atrophied; the mouth often has greenish foul-smelling ulcers, and the teeth covered with a dark brown, foul-smelling slime, accompanied in many instances by drooling from the mouth, of tacky saliva.

The pulse is hypertensive but as the animal becomes weaker, the pulse becomes less bounding. The temperature drops from normal to sub-normal. In the latter stages of chronic nephritis, there is a definite anaemia and it is wise to examine a blood smear to exclude biliary fever.

There is a marked dehydration due to the vomiting, and in spite of the thirst there may be nervous symptoms: in particular, a loss of chloride salts occurs.

Urine examination, and the clinical symptoms, are of value in these cases.

Urine Analysis

The urine may contain the normal amounts of pigments, to the complete absence of pigments. The urine has the appearance of water.

The specific gravity estimation is generally only of value if a twenty-four hour composite sample can be examined. It is important to examine for albumin. In the less acute cases there will be albuminuria, which can gradually change to a trace of albumin and finally a complete absence of albumin, in a severe chronic case.

The urine is centrifuged for about three minutes at 1,500-2,000 r.p.m. There is often a good deposit but in some cases, particularly in the terminal phases, it may be a very scanty.

Examination of deposits often shows epithelial casts usually the result of a complete separation of a mass of tubular cells. Granular casts are normally disintegrated epithelial casts and are formed with a nephritis of longer standing. Hyaline casts are slightly refractile and homogenous, and consist of protein — normally a sign of an old-standing nephritis.

The urine is usually alkaline.

Diagnosis

Urine analysis on its own does not suffice to make a fair diagnosis, for it must be combined with other clinical findings. If a composite twenty-four hour sample of urine can be obtained, the specific gravity is of value. A low specific gravity will indicate lack of absorption by the tubular epithelium. The presence in the urine of albumin, and casts, and a determination of their type together with a blood urea estimation will be of value in arriving at a prognosis. In health the blood urea level will vary with the protein intake. A rise of blood urea is a sensitive index of renal failure, if the protein intake is high. On a low protein intake con-

siderable renal failure may be present, without the blood urea rising above the normal upper limit.

If practical, a urea concentration test could be carried out.

Differential Diagnosis

Gastritis.

Gastro-enteritis.

Foreign bodies particularly in the stomach or small intestine when they do not completely occlude the bowel.

Constipation causing vomiting particularly in old dogs fed on dog biscuits, bones or butchers saw cuttings.

Diabetes Mellitus.

Treatment

When the kidneys are fibrosed and the renal function is failing, treat, ment can be a difficult task.

Firstly, if the animal has any focus of infection, this should be removed. Bad teeth should be extracted. Any localised infected tumours or skin infections must be cleared up.

The blood urea level should be controlled as much as possible. The dog should be fed on a diet low in protein, which must be of high quality. Protein may perhaps also help by stimulating metabolism and by giving rise to urea which acts as a powerful diuretic. Water soluble vitamins are generally lost in excessive amounts and must be replaced. Vomiting must be controlled as this combined with polyuria leads to rapid dehydration.

The failing heart and circulation will require attention. If there is anuria a diuretic may be of help.

Excessive exercise must be avoided and so should excessive protein intake, i.e. meat. If the animal is hospitalized facilities for frequent micturition must be provided.

In cases of dehydration, glucose saline or normal sodium chloride should be administered by slow intravenous drip. The animal must be comfortably warm and should be fed preferably small meals three to four times daily. Peritoneal lavage, if uraemic, may be of value but is merely palliative.

The electrolyte balance must be restored if possible and in these cases it is often wise to give normal sodium chloride intravenously.

Adreno-cortico hormone treatment may also be of value.

Ureters

Conditions affecting the ureters in the aged dog are not common.

Bladder

This organ is frequently involved in the old dog, due to—

Infections.

Calculi.

Tumours.

Infections

Infection is the most common in the aged animal and may be due to ascending infection, descending infection, bacteriaemia, the use of non-sterile catheters, and irritations due to calculi.

Ascending Infections: In the bitch, due to an infection of the uterus or the vagina. In the male due to an infection of the prostate or the urethra or balanitis.

Descending Infections: Due to kidney infections or actual abscesses in the kidney or pelvis of the kidney.

Bladder infections often arise in old dogs when they are kenneled or hospitalised with infrequent opportunities to urinate. The bladder often becomes excessively stretched, and may lead to a partial paralysis with emptying only due to over-spilling.

The bladder wall is often thickened and may be tender on palpation. Albumin is present in the urine, often accompanied by blood cells and pus cells. Centrifuged samples of urine must be examined after the deposits have been stained for organisms and bladder cells. The animal will also make frequent attempts at urinating. Often only small quantities of urine will be voided. The reaction of the urine is often alkaline.

Treatment: Antibiotics and chemo-therapeutic agents and acidify urine.

Calculi

Can be fairly common in middle-aged and younger dogs and are therefore excluded.

Tumours

Tumours are not very common in the bladder of canines.

PROSTATE

Enlargement of the prostate can be due to infections, tumours or simple hyperplasia.

Infections

Normally the animal runs a high temperature and is definitely in pain. Blood and pus may be present in the urine. If a gum elastic catheter is passed, just a few cc.s of blood-stained urine will be passed and clear urine will normally follow as the catheter is introduced into the bladder. Attempts at defaecation will be made. The animal is usually constipated. Rectal palpation and abdominal palpation of the gland will be resented as it is normally very painful. Vomiting may also be a feature of the illness.

Treatment

Usual antibiotic treatment, particularly penicillin and streptomycin intramuscularly.

Tumours

Tumours of the prostate are not very common. The animal will not show signs of pain to the same extent as infections of the prostate gland. There will be constipation and frequent attempts at defaecation. Tumours may be confused with hyperplasia of the gland. In hyperplasia the gland will normally be firmer and the enlargement bilateral, and symmetrical. With tumours only part of the prostate may be affected, with consequent enlargement of the one side only.

Treatment

Removal of the tumours, if possible.

Hyperplasia

Stilboestrol injections or oral therapy.

These enlargements of the prostate with attempts at defaecation, may lead to a perineal hernia or aggravate the development of perineal hernia.

URETHRA

Conditions of the urethra are not discussed as it is usually associated with calculi. causing damage in their passage from the bladder.

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SYMPOSIUM: GERIATRICS OF SMALL ANIMALS

SOME CONDITIONS REQUIRING SURGERY IN AGED DOGS

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SUMMARY

The purpose of this short paper is to cover some of the surgical interferences performed on aged dogs. I have not attempted to detail operative procedure, as this is usually well known or can be easily learnt from reference books; but to mention a few points that we have found helpful in saving the animals' health and lives.

TARTAR, GUM RECESSION AND PYORRHOEA

To remove a small amount of tartar or remove, say, one or two loose incisor teeth, no anaesthetic is required. For any other interference involving the removal of tartar and for the extraction of teeth a general anaesthetic, provided the animal is able to withstand one, is advisable in in order to complete the operation satisfactorily. Massive tartar is removed by "cracking" it cleanly off the teeth, using tooth forceps. Thin tartar and that near the gum is usually removed with a tooth scaler. Great care should be taken to remove tartar in contact with or actually under the gum, thoroughly, without damaging the gum itself. It is this tartar, which if left, causes gum recession and later pyorrhoea.

A small motor driven dental drill is a great help. Metal burrs will remove tartar beautifully, being followed by a polisher. This latter is excellent for removing brown stain from the surface of the teeth.

The backs of the teeth and interdental spaces should not be neglected.

When there has been extensive loss of alveolar bone and infection of the socket and root tooth, extraction is necessary and usually very easy.

When extracting molar or canine teeth in old patients it is usually only necessary to insinuate the forceps high up beneath the gums and obtain a firm hold. With rotatory and lateral movements the tooth is loosened and extracted.

Deposits of tartar are said to be induced by acidity of the saliva. Regular mouth washes of an alkali solution, such as bicarbonate of soda, given by the owner often seem to help.

Scaling should be undertaken regularly, say every three to six months, to keep an old dog's mouth in good order.

URETHRAL AND CYSTIC CALCULI

In the female large cystic calculi should be removed surgically. Strangely enough in many cases recurrence does not take place.

Many veterinary surgeons perform both a urethrotomy and cystotomy on cases of urethral obstruction, due to calculi, as a routine.

Personally, I prefer to perform a urethrotomy only to relieve the first attack, as in some cases recurrence does not take place, especially when only a single irregular oxalate type calculus is removed. For relief of subsequent attacks both operations are performed, often resulting in the removal of many hundreds of small calculi from the bladder. If the bladder is lifted through the operation wound and a warm, sterile drape packed carefully round it leaving the bladder incision open, a catheter can be passed up the urethra, via the urethrotomy wound, into the neck of the bladder, and the small multiple calculi flushed out with warm sterile saline solution.

Perineal Hernia

When the hernia contains only omentum and does not increase in size or give rise to objective symptoms, it is usually better to postpone any operative interference until circumstances point to such being necessary.

When the bladder is herniated, the dog is unable to pass urine and is in great discomfort and pain. This can be relieved by cleaning an area of skin over the herniated bladder and passing a long needle through the skin into the bladder and so draining it. If a short needle is used the bladder will soon recede from the needle point as it empties. When the bladder is empty, or nearly so, the needle is removed. It is then usually a simple matter to manipulate the bladder back into the abdomen by palpation. The latter may then be opened and the bladder sutured to the peritoneal wall. This often results in relief from undesirable symptoms for the rest of an old dog's life. In some cases, however, insufficient adhesions are produced and the bladder re-prolapses after a variable period of time, in which case a major repair of the hernia and sac may be attempted.

If the hernia is bilateral the chances of success of this operation are very slight indeed. In the case of unilateral herniation the outlook is slightly better.

Tumours

It is not our practice to attempt removal of obviously malignant tumours, except under exceptional circumstances.

We do, however, feel that if there is doubt as to the malignancy, it is advisable in the interest of both patient and owner to either remove the whole tumour if a small one, or take a biopsy if a large one, and then be guided by the result of a histological examination of the tissue.

Before removing obviously benign tumours from old dogs several factors should be carefully considered, viz. the condition of the patient regarding anaesthetic and operative risk. If the tumour is slow growing or stationary it is rarely removed. To remove a tumour that is not worrying an old patient, and is not likely to, just because the owner does not like the look of it, is, I believe, a great mistake.

Papillomata are common about the body of old dogs and should be carefully dissected out and the skin sutured; if they are to be removed at

all. In many cases this is only necessary if they become ulcerated and thus bleed and become secondarily infected, are rapidly growing, or are in a position which inconveniences the dog, as on the edge of the eyelid.

Many of the soft warty growths are melanotic and recurrent; so it is wise to remove every vestige before suturing.

Small "warts" are usually destroyed by caustics or actual cautery.

Epulides, the smooth looking hard growths found on the gums, usually near the incisor or canine teeth, are usually seen in elderly animals. Again, if not causing inconvenience to the animal they are usually left alone, but preferably re-examined at intervals. Some are pedunculated and can be easily removed. Others are bony and require bone forceps or a saw for their removal. They are very vascular, but the haemorrhage can readily be controlled with a cottonwool pad soaked in ferri perchlor. Teeth are often involved and may need extraction. The chance of re-currence depends upon whether they are fibromata, carcinomata or sarcomata.

Nasal tumours in old dogs are in many cases rapidly locally malignant and are in most cases, in our experience, inoperable. A persistant epistaxis, usually uni-lateral, is often the first sign one gets of trouble, followed by a bloodstained muco-purulent discharge.

Excision of the tumourous prostate gland in the old male dog is exceedingly hazardous and, we believe, is not recommended.

In some cases, the osteosarcoma presents a problem, but in most cases euthanasia is advised immediately. They usually occur in the long bones of the limbs of the breeds where the removal of a limb is a great inconvenience, whereas in, say, a Fox Terrier this is not the case. Also, in many cases they are not presented to the veterinary surgeon until the primary tumour and secondaries are so advanced that amputation of the limb is definitely not indicated. If presented and diagnosed early it is certain that the life of the animal can be prolonged for a variable period by amputation. However, in almost every case, deterioration of the dog occurs sooner or later as a result of secondary tumours.

Adenomata are common in the aged dog and are usually associated with the sebaceous glands of the skin, the mammae, or the circum-anal glands. This latter, the so-called anal adenoma is usually a benign tumour and may attain the size of a golf-ball. It therefore does not normally recur after removal. The limits of the tumour are usually well-defined, so with careful dissection can be removed completely. Great care must be taken not to damage the peri-anal muscle fibres if the tumour en-croaches upon the anus itself. The skin in the peri-anal region is very thin and easily tears; when being sutured the edges should not be opposed too tightly; if so the suture material will soon tear through the delicate skin. Any wound in this region either sutured or otherwise seems to heal very quickly indeed in spite of its position near the anus and under the tail.

Some of these tumours become cystic, the cysts containing inspissated secretory products.

Although pure adenomata are generally regarded as benign and non-metastatic, the frequency with which they assume malignant characters justifies one in always regarding them with suspicion. It is advisable in

the interests of patient and client to obtain a histological report on the removed tissue.

A large adenoma in the wall of the small intestine of an aged Dachshund was removed by performing an enterectomy upon the affected portion of bowel. No macroscopic change could be detected in the mesenteric glands at the time of the operation. The dog has lived in excellent health for a further eighteen months without any complications.

Tumours of the mammary glands are very common among old bitches. They may be benign or malignant, though mostly the former-adenomata. Unless they become ulcerated and or cause the animal discomfort or annoyance, it is not usually necessary to interfere with them. If the growth is obviously becoming rapidly larger it may be better to remove it whilst it is small, than to wait until it has assumed formidable proportions. Mammary tumours always increase in size a few weeks after a normal heat when the blood supply to the glands is increasing considerably. It is therefore at this time that a great majority of these cases are presented. It is advisable not to operate at this time for two very good reasons, unless absolutely necessary. Firstly, if left undisturbed for a few weeks the size of the growth or growths will often recede considerably making operation unnecessary. Secondly, if still necessary after a short period the operation will be much easier due to the reduced size and blood supply of the tumour.

One sometimes encounters cases in which the tumour is malignant and in which, in spite of clean dissection, several new growths appear on the same site at intervals of weeks or months. Provided the new growths are confined to the mammary tissue only, it may be advisable, in the early stages, to perform a complete mammectomy. Once the local lymph glands are obviously affected this is not advisable or beneficial. Total mammectomy may be performed if there are many diffuse, or rapidly growing, defined tumours of several or all of the glands.

Pyometra

If at all possible, complete ovaro-hysterectomy is the best treatment for all cases of closed pyometra and most cases of open pyometra. Unfortunately, this is not always practical due to the condition of the bitch when presented. In some cases marsupialisation under local anaesthetic, followed by ovaro-hysterectomy when the patient gains a little strength gives good results. Constant careful nursing does more than anything after marsupialisation to save a patient's life.

Blindness due to Cataract and Dislocated Lens

The hazards, difficulties and complications of lens extraction in the dog are so numerous, and the resultant advantages so slight that we feel, except in a few rare cases, surgical interference of these cases is not advisable.

Dogs can obviously live a very happy life totally blind, provided they are familiar with their surroundings.

Most cases of subacute or occasional constipation can be dealt with by drug treatment alone; however, many cases of chronic habitual constipation in old patients due to torpid bowel can only be relieved under anaesthetic using forceps. These are usually neglected cases which would have readily responded to drugs or enemas if observed earlier. Unless the owner habitually watches the patient defaecating, or attempting to, the dog is often presented in an advanced state of constipation, where a solid "cement-like" obstruction of dry motion is present just inside the anus pressing against the pelvic canal. If the dog is not vomiting repeatedly, liquid paraffin is given by mouth and allowed to pass through the alimentary canal lubricating the outside of the faecal mass in contact with the bowel wall.

Under a deep anaesthetic the worst of the mass can be removed with safety. An assistant presses on the patient's spine. The operator palpates the faecal mass with the left hand through the abdominal wall, and manipulates the forceps per rectum with the right hand. An old pair of whelping forceps of suitable size are used. The forceps are passed between the mass and bowel wall, guided by the left hand, and lubricated by the liquid paraffin. The mass is usually partially broken down between the forceps and removed. It is then usually possible to bring more motion backwards within reach of the forceps with the left hand. Once the largest and hardest portions have been removed the rest is usually passed with the help of normal laxatives within the next day or two.

It is surprising how quickly the dog recovers and "bucks up" after this interference, provided it is performed very carefully and thoroughly.

SYMPOSIUM: GERIATRICS OF SMALL ANIMALS

SURGICAL ASPECTS OF THE DOG AND CAT IN OLD AGE

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INTRODUCTION

Before considering the surgical problems of the aged dog or cat, let us take a preliminary look at them in a state of health. As in the human subject senility creeps on at very varying ages. A twelve year old fox terrier may be an extremely active creature, capable of quite a lot of violent exercise, whereas a Ridgeback of the same age may be rapidly approaching the end, having suffered from chronic arthritis or posterior paresis for a couple of years. In general, senile changes come gradually, causing a lowering of the metabolic rate, slower pulse and respiration and a general increase of fibrous tissue in muscles and arteries. The mode of life of the old pet animal has usually settled down to a quiet humdrum repetition of habits, and, if nothing happens to disturb this, he may attain a maximum span of life. But it must always be remembered that the state of health is much more easily disturbed in the aged animal than in the young one. For example a minor accident or administration of an anaesthetic for, say, tooth removal, may cause kidney collapse, when, up to then these organs have been maintaining sufficient function to cause no symptoms. This severe reaction to any form of stress must always be borne in mind by the practitioner when giving a prognosis. A case can be recalled of a 12 year old Welsh Corgi bitch which was run over and sustained a comparatively minor fracture of the pelvis, with no damage to the bladder. Up to this time she had been a very hearty old dog with an excellent appetite, although suffering from other conditions — a bad chronic eczema, an inguinal hernia and a chronic emphysematous cough. The shock from the accident was minimal and over in a few hours, but within three days she had completely gone to pieces, with acute vomiting and diarrhoea, secondary pneumonia and collapse, dying on the fourth day after the accident.

COMMONEST CAUSES FOR SURGICAL INTERFERENCE IN THE AGED SMALL ANIMAL

Tumours of all types are the commonest reason for operating on old dogs and cats.

Taking an analysis from our records of 846 dogs and cats known to be over 8 years of age, operated on during the last ten years, 44 per cent of all these were performed for the removal of tumours, 13 per cent were for the removal and cleaning of teeth, 7 per cent for hysterectomy for

pyometritis, and 2 per cent for the repair of herniae. The remaining 34 per cent were for other various surgical procedures including othaematomas, aural resection, laparotomies, extirpation of eyes, etc.

Repairs of inguinal herniae in the old bitch are relatively simple and give promise of a permanent cure, unlike the repair of perineal herniae. We have had very little experience of this operation and would be pleased to hear from any colleague who has had any measure of success with it.

Anaesthesia

We have found that old dogs and cats have, as a general rule a high tolerance to intravenous thiopentone anaesthetics. This method has been used for the past 10 or 12 years and has proved highly satisfactory, particularly in aged animals. For major surgical interference the required dose is given slowly to give deep anaesthesia and the needle left in the vein, the syringe being tied on to the leg and more anaesthetic given when necessary during the course of the operation. All major surgery is done using this anaesthetic, except the longer operations, such as double aural resection, removal of dermoid cysts in the Ridgeback, or in old dogs excision of large neoplasms when "Nembutal" or "Sagatal" is used. Providing an assistant is available during operation, we feel that the use of thiopentone is preferred since the recovery period is much shorter and it is considerably less dangerous in old or "toxic" animals.

Closed circuit anaesthesia using fluothane is extremely safe and easily controllable in the old patient, but has the drawbacks of requiring preliminary narcotization with "Themalon" and intubation, as well as an assistant to act as anaesthetist, during the whole course of the operation.

Here we may say a word about the use of tranquillizers such as chlorpromazine and its derivatives in our old patients. There is no doubt that their sensitivity to these drugs is high and the effects of a normal dose of "Largactil" or "Siquil" can be both alarming and prolonged, sometimes causing inco-ordination for days. A small dosage only should be given primarly, to see if any such sensitivity exists.

Sequelae to Surgical Interference

Resistance to surgical shock seems to be fairly high in the healthy dog. For example, many old dogs can survive an operation for the removal of very extensive tumours with very little sign of shock. However, in dealing with an already "toxic" subject, as in a case of say, a pyometritis, it is a very different matter and such sequelae as kidney collapse can be encountered. The onset of this causes symptoms of vomiting, depression, diarrhoea and dehydration, followed fairly rapidly by uraemic convulsions and death. Once this chain of symptoms has started, the condition seems irreversible and nothing seems to alter the end result.

On post mortem it is usually found that these animals have had a chronic nephritis and the toxaemia from the infection and subsequent surgical interference have just precipitated the end.

Pneumonia has seemed to us to be a rarity as a sequel to operation. It is much more common, as in the human subject, after gross shock and trauma, such as road accidents or extensive fight wounds and mauling.

The value of cortisone post-operatively and in conditions of stress such as these is well known, but we have also found that massive vitamin B complex given intravenously with dextrose is a useful adjunct in combatting post-operative shock, particularly when there is any liver disfunction. This massive vitamin B therapy has apparently proved of considerable value in the senile human patient, and undoubtedly will do so in the small animal field.

There is little need, we feel to stress the importance of good nursing, warmth and administration of fluids by the mouth post-operatively in the old animal, where it is much more necessary than in the young subject.

Hospitalization of Aged Animals

The adaptability of animals to strange surroundings varies greatly, but we feel that there is no doubt that the old patient hates being away from its own home far more than the young one. One does, of course, find the old dog or cat who has spent his life in and out of kennels and takes all changes most philosophically, but, generally speaking, the slightly nervous pet dog is not a good subject for hospitalization, especially when advanced in years. So, with these dogs, we tend to get the typical picture of an animal crouched at the back of a hospital kennel, thoroughly miserable, refusing all food, resenting any handling and really not caring whether he lives or dies. If possible at all it is better for such dogs to be nursed at home, if the owner can be persuaded to spend the necessary time and interest on them and is capable of following professional instructions.

Where this is impossible, such dogs need quiet and gentle handling to inspire some degree of confidence in their new surroundings. The majority of old dogs in hospital respond to this treatment after a few days or a week, but there are some which will fret all the time they are away from home and if possible the owner should be persuaded to take them out of hospital. Luckily most owners are only too flattered to think their dog cannot live without them and no veterinarian's reputation is enhanced by insisting on keeping them hospitalized.

Euthanasia

I would like to finish with a few words on the situations in which the destruction of our old patients is desirable. In all cases this question has to be discussed thoroughly with the owner of the dog, and in no case, we feel, can a veterinary surgeon force the decision to destroy a dog on to its owner, but can only strongly advise it. There are dog and cat owners who will never agree to it on moral grounds, and there are those who really welcome the suggestion and have subconsciously been waiting for the veterinarian to suggest it in order to relieve them of the responsibility of introducing the idea.

Speaking generally, we try to persuade owners to keep their old pets whilst the animal can get a little enjoyment out of life, even in spite of the old chronic troubles such as arthritic joints, or irritable skin or ears. After all, many aged human beings have chronic ailments and yet manage to lead a relatively active and enjoyable life.

Quite obviously, if an animal has a malignant neoplasm, an ascites

which makes moving about a great difficulty, or is so crippled that he is unable to walk, then euthanasia is the best course. Destruction on the grounds of old age alone is to be deplored.

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*SYMPOSIUM: THE CHANGING ROLE OF THE VETERINARIAN IN THE MODERN WORLD

VETERINARY RESEARCH

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Veterinary research, which played only a marginal rôle in the world of the nineteenth century, has become so important in the twentieth century that all countries relying on their animal industry for the supply of protein, maintain highly developed veterinary research organizations. Research is depended upon to reveal the variety and complexity of the aetiology of disease and the factors underlying animal health.

In veterinary research the individual approach to the solution of problems has been replaced by a multi-disciplined approach in accordance with the trend in scientific investigation in general. While in the past a single investigator described the aetiology, pathogenesis and many other aspects of a disease, it is at present common practice for teams of research workers to study single problems. Such teams consist of epizootiologists, pathologists, biochemists, physicists or specialists in other related fields of learning. The result is a more profound and complete study which is more likely to lead to an entire solution than the efforts of a single worker. As a result of this logical tendency larger research establishments have systematically replaced many smaller institutions.

Due to sustained research development, certain of the older disciplines, e.g., bacteriology, have undergone impressive changes. The introduction of gel diffusion and precipitation techniques, immunochemistry, electrophoresis and chromatography has widened the scope of modern bacteriology and brings us nearer to understanding phenomena which were completely obscure some twenty years ago. Bacteriophages are harnessed to classify bacteria and elucidate epizootiological problems. Biochemical and biophysical methods are used to study the exact growth requirements of bacteria and this in turn leads to the possibility of large scale cultivation of certain organisms for the production of prophylactics. Antibiotics and other modern drugs enable research workers to control the growth of most species of bacteria both *in vivo* and *in vitro*.

Substantial progress has been made in virology during the past fifteen years. The major problems encountered by virologists today are the chemical complexity of the virus itself, the multiplicity of virus strains within types, the difficulty of identifying and propagating viruses and the elucidation of their rôle in the production of animal disease. The modern virologist, however, has at his disposal vastly improved techniques, such as the propagation of viruses in developing egg embryos or tissue culture,

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and freeze-drying to prolong their viability. Biophysical methods serve to purify viruses and determine their characteristics.

What has proved to be of immense practical significance is the characteristic of many pathogenic viruses to lose their virulence while retaining their immunogenicity on serial passage in an unnatural host system. This phenomenon is commonly harnessed for the production of prophylactics in our campaign against virus disease. Lumpy skin disease virus, for instance, is no longer pathogenic for cattle after twenty passages in developing egg embryos but protects injected animals against the original disease. Live, attenuated vaccines, produced in this way, have the added advantage of producing a lasting immunity. As a result epizootic diseases, e.g., horsesickness, rinderpest and bluetongue can be controlled with relative ease and at incalculable economic saving.

During recent years the attention of veterinary research scientists has been focussed increasingly on the problem of animal trypanosomiasis, a disease which prevents the establishment of a cattle industry in vast areas of the African continent. Difficulties arise in curative and preventive therapy due to the development of drug-resistant strains of the trypanosome, and the eradication of the insect vector, *Glossina*, appears to be physically impossible as yet. Modern veterinary researchers, especially in Africa, are not only faced with the rôle played by game animals in harbouring pathogenic trypanosomes, but also the fact that they can serve as reservoirs or vectors of other livestock diseases, e.g., foot and mouth disease, malignant catarrh and rabies. Detailed studies in this field are urgently required.

Pathologists are today called upon to investigate diseases at the cellular level. With the aid of electron microscopes and histochemical techniques the changes occurring in the cell nucleus or protoplasm are observed and interpreted.

While previously diseases were studied in terms of clinically detectable symptoms, the present approach is to investigate the chemical changes and enzyme activities brought about in body fluids and tissues in the minutest detail. This new fundamental approach, although very exacting, enables investigators to explain symptoms and find rational methods of treatment.

With the rapid growth of research in nuclear physics and high level radiation, and the practical applications to which this research is being put, great importance now attaches to problems relating to the effect of ionizing radiations on the living cell and to the repercussions of these effects on organisms in general. With the aid of radio-isotope tracers the basic chemical and physical processes of cell life are studied. By the use of labelled amino-acids or other components of living matter, many phenomena about cellular metabolism are clarified. The same techniques are used to investigate the different metabolic diseases with remarkable success. An outstanding practical result which has thus far accrued from the application of irradiation to veterinary science, is the control of the screw-worm threat by the liberation of artificially sterilized males. Further significant results can be expected.

The present day veterinary physiologist has many incentives for research as a result of the new possibilities offered by technical progress

and the demands of practical application. The advances in electronic techniques, the use of the electron microscope and of tracers, the progress in developing methods of identification, separation and quantitative biochemical micro-analysis, the considerable increase in the number of biologically active synthetic products, now afford the research physiologist powerful means of investigation. Research is concentrated on endocrinology, rumen function, metabolism of the ruminant, liver function and renal physiology.

Entomologists are presently in the fortunate position of having synthetic insecticides for the control of insects but are also faced with the problem of insects developing a resistance to these substances. With the object of elucidating the role of insect vectors in the transmission of disease and learning more about their bionomics, attempts are made at colonizing various insects. Considerable success has already been achieved, although the requirements for breeding insects under artificial conditions are very exacting and may vary from species to species.

Modern parasitologists study the ecology of worm infestations both inside and outside the animal in order to increase the efficiency of control methods. While previously the study of immunology was the preserve of the bacteriologist or virologist, it is now also applied to parasitology in the investigation of the host-parasite relationship. In the field of anthelminthic therapy the research undertaken by the pharmaceutical industry has already and is still producing spectacular results. The possibility to free an animal completely against worm infestation, e.g., lung worms, has become a reality and research on the extension of this principle continues.

All modern research is dependent on advanced techniques; at the same time it is true that new techniques open ever increasing fields of research. There are more tools at our disposal to lighten our burden, but they also uncover more problems. As an example, gel-precipitin tests and immuno-electrophoresis have enabled protozoologists to investigate problems connected with drug-resistance in trypanosomes. Fluorescent antibody techniques are applied to study preimmunity, and tissue cultures to elucidate the life cycles of protozoa. While previously research scientists were satisfied to work with microscopes, centrifuges, test tubes and relatively simple bacteriological media, in modern times they have to be acquainted with ultra-centrifuges, refrigerated centrifuges, photo-electric colorimeters, electrophoresis apparatus, electronic recorders and complex synthetic media.

The breeding and care of experimental animals have become specialised to satisfy specific demands. In spite of the development of tissue cultures and specialized media for the multiplication of viruses, bacteria and protozoa, the use of experimental animals has increased with the vast extension of research. Certain experimental work can be conducted only on pathogen-free animals. These are ootained by hysterectomy under aseptic conditions and reared in an atmosphere absolutely free of bacteria or viruses. For some purposes, e.g., the study of a particular type of tumour, animals with increased hereditary susceptibility to that lesion have to be bred. More types have been added to the range of animals used previously. Experimenters have become more and more conscious

of the requirements of experimental animals and their humane treatment while under experimentation.

From what has been described, it is obvious that too many problems exist for individual scientists to fathom completely and by far too many techniques for one person to master *in toto.* But it is also abundantly clear that a vast scope exists for any enthusiastic person who desires to devote his life to creative research work. Together with the vast scope there are many satisfying rewards as proved by the significant contributions appearing regularly in veterinary literature.

Veterinary research as such is the function of an institute sufficiently provided with specialized personnel and equipment. In many countries with modern veterinary services, diagnostic centres have been established to assist clinicians working under field conditions and to relieve research laboratories of certain routine duties. It is commonly accepted that clinicians cannot always depend only on their powers of observation, sound training and experience when investigating problems. Many investigations require laboratory facilities; clinicians who do not use laboratory aids cannot provide the service which the livestock industry needs.

The nature of the work of diagnostic centres can be defined as follows: consultative work on farms, the laboratory investigation of outbreaks of disease and the routine performance of laboratory diagnostic tests in the course of surveys on the incidence of disease conditions. Liaison with the research organisation should of necessity be very close to allow for consultation on diagnostic methods and collaboration in field research. It is also inevitable that the problems requiring more detailed research into their nature have to be referred to a research organization.

The Division of Veterinary Field Services of South Africa has recently embarked on a scheme of establishing diagnostic centres at selected localities. Much will still have to be learnt about the *modus operandi* of such centres under South African conditions, but the scheme has already proved itself of value to field veterinarians and private practitioners. While previously specimens for biological tests had to be transported over many miles in hot weather to the central laboratory, they can now be examined at a regional centre within reasonable distance. Undoubtedly this organisation will develop into an important factor in the veterinary services of South Africa as it has done in a country such as Great Britain.

SYMPOSIUM: THE CHANGING ROLE OF THE VETERINARIAN IN THE MODERN WORLD

THE ROLE OF STATE SERVICES IN ANIMAL DISEASE CONTROL AND HEALTH PROMOTION

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INTRODUCTION

Even in this mechanical age of synthetics, animals have retained their specific place in human society. The scope of their usefulness may have been reduced in breadth but not in depth. In fact, their relative importance is increasing in direct relation to the increase of the human population and consequent decrease in living space. This same phenomenon has been responsible for endeavours to improve animals by selective and scientific breeding to enhance their productivity, which is further maintained and bolstered by scientific care and feeding. The scientific approach has also become a necessity in the settlement of regions of the world which are unfavourable for the keeping and maintenance of animals from a climatic and health point of view.

The hazards to animal health remain impressive after many centuries of human endeavour to improve this state of affairs. A large measure of success has attended these efforts in many parts of the world. It remains, however, a sad truth that practically all the devastating epizootic animal diseases of olden times are still present in various regions of the world. The potential danger of the spread of these diseases to highly developed and valuable animal populations remains very real. The increasing tempo in international communications and especially air transport greatly enhances this danger. Upheavals in human society also remain the danger in this regard that they have always been in the history of mankind.

STATE CONTROL OF ANIMAL DISEASES

The State has a very important and responsible role to fulfil in regard to the control of animal diseases and parasites and the promotion of animal health, in relation to the economy and well-being of any country. This responsibility begins with the training of veterinarians and the institution of organized veterinary services, supported by veterinary research. These organizations are basic requirements in the fulfilment of this comprehensive obligation.

State control of animal diseases is usually restricted to certain economically important epizootic diseases and would further be determined by the value of the animal industry of the particular country, and whether

that country can afford to institute and maintain such control. The logical obligation of the State in this field rests on the fact that only the State possesses the required legislative authority to enforce measures decided upon, and to finance the creation of controlling organizations responsible for diagnoses and the general arrangement of control, as well as financial assistance to stockowners, etc. Epizootic diseases which are of economic importance are generally "proclaimed" in terms of the animal diseases legislation of that country and are known as 'proclaimed' or 'notifiable diseases', signifying that their existence or suspected existence must be reported forthwith to the proper authorities. These diseases are controlled by the State. Although the approach to the control of diseases may vary somewhat in different countries, required standards are largely determined by the nature of the epizootiology of the diseases concerned. In South Africa the development of disease control was initially largely dictated by the presence of destructive epizootic diseases like rinderrpest bovine contagious pleuropneumia, East Coast fever, sheep scab, etc. The Field (Regulatory) Services were largely built around the necessity to control these epizootics, especially East Coast fever and sheep scab. The sub-tropical climate of the country is, however, favourable to the existence of a number of other diseases and parasites — horsesickness, bluetongue, etc.— and it was essential that an effort be made to control these. This resulted in the establishment of the Research Services, which were followed later by veterinary education.

The history of the creation, development and functioning of the aforementioned service complex is generally known: all the major epizootic diseases have been eradicated, whilst others are effectively controlled by a wide range of efficient vaccines, resulting from research efforts. Out of these developments, together with the development and intensification of stock farming, the present pattern of animal disease control has come about. It is planned on the following lines:

National Regulatory Services

The national regulatory services provide for—

(a) the regular inspection of all stock in the country, the intensity varying according to the incidence or likely incidence of disease;
(b) the proclamation of various control areas in respect of particular diseases and parasites and the institution of special control measures, e.g. East Coast fever, rabies, tick control, etc.;
(c) the proclamation of specially controlled border regions along the international land borders;
(d) the institution of the keeping of a census of stock and permit control in the control areas referred to and in respect of markets and agricultural shows where necessary;
(e) investigation of all significant instances of disease and mortality in stock;
(f) the two major game areas of the Kruger and the Gemsbuck National Parks have been game-fenced and control organizations instituted to patrol and maintain these fences;
(g) the progressive fencing of our international land borders is in

progress as an added measure against the possible invasion of animal diseases from elsewhere;

(h) schemes of eradication of certain erosion diseases have been initiated e.g. bacillary white diarrhoea, fowl typhoid, bovine tuberculosis. The intention is to develop and extend such schemes both in tempo and scope in an attempt aimed at the total eradication of these and other diseases;

(i) several of the measures mentioned above are aimed at an early diagnosis and the prevention of the spread of disease. Diagnostic services are at present being extended by the institution of Regional Diagnostic Centres;

(j) import control of animals and 'infectious things' is based on a world wide knowledge of both the incidence and control of animal diseases in exporting and other countries. This information is obtained by way of international agreement, regular exchange of animal disease reports and through the agency of international organizations like the O.I.E., F.A.O., etc.

State quarantine stations are maintained at Cape Town, Durban and Jan Smuts Airports, for the isolation and testing, if necessary, of imported animals. The Department of Customs and Excise assists in regard to the importation of products and things, also the Postal Department and the South African Railways, Harbours and Airways. In fact, the entire applicable State organization is geared to this task.

Broad-based Animal Health Service

With the disappearance of control of the major epizootic diseases, the State's approach to animal disease control has recently been augmented to embrace a broad-based animal health service. The State's interest in animal diseases will therefore also include the important erosion diseases and in fact, all aspects that adversely affect animal health. This approach has received momentum as a result of the recent reorganization of the Department of Agricultural Technical Services and the establishment of the Directorates of Field and Research Services. The State Veterinary Field Services now forms part of the all-embracing departmental Field Services, ensuring that the veterinary aspect of this service will function in close mutual collaboration with related services in the Department.

The new animal health service approach will require larger numbers of State veterinarians, specialized training of these officers, as well as the appointment and training of technical assistants and the further training of existing lay staff. Facilities in the form of accommodation, equipment, etc. are being extended. The Diagnostic Centres previously referred to, form an integral part of this endeavour. The service will essentially undertake national and local surveys of the incidence of animal diseases and parasites, regional diagnostic services, field and survey research in co-operation with the Veterinary Research Institute, organized veterinary extension services, animal disease and parasites eradication schemes and general measures concerning the prevention and control of diseases, in addition to the regulatory services previously referred to.

The State veterinary organization must also be considered an essential precautionary institution to safeguard the country's animal industry in the event of destructive animal diseases gaining access to the country.

The adaptation of the regulatory veterinary services to the requirements of the country in regard to climate, disease incidence and geography, etc. has resulted in the strategic placing of both professional officers and auxiliary staff in such a manner as to ensure suitable and complete 'cover' of all regions.

The Veterinarian in Modern Society

The usefulness of the veterinarian to society depends on his training. It can also be accepted that the basic approach to the training of veterinarians is the same throughout the world, with adaptation to local requirements. The broad and specialized training of the veterinarian has served as the background to his successful endeavours in the fields of research, epizootiology, surgery, medicine, etc., etc., in the past. The outstanding services of State veterinarians to this country in these various fields, is well-known history. The question now arises whether the veterianarian's present training fully equips him to function efficiently and productively in the scope of modern farming enterprize. Farming has become a highly technical and scientific business undertaking and will of necessity become progressively more so. It is submitted that the veterinarian must keep pace with these developments, which may be termed "science in relation to farming economics", to be able to render a very necessary service, which is his natural function by virtue of his background and tradition.

This will require advanced knowledge of animal breeding in relation to function, animal management and farming practices, dietetics, metabolism, physiology and related subjects. Especially in the field of the State service is this a particular need to be able to fulfil the global function of rendering a complete scientific service in the realm of practical economics, and the rendering of efficient veterinary (animal health and production) extension services. This expansion of the veterinarian's functions and his adaptation to changing circumstances is a natural development. Neglect of this aspect will be a disservice to the community and will detract from the usefulness of the profession we serve.

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SYMPOSIUM: THE CHANGING ROLE OF THE VETERINARIAN IN THE MODERN WORLD

VETERINARY PRACTICE IN SOUTH AFRICA

J. G. BOSWELL—P.O. Box 1, Sandown, Johannesburg.

It is indeed an honour and privilege to give this talk on private practice past, present and future, as it is only two or three decades since practice was the "Cinderella" of the profession. Many changes have taken place during these last thirty years.

For example, the speaker was the fourth Onderstepoort graduate to start practice; of the other three, one has died and the other two took up Municipal appointments, with the result that when the ripe old age of 45 was reached the speaker had been in practice longer than any other registered veterinarian in S.A.

The above shows up the rapid changes which have taken place, and today our numbers far outweigh the rest of the profession. In 1936, when the practice was started in Johannesburg, this type of Veterinary work was undertaken mainly by men who had come out from Britain during the Anglo Boer War and were mostly interested in horse work. Very few practitioners established themselves in the country districts, whereas today most country towns have one, or in a few cases, more than one veterinary practitioner.

The function of the practitioner, apart from diagnosing and treating pathological conditions, is to act as a liaison between the research worker and the farmer. The trend these days is for some practitioners to assist the farmer in his general organization by advising him on inoculations, dips, vermifuges and by doing pregnancy and other tests, as it is obvious that the most successful stock farmers are those who can organize and make use of the veterinarian's knowledge and guidance.

Of the two types of practice, town and country, there is no need to dwell on the former, as a capable man who is willing to work long hours has every opportunity of becoming established. Country practice, however, in this country is a problem for it often entails long distances, long hours and bad debts. The farmer can cope with 90% of his veterinary work and as we all know only too well, only calls us for difficult cases; and then often when the animal is on its last legs.

A practitioner with an office in the suburbs of a large city and also with a practice in the country, is advised to build up a herd control system with the better farmers in the district and so ensure a more steady income; or else build up a small easily manageable farm to augment his income from practice and so enable him to eliminate the bad client.

Naturally from a humane point of view, he would still have to tackle certain cases but could eliminate the farmer who never pays a veterinary bill, but never fails to invest in a new car annually.

The young practitioner must be honest and diligent and have an awareness of his duties and must put himself in the owner's shoes when he gives an opinion. He should spend some time with an older practitioner before he decides to put his plate up. The speaker knows from experience as he has had more veterinarians through his hands than most others. He must remember too that if a Doctor keeps his consulting hours, his consulting hours will keep him.

As for partnerships, it is so often said that a partnership is a bad ship to sail in, but in the speaker's experience the reverse has been the case as he and his partners have had enjoyable lives, with time for work and play, local leave, and even overseas leave. As long as petty jealousies are dropped, one learns to agree to disagree, to give and to take, and plumps for co-operation, that is the answer to modern practice. Where possible, the ideal size of a practice is from three to five veterinarians.

There are so many aspects on which it is not able to touch in the time at one's disposal. A word of warning however on veterinary hospitals: they are expensive to run.

It has often been said that the research workers are the brains of the profession and if one looks around it is quite obvious that they are the ones that collect the honours, knighthoods and doctorates, honorary or otherwise; but it is still felt that the practitioners are the backbone of the profession, and remember that an ounce of backbone is worth a ton of wishbone. When choosing men for the profession, we must also consider the practical as well as the academic side. Finally, the practitioner is advised to work hard day and night, not to worry, and one day he will reap his reward in heaven.

SYMPOSIUM: THE CHANGING ROLE OF THE VETERINARIAN IN THE MODERN WORLD

THE VETERINARIAN'S ROLE IN TOMORROW'S INDUSTRIALISED PRODUCTION OF LIVESTOCK

I. VAN SCHALKWYK — P.O. Box 55, Pretoria

Received for publication, April, 1963

Farmers all over the world have to face accusing critics who deplore their inefficiency. These bald criticisms are very unkind, but they are also very true.

They are unkind because they are unqualified by explanations. They do not take into consideration the limitations of the individual, and the very real, often insuperable obstacles which impede this individual in his personal drive towards the goal at which his stern critics direct him.

They are unkind because they do not take into consideration the fact that no one man can have at his fingertips, and therefore apply, the vast knowledge which has been amassed in the many sciences which are related to his farming enterprise.

They are unkind because they do not take into consideration the farmer's limited access to capital, his lack of knowledge in the application of modern business methods, and the fact that his operation being virtually a "one man show" cannot afford the managerial skills which enable other industries to produce more efficiently.

And yet these accusations are true, and must continue to be levelled until the gap between knowledge and practice is closed.

If the world were abundantly supplied with food this criticism would be unnecessary, but populations continue to grow, and this criticism becomes more and more urgent, for mankind has stopped begging and is now demanding that food be placed within the compass of its purchasing power.

In the light of today's knowledge, the theory and philosophy of Malthus have become untenable. To say that man *cannot* produce the food to provide for the products of his own uncontrolled breeding is to say that man *will not* use the tools which his ingenuity has already forged, and will continue to forge in the years and even centuries, which lie ahead.

Many might agree with a modified Malthusian theory, particularly if it were based on the premise that man might prefer to risk his destruction through global nuclear warfare rather than make a concerted and disciplined contribution towards the production and equitable distribution of food. It does not, however, lie within the scope of this paper to contribute towards such fascinating intellectual exercises. It will be assumed that man *will* use his knowledge for the survival, and not the destruction of mankind, and that food *will* be made available to all mankind.

It remains therefore to determine *how* this will be done, more specifically in the narrower field of livestock production, and furthermore, how the veterinarian will contribute towards this accomplishment.

To bring about this achievement we must firstly solve a socio-economic problem. The stock farmer, as we know him today must disappear sadly but progressively from the scene for the new methods which must be applied, discards completely the traditional approach towards the production of meat, milk, butter and eggs. Because these new methods demand efficiency at all levels they will eliminate a traditional way of life, for the type of farming which will be carried out will ensure that mankind can continue to live, and that farming must therefore cease to be a way of living. Precision tools must replace the clasp-knife. Linear programming must replace the snap and frequently unwise decision. Teams of specialists will be assembled, and the stock farmer of tomorrow will emerge as the catalyst whose function it is to promote, co-ordinate, direct, and balance the activities of these specialists.

A critical re-evaluation of the four pillars upon which the stock farming edifice stands is essential to understand why changes are inevitable. All of us have been taught that breeding, feeding, disease control and management combine to produce a suceessful livestock enterprise.

It must be admitted that there is too great a difference between the knowledge which exists, and the practice of the knowledge surrounding these principles. Let us examine this statement a little more fully.

Breeding

With the exception of the poultry industry very little progress has been made during the last few decades in the application of genetic selection methods based purely upon points of economic importance. There is still an aesthetic and efficiency robbing pre-occupation with 'breed points' which have no economic significance, and noteworthy progress can only be expected if breeders of all types of livestock confine themselves to the assembly of those genes which are of economic significance. Tomorrow's stock farmer will not be interested in so called "Dual Purpose" breeds. He will however seek for the animal which converts feed most economically into meat, milk, butter and eggs. The modern and highly efficient American poultry breeds were evolved only when geneticists courageously discarded many of the show bench criteria. Purity of breed was sacrificed for hybrid vigour and now breeds are being evolved which may lack a uniformity of plumage colour and may show evidence of breed disqualifications such as of "side sprigs", but these birds lay more eggs at less feed cost than their "pure bred" forebears.

Feeding

Nutrition will become more of a science and less of an art, and again the emphasis will be laid on the efficiency of feeds rather than the cost of a given weight of feed. The stock farmer will know his cost of feed per unit of production. He will feed according to production potential for he will know exactly what this potential is. Feed wastage will be eliminated, and undigested feed will be reclaimed and reused.

It is in this field that the veterinarian will, of course, be able to make his greatest contribution and his function must change from that of the man who today is still regarded as the farmer's last hope. Instead of being a periodic visitor on the farm factory, he will be a full time administrator. Instead of curing disease he will be expected to prevent disease and in his chances of doing just this lie the greatest challenge yet offered to our profession. The farm factory will be a very intensively stocked operation, and effective isolation will be difficult. The outbreak of any disease which cannot readily be brought under control will have disastrous economic consequences. This applies not only to the killer diseases which by their very virulence are inclined to be self limiting but more particularly to the less spectacular, but far more significant erosive diseases. A much greater study must be made of these diseases. More efficient and more rapid diagnostic techniques must be evolved and above all a complete understanding must be gained of the relationship which exists between disease, the animal, and its forced intensive environment. The link between the farm and the laboratory must be short and strong. There must be complete understanding of the so called "sub-clinical" disease syndrome, the condition recognisable at present only as a state of reduced efficiency which cannot be explained away in terms of genetics, nutrition, management or detectable disease. Drugs must be more intelligently applied and above all must be more timeously administered. Vaccines must be improved upon and the consequences of the use of live virus vaccines must be seriously re-examined in the light of the possibility of undesirable side reactions, as well as the dangers of unintentional infection through the use of adventitiously contaminated vaccines.

If the veterinarian is to play a full and complete role he will indeed be the key figure in the entire operation. He will of necessity have to probe his way back into the genetic structure of the stock under his care for if it is conceded that a genetic susceptibility to disease can be induced through a one sided breeding programme, he must ensure the prevention of this end result.

If it can be shown that the nutritional status of the animals is contributing towards a disease susceptibility he must be in a position to eliminate this possibility. Management, in the narrow sense of the care of animals in terms of their physiological requirements must also be under his constant review, for if the end expression of failure or shortcoming in this regard is clinical or sub-clinical disease, its prevention at any level is his concern.

MANAGEMENT

In its broad sense management is far more than the regulation of the movement, housing, nutrition, breeding and disease control of the animal. In its complete sense management is based upon economic consequences. Good management ensures that the cost of the tools required to do any job are within the limits of economic truth and no more, and that the costs of procedures are justified. The veterinarian who is responsible for the

productivity of stock will only be welcomed into tomorrow's farm factory if his advice is acceptable after careful consideration of the economic consequences. Any business venture has inherent risks all of which might be completely eliminated in theory. If the cost of eliminating such risks is so exorbitant that no profits are possible within the new safe, but costly framework then the risks must be borne or the advice must be amended.

The veterinarian must know clearly the economic consequences of his advice, for in the livestock industry our profession deals with a form of life that has a market price on its head.

In the light of these statements, very little thought is necessary to arrive at a significant conclusion regarding the veterinarian's future role in this vital industry. His full and successful participation in tomorrow's stock industry depends upon a training which is beyond the scope of any single university degree. The acquisition of this knowledge can never in practice be supplied to the undergraduate and must be acquired partly from his contact with the real life problem, and partly from a planned post graduate education which permits of specialised training in the fields which require greater understanding. If our profession can meet the challenge of tomorrow the world at large must become a far more pleasant place to live in.

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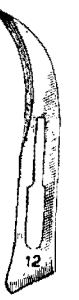

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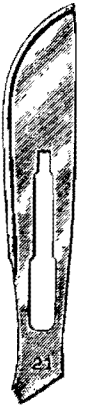

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SYMPOSIUM: THE CHANGING ROLE OF THE VETERINARIAN IN THE MODERN WORLD

THE VETERINARIAN IN PUBLIC HEALTH SERVICES

B. M. HORWITZ — P.O. Box 11, Maitland, Cape Town

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INTRODUCTION

To quote the report of the Joint W.H.O./F.A.O. Expert Group on Zoonoses "the term Veterinary Public Health" well describes the modern concepts of the responsibility of veterinary medicine to the health of the public[5 6 7]). They state further that veterinary medicine is responsible for the protection of human life against those hazards which result from (*a*) contact with diseased animals; (*b*) consumption of the tissues or products of diseased animals; and (*c*) consumption of animals products contaminated during the processing and delivery of such foods to the consumer. These functions are of basic importance in the public health programme and to be carried out effectively the public health veterinarian must be responsible for a variety of duties which includes the following:—

(1) Promotion of activities to eradicate animal diseases transmissible to man.
(2) Supervision of inspection and hygiene of all foods of animal origin.
(3) Consultation and liaison with voluntary or official agencies such as farm organisations, professional groups, and health and agricultural departments.
(4) Development of special statistical services with reference to zoonoses.
(5) Research activities in public health services.

While in the United States of America these public health functions are carried out by the various departments of the Central Government Veterinary Department, here in South Africa these activities are shared between the various branches of the veterinary profession (i.e. government, educational, private and municipal.) The public health or municipal veterinarian confines his activities mainly to (2) above, i.e. the supervision of inspection and hygiene of some (not all) foods of animal origin and to some slight extent also to (1) and (5) above i.e. to the promotion of activities to eradicate animal diseases transmissible to man and to some research in public health sciences.

The municipal or public health branch of the veterinary profession in South Africa is certainly small but it is nevertheless a growing section. There is a definite lack of knowledge in local government circles of the valuable functions which could be carried out by veterinarians and those municipalities that employ veterinarians do not make full use of their

knowledge and experience. However as the value of the veterinarian in public health control becomes more and more appreciated, his scope of activities and responsibilities will enlarge and the time must come when the Veterinary Officer of Health (to quote Dr. H. Nelson of Pretoria)[1] will become recognised as an essential member of the public health team of all major municipalities.[1] The time must come when the veterinary department of a municipality will be accepted as an essential department of local government, a department essential for the protection of the health of the public.

Outline of Public Health Activities of present day Municipal Veterinary Services

This outline covers the activities of veterinarians employed by municipalities but, in some municipalities, only a few of these duties are carried out by veterinarians.

Meat Control

The following are the steps adopted:—

(*a*) Ante-mortem inspection — this is essential, the main object being:—
  (1) The detection of diseases such as rabies, and tetanus, diarrhoeas, etc. that are difficult to diagnose on post mortem and the early detection of such diseases as foot and mouth disease, anthrax. swine fever, etc.
  (2) The prevention of unnecessary suffering by supervising the unloading, penning, watering and feeding of stock and to allow immediate slaughter in the case of injury.
  (3) To expedite the immediate handling of consignments of stock among which mortality is taking place in order to salvage stock which may otherwise be condemned.

(*b*) Supervision of slaughter — this is a very important aspect of the veterinary officer's duties — he must see that no cruelty is inflicted on the animals, that every animal irrespective of type, is given a complete anaesthetic (stunned) by either mechanical or electrical means, before being bled to death; that the animal is bled with as little delay as possible after stunning. As far as stunning is concerned exception must unfortunately be allowed for "Kosher" killing — here the provision of proper stunning boxes will eliminate a large amount of cruelty.

(*c*) Supervision of meat inspection process — the method of post mortem examination is laid down in the Regulations re Slaughtering and Meat Inspection — this is carried out by qualified meat inspectors under veterinary supervision. The final inspection of detained carcasses should be made by a veterinary officer. The authority to condemn is confined by the Public Health Act to "Approved Veterinary Surgeons, Medical Officers of Health and Medical Practitioners."

(*d*) Supervision of proper stamping of carcasses that have been passed as fit for food is laid down in the Regulation re Slaughtering and Meat Inspection.

(*e*) Disposal of condemned carcasses and offal.

(*f*) Administration of the abattoir — essentially this consists of the business administration of a complex factory with the aim to run it "at cost", a difficult undertaking due to the fluctuating supplies of livestock from which the bulk of revenue is derived and one made even more difficult by the many, varied, commercial interests that use the abattoir as their place of business.

(*g*) Supervision of meat for export — involves control of cold storages in which such meat is kept, supervision of wrapping, control of holding temperatures up to the time of loading into the ship and the issue of export certificates.

(*h*) Supervision of the handling of meat at the abattoir and the vehicles used for the transport of meat from the abattoir.

Control of Milk Supplies

In some municipalities this involves supervision of all phases of milk production from the cow through to the bottling of milk for delivery. In addition this supervision covers skim-milk, fresh cream, ice cream and cultured milk. Briefly this involves supervision of:—

(*a*) Hygiene of production of milk on the farm including the supervision of construction and lay-out of farm dairy premises, milking methods, cooling, and transport of milk.

(*b*) Veterinary inspection of dairy herds — this includes advice to dairy farmers and lectures to farmers' associations; all diseases found have a bearing on public health, even those that cannot be classified as zoonoses since any disease has a bearing on productivity and quality.

(*c*) Laboratory control of all phases of production and transport including tests on milk for tuberculosis, contagious abortion, and mastitis.

(*d*) Inspection of bottling depots, and pasteurisation plants including the most important laboratory testing of daily samples from all depots and pasteurisation plants. The hygiene of bottling depots and the efficiency of pasteurisation plants can only be controlled effectively by those daily tests.

(*e*) Supervision and laboratory control of the manufacture, packing and hygiene of the production of ice cream.

Unfortunately the above is not the pattern of milk control in all large municipalities — in one large municipality veterinary control of milk is confined to supervision of the health of the dairy herds only, with the result that the specialised knowledge of the veterinarian of all phases of the hygiene of production and of processing of milk is lost to public health.

Public Health Education

An important function is the assistance given in the training of

health inspectors by means of lectures in meat inspection and milk control and in one centre by lecturers on meat inspection to medical officers studying for their diploma of public health.

In addition to the above, the municipal veterinarian carries out other functions not directly connected with public health — i.e. veterinary attention to municipal draught animals, zoos, etc., which do not form part of the scope of this paper.

There is no doubt that the specialised training that a veterinarian receives, fits him to take a far greater part in the control of public health than he does to-day. In addition, he could be even more useful if the veterinarian engaged in public health receives advanced training in public health on similar lines to the Medical Officer of Health. The provision of a post-graduate veterinary degree or diploma in food hygiene and public health is a tremendous forward step and there is no doubt that the municipal veterinarian of the future will be required to hold this post-graduate qualification before he can be appointed to a public health post. To attract a sufficient number of veterinarians to this work there must be adequate reward for his services. Not only should his post receive the same subsidies as other public health posts from the Central Government but his post should be up-graded to the same grades occupied by his medical colleagues engaged in public health work.[2, 3, 4]

For South Africa I consider a modified form of centralisation of control to be the ideal in contrast to the complete centralisation of all public health veterinary activities in one department as carried out in the United States of America. State veterinary services of the Republic should exercise control over the municipal and other public health veterinary departments by supervising the administration of Government regulations controlling the activities of veterinary health departments.

To this end it is essential that:—

(1) The administration of the Regulations re Slaughtering and Meat Inspection be taken over by the State veterinary services and, in addition, be thoroughly revised. The interpretation of these regulations vary from centre to centre and it is essential that there be absolute uniformity.

(2) That regulations be promulgated governing all phases of production, transport and treatment of milk and milk products, etc. These must apply to the whole Republic. These also should be administered by the State veterinary services in order to achieve uniformity.

The above will allow for a modified form of centralisation with the central State veterinary services controlling the application of these regulations by the municipal veterinary department in the larger centres and the peri-urban and State veterinary departments in the smaller centres. It will allow the State veterinary services to make full use of the abattoir as a centre (among other advantages) for the early detection of animal diseases without interfering with the present set-up.

(3) The formation of municipal veterinary departments in all large municipalities, peri-urban areas, and divisional councils. These departments should not only be fully responsible for the activities

at present carried out by municipal veterinarians but should widen their responsibilities to cover the public health control of all foodstuff of animal origin (prepared meats, poultry, etc.) up to the time of their distribution to the public. The designations Director of Abattoirs, Municipal Veterinary Officer, etc. should fall away and the term Veterinary Officer of Health substituted.

There are four extremely important major zoonosis problems in South Africa to-day, namely bovine tuberculosis, brucellosis, rabies and hydatidosis. At the moment the aim of the municipal veterinarian must, through necessity, be merely the control and the prevention of the spread of these diseases to human beings. These four diseases are sufficiently well understood for satisfactory eradication schemes to be inaugurated. For this to be accomplished the municipal veterinarian must play his part in a team consisting of all sections of the veterinary profession in partnership with the health services of the medical profession. With sufficient financial backing the combined knowledge and resources of these two allied professions could easily accomplish this task, possibly within our lifetime. Mere control of a disease that can be eradicated must in the long run be far more costly in money, manpower and human suffering than its complete elimination within a definite period of time. The aim of all health workers, whether medical or veterinary, must be the eradication and not merely the control of those diseases that can be transmitted to man.

REFERENCES

1. NELSON, H. (1944): The Veterinary Officer of Health. J.S. Afr. vet med Ass. XV, 4, 125-136.
2. ROBINSON, M. C. and PULLINGER, E. J. (1955): Municipal Veterinary Service with Special Reference to Johannesburg. J.S. Afr. vet. med. Ass. XXVI, 161-171.
3. STEEL, JAMES H.: Veterinary Public Health — Advances in Veterinary Science. Vol. 1.
4. MEYER, K. F.: Animal Diseases and Human Welfare — Advances on Veterinary Science — Vol. 1.
5. W.H.O. Tech. Rp. Series, No. 40 (1951): Joint WHO/FAO Expert Group on Zoonoses.
6. W.H.O. Tech. Rp. Series, No. 19 (1955): Joint WHO/FAO Expert Committee on Meat Hygiene. (First Report).
7. W.H.O. Tech. Rp. Series, No. 111 (1956): Advisory Group on Veterinary Public Health.

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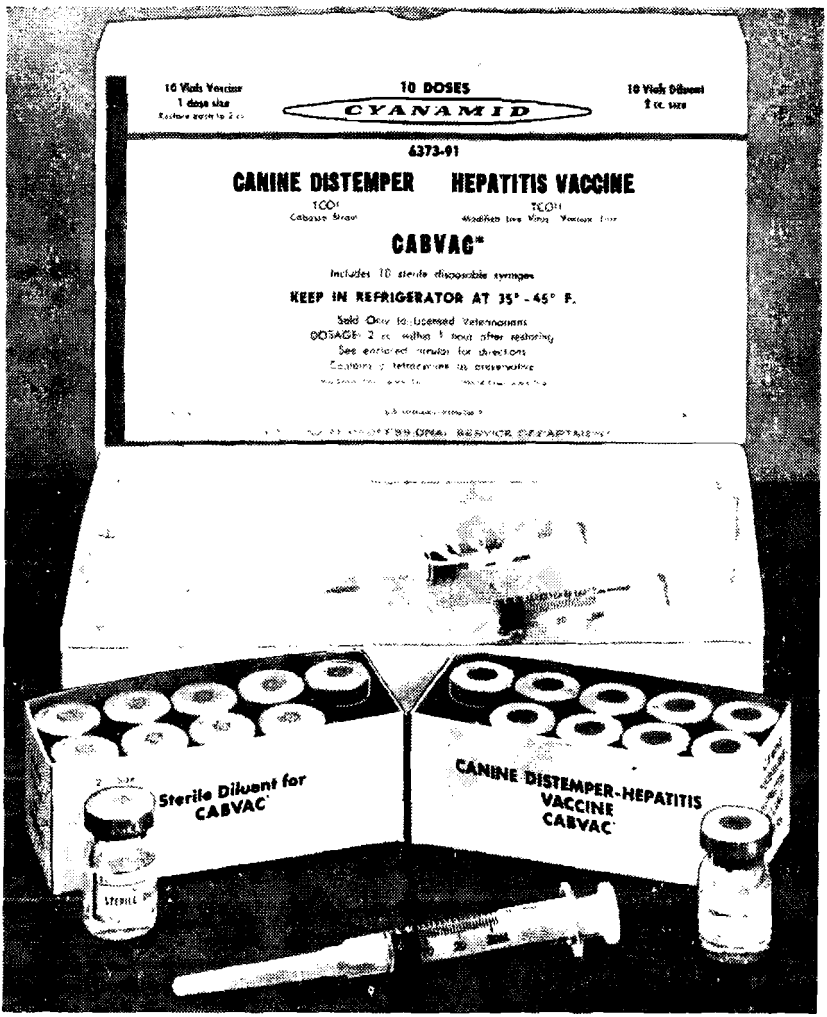

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SYMPOSIUM: THE CHANGING ROLE OF THE VETERINARIAN IN THE MODERN WORLD

VETERINARY EDUCATION

R. DU TOIT — Dean, Faculty of Veterinary Science, Onderstepoort

Received for publication, April, 1963

Recently much has been published on the ever increasing specialization which is occurring in animal industry in the more highly developed countries and on the demands this is making upon the veterinary profession in respect of specialized knowledge to cope with the problems created. Not only is a greater output of products of animal origin required to meet the demands of an increasing human population, but the economic pattern is changing, and greater efficiency in production is being forced upon us, which in turn requires increased knowledge on the part of the veterinarian in playing his part in animal breeding, husbandry and maintenance of health to ensure peak production.

The increase in educational facilities, particularly at university level, which are available to a greater proportion of the population than ever before, has led to a more intensive study of disease and a better understanding of aetiological and environmental factors. These advances in scientific knowledge have been made possible by the greater awareness on the part of governments, of the extremely important part the scientifically trained worker can play in promoting the welfare of the state in general; it has led to more liberal subvention of education and research. The result has been the elaboration of a host of improved techniques, diagnostic aids, therapeutic and prophylactic measures, etc., knowledge about all of which must be acquired by the veterinarian to equip him for the rôle expected of him in the modern world.

Even in the less highly developed human societies modern advances have expanded so rapidly that, in spite of increased facilities for training veterinarians, a very serious shortage of personnel trained to assist and advise in this expansion, still exists in the world today. This shortage of veterinarians has been viewed with considerable concern by international bodies such as the Food and Agricultural Organisation of the United Nations. To investigate the problem an international meeting on veterinary education was convened in London in 1960. At this meeting, which was attended by the late Dr. Herman Graf representing the Faculty of Veterinary Science of the University of Pretoria, the conclusions arrived at included a recommendation for the formation of a panel of experts on veterinary education.

The panel met in Rome in 1962. Attempts were made to assess the shortage of veterinarians in terms of the needs of the countries concerned, on the basis of the required ratio of veterinarians to livestock of various

types. In practically all the countries investigated it could be stated that shortage of veterinarians existed, but no adequate basis could be arrived at whereby a true assessment of actual requirements could be made; even within and among the more highly developed countries. Economic values of livestock varied considerably; farming methods differed, as did the fields of veterinary activity in relation to the animal industry. In the less highly developed countries the picture was even more confused but nevertheless some interesting figures emerged.

Ratios of 2,600 livestock units per veterinarian in Britain to 4,400 in France were calculated on the basis of equine species being regarded as equivalent to 1.0 units; dairy cattle = 1.0; beef cattle = 0.5–0.1; buffaloes = 1.00; sheep and goats = 0.1–0.01; pigs = 0.2–0.4 and poultry = 0.01 units; where 2 figures are given the latter refers to very large herds or flocks. In the less developed areas it varied from 10,900 livestock units to 20,100 and even 2,857,000 units per veterinarian.

The question of student wastage in veterinary schools in a number of countries was investigated from figures submitted covering a period of four years from 1950 to 1954, the pre-veterinary training period being omitted. Onderstepoort compared very favourably with other countries: 3 per cent of students failing to qualify as against 2 per cent to 19 per cent in the United Kingdom, 5 per cent to 36 per cent in the U.S.A. and about 17 per cent in India. South Africa is dealing, of course, with a single faculty with a limited number of students, whereas 6 veterinary schools were included in the survey in the United Kingdom, 15 in the U.S.A. and 8 in India. Generally speaking the pass rate from the second to the fifth year increases progressively although a fair percentage may not qualify at the first attempt.

The actual curricula offered by veterinary schools throughout the world formed the subject of close study by the panel. Although basically the subject matter taught does not differ greatly from school to school and courses have obviously been based upon those of the older established schools of Europe, the grouping of subjects varies considerably. Thus under the general subject of physiology some schools include the greater part of zootechnology, which is treated somewhat theoretically under this heading. Parasitology includes protozoology, which subject does not receive nearly the same emphasis as in the Faculty at Onderstepoort, by virtue of the importance of protozoan diseases in a subtropical region.

The impact of the atomic age is clearly visible by the inclusion of radiology in the curricula of several veterinary courses. Radio-active contamination of premises and animal products figures prominently in some courses of food hygiene and veterinary public health, and will undoubtedly receive greater consideration in future with the increased use of radio-active isotopes in research and diagnostic procedures.

With the greater specialization of the livestock industry which, in the more highly developed countries, includes both large and small animals with the emphasis particularly on poultry, there is greater awareness of the importance of economics, marketing, biometry and genetics. Provision is made in certain veterinary courses for instruction in these subjects by specialists, not necessarily with a veterinary training, who, nevertheless, can impress upon veterinary students the role they will be

required to fulfill in their post-graduate careers in a society which is becoming increasingly more commercialised and demanding.

Although there is a tendency, manifest in certain countries, to introduce undergraduate specialisation in certain subjects upon which the economy of those countries is largely dependent, e.g. meat and milk hygiene, the general consensus of opinion of teachers in veterinary schools was strongly opposed to this. It was felt generally that the function of the veterinarian is bound up basically with control of diseases of infectious and sporadic nature, and the maintenance of health of the animal populations of the world. For this purpose a broad scientific training to equip the graduate to fulfill this function and upon which he can build to embark upon whatever field he subsequently may choose to specialise, is required. By a judicious choice of subjects, the basic sciences in the earlier years of study, to be followed in the pre-clinical years by those subjects of a more applied nature, and in the latter portion of the course by the practical application and the acquisition of the necessary skills, the veterinarian becomes adequately equipped to deal with the situations confronting him in his subsequent career.

It is readily admitted that with the rapid advances in scientific knowledge in recent years a great deal more is expected of the veterinary student than was expected previously. The result is that within the four years comprising the actual veterinary training, which applies in most veterinary schools, increasing difficulty is being experienced in so arranging teaching schedules, to provide the requisite time to do justice to all subjects. However, if the broad concept of the functions of the veterinarian in human society is borne in mind, and the course of training arranged accordingly, the time allocated for the basic degree is still regarded as adequate.

The importance of postgraduate training and the acquisition of specialised knowledge in particular fields, is fully and generally appreciated; provision for such postgraduate training exists in a large number of veterinary schools today. Postgraduate training is intimately bound up with research. Adequate research facilities and trained professional and technical staff are essential for the guidance of the postgraduate student.

Finally, the necessity for the training of more veterinarians to meet the demands of the modern world is stressed but emphasis is laid on the limitation of numbers of students which the veterinary school is capable of handling. To provide the necessary training and individual attention required, particularly in the clinical subjects, a total of 30 students per year in the clinical years is regarded as ideal. More than this number introduces grave difficulties both in instruction and demonstration, as well as in the provision of clinical material which can be handled adequately. Rather than increase numbers of students admitted or the duplication of classes, consideration of the establishment of additional schools is recommended.

SYMPOSIUM: CHANGING ROLE OF THE VETERINARIAN IN THE MODERN WORLD

THE ROLE OF THE VETERINARIAN IN WILDLIFE CONSERVATION AND PRESERVATION

M. J. N. MEESER — Assistant Chief, Veterinary Field Services, Pietersburg

Received for publication, April, 1963

SUMMARY

A brief description of the part played by veterinarians in game conservation is given. Initially veterinarians played a negative role. They were inclined to consider destruction as the best means of control. Recently, however, newer concepts have given rise to a finer appreciation of game, game ecology and game preservation. It is suggested that the veterinarian has a most important role to play in this field.

INTRODUCTION

Centuries ago man hunted wild animals for meat and clothing. Later, after he had domesticated some of the species, he used these as beasts of burden as well as a ready source of food and clothing. As human populations multiplied, and tilling of the ground for edible crops assumed increased proportions, so did domestication of animals increase until such animals more or less sufficed for the needs of man while wild animals still remained a source of food. However, as time marched on, man found that while his own domesticated animals and crops could provide him with the necessities of life, wild animals tended to destroy his crops. There was a suspicion that they also spread disease amongst his domesticated animals. This situation coupled with an inexplicable, insane urge to destroy, especially during the 19th and first part of the 20th centuries, led to mass destruction of wild animals in America and Africa. In Europe and Asia wild animals had ceased to play a role in the habits and habitat of man. Apart from man made factors there were some biological factors which also played a role in the extermination of animal life.

As sanity returned, efforts were made to repair the ravages of destruction that had taken place. Throughout the civilised world, or rather in those areas where western civilisation played a major role, enactments to preserve and conserve flora and fauna were made. These acts are perhaps best summed up in the South African National Parks Act of 1926 which, inter alia, states that a national park shall be constituted for the propogation, protection and preservation therein of wild animal life, wild vegetation and objects of geological, ethnological, historical and other scientific interests for the benefit, advantage and enjoyment of the general public.

Past Activities

What role did the veterinarian play prior to this new concept? As a conservator, the veterinarian played no part. Rather was he busy determining the presence of diseases of wild animals. He was also busy deciding which of these diseases fitted into the zoonoses pattern. A large number of such diseases were discovered. Such diseases as rabies, anthrax, trypanosomiasis, ornithosis, malignant catarrhal fever, rinderpest, corridor disease and foot and mouth disease received a vast amount of attention. The outcome of the studies on some of these diseases was the recommendation of mass destruction of game in certain specified areas in an effort to stop the transmission of disease from wild to domesticated animals. The veterinarian's role here was a negative one. It was in fact so negative that conservationists working under the newer concept of preservation were extremely chary of the help proffered by the veterinarian. The veterinarian was considered to be the arch instigator of the mass destruction of wild animal life. Strangely enough while it was in Africa that the veterinarian authorised the official destruction of game animals in an effort to stamp out disease transmitted to domesticated animals, it was also in Africa that he realised that he had an important role to play in conservation and preservation of wild animal life.

The realisation that destruction of game life was of no value in the control of animal diseases, compelled the veterinarian to adopt other methods to protect domesticated animals. The erection of game barriers and the use of aircraft and insecticide were amongst the newer methods used. The erection of game barriers instituted not only a study of the habits and habitat of game animals, but also a study of the ecological areas to which game animals confined themselves. These studies were necessary to the successful erection of game barriers and made the veterinarian realise that he too had a part to play in fauna and flora conservation.

The veterinary biologist had much leeway to make up. Not only did he exhibit lack of knowledge of game and its mode of life but he had to convince other biologists and conservationists of the sincerety of his intentions. The latter is the more difficult of the two self imposed tasks.

Present Activities

In his game studies the veterinarian found that the aspects of game ecology important to him were threefold. They were:—

(1) Game ecology in national parks and nature reserves.
(2) Game ecology on privately owned farms.
(3) The role played by diseases carried by and transmitted from game to domesticated animals.

In national parks and nature reserves the veterinary biologist had not only to deal with large numbers but also with a variety of species of game animals. In nature reserves the numbers and species of animals were of necessity limited. Again nature reserves are man made and as such it is relatively easy to confine the game to definite, decided limits. National parks on the other hand are enactments of a governing body which, unfortunately, is never advised, prior to the promulgation of enactments,

of the required ecological boundaries of such a national park. This being the case game animals are subjected to unnatural stresses within the confines of and especially on the boundaries of such national parks. The veterinarian's knowledge of animal management can be brought into play here. A study of the stresses involved can help to solve the difficulties encountered. Daily counts of animals in given or selected areas; the daily movements of the animals; the feeding habits of the animals; the mating and lambing or calving time all provide a mass of valuable information. This information is then used to determine:—

(1) The extent of the grazing area necessary to the maintenance of life for that particular group in that area.
(2) The extent of required water supplies and edible grasses, shrubs and trees necessary to such a grazing area.
(3) The role played by predators (man or animal), by disease and by the erection of man made barriers on the continued existence of the community.

Of necessity the acquirement of such knowledge covers a succession of seasonal observations. With this knowledge to hand the Veterinary Biologist can then advise the Game Biologist as to measures to be adopted to conserve the species within a grazing area. Such advice may include the provision of extra watering facilities so as to obtain a more even spread of game over the area; this more even spread leads to a conservation of grazing, controls soil erosion and minimises the risk of mass infestation with internal and external parasites. The census of animals within the area affords valuable data as to how and when control has to be exercised. This control may be the judicious elimination of selected animals on the fringe of the grazing area; it may be the provision of watering points outside the accepted grazing area. These watering points then tend to draw animals away from the accepted grazing area to a new area. In such manners new or enlarged grazing areas are created.

The newer knowledge of the successful application of tranquilisation of game animals can be used to capture and translocate animals from a grazing area to relieve pressure on that area. Such movements should be successful as the studies on the requirements of a grazing area enable the veterinary biologist to choose a new grazing area which has all the attributes of a grazing area required by the species. On the other hand tranquilisation can be used to combat disease in game animals. This can be particularily true of the rarer species in a national park where these are threatened by an epidemic with a high mortality rate. These animals can be caught and inoculated with a suitable protective vaccine.

Knowledge of game habits and habitat can enable the veterinary biologist to predict the course of disease of game transmissible to domestic animals. Such knowledge can enable the veterinarian, if warned in time, to take the necessary steps to prevent the spread of such a disease to domesticated animals.

The knowledge of animal ecology acquired by the veterinary biologist will allow him to advise as to the correct methods and place of introduction of extinct or rare species of game animals into a national park. He will be able to advise as to the correct method of capture, transport care and care in the new area while the animal is busy acclimatising itself.

This study of animal ecology will enable the veterinarian to attempt control of diseases of game animals in the game animal itself. As knowledge of the more prevalent diseases is gained, combative or curative measures can be employed. As an example the supply of licks to combat internal parasites can be cited. Another example could be a curb on the activities of vultures by preventing them from gorging on animal carcases infected with a disease such as anthrax.

Both on privately owned farms and in national parks and nature reserves the veterinarian can help to combat the evils of poaching. In a court of law it is not always possible to prove or have accepted as proof a statement that meat in a court exhibit is the meat of a game animal. The veterinarian however, by means of a study of the histology of the hair of animals, is able to state from what animal that meat was obtained merely by an histological study of the hairs collected from such meat. This is material assistance to the art of game preservation.

A knowledge of the diseases of game animals will assist the veterinarian in advising the farmer who desires to keep game animals on his farm as to control of the transmission of disease to domestic stock. Suitable advice as to isolation, care and management can be proffered.

Individuals who farm game animals will need advice on cropping. In order to obtain the best carcasses without destroying the entity of the herd, the knowledge of the veterinary biologists should be of inestimable value to the game farmer.

Conclusion

Veterinary biologists are a necessity to the maintenance of wild animal life. The very nature of the veterinarian's training suits him eminently to this task. Because of past policy he has a lot of leeway to make up. This, however, should not act as a deterrent but rather as encouragement as the very nature of the work is full of incentive and rich in reward.

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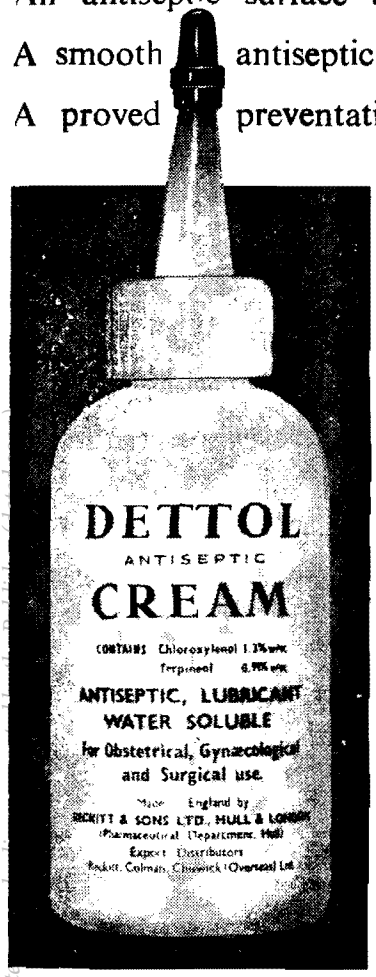

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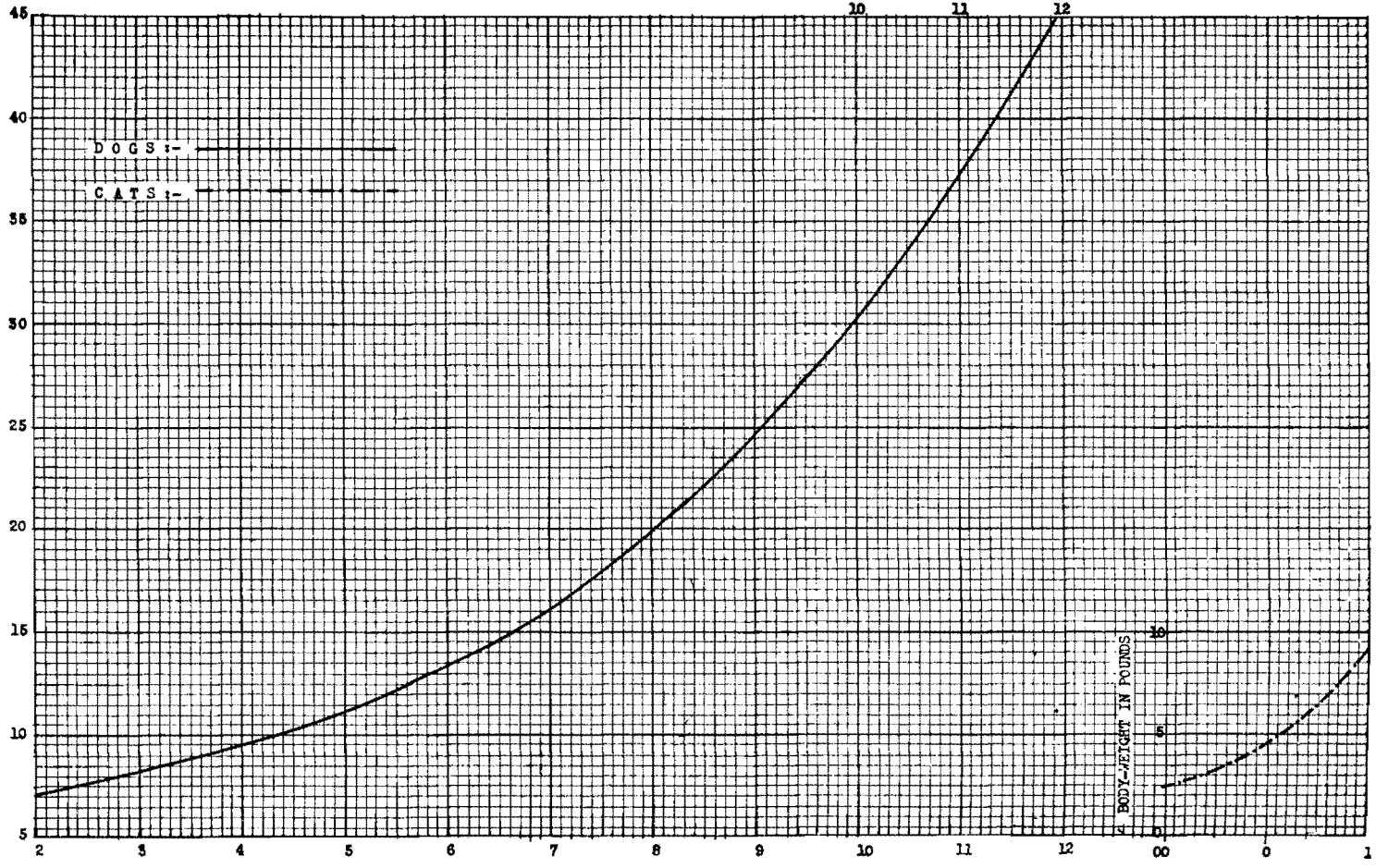

A GRAPH EXPRESSING BODY WEIGHT IN RELATION TO THE SIZE OF AN ENDOTRACHEAL CATHETER FOR DOGS AND CATS

P. H. LE ROUX — 38 Rhodes Avenue, Parktown, Johannesburg

COMMENTARY

It is apparent from the curve of the graph that the ratio between bodyweight and the size of trachea is not linear. One cannot therefore divide the weight by a constant factor to determine the correct size of endotracheal tube to be used for intubation.

In plotting this graph extreme variations such as brachycephalic dogs and very fat subjects were not included in the data.

Cuffed oral Magil endotracheal catheters sizes 00 to 12 were used. Larger tubes were not available and it was found that the cuff could close the gap in large dogs.

Anaesthesia was induced with Brietal (methohexethal sodium; Lilly) Intraval (thiopentone sodium; May Baker) or Themalon (diethylthiambutane hydrochloride; Burroughs Wellcome). The glottis was sprayed with tetracaine hydrochloride 2 per cent. The tube was lubricated and inserted under direct vision after drawing the tongue forward. A snug but not tight fit was aimed at.

METHODS OF TESTING ANTHELMINTICS IN SHEEP

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Received for publication, April, 1963.

SUMMARY

Standard and modified anthelmintic tests were reviewed and compared.

The controlled anthelmintic test is the method of choice for specific observations on immature and mature worms.

INTRODUCTION

The standard procedures for testing anthelmintic efficacy have been used extensively in this laboratory. From time to time various modifications of these methods have been introduced. However, none of these procedures were entirely satisfactory for immature worms, and an attempt was made to solve this difficulty.

CRITIQUE OF STANDARD PROCEDURES

The worker is faced with various alternatives depending on the scope of the information desired from anthelmintic tests.

Faecal Egg Count Anthelmintic Test

This has been extensively used by Gordon[4] who carries out 10 faecal egg counts during the fortnight preceding treatment and daily counts for 30 days thereafter. In his trials he prefers using artificially infested sheep, carrying a single species or in the case of Trichostrongylus, species of a single genus. No faecal cultures are necessary since only pure infestations are used.

Under field conditions Reinecke and Rossiter[9] modified his methods as follows:—

(*a*) Flocks or herds with natural mixed infestations are selected and divided into groups including at least one group of undosed controls. It is preferable for groups to be fairly large, i.e. 20 to 25 per group, but useful results can be obtained with only 10 animals per group.

(*b*) Faecal samples are collected every week; seven days prior to dosing and weekly thereafter for four weeks.

(*c*) Differential egg counts, using a modified McMaster methop described by Reinecke[8] are carried out.

Comment

The advantages of this test are that it is a rapid, cheap and effective way of testing anthelmintics in the live animal. The range of activity on a species or genus basis can be determined. Egg output is examined for at least three weeks after treatment; drugs which temporarily suppress the egg laying capacity of female worms may be distinguished from those which expel the parasites. A refinement such as the examination of the total faecal output after treatment for expelled worms confirms anthelmintic efficacy. A trial of this nature on horses was described by Reinecke and Rossiter[9].

The limitations of this method must, however, be clearly understood. It is not an index of the immature worms present. It can be assumed that high egg counts indicate heavy adult worm burdens, particularly of species such as *Haemoncus contortus* and *Oesophagostomum columbianum* but low egg counts do not necessarily indicate the reverse, particularly in resistant animals. Comparison of differential egg counts with the number of worms recovered *post mortem* by Muller[7] and Barrow, (personal communication, 1962) have shown that egg counts are unreliable where *Trichostrongylus* spp., *Nematodirus* spp. and *Ostertagia* spp. are present.

Once having established that the drug has some anthelmintic effect, slaughter tests must be carried out for more precise observations.

Critical Anthelmintic Test

This is the method of Hall and Foster[5]. Briefly the method consists of collecting all the faeces for at least four days after treatment, counting the worms expelled therein and the unaffected worms recovered *post mortem*. Gordon[4] and Steward[11] have called this the direct method and as Gordon states, a balance sheet can be drawn up between the unaffected parasites that are recovered *post mortem* and the affected parasites expelled *ante mortem* in the faeces. The efficacy is expressed as follows:

$$\text{Percentage efficacy} = \frac{\text{Worms expelled from treated animals}}{\text{Total number of worms recovered}} \times 100$$

Comment

This method was modified by Reinecke, Snijders and Horak[10]. Their experiments showed that the method was totally unsuited to the abomasal parasite, *H. contortus* which after being killed by the anthelmintic was digested in its passage through the intestinal tract. It was of doubtful value with *Ostertagia circumcincta* and immature worms, but was satisfactory for adult *Trichostrongylus colubriformis* and *O. columbianum* which were recovered from faecal bags in large numbers in a good state of preservation.

The main advantage of this method is that each animal acts as its own control and fewer experimental animals are required than in the controlled test which will now be described.

Controlled Anthelmintic Test

This was described by Moskey and Harwood[6] and involves the artificial infestation of susceptible animals reared under worm-free conditions.

When the worms reach maturity, half the experimental animals, selected at random, are retained as controls while the other half are treated. Two weeks after treatment, during which time the entire group is maintained under worm free conditions, all the animals are slaughtered and the number of worms in the treated animals compared with that in the un treated controls.

Steward[11] has called this the indirect method and the efficacy can be estimated thus:

$$\text{Percentage efficacy} = \frac{\text{average number of worms in untreated group} - \text{average number of worms in treated group}}{\text{average number of worms in untreated group}} \times 100$$

This method has been modified for tests on immature worms (Reinecke *et al.*[10]). These workers employed two different methods:

I. In the first trial they dosed 40 Merino yearlings with *H. contortus* and *T. colubriformis* infective larvae. Eight of these sheep were slaughtered from the second to fourteenth day to act as indicators of the infestation present. The remaining 32 sheep were divided at random into groups; eight were not treated and served as controls; the balance (24) was divided into six groups of four sheep each. Three of these groups were dosed with anthelmintics on the 7th, the other three on the 14th day after the larval challenge. All the sheep were slaughtered 27 to 30 days after larval infestation and worm counts carried out.

Comment

Although the eight sheep slaughtered during the prepatent period showed that large numbers of *H. contortus* and *T. colubriformis* were present the eight controls slaughtered when the worms were mature had only half the number of *H. contortus*. Since the worms at treatment were immature, the loss in the controls could be attributed to a natural loss during development to adults. They were therefore not a true reflection of the number of worms present at treatment.

II. The second trial overcame many of these difficulties. Twenty-five Merino weaners were dosed with *H. contortus* larvae three times a week on alternate days for 10 weeks. After the last larval dose they were divided at random into three groups: thirteen sheep acted as undosed controls; two groups of six sheep each were dosed either with thiabendazole or methyridine at standard dosage rates. The drugs were administered to two sheep in each group 24 hours, and to four sheep in each group 58 hours, after the last larval dose. All sheep including the undosed controls were slaughtered from 34 to 58 hours after treatment.

Comment

Since larvae had been dosed on alternate days and anthelmintics

administered at different times, all stages of development with the exception of 7 and 14 day old worms were present at the time of treatment.

The time lag between treatment and slaughter was less than 60 hours. The controls were therefore a truer reflection of the worm burdens at the time of treatment, than in the first trial. An improvement would have been to have dosed larvae over a shorter period to avoid the possible development of resistance, which probably accounted for the low worm burdens in some of the controls.

As none of the tests described were satisfactory for trials on immature worms, the controlled critical anthelmintic test of Steward[11] was modified to include these larval stages.

Controlled Critical Anthelmintic Test

The trials summarised above had not clarified the following:

(1) The importance of the susceptible host as an experimental animal.

(2) The validity of the modified controlled test for immature *Ostertagia* spp. and *Trichostrongylus* spp.

(3) The value of the modified critical test for adult *Ostertagia* spp. and *Trichostrongylus* spp.

An attempt was made to solve these problems by carrying out the following experiment:

Materials and Methods

Twenty weaner Merino lambs were used. Some of them had not been reared under worm-free conditions, and were lightly infested with mixed worm burdens. Before the commencement of the experiment they were treated with thiabendazole at 50 mg./K. and housed on concrete floors under worm-free conditions.

Cultures consisting of 92 to 96 per cent *O. circumcincta* and four to eight per cent *T. colubriformis* larvae were used to infest these animals. At first larvae were irregularly dosed on eight occasions for a period of 19 days and thereafter daily for 10 days until a total of 87,760 larvae had been administered to each sheep.

The sheep were divided into three random groups, 48 hours after the last larval dose:

(1) Eight sheep served as undosed controls.

(2) Six sheep were dosed with thiabendazole at 50 mg./K. *per os.*

(3) Six sheep were injected with methyridine at 200 mg./K. intraperitoneally.

Faecal collecting bags were attached to the hind quarters of each sheep in groups two and three, and replaced daily until slaughter.

The sheep were slaughtered as follows:

(*a*) Two sheep from each group 24 hours after treatment.

(*b*) Six control sheep (group one) the following day.

(*c*) The remainder 72 hours after treatment.

At autopsy, on opening the abdominal cavity, the procedure varied in the treated and control animals.

Treated sheep

Tight double ligatures about an inch apart were tied round the alimentary tract at the following points:

(1) The abomasum at both the fundus and pylorus.

(2) The duodenum at the duodeno-colic ligament at the commencement of the jejunum.

(3) The ileum at the ileo-caecal valve.

After stripping the mesentery, the gut was severed between the double ligatures to yield four isolated portions of the gastro-intestinal tract which were handled separately.

Controls

It has been shown by Reinecke *et al*[10] that *O. circumcincta* is an abomasal parasite although a few worms may be found in the duodenum and that very few (nought to four per cent) *T. colubriformis* could be recovered beyond the first seven metres of the jejunum. Therefore the abomasum and duodenum were ligated as previously described and after stripping the mesentery, double ligatures tied on the jejunum, seven metres beyond the duodeno-colic ligament. After cutting between the double ligatures these portions of the gut were removed and the balance discarded. The procedure thereafter with the organs collected *post mortem* was the same in both treated and control sheep.

Each portion of the gut was then opened and the ingesta washed through sieves (100 and 200 mesh to the linear inch) the sievings finally being washed into labelled jars to which formalin was added to a final concentration of 10 per cent. Each portion of gut was cut into pieces three to four inches long, placed in separate labelled jars, digested with pepsin and sieved (Reinecke[8]). The caecum and colon were not digested.

Faeces from the faecal collecting bags of each sheep were soaked in water for a few hours to soften them. After breaking up the pellets by hand they were sieved and the sievings collected in a manner similar to the ingesta.

For the purpose of counting the worms in each separate specimen water was added to the sievings until a thin suspension was formed and the volume adjusted to the nearest litre, which varied from two to five litres depending on the amount of ingesta present.

Aliquots from each diluted specimen were collected in the following manner: A glass tube with a wide mouth (one cm. diameter) was attached to a rubber tube which was connected to an air pump and a stream of air blown vigorously through the fluid to form a uniform suspension. A wide mouth pipette such as a 20 ml. graduated pipette with the tip cut off, was used to withdraw a volume of fluid which was transferred to a suitably calibrated container. The procedure was repeated until a volume not less than one tenth of the total volume had been collected. From each specimen three such aliquots were collected.

For counting and identifying the worms each aliquot was stained with iodine, a few ml. pipetted into a square glass counting chamber (3 in. by 3 in. by $\frac{1}{2}$ in.) and decolourized with sodium thiosulphate (Whitlock[12]). The brown stained worms were readily seen under the dissecting microscope. In the digested gut the worms were stained with iodine but the specimens were not treated with sodium thiosulphate as the larval stages decolourized too rapidly. When necessary, individual worms were removed for examination under a higher magnification. The process was repeated until all the worms in the three aliquots had been counted.

If the number of worms in the three aliquots varied by more than 10 per cent from the mean, further aliquots were counted. If there were less than 100 worms in the first aliquot indicating a total of less than 1,000 worms, at least half the specimen was examined. In massive infestations (10,000 or more) three one hundredth aliquots were examined. From these counts the total number of worms in each separate specimen could be calculated.

In the critical trials, in order to calculate the anthelmintic efficacy of the drugs, due attention was paid to the normal habitat of the various worm species. Thus *O. circumcincta* distal to the duodenum and *T. colubriformis* recovered beyond the ileo-caecal valve, as well as worms in faecal bags were regarded as expelled.

To assist in identifying the stages of development the description of the larval stages of worms of these genera given by Douvres[2,3] was used. They were divided into third, fourth, fifth stage and adult worms. Worms in the third moult were regarded as fourth stage, while those in the fourth moult were regarded as fifth stage worms. In addition males which were smaller than adults with unpigmented spicules and females that had no eggs in their uteri, were classified as fifth stage worms. Only fully developed males with pigmented spicules and gravid females were classified as adults.

Results

Since this is a combination of two methods, the results will be summarised in separate tables.

A. Controlled Tests

Table I

Controlled test. Number of *Ostertagia circumcincta* recovered *post mortem* from the normal habitat

Sheep No.	Hours between dosing and slaughter	Stage of development				Total
		3rd	4th	5th	Adult	
	Undosed controls*					
63		290	2,735	561	568	4,154
74		0	15,150	1,575	3,030	19,755
160		150	9,846	3,521	5,288	18,805
166		50	14,814	3,850	4,196	22,910
192		0	13,827	2,400	10,750	26,977
510		0	8,785	2,155	3,265	14,205
725		0	19,080	1,550	7,752	28,382
851		0	18,033	1,450	5,520	25,033
	Total.....	490	102,270	17,062	40,369	160,191
	Mean.....	61	12,784	2,133	5,046	20,024
	Thiabendazole 50 mg./K. *per os.*					
397	24	3	2,763	1,235	602	4,603
720	24	543	2,188	@	3,275	6,006
	Total.....	546	4,951	1,235	3,877	10,609
	Mean.....	273	2,475	618	1,938	5,304
	% Reduction	+345.4	80.6	71.0	61.6	73.5
843	72	13	271	144	0	428
844	72	0	64	26	6	96
873	72	0	0	0	0	0
874	72	0	5	11	15	31
	Total.....	13	340	181	21	555
	Mean.....	3	85	45	5	139
	% Reduction	94.6	99.3	97.9	99.9	99.3
	Methyridine 200mg./K. intraperitoneally					
522	24	15	2,155	460	485	3,115
588	24	5	909	166	139	1,219
	Total.....	20	3,064	626	624	4,334
	Mean.....	10	1,532	313	312	2,167
	% Reduction	83.7	88.0	85.3	93.8	89.2
828	72	0	871	54	64	989
840	72	0	84	24	59	167
872	72	0	424	113	590	1,127
919	72	0	1,167	81	285	1,533
	Total.....	0	2,546	272	998	3,816
	Mean	0	637	68	249	954
	% Reduction	100.0	95.0	96.9	95.7	95.2

* Nos. 63 and 74 slaughtered 24 hours, the rest of the controls 48 hours after the other groups were dosed.

@ Fifth stage and adult worms not differentiated.

TABLE II

Controlled Test. Number of *Trichostrongylus colubriformis* recovered *post mortem* from their normal habitat

Sheep No.	Hours between dosing and slaughter	Stage of development				Total
		3rd	4th	5th	Adult	
	Undosed controls*					
63		5	269	270	1,417	1,961
74		0	1,219	684	2,747	4,650
160		0	2,245	695	2,570	5,510
166		5	1,173	589	1,057	2,824
192		0	1,341	594	1,560	3,495
510		0	762	446	1,287	2,495
725		0	672	408	1,020	2,100
851		0	273	298	1,298	1,869
	Total.....	10	7,954	3,984	12,956	24,904
	Mean.....	1	994	498	1,620	3,113
	Thiabendazole 50 mg./K. *per os.*					
397	24	0	0	0	0	0
720	24	0	0	0	0	0
	Total.....	0	0	0	0	0
	Mean.....	0	0	0	0	0
	% Reduction	100.0	100.0	100.0	100.0	100.0
843	72	0	0	0	0	0
844	72	0	0	0	0	0
873	72	0	0	0	0	0
874	72	0	0	0	0	0
	Total.....	0	0	0	0	0
	Mean.....	0	0	0	0	0
	% Reduction	100.0	100.0	100.0	100.0	100.0
	Methyridine 200 mg./K. intraperitoneally					
522	24	0	0	0	5	5
588	24	0	0	0	0	0
	Total.....	0	0	0	5	5
	Mean.....	0	0	0	2.5	2.5
	% Reduction	100.0	100.0	100.0	98.5	99.2
828	72	0	1	0	8	9
840	72	0	0	0	45	45
872	72	0	0	0	2	2
919	72	0	0	10	320	330
	Total.....	0	1	10	375	386
	Mean.....	0	0.25	2.5	93.75	96.5
	% Reduction	100.0	99.9	99.5	94.8	97.2

* Nos. 63 and 74 slaughtered 24 hours, the rest of the controls 48 hours after the other groups were dosed.

Although the number of *T. colubriformis* in the undosed controls was considerably less than the number of *O. circumcincta* recovered, this is understandable when account is taken of the small numbers of *T. colubriformis* larvae dosed originally (see materials and methods).

Whereas the animals slaughtered 24 hours after treatment, still retained a fair number of *O. circumcincta*, those slaughtered after 72 hours had considerably less. This indicated that insufficient time had elapsed for drugs to have their maximum effect (Table I).

Thiabendazole acted more rapidly against *T. colubriformis* as it was 100 per cent effective throughout. The sheep dosed with methyridine showed certain inconsistencies, the efficacy being slightly lower in the sheep slaughtered at 72 hours.

B. Critical Tests

These are summarised in Tables III and IV, given below.

On examining Tables III and IV it is obvious that critical tests are unsuited to immature worms although they have some value for mature parasites.

Once again it was obvious that thiabendazole was considerably more effective against *O. circumcincta* if a longer period was allowed to elapse between treatment and slaughter (Table III). Methyridine also showed increased efficacy if allowed to act for a longer period (Table III). Results with *T. colubriformis* showed that both these drugs were extremely rapid in action and thiabendazole was consistently 100 per cent effective, while methyridine was only slightly less effective, viz. 94.9 to 100 per cent (Table IV).

On examining the worms in the faecal bags it was noted that with few exceptions only adult and fifth stage worms were recovered. It was difficult to recognise some of the *O. circumcincta* as they were not always in a good state of preservation. Fragments of these worms were also present but were ignored unless the posterior extremities could be identified. On the other hand *T. colubriformis* seemed little affected, were easily recognisable and seldom broken into fragments. This appears to confirm that this method is more suited to adults of this species than those of *O. circumcincta*. The critical test was not of much value with immature worms, which were rarely recovered in a preserved state beyond their normal habitat.

If a comparison is made between the two methods, this point can be more clearly illustrated.

TABLE III

Critical tests on *Ostertagia circumcincta*

Sheep No.	Hours between dosing and slaughter	Stage of development	Worms Recovered					Total	Efficacy %
			In normal habitat		Distal to normal habitat				
			Abo.	Duo.	Je. Il	C.C.	F.		
		Thiabendazole 50 mg./K. *per os.*							
		3rd	0	3	20	70	0	93	96.8
		4th	2,681	82	385	440	0	3,588	23.0
397	24	5th	1,192	43	210	440	0	1,885	34.5
		Adult	581	21	155	200	500	1,457	58.7
		3rd	542	1	30	60	0	633	14.2
720	24	4th	2,160	28	322	1,250	0	3,760	41.8
		@Adult	3,246	29	476	1,890	800	6,441	49.2
		3rd	13	0	0	0	0	13	0
843	72	4th	271	0	0	0	100	281	27.0
		5th	144	0	0	0	600	744	80.6
		Adult	0	0	0	0	3,620	3,620	100.0
		4th	64	0	0	0	300	364	82.4
844	72	5th	26	0	0	0	400	426	93.9
		Adult	4	2	0	0	1,750	1,756	99.7
		5th	0	0	0	0	565	565	100.0
873	72	Adult	0	0	0	0	725	725	100.0
		4th	5	0	0	0	25	30	83.3
874	72	5th	10	1	0	0	350	361	97.0
		Adult	15	0	0	0	1,075	1,090	98.6
		Methyridine 200 mg./K. intraperitoneally							
		3rd	15	0	0	0	0	15	0
522	24	4th	2,155	0	0	0	0	2,155	0
		5th	460	0	0	0	12	472	2.5
		Adult	485	0	0	0	63	548	11.5
		3rd	5	0	0	0	0	5	0
588	24	4th	909	0	0	0	0	909	0
		5th	166	0	0	40	0	206	19.4
		Adult	139	0	0	400	0	539	74.2
		4th	871	0	0	0	0	871	0
828	72	5th	54	0	1	0	25	80	32.5
		Adult	62	2	0	0	450	514	87.5
		4th	84	0	0	0	0	84	0
840	72	5th	24	0	0	0	100	124	80.6
		Adult	58	1	1	0	3,701	3,761	98.4
		4th	424	0	0	0	1	425	0.2
872	72	5th	113	0	0	0	140	253	55.3
		Adult	589	1	0	0	2,300	2,890	79.6
		4th	1,167	0	0	0	0	1,167	0
919	72	5th	81	0	0	0	0	81	0
		Adult	285	0	0	0	2,990	3,275	91.3

@ No 5th stage worms identified.

KEY:

Abo. Abomasum
Duo. Duodenum
Je. Il. Jejunum and Ileum
C.C. Caecum and Colon
F. Faeces in collecting bags.

TABLE IV

Critical tests on *Trichostrongylus colubriformis*

Sheep No.	Hours between dosing and slaughter	Stage of development	Worms recovered					Total	Efficacy %
			In normal habitat			Distal to normal habitat			
			Abo.	Duo.	Je. Il.	C.C.	F.		
	Thiabendazole 50 mg./K. *per os.*								
397	24	Adult	0	0	0	0	1,200	1,200	100.0
720	24	Adult	0	0	0	39	150	189	100.0
		4th	0	0	0	0	140	140	100.0
843	72	5th	0	0	0	0	210	210	100.0
		Adult	0	0	0	0	1,570	1,570	100.0
		5th	0	0	0	0	100	100	100.0
844	72	Adult	0	0	0	0	1,800	1,800	100.0
		5th	0	0	0	0	40	40	100.0
873	72	Adult	0	0	0	0	1,000	1,000	100.0
		5th	0	0	0	0	175	175	100.0
874	72	Adult	0	0	0	0	1,200	1,200	100.0
	Methyridine 200 mg./K. intraperitoneally								
522	24	Adult	5	0	0	0	93	98	94.9
588	24	Adult	0	0	0	0	790	790	100.0
		4th	0	1	0	0	0	1	0
828	72	Adult	0	2	6	0	850	858	99.1
840	72	Adult	0	3	42	26	3,400	3,471	98.7
		4th	0	0	0	0	20	20	100.0
872	72	5th	0	0	0	0	40	40	100.0
		Adult	0	2	0	0	1,320	1,322	99.8
		5th	0	0	10	0	0	10	0
919	72	Adult	0	3	317	0	1,191	1,511	78.8

C. COMPARISON OF CONTROLLED AND CRITICAL TESTS

On examination of Table V, the number of *O. circumcincta* worms recovered is interesting. While the average number of third stage worms was larger in the group treated with thiabendazole, this is largely due to one sheep, No. 720 (cf. Tables I and III), which happened to have a large number of this stage present, and was slaughtered before the drug had had its maximum effect. Elsewhere the larval stages in the controls were far in excess of those recovered from all sources in the critical test. While an average of 5,046 adult *O. circumcincta* were recovered from the controls, only an average of 2,515 and 1,921 adults were recovered from the groups treated with thiabendazole and methyridine respectively in critical tests.

TABLE V

Comparison of the number of worms recovered in the controlled and critical tests

Group	Stage of development				Total
	3rd	4th	5th	Adult	
			Ostertagia circumcincta		
Controls in the controlled test					
Range.....	50–290	2,735–19,080	561–3,850	568–10,750	4,154–28,382
Mean.....	61	12,784	2,133	5,046	20,024
Critical tests					
(*a*) Thiabendazole 50 mg./K. *per os.*					
Range.....	0–633	0–3,760	361–1,885	725–6,441	1,290–10,834
Mean.....	123	1,352	664	2,515	4,654
(*b*) Methyridine 200 mg./K. intraperitoneally					
Range.....	0–15	84–2,155	80–472	514–3,761	1,465–4,523
Mean.....	3	935	203	1,921	3,062
			Trichostrongylus colubriformis		
Controls in the controlled test					
Range.....	0–5	269–2,245	270–695	1,020–2,747	1,869–5,510
Mean.....	1	994	498	1,620	3,113
Critical tests					
(*a*) Thiabendazole 50 mg./K. *per os.*					
Range.....	0	0–140	0–210	189–1,800	189–1,900
Mean.....	0	23	88	1,101	1,212
(*b*) Methyridine 200 mg./K. intraperitoneally					
Range.....	0	0–20	0–40	98–3,471	98–3,471
Mean.....	0	4	8	1,342	1,354

Where *T. colubriformis* was concerned, the larval stages showed that larger numbers were present in the controls than indicated in the critical test. There was, however, a closer correlation between the mean number of adults recovered. The controls had an average number of 1,620 while an average of 1,101 (67.9 per cent) and 1,342 (82.8 per cent) worms were recovered from sheep treated with thiabendazole and methyridine respectively in critical tests.

DISCUSSION

The use of the controlled critical test confirmed that critical tests were of value for adult *T. colubriformis* only; the results on *O. circumcincta* were not very satisfactory. Therefore tests by the direct method were not suited to this species.

Steward[11] has stated that in his trials "the worms were probably affected by the compound and either digested and absorbed or destroyed

by bacterial activity, according to the part of the alimentary tract in which they existed. In many instances, therefore, the direct anthelmintic activity detected by critical testing is not the full anthelmintic activity. It is for these reasons that a controlled critical anthelmintic test is to be preferred as a routine sorting or comparative assay test for anthelmintics." Steward's observations were confirmed in the controlled test. This is the only reliable method for testing anthelmintic efficacy on immature worms. However, the extra labour involved in doing critical trials at the same time is not justified merely to confirm the direct effect of an anthelmintic on adult parasites.

An omission in these experiments was that the immature worm burdens at the time of treatment were unknown. The larval stages develop continuously and larval mortality is also a constant feature. Therefore the number of, and proportion between the various larval stages, change from day to day. The worm burdens should therefore be known at the time of treatment as well as at the completion of the experiment.

This can be solved by doubling the number of controls. Half of these should be slaughtered at the time of treatment, the others when the treated sheep are killed.

Conclusions

The faecal egg count anthelmintic test is of value as a preliminary screening test in the live animal. More specific information can be obtained by slaughtering the experimental animals using critical, or controlled, or a combination of both tests.

Critical anthelmintic tests are of value in trials on adult intestinal parasites only. The controlled critical anthelmintic test, despite the extra labour involved, is no improvement on the controlled test alone.

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REFERENCES

1. BARROW, D. B. (1962): Personal communication.
2. DOUVRES, F. W. (1956): Morphogenesis of the parasitic stages of *Ostertagia ostertagi* a nematode parasite in cattle. *J. Parasitol.* **42**, 626-635.
3. DOUVRES, F. W. (1957): The morphogenesis of the parasitic stages of *Trichostrongylus axei* and *Trichostrongylus colubriformis*, nematode parasites of cattle. *Proc. Helm. Soc. Wash.* **24**, 4-14.

4. GORDON, H. McL. (1950): Some aspects of parasitic gastroenteritis of sheep (continued). *Aust. Vet. J.* **26**, 65-72.
5. HALL, M. C. & FOSTER, W. D. (1918): Efficacy of some anthelmintics. *J. Agric. Res.* **12**, 397-447.
6. MOSKEY, H. E. & HARWOOD, P. D. (1941): Methods of evaluating the efficacy of anthelmintics. *Am. J. Vet. Res.*, **2**, 55-59.
7. MÜLLER, G. L. (1961): Cited by Hobbs, W. B., Rossiter, L. W., Reinecke, R. K., Müller, G. L., Verster, Anna, van der Walt, K. and Tustin, R. C. Symposium: Helminth Research in South Africa, *J.S. Afr. vet. med. Ass.*, **32**, 477-479.
8. REINECKE, R. K. (1961): Helminth Research in South Africa: III. The diagnosis of nematode parasites for worm survey purposes. *J.S. Afr. vet. med. Ass.*, **32**, 167-173.
9. REINECKE, R. K. & ROSSITER, L. W. (1962): Anthelmintic trials with thiabendazole. *J.S. Afr. vet. med. Ass.*, **33**, 193-199.
10. REINECKE, R. K., SNIJDERS, A. J. & HORAK, I. G. (1962): A modification of standard procedures for evaluating the relative efficacy of anthelmintics. *Onderstepoort J. Vet. Res.*, **29**, 241-257.
11. STEWARD, J. S. (1955): Anthelmintic studies: I. A controlled critical enteronemacidal test. *Parasitology*, **45**, 231-241.
12. WHITLOCK, H. V. (1948): A method of staining small nematodes to facilitate worm counts. *J. Coun. Sci. Ind. Res. Aust.*, **21**, 181–182.

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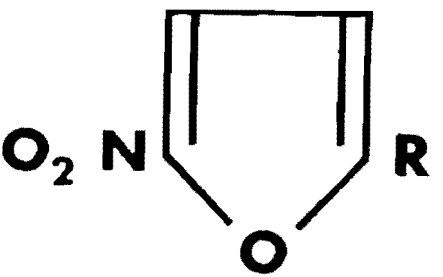

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PNB 219

STERILIZATION OF TEASER MALE RUMINANTS — THE RELIABILITY OF SURGICAL METHODS

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SUMMARY

The techniques and results of sterilization by resection of a portion of the *cauda epididymis* and of the *vas deferens* are compared. Failure in 67 per cent of the epididymectomy operations was revealed after long-term study of fertility. The failures are ascribed to spontaneous anastamosis following post surgical spermatocoele formation.

Various methods of sterilization of male ruminants are discussed. The injection of *sclerosing agents* into the *cauda epididymis* appears to hold most promise as a satisfactory method.

INTRODUCTION

Resection of a portion of the *vas deferens*, the conventional method of sterilizing the male animal for use as a teaser, is an unsuitable procedure when large numbers are involved. It requires recumbency in the bull, is time consuming, and demands appreciable operative experience.

Sterilization by means of simple resection of the *cauda epididymis* was reported by Rosenberger[4] as an effective method, particularly suitable for bulls, as the operation could be preformed swiftly on the standing animal. The simplicity of this technique rapidly caused its widespread use in Europe. Poorly substantiated reports of failure followed. These have in turn been repudiated by the originator of the method, who considered that any spontaneous anastamosis of the severed tubules was impossible (Rosenberger[6]), even following partial resection of the *cauda epididymis*

The technique of partial resection of the *cauda epididymis* has been used by us on rams; and this paper records failure in a large proportion of cases, together with comparative notes on other methods.

PROCEDURE

The animals were to be used as "teasers" at this institute and identification was positive. The tail of the *epididymis* was partially resected (epididymectomy) by simply making a ventral one centimeter incision through the scrotum and removing an 0.3–0.5 gram portion of the *cauda*

* Senior Research Fellow, Stock Diseases Research Fund.

epididymis with scissors and forceps. In all instances semen was observed to flow freely from the severed tubules, and the tubular nature of the removed tissue was carefully confirmed. Vasectomy was performed as described by Webster.[10]

Following operation, semen was collected by electro-ejaculation, using the apparatus described by van Rensburg and de Vos.[9] Each result presented in the table represents the mean of three ejaculates. Density was established by direct counting using a haemocytometer. In those animals which were slaughtered, the portion of the *vas deferens* distal to the surgical site and including the *ampulla* was dissected and flushed to determine the spermatozoa content.

Results

The epididymectomy scrotal incisions became heavily contaminated with faecal material during recumbency. Both rams whose wounds were left unsutured, as recommended by Rosenberger in the bull to allow drainage, developed periorchitis. This complication was obviated in the others by skin suturing. No adverse effects were apparent following vasectomy.

Semen examinations during the first two weeks confirmed sterility in all rams following operation. After vasectomy, only occasional dead sperm were present five days later. Greater sperm reserves were evident in the epididymectomy group; they were not used as teasers before 8–10 days had elapsed after operation.

After epididymectomy two rams (Table I — Nos. 5 and 6) were used as teasers for an entire breeding season on a flock of 40 ewes. Each ewe was served during a number of oestrous periods and no conceptions occurred. The following year, without any prior semen examination being preformed, these two rams were again used on the same flock. A high conception rate was soon indicated by failure of the ewes to return to oestrus. Semen examination revealed normal fertility (Table 1) and 16 ewes subsequently kidded.

TABLE I
Semen examinations and sperm reserves in vas deferentia

Number	Operation	Species	Time after operation Months	Semen Examination *			Total sperm in vas deferens at slaughter. X10⁶.	
				Volume ml.	Live sperm %	Density X10⁶	Left	Right
1	Vasectomy	Caprine	6	0.3	0	0.04	0.71	1.10
2	,,	Caprine	6	0.5	0	0.05	0.65	0.27
3	,,	Caprine	6	0.4	0	0.02	—	—
4	,,	Ovine	8	0.9	0	0.02	—	—
5	Epididymectomy	Caprine	19	0.8	71	2,122.0	0.02	33.75
6	,,	Caprine	19	1.5	77	2,870.0	160.0	97.6
7	,,	Caprine	18	1.2	0	0.01	0.03	0.01
8	,,	Ovine	14	0.4	15	0.33	5.95	3.84
9	Control	Ovine	—	1.4	85	4,743.0	196.0	162.0
10	,,	Caprine	—	1.1	83	3,447.0	53.0	74.0

* Mean of 3 ejaculates obtained by electrical stimmulation.

Examination of the semen of a further two rams (7 and 8) showed that epididymectomy had been entirely successful in one case but not in the other. Four rams which had been vasectomized six to eight months previously showed only occasional degenerated spermatozoa in their ejaculates.

As Table I shows, the sperm reserves found in the *vasa deferentia* indicated the instances where tubal patency was restored. Up to a million dead sperm were found when the operation was successful and these must be regarded as residual spermatozoa. The fact that many spermatozoa were motile when more were present, confirmed the assumption of restoration of tubal patency. The patency appears to have been limited in ram 8, whose use on a number of ewes did not result in any conceptions.

In addition to those animals reported on in the table, a further ram and also the organs of a fertile bull, which had undergone epididymectomy, were examined. The epididymis was patent unilaterally in the ram and bilaterally in the bull. Therefore, of the 12 epididymectomy operations on six animals, only 33 per cent were successful after prolonged observation.

Clinically, the partially resected *cauda epididymis* was grossly enlarged whenever obstruction was complete. On section, a spermatocoele three to four centimetres in diameter, surrounded by displaced epididymal tissue dorsally and adherent to the parietal tunica vaginalis ventrally, was found. In instances of recovered tubal patency, the structure was invariably within normal limits of size.

Vasectomy resulted in the accumulation of spermatic detritus masses at the proximal end of the severed duct, 0.5 to 4.0 centimetres in diameter. The distal severed end was generally about five centimetres distant from the proximal end; no tissue reaction was present, and it was occluded in all four examined.

Discussion

The finding that fertility is restored only after a long period following epididymectomy disproves Rosenberger's assertion[5] that instances of failure are due to defective technique. Criteria for claims of success for a particular technique should include proven sterility for a minimum of 18 months.

The parietal *tunica vaginalis* was always adherent to the periphery of the excision site following epididymectomy. When patency was permanently interrupted, a large spermatocoele formed in the site of the excised tissue. It may be visualized how patency could be restored if both afferent and efferent severed ducts open within this spermatocoele which has been created surgically. Scheatz and Dietz[7] pointed out that this is the principle on which an artificial anastamosis between the vas deferens and epididymis is created in human surgery.

These cases indicate that when recanalization does occur, the spermatocoele subsides and may be barely detectable, whereas if obstruction is present the structure continues to increase in size. A *cauda epididymis* of clinically normal size following its partial resection, must therefore be regarded with suspicion.

Drastic total resection of the *cauda epididymis* is probably very reliable compared with partial resection. For large numbers of bulls this would certainly be the surgical technique of choice as the operation may be performed swiftly on the standing subject. Performed as elaborately as described by Tillman[8] on rams, however, this technique seems to offer little advantage over usual vasectomy. The risk of wound contamination and a pendulous accumulation of testicular products is increased. Ligation of the proximal severed duct, whichever method is used, will be advantagous in reducing semen leakage and consequent tissue reaction.

Simple injection of a sclerosing agent (Dondren-Knoll Pharm. Co.) into the *cauda epididymis* was described by Dorn[2] as a method of sterilization of ruminants. A lengthy controversy concerning the relative efficacy of surgical and chemical methods of sterilization followed in the German literature (Rosenberger[6]). Dorn's technique has been very successfully used by American veterinarians (Bierschwal & Ebert)[1] who routinely use multiple injections into each *cauda* to ensure reliability of the method. The present authors have sterilized successfully a bull and a ram with this technique by using a two per cent solution of euflavine. A total of 0.75 and 1.5 ml. was injected into each *cauda epididymis* of the ram and bull respectively. At the time of writing, however, these animals have only been sterile for four months and the reliability of euflavine is therefore not proved. The injection of sclerosing agents will obviate complications following surgery, the procedure is simple and humane, and probably more reliable in inexperienced hands.

After castration, at least sufficient spermatozoa remain in the *vasa deferentia* for one normal ejaculate (Leidl and Berchtold[3]) but all are dead within five days. Our experience with vasectomy was similar, but greater reserves of viable sperm were apparent following epididymectomy, and such rams were not used before eight days had elapsed.

The small numbers of sperm found in the ejaculates and *vasa deferentia* of our cases, six to eighteen months after successful sterilization, were invariably dead, and most certainly were residual sperm present in the *vas deferens* at the time of operation. The finding that sperm retain their morphology for such a lengthy period mitigates against so-called "ductal resorbtion" of aged sperm, a phenomenon the occurrence of which appears to be relatively unsubstantiated.

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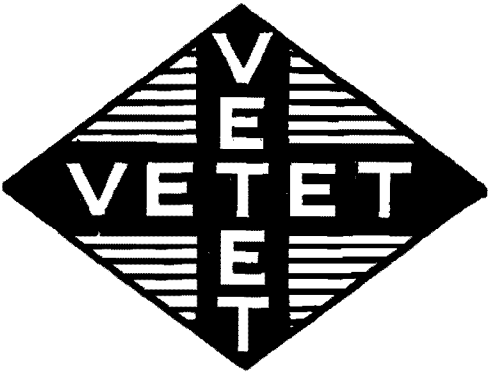
REFERENCES

1. BIERSCHWAL, C. J. and EBERT, E. F., 1961: Clinical Applications of a Sclerotherapeutic Agent. *Vet. Med.*, **56**, 323–332.
2. DORN, H. J., 1957: Die Sterilisation Mannlicher Wiederkäuer durch Dondren —Injektion. *Berl. Munch Tierarztl Wochenschrift*, **70**, 127–130.

3. LEIDL, W., and BERGHTOLD, M., 1961: Zur Frage der Spermienlagerung in Samenleiter und Samenleiterampulle beim Bullen. *Berl. Munch. Tierarztl. Wochenschrift*, **74**, 305–307.
4. ROSENBERGER, G., 1956: Sterilisierung der Bullen durch Resektion der Nebenhodenschwänze. *Dtsch. Tierarztl Wschr.*, **63**, 359.
5. ROSENBERGER, G., 1958: Hinweiss zur Frage der Sterilisierung der Bullen durch Resektion der Nebenhodenschwänze. *Dtsch. Tierarztl. Wschr.*, **65**, 246.
6. ROSENBERGER, G., 1959. Zur Frage der Erflogssicherheit der Bullensterilisierung. *Tierarztl. Umshau*, **14**, 191–193.
7. SCHAETZ, F. and DIETZ, O., 1959: Kurze Stellungnahme zu den Veröffentlichungen von H. J. Dorn. *Tierarztl. Umshau*, **14**, 132–133.
8. TILLMANN, H., 1956: Die Kunstliche Sterilisierung der Schafböcke. *Berl. Munch. Tierarztl. Wschr.*, **69**, 457–459.
9. VAN RENSBURG, S. W. J. and DE VOS, W. H., 1957: A Convenient type of Electro-ejaculator for Bulls and Rams. *J.S. Afr. vet. med. Ass.*, **28**, 1–3.
10. WEBSTER, W. M., 1954: Vasectomy — How and Why. *N.* 2, *Vet. J.*, **2**, 10–13.



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ENZYME CHEMISTRY . . . AN AID TO VETERINARY DIAGNOSTICS

By WILLIAM D. MALHERBE, University of Pennsylvania, and Faculty of Veterinary Science, University of Pretoria, Onderstepoort

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(This paper was presented by Dr. Malherbe at the 1962 Midwinter Conference of the California VMA, January 29, in Sacramento, Calif.)

SUMMARY

A brief summary is given of recent advances in precision of diagnosis provided by the determination of activity of certain cellular metabolic enzymes in serum. Particular mention is made of transaminases, lactic acid dehydrogenase and isocitric acid dehydrogenase as examples of such enzymes, and of certain applications of these agents up to the present in veterinary medicine.

As aids in improving efficiency in one of the most fundamental aspects of veterinary science, making a definitive diagnosis, a series of new tests based on enzyme chemistry and yielding important new information has in the last seven years become available.

Tests such as the determination of amylase, lipase, and alkaline phosphatase have been in use for years and are fairly well known. Estimation of the serum concentration of enzymes active in normal intermediary metabolism have become increasingly useful in showing up necrosis or degeneration of tissue cells rich in these enzymes.

This happens as the result of escape of these catalytic agents from the cells and into the bloodstream. Their activity in general is measured by adding a known quantity of serum to known quantities of selected substrates and measuring the chemical change it brings about in the substrate per unit of time. These substrates represent substances which at various points directly or indirectly are involved in the Krebs cycle or other metabolic pathways. Use is made of the spectrophotometer in this measuring process since it is possible to select a wavelength suitable for detecting the speed and degree of specific chemical changes over a given period by passing a beam of light of a suitable wavelength through the solution.

The significance of measuring this enzyme activity lies in the fact that in the different body tissues the cells contain different quantities of any given enzyme and that the presence or increased quantity or "activity" of a particular enzyme in the serum represents an *escape* of the particular substance from cells rich in that substance.

It is a well known fact that virtually all organs to a greater or lesser extent have a reserve capacity, as a result of which they can withstand quite massive insults without losing their functional capacity.

Many of the so-called "function" tests do measure specific functions and to that extent they are useful. As a case in point: it is quite possible for considerably more than half the population of liver cells to be destroyed without any detectable evidence of disturbed function. What does however happen is that the liver cells on losing their integrity discharge the metabolic enzymes within them into the blood stream. By measuring their increased activity in the serum we are able to determine the degree of necrosis or degeneration of cells normally rich in the particular enzymes.

Transminases

The first of the enzymes in which this type of clinical use was found were the transaminases, which are normally concerned with the transfer of the *alpha*-amino group of either aspartic acid or alanine (amino-acids) to *alpha*-ketoglutaric acid (a Krebs cycle metabolite). Their existence has been known for many years, certainly since 1937[1], but it is only since 1954 and 1955[2, 3] that they have been found useful in diagnostics through the efforts of Wroblewski-Karmen-LaDue group at the Sloane-Kettering Institute for Cancer Research in New York.

They found that as a result of necrosis or degeneration of certain tissue cells the serum concentration of these enzymes rose appreciably. The first pay-off of clinical significance came in the fact that *oxaloacetic* transaminase (GO-T), normally present in heart muscle in greater concentration than in any other tissue, rose sharply during the first 24 hours after myocardial infarction in man, returning to the normal range within 3 to 6 days. This provided an extremely useful parameter in the differential diagnosis of this condition when electrocardiographic results were equivocal.

Serum oxaloacetic transaminase (SGO-T) is affected not at all or only minimally in angina pectoris, coronary insufficiency, heart failure or in cardiac arrhythmias. In other conditions characterized by more or less extensive cellular damage such as acute myocarditis, acute pancreatitis, hemolytic crisis, extensive crush injuries, after surgery and large doses of aspirin Manso and co-workers[4] have recorded high values. Levels were, however, normal in pericarditis, pulmonary infarction, rheumatic fever, rheumatoid arthritis and acute cholecystitis.

SGO-T in Liver Disease

The Wroblewski group[5] followed up their cardiac work with an investigation of the concentration of SGO-T in liver disease caused by such conditions as carbon tetrachloride poisoning, viral hepatitis, cirrhosis, obstructive jaundice and carcinomatosis. More particularly in the first two where liver cell necrosis and degeneration are prominent, impressive elevations were found. In using the better known liver "function" tests at the same time it was shown that much of the information which could

now be obtained was new for the reason that enzyme determination would reflect damage to cells before such damage was sufficiently extensive to affect "function."

The clinical features would serve to differentiate between cardiac and hepatic pathology.

After this initial work the Wroblewski group investigated[6] the clinical value of another transaminating enzyme, the serum glutamic *pyruvic* acid transaminase, now customarily abbrevated SGP-T. This they found to be a sensitive index of hepatocellular damage, rising to higher levels, and not being affected to any appreciable extent by myocardial damage.

When both these tests are done the situation emerges in the case of man that if SGO-T only is affected involvement of the heart muscle is likely, whereas if they both are, especially SGP-T, liver cell necrosis could be expected to be present.

The pioneer work in connection with the use of these determinations in veterinary medicine was done by C. E. Cornelius and his collaborators in California and published in 1959 and 1960[7, 14]. They found that with carbon tetrachloride poisoning in horses, cattle, pigs, cats and dogs there was a notable species variation. The enzymes behaved in dogs and cats more or less as they do in humans with liver damage but in the other animals only SGO-T was affected under similar conditions.

We were able to confirm these results at Onderstepoort in 1960, using a different system of units, the King units (while in this country the Sigma units are extensively used). We did a large number of determinations on clinically normal horses, cattle, sheep and dogs and also on a number of these animals suffering from various disease conditions. The results have been described in detail elsewhere[8].

The normal values found corresponded qualitatively with those of the Cornelius group, but in King units our levels were numerically about three times as high.

Useful Parameter Found

In dogs we found no alteration of transaminase activity in a number of animals suffering from various stages and forms of distemper, but in infectious canine hepatitis a definite rise in SGP-T pointed to a useful parameter in differentiating between distemper and hepatitis at times when clinical features did not distinguish between them adequately or at all.

Some experimental work at the time on induced infectious (viral) hepatitis in dogs provided an opportunity of following the progress of transaminase figures during the entire course of the disease and comparing these with the development of disturbed liver *function* as shown by liver "function" tests. Transaminase showed itself a better index of liver cell necrosis and degeneration, and sooner, than the "function" tests. In the milder cases liver function remained undisturbed throughout the course of the disease.

A number of natural cases of babesiosis in horses, cattle and dogs and of anaplasmosis in cattle were studied. In these animals the transaminase figures remained normal until the liver became involved, when they would rise.

In the same period enhanced values were found in two cases of intrahepatic cholestasis[9], one each of hepatic carcinoma, purulent hepatitis and cirrhosis and three cases of suspected *Leptospira icterohaemorrhagiae* infection.

In sheep some field outbreaks of bacterial icterus[10], followed by induction of cases in the laboratory, provided material for study, which showed SGO-T as useful an index of liver pathology as was SGP-T in dogs and man.

In the recent studies of the nutritional myopathies — white muscle disease — in lambs and calves, Muth and co-workers in Oregon, and other groups,[11, 12, 13] have used SGO-T as the yardstick of incidence and extent of muscular pathology. This has proved an eminently satisfactory tool as it was found possible to detect even minor damage in muscle fibres in cases where the animals showed no clinical symptoms at all. Histological examination of muscle from such animals confirmed these findings.

Lactic Acid Dehydrogenase (LD)

Several groups of workers were active in assessing the value of this enzyme as a diagnostic agent, particularly in neoplastic disease, during the middle fifties. Wroblewski[18] and others[16, 17, 22] found that heart muscle was rich in this substance and that a considerable enhancement of its activity could be found in myocardial infarction in man. Rises were also noted in various types of leukemia, disseminated carcinomatosis, trauma of skeletal muscle, acute liver injury and hepatitis and in intravascular hemolysis (the latter only because red blood corpuscles are much richer in LD than is serum).

Occasional rises have been found acute renal disease and in acute pancreatitis, but it has not received much application in this area.

In the diagnosis of neoplasia associated with pleural effusions and ascitic fluid it has proved to be particularly useful. Wroblewski and Wroblewski[15], and de Torregrosa in Puerto Rico[19] found values higher than those in the serum of the same individuals at the same time if cancerous conditions were present in the cavity, and values lower than in serum if tumors were not present.

Cerebrospinal fluid normally has a low LD activity and even under conditions of degenerative or nonspecific diseases of the C.N.S., in man of the order of less than 40 units, about one fifth of the lowest serum figure. In tumors of the C.N.S. on the other hand[18] the figure rises to appreciably more than 40 units. Wroblewski[23] reviewed the whole situation in 1958.

Erickson in San Francisco[20] has confirmed these findings and has found uniformly low LD activity in peritoneal effusion secondary to cirrhosis and pleural transudation in congestive heart failure. Nonmalignant effusions which were purulent or which involved massive tissue destruction and were therefore easily recognizable showed greater activity but this fact does not detract from the value of this determination in the differential diagnosis of the origin of noninflammatory products in these two cavities and the pericardium.

We have made use of this assay in connection with the lymphosarcoma studies in cattle currently being pursued by Marshak and his group at the University of Pennsylvania.[21] In one series of 40 cases of lymphosarcoma 29 showed greatly increased LD activity. In fact, Marshak regards LD to be the most consistently abnormal biochemical change in this condition.

In summary then we find some overlap with transaminases especially as far as liver necrosis and myocardial infarction are concerned, but in detecting neoplastic conditions in blood, C.S.F. and effusions in the body cavities LD holds promise of useful application.

Isocitric Acid Dehydrogenase (ICD)

This enzyme is also normally found in serum and in practically all tissues of the body. The early work on its clinical use was done by Wolfson and Williams-Ashman and others and several publications from 1957 onwards have discussed the subject.[24, 25, 26]

They found that in contrast to transaminases and LD normal values persisted during acute myocardial infarction and skeletal muscle injury, while significantly elevated values were found in the presence of inflammatory necrotic and malignant liver diseases.[26] Normal values were found with obstructive lesions and cirrhosis. This is interesting since in the case of transaminases obstruction is accompanied by higher serum concentration. It seemed then that ICD might provide a valuable parameter in the often troublesome area of the differential diagnosis of icterus. Malignancies moreover did not produce elevations of LD activity.

In veterinary medicine Cornelius[27] has studied the normal levels and the influence of carbon tetrachloride poisoning on various animal species and found ICD elevated but giving no information additional to transaminases in the case of liver cell damage. Investigating tissue concentrations in a number of different species he found the enzyme present in appreciable amounts in all tissues and concluded that the ideal enzyme determination had not yet been found which would be as specific for liver pathology as is SGP-T in man, dogs and cats.

If however it proves as useful in dogs for the differential diagnosis of icterus as has been found in man it should indeed prove to be an advance. Information is at this time still lacking on the situation concerning differentiation between "medical" (intrahepatic) and "surgical" (extrahepatic) forms of obstructive icterus. Further work will be needed to clarify these issues.

REFERENCES

1. EDITORIAL, 1959: Transaminase activity in diseases. *S. Afr. Med. J.*, **33: 15**, 309.
2. KARMEN, A., *et al.* 1955: Transaminase activity in human blood. *J. Clin. Invest.*, **34**, 126.
3. LADUE, J. S., *et al*, 1954: Serum gultamic transaminase activity in human acute transmural myocardial infarction. *Science*, **120**, 497.

4. MANSO, C., *et al*, 1956: Effect of aspirin administration on serum glutamic oxalacetic and glutamic pyruvic transaminase in children. *Proc. Soc. Exp. Biol.*, **93**, 84.
5. WROBLEWSKI, F., and LADUE, J. S., 1955: Serum glutamic oxaloacetic transaminase activity as an index of liver cell injury — a preliminary report. *Ann. Int. Med.*, **43**, 345.
6. WROBLEWSKI, F., and LADUE, J. S., 1956: Serum glutamic pyruvic transaminase in cardiac and hepatic diseases. *Proc. Soc. Exp. Biol. & Med.*, **91**, 569.
7. CORNELIUS, C. E., *et al.*: Serum and tissue transaminases in domestic animals. *Cornell Vet.*, **49**, 116–126.
8. MALHERBE, W. D., 1960: The value of the determination of transaminase activity in plasma as a screening test for liver disease in animals. *J.S. Afr. vet. med. Assoc.*, **31:1**, 159–171.
9. MALHERBE, W. D.: Intrahepatic cholestasis in a Ridgeback dog — a clinicopathological study. *J.S. Afr. vet. med. Assoc.*, **30:2**, 113–124.
10. TUSTIN, R. C., and ADELAAR, T. F., 1960: An outbreak of bacterial icterus in sheep. *J.S. Afr. vet. med. Ass.*, **31:2**, 275–283.
11. MUTH, O. H., *et al.*, 1959: White muscle disease (myopathy) in lambs and calves VI Effects of selenium and vitamin E on lambs. *Am. J. vet. Res.*, **20**, 231–234.
12. LAGACE, A., *et al.*, 1961: Serum transaminase in the blood of lambs given preventive treatments for white muscle disease. *Am. J. Vet. Res.*, **22:89**, 686–688.
13. BLINCOE, C. and DYE, W. B., 1958: Serum transaminase in white muscle disease. *J. Anim. Sci.*, **17**, 224.
14. CORNELIUS, C. E., and KANEKO, J. J., 1960: Serum transaminase activities in cats with hepatic necrosis. *J. Am. vet. med. Ass.*, **137:1**, 62–66.
15. WROBLEWSKI, F. and WROBLEWSKI, R., 1958: Clinical significance of lactic dehydrogenase activity of serous effusions. *Ann. Int. Med.*, **48**, 813–822.
16. HILL, B. R., 1956: Some properties of serum lactic dehydrogenase. *Cancer Res.*, **16**, 460–467.
17. HILL, B. R. and LEVI, C., 1954: Elevation of serum component in neoplastic disease. *Cancer Res.*, **14**, 513–515.
18. WROBLEWSKI, F., 1957: The clinical significance of alterations in lactic dehydrogenase activity of body fluids. *Am. J. Med. Sci.*, **234**, 301–312.
19. DE TORREGROSA, M. V., 1959: Results of lactic dehydrogenase determinations in benign and malignant effusions. *Am. J. Med. Sci.*, **238**, 552–556.
20. ERICKSON, R. J., 1961: Lactic dehydrogenase activity of effusion fluids as an aid to differential diagnosis. *J. Am. Med. Ass.*, **176**, 794–796.
21. MARSHAK, R. R., *et al.*, 1962: Studies on bovine lymphosarcoma I. Clinical aspects, pathological alterations, and herd studies. *Cancer Res.*, **22:2**, 202–217.
22. WHITE, L. P., 1956: Serum enzymes I. Serum lactic dehydrogenase in myocardial infarction. *N. Eng. J. Med.*, **255**, 984–988.
23. WROBLEWSKI, F., 1958: Mechanisms of alterations in lactic dehydrogenase activity in body fluids. *Ann. New York Acad. Sci.*, **75**, 322–238.
24. WOLFSON, S. K. and WILLIAMS-ASHMAN, H. C., 1957: Isocitric and 6-phosphogluconic dehydrogenases in human blood serum. *Proc. Soc. E p. Biol. Med.*, **92**, 231.
25. BOWERS, G. N., 1959: Measurement of isocitric dehydrogenase activity in body fluids. *Clin. Chem.*, **5:6**, 509.
26. WOLFSON, S. K., *et al.*[Clinical and experimental studies on serum pyridine nucleotide-linked dehydrogenases in liver damage. *Ann. New York Acad. Sci.*, **75:1**, 260–269.
27. CORNELIUS, C. E.: Serum isocitric dehydrogenase (SIC-D) activities in domestic animals with experimental hepatic necrosis and in equine hepatopathy. *Cornell Vet.*, **51:4**, 559–568.

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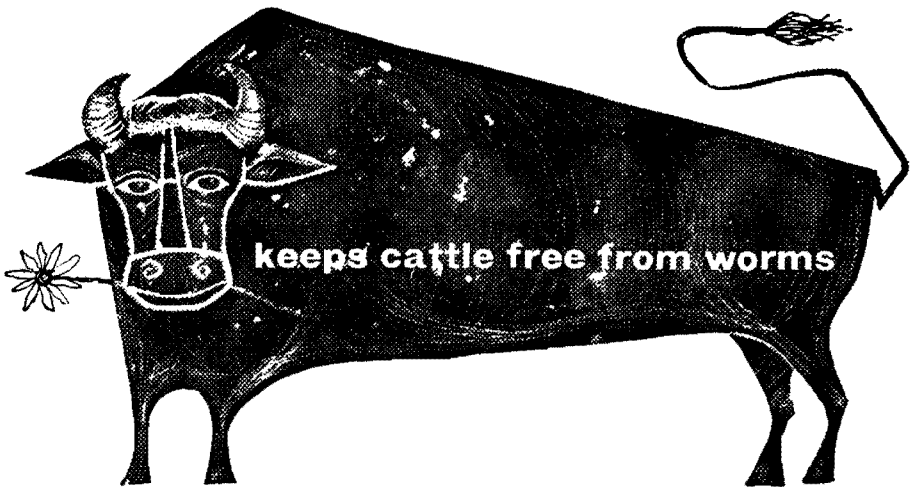

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THE USE OF FLUORESCENT ANTIBODY IN THE DIAGNOSIS OF *Brucella ovigenitalum* INFECTION IN SHEEP SEMEN SMEARS

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SUMMARY

Genital brucellosis in rams is best diagnosed by microscopical examination of semen smears. When stained by conventional methods the smears from some known infected animals occasionally fail to reveal infection owing to the small number or atypical appearance of *Brucella* organisms present.

Fluorescent antibody staining has shown an advantage over fuchsin staining by aiding the detection of infrequent organisms and by providing additional proof of the identity of *Brucella* organisms discovered in the smears.

Indirect tests with fluorescent antiglobulin promise to yield even better results though the elaborate facilities demanded may limit the wide application of this technique.

INTRODUCTION

Microscopical diagnosis of Brucellosis in sheep by the semen smear technique has been shown to be superior to cultural, biological and serological methods[1, 2]. Positive results are obtainable only intermittently from some rams rendering the diagnosis unreliable for individual animals though suitable as a "flock test". The failure to secrete the *Brucella* organisms in sufficient numbers and in the diagnostic grouping for demonstration of these bacteria by the conventional staining techniques could be responsible for this limitation.[3, 4]

The fluorescent antibody staining technique introduced by Coons et al.[5, 6, 7, 8, 9, 10] has been shown to permit detection of as few as 250 *Brucella* cells per ml even in the presence of very large numbers of contaminants.[11, 12, 13, 14] The method has been applied to dry smears.

Indirect methods with stained antiglobulin or stained anticomplement and inhibition tests with fluorescein isothiocyanate have also been developed.

1. Semen smears were obtained from:—

(*a*) Known infected rams at Onderstepoort.

(*b*) Rams believed to be free from *Brucella* infection.

(*c*) Routine semen specimens received for diagnostic examination.

(*d*) Bovine semen (normal).

2. The microscope employed was the Zeiss large fluorescent apparatus consisting of fluorescent lamp with power supply unit — Osram HBO 200 bulb — illumination equipment with exciter light filters and microscope with barrier filter equipment. Best fluorescence was obtained with No. 2 exciter light filter and No. 111 (top) and zero (bottom) barrier filters under oil emersion.

3. Buffered Saline (pH 7.5) was prepared from:—

Solution A — Na_2HPO_4 1.4 g.
H_2O (dist.) up to 100 ml.
Solution B—$Na_2H_2PO_4.H_2O$ 1.4 g.
H_2O (dist.) up to 100 ml.
84.1 ml. solution A was added to 15.9 ml. solution B and 8.5 g. NaCl diluted to 1 litre with distilled water.

Buffered saline was used for washing smears to remove excess conjugate solution.

4. Fluorescein-isothiocyanate (F.I.T.)[9] was obtained from Messrs. Baltimore Biological Laboratory, U.S.A.

5. Antiserum was prepared in rabbits injected intramuscularly with 4 ml of a suspension of heat killed, washed *Br. melitensis* 16 M (W.H.O.) cells (48 hour culture). The rabbits were bled 14 days after injection and pooled serum containing more than 20,000 I.U. of agglutinin per ml. was used.

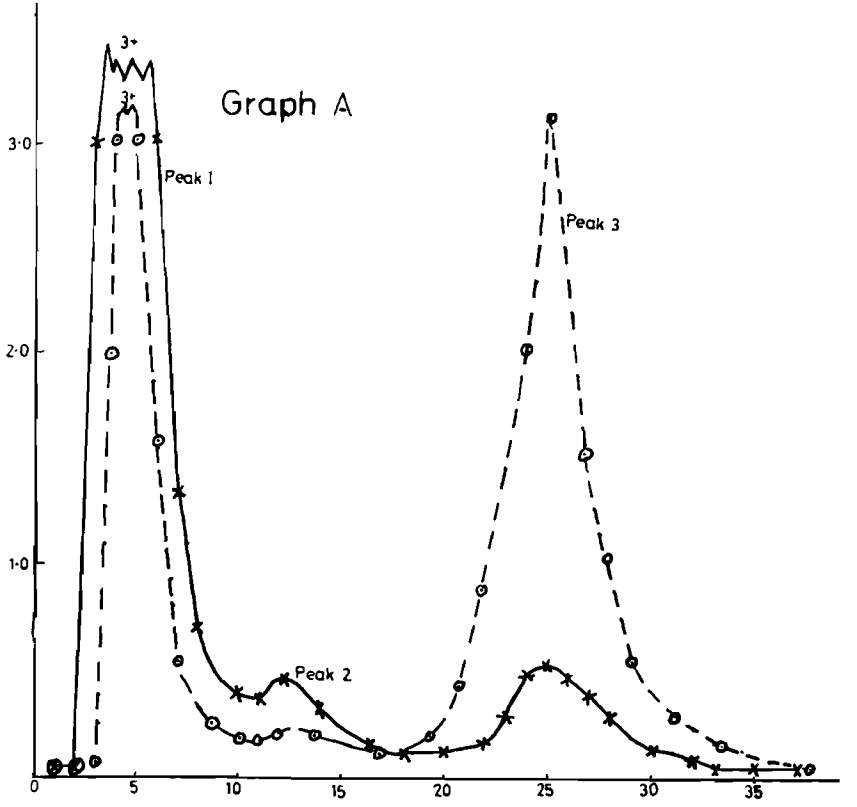
6. Fluorescent antibody (F.A. conjugate) was prepared by three precipitations of the gamma-globulin from the serum with concentrated ammonium sulphate solution.

This was dialysed against 0.85 per cent NaCl to remove sulphate. Nitrogen was determined by micro-Kjeldahl method, and the calculated protein content adjusted to 1 per cent by dilution with saline.

To 20 ml. of cold 1 per cent globulin solution was added 2 ml. carbonate-bicorbonate buffer (pH 9.0). This was cooled in an ice bath and 10 mg of F.I.T. powder (dye) was slowly added. Stirring was continued overnight in a refrigerator.

7. For the removal of unreacted F.I.T. from fluorescent protein conjugate use has been made of the gel filtration method on Sephadex G-75.[15, 16, 17]

Absorption of fractions collected from the column were read at wavelengths of 280 millimicron for protein concentrations and 490 millimicron for F.I.T. concentration. Values are presented in Graph A.



GRAPH A

Graph showing separation of fluorescent antibody conjugate (F.A.) from fluorescein isothiocyanate (F.I.T.) by means of a Sephadex G-75 column.

F.A. absorption at 280 m/u.
F.I.T. absorption at 490 m/u.

The contents of tubes 3 to 7, which contained the desired F.A. (peak 1), was collected and suitable volumes lyophilized in ampoules. Peaks 2 and 3 were discarded. Peak 3 show the free F.I.T.

PREPARATION OF SMEARS

Semen diluted 1:10 with sterile buffer was streaked on to a 1 mm. thick microslide ("0.8/1 mm") (Taeuber and Corssen Ltd.) previously cleaned in a flame, dipped into alcohol and dried. Thinly spread smears gave the best results.

Staining of Smears

Smears were fixed by heat, at 60°C for 1 minute, cooled and transferred to a moist chamber (petri dish lined with moist filter paper).

One or more drops of conjugate — enough to cover the smear area — were pipetted onto the smear which was kept in the moist chamber for one hour, washed (twice or more) in buffered saline to remove excess conjugate solution and dried. One drop glycerol-saline (9:1) was placed under a cover slip (No. 1 $\frac{3}{4}$ in. diam.) on the smear. The smear was then examined.

TABLE I

Preliminary results in the diagnosis of Brucella *infection in semen by means of fluorescent antibody*

Date	Specimen (semen)	Result		
		Staining method		
		Hansen	Stamp	F.A.
17/7/62	4036 + Bruc.	—	+	+++
17/7/62	2001	1	1	+++
17/7/62	4036	—	—	—
18/7/62	Thornton	+	+	+++
24/7/62	8747	—	—	+
24/7/62	11205	—	—	+
24/7/62	11214	—	+	+++
26/7/62	11205	—	—	+++
26/7/62	11214	—	+	+++
26/7/62	8747	+	+	++
30/7/62	13467	?	—	+++
30/7/62	13468	?	+	+++
30/7/62	13469	—	—	+++
30/7/62	13470	—	—	++
2/8/62	Deacon	—	—	—
2/8/62	40	—	++	+++
2/8/62	60/37	—	—	—
2/8/62	72	+	+++	+++
2/8/62	79	—	—	—
2/8/62	84/184	—	?	++
2/8/62	237	—	—	+++
16/8/62	S	—	—	—
16/8/62	S + Br.	+	+	+
16/8/62	S + Cor.	—	—	+
16/8/62	S + Ec.	—	—	++
16/8/62	S + Stap.	—	—	+
11/9/62	11206	—	—	—
11/9/62	4036	?	?	++
11/9/62	4098	?	?	++
11/9/62	4082	+	+	+++

RESULTS

Semen smears of known infected rams showed strong fluorescent *Brucella* after staining with bovine antiserum. This serum was, however, not suitable for diagnostic purposes because it was soon discovered that

the semen smears from rams with incidental infection of *Escherichia* and *Corynebacterium* organisms gave an indistinguishably similar reaction.

Consequently a high titre *Br. melitensis* antiserum was prepared in young healthy rabbits reared under circumstances in which contact with ruminants or materials from ruminants was minimal. In fact the green-feed which was produced on lands fertilized with very well seasoned manure appeared to be the only connection between the two.

The fluorescent antibody in this serum gave positive results as presented in table 1.

Discussion

In the diagnosis of an infectious agent by means of the fluorescent antibody technique, the emphasis falls on the specificity of the antiserum. Immunization with multiple antigenic components and absorption of the undesired elements are being replaced by modern biophysical techniques for separating antigenic components in order to enhance specificity in the antibody formation. Use of suitable adjuvants[18] deserves consideration.

The identification of *Brucella* in semen smears demands an immune semen with a high degree of specificity and a high titre. Non-specific reactions still require intensive study. The morphology of the organisms present is still an important factor in the diagnosis. Non-specific reactions were slight in the last part of the experiment.

Non-specific reactions due to:

(1) free fluorescein;
(2) antibodies formed as the result of infection; and
(3) reactions with proteins posessing similar isolelectric points are apparent in most smears. Free fluorescein, which is continuously liberated by denaturing molecules in the conjugate, may be removed by ethyl acetate.[11] Screening of each antiserum against common contaminants and possible intercurrent infections is essential.

Fixation by heat proved to be far superior to other methods used (ethyl alcohol at room temperature or below 70°C) for preserving antigenicity.

Steaming for a period longer than 1 hour did not seem to make any material difference in the fluorescence response. For all practical purposes an immune reaction of 30-60 minutes proved not only to be adequate but also time saving.

The results of a series of 30 semen specimens involving some 500 smears examined by various methods and an even greater number of control smears prove the value of the F.A. technique under laboratory conditions.

Our sample of 30 specimens showed with F.A.: 24 positives (including three (3) proved false positives due to unsuitable antiserum); with Stamp: 10 positives and 3 doubtful (all F.A. positive); with Hansen: 5 positives and 5 doubtful (all F.A. positive and all except 3 of the doubtfuls also Stamp positive).

Biological proof of the infectious nature of all F.A. positives was present in 19 out of the 23 cases and the 4 not suspected of being infected had been reported bred in isolation on a known infected property.

The detection of *Brucella ovigenitalium* especially with the small number of bacteria occasionally present in semen from old cases undoubtedly will be much enhanced by the antiglobulin antisera now being prepared to be applied as follows:—

(1) Rabbit anti-brucella-ovigenitalium.
(2) Goat anti-rabbit-globulin.
(3) Fowl anti-goat-globulin.
(4) Guinea pigs anti-fowl-globulin.

These contribute to produce a more brilliant zone of fluorescence.

Conclusion

The fluorescent antibody technique as applied to the diagnosis of *Brucella* infection in ram semen smears has proved to be superior to the conventional staining methods. In the absence of a 100 per cent diagnostic method F.A. technique with its minor limitations provides a high degree of diagnostic specificity. Improvements in its application will undoubtedly overcome these limitations in the near future.

Acknowledgements

The authors acknowledge permission from the Chief of the Veterinary Research Institute, Onderstepoort for permission to publish this report; the Director of the National Chemical Research Institute is thanked for assistance and facilities provided, and technical help from F. D. Horwell, J. P. Swanepoel and C. A. W. J. van Niekerk is warmly appreciated.

References

1. VAN RENSBURG, S. W. J. and DE VOS, W. H., (1957): A. Convenient Type of Electro-ejaculator for Bulls and Rams. *Jnl. S.A.V.M.A.*, **28**, 1–3.
2. VAN DRIMMELEN, G. C. (1959): Diagnosis of Brucellosis in Sheep and Goats. *Jnl. S.A.V.M.A.*, **30**, 259–269.
3. HANSEN, K. and KOESTER, H. (1936): Nachweiss von *Brucella abortus* (Bang) auf Grund der Alkalifestigkeit. *D.T.W.*, **44**, 739–742.
4. STAMP, J. T., McEWEN, A. D., WATT, J. and NISBET, P. L. (1950): Enzootic Abortion of Ewes. I. Transmission of the disease. *Vet. Res.*, **62**, 251–254.
5. COONS, A. H., CREECH, H. J. and JONES, R. N. (1941): Immunological properties of an antibody containing a fluorescent group. *Proc. Soc. Exp. Biol. Med.*, **47**, 200–202.
6. COONS, A. H., CREECH, H. J., JONES, R. N. (1942), and BERLINER, E. (1942): The demonstration of pneumococcal antigen in tissues by the use of fluorescent antibody. *J. Immunol.*, **45**, 159–170.
7. COONS, A. H., and KAPLAN, M. H. (1959): Localization of antigen in tissue cells. II. Improvement in methods for detection of antigen by means of fluorescent antibody. *J. Exp. Med.*, **91**, 1–13.

8. COONS, A. H. (1956): Histo-chemistry with labelled antibody. *Inter. Rev. Cytol.*, **5**, 1–23.
9. RIGGS, J. L. (1957): Synthesis of fluorescent compounds and their use for labelling antibody. *Master's Thesis, University of Kansas.*
10. COONS, A. H. (1958): Fluorescent antibody methods in General Cytochemical Methods. Vol. 1. *J.F. Danielli, Ed. Academic Press, Incorp.*, Nwe York, 399.
11. CHERRY, W. B., GOLDMAN, M., CARSKY, T. R. and MOODY, M. D. (1960): Fluorescent antibody techniques in the diagnosis of communicable diseases. *U.S. Dep. H. Ed. W. Pub. H. Serv.*, Atlanta, Georgia.
12. GOLDMAN, M. (1957): Staining *Toxoplasma gondii* with fluorescein labelled antibody. 1. The reaction in smears of peritoneal exudate. *J. Exp. Med.*, **105,** 549–556.
13. CHERRY, W. B. and FREEMAN, E. M. (1959): Staining bacterial smears with fluorescent antibody. *Zents. Bakt.* 1 *Abt. Orig.*, **175,** 582–604.
14. WINTER, C. C. and MOODY, M. D. (1959): Rapid identification of *Pasteurella pestis* with fluorescent antibody. I. Production of specific antiserum with whole cell *Past. pestis* antigen. II. Specific identification of *Pasteurella pestis* in dried smears. *J. Infect. Dis.*, **104:** 281–287.
15. FOTHERGILL, F. E., NAIRN, R. C. (1961): Purification of fluorescent protein conjugates: Comparison of charcoal and "Sephadex". *Nature*, **192,** 1073–1074.
16. GEORGE, W., WALTON, K. W. (1961): Purification and concentration of dye — protein conjugates by gel filtration. *Nature*, **192,** 1188–1189.
17. WAGNER, M. (1962): The use of Sephadex for rapid purification of fluorescence labelled antibody solutions. *Zbl. Bakt.*, **185,** 124–128.
18. VAN DRIMMELEN, G. C. (1962): The use of Adjuvant with Live Brucella Vaccine. *Jnl. S.A.V.M.A.*, **33,** 151–159.
19. DINIEN,, J. K., and ADA, G. L. (1957): Rapid extraction with ethyl acetate of free fluorescein derivatives from fluorescein isocyanateglobulin conjugates. *Nature*, London, **180,** 1284.

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NOCARDIOSIS IN A DOG

R. K. LOVEDAY — Department of Medicine, Faculty of Veterinary Science, Onderstepoort

Received for Publication, April, 1963

SUMMARY

What is believed to be the first report of canine nocardiosis in South Africa is presented, together with brief comments on bacteriology, symptomatology, diagnosis and therapy of the disease.

INTRODUCTION

Infection in the dog with the aerobic, Gram-positive, inconstantly acid-fast, filamentous organisms of the genus *Nocardia* is world-wide in distribution. The commonest forms of clinical manifestation are chronic, granulomatous or suppurative lesions of the skin and subcutis. Primary involvement of lymph nodes, lungs, kidneys, liver, omentum, spleen or central nervous system may also occur.

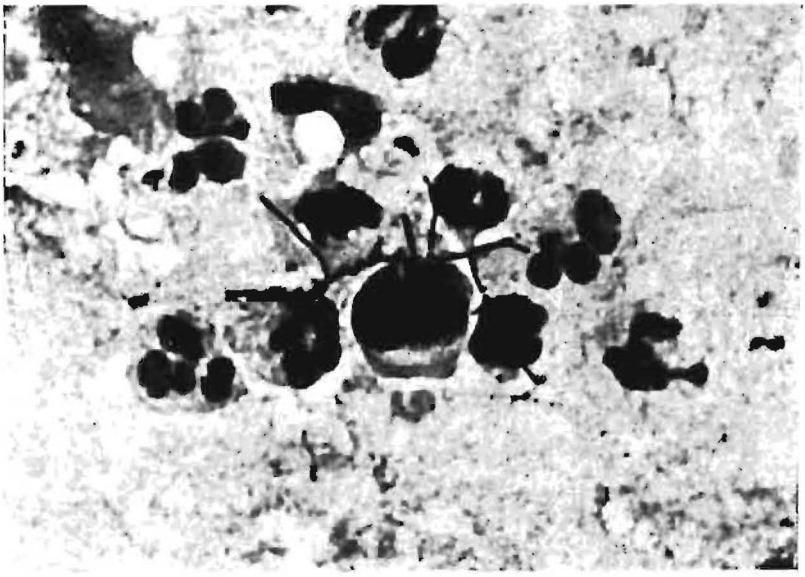

Figure 1. Gram-stained pus smear showing Gram-positive branching filament x 1,200.

The organism is a widely-distributed soil saprophyte and may gain entry to the subcutis via skin wounds and abrasions such as those resulting from fights. Infection may also be introduced by a penetrating vegetable foreign body.

Granulomatous lesions of the above type from which filamentous micro-organisms may be demonstrated have in the past often been incorrectly designated as "actinomycosis". True actinomycosis has been reported on a few occasions only in the dog.[1]

Historical

In the seventy year period from 1882 to 1952 only 45 to 50 cases of canine nocardiosis were reported.[2] A recent report[3] cites 9 further case reports in the literature since 1952, mostly from the United States, and describes 8 additional cases from the Sudan, seven of these dogs exhibiting cutaneous lesions. A British report[4] describes the spread of infection from a skin lesion to the liver and omentum. American workers[5] have very recently reported central nervous system infection with *Nocardia asteroides* and state that they found only two other reports of such infection in the literature.

Despite some 15 published records of feline nocardiosis, not one of these has been authenticated by the identification of *Nocardia* species as the causal organism.[1, 6]

Case Report

(*a*) *Clinical.*—A nine-months old male sable Alsatian, weight 18 kg., was hospitalised at Onderstepoort on 16/11/62 suspected of suffering from distemper.

Clinical examination showed a temperature of 105°F, moist rales in both lungs on auscultation and conjunctival and scleral injection. At the point of the right shoulder there was a swollen, partially hairless area about 8 cm. in diameter, where a number of vesicles could be seen on the surface of the thickened, moist skin.

The temperature elevation persisted during the next few days, despite the administration of large doses of penicillin combined with streptomycin. The skin lesion enlarged rapidly and assumed the appearance of a carbuncle. After drainage had been established by the department of surgery the animal developed a severe purulent ocular discharge and was placed in an isolation ward.

Within a few days several sinuses opened on the skin of the neck in close proximity to the original skin lesion. A thick, red, odourless pus containing a few small granules discharged in copious amounts from these sinuses. Pus smears stained by Grams method showed numerous Gram-positive branching filaments. (Figure 1).

The animal's condition continued to deteriorate despite continued antibiotic and supportive treatment and euthanasia was applied 17 days after admission.

(*b*) *Post-mortem findings.*—Broncho-pneumonia and pleurisy, involving particularly the anterior lobes of the right lung, the tissue showing a brownish-green discoloration in places; a large, granulomatous, purulent mass extended subcutaneously from the first rib on the right side about two thirds the way up the neck. Five sinuses connected this

granuloma with the skin surface; a shallow ulcer, 2 mm. in diameter in the mucosa of the bladder; *Spirocerca lupi* granuloma of the thoracic oesophagous.

Portion of the lung was examined histologically but did not show the presence of inclusion bodies.

(*c*) *Bacteriological examination:* Material from the granuloma was streaked on blood agar plates by the writer and incubated aerobically at 37°C. After 48 hours numerous small, opaque porcelain-white, non-haemolytic colonies were visible, which, with further incubation, became larger and chalky-white in colour. Smears from 48 hour cultures showed a mixture of filaments, some branched, with rods and cocci.

Similar material was examined by the bacteriology department of the Veterinary Research Institute, who reported as follows: "*Nocardia* species was isolated from the specimen. Colonies were rough, discreet, white on Loewenstein-Jensen and serum milk agar, but produced a pink pigment on serum agar and a pink, granular pellicle on 10 per cent serum broth. The organism was not caseolytic, did not liquify gelatin and caused alkaline peptonisation of litmus milk. It could not be shown to be pathogenic for guinea pigs".

Discussion

Most cases of nocardiosis are reported to occur in young dogs less than one year old.[6] The subcutaneous form is reported to be most common and it is apparent that the subcutaneous lesions may eventually spread inwards to involve the thoracic viscera, as in this case, or such organs as the liver and omentum.[4] There is also some tendency for neighbouring bony structures to become infected.[1] Spontaneous recovery is apparently rare, a slow progression and extension of the lesion commonly occurring.

The diagnosis rests upon the microscopic or cultural demonstration of the causal organism. Nocardiosis is frequently mistaken for canine distemper,[6] as it was in this case. The age incidence and pulmonary involvement noted in many cases are points in common between the two diseases. Animals with infection of the central nervous system may also show nervous symptoms.[5]

The results of chemotherapeutic trials in the Sudan[3] suggest that successful therapy may only be expected with early diagnosis and the employment of massive dosage of the chosen antibiotic. In vitrosensitivity testing of an Australian strain of *N. asteroides* showed it to be sensitive to streptomycin, neomycin, sulphadimidine, chloramphenicol, oxytetracycline and hibitane (chlorhexidine).[6] Canadian workers reported complete clinical cure in two severely affected dogs treated with chlorhexidine intravenously and topically.[7] Surgical excision of granulomata is recommended as an adjunct to specific therapy.

Two reports[3, 6] stress the fact that *N. asteroides* may be pathogenic for man. Up to 1952 43 cases had been reported, the majority being fatal.[6] The strains of *N. asteroides* isolated from dogs in the Sudan appear to be identical with the organisms responsible for human disease, and the possibility of acquiring infection by contact with infected dogs cannot, therefore, be ignored.[3]

ACKNOWLEDGEMENTS

The writer wishes to thank his colleagues, Dr. C. Cameron and Dr. J. G. Pienaar, of the Veterinary Research Institute, Onderstepoort, for their assistance with the bacteriology and histo-pathology respectively. The Chief, Veterinary Research Institute, Onderstepoort, is thanked for permission to publish this report.

REFERENCES

1. ANON (1961): Aspects of skin disease of the dog and cat. *Brit. Vet. Ass.*, London.
2. MCGAUGHEY, C. A. (1952): Actinomycosis in carnivores. *Brit. vet. J.*, **108**, 89.
3. AWAD, F. I. and OBEID, H. M. (1962): Further studies on Canine nocardiosis in the Sudan with particular reference to chemotherapy. *Zbl. Vetmed.*, **9**, 257.
4. BROWN, A. R. and OSBORNE, A. D. (1962): A case of canine nocardiosis. *Vet. Rec.*, **74**, 371.
5. RHOADES, H. E., REYNOLDS, H. A., RAHN, D. P. and SMALL, E. (1963). Nocardiosis in a dog with multiple lesions of the central nervous system. *J. Amer. vet. med. Ass.*, **142**, 278.
6. FROST, A. J. (1959): A review of canine and feline nocardiosis with the report of a case. *Austr. vet. J.*, **35**, 22.
7. SAPEGIN, G. and CORMACK, G. R. (1956): Canine nocardiosis treated with hibitane: report of two cases. *N. Amer. Vet.*, **37**, 385.

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PUBLIC RELATIONS SERVICE

Dr. M. de Lange, Deputy Chief, Veterinary Research Institute, Onderstepoort, and Dr. M. C. Lambrechts, Chief, Veterinary Field Services attended a meeting of the Office Internationale des Epizooties in Paris from 13–18 May, 1963. Both presented papers on rabies. Dr. de Lange also delivered a paper on the latest research developments on horse-sickness. Dr. Lambrechts and Dr. de Lange plan to remain in Europe until the end of June, 1963. Dr. de Lange will visit the Alfort Veterinary Institute near Paris. Dr. Lambrechts will pay an official visit to Israel.

Dr. Pieter van Drimmelen, son of Dr. G. C. van Drimmelen of Onderstepoort, who qualified in Medicine at the University of Pretoria in November, 1960, is at present employed as a Senior House Officer in pathology at St. Thomas' Hospital, Lambeth, England. He is studying for the M.R.C.P. Examination which he will take in June, 1963.

Under the Veterinary Surgeons Act 1961 and the Veterinary Surgeons (Registration) Regulations 1962, The Council of Veterinary Surgeons of Rhodesia and Nyasaland requires that qualified veterinary surgeons entering the Federation to practice as locums, apply for registration to the Registrar, P.O. Box 8160, Causeway, Salisbury. The registration fee is £10.10.0 (R21.00). Veterinarians in permanent residence in the Federation are of course required to register in any case.

Dr. P. D. de Wet of the Anatomy Section of the Faculty of Veterinary Science, Onderstepoort has been awarded The Ford International Fellowship for the Republic of South Africa. This is the only award in South Africa. We congratulate Dr. de Wet on this attainment.

Council has approved the suggestion that members and guests attending the 58th Annual General Meeting and Scientific Congress at Onderstepoort from 24–27 September, 1963, who wish to be accommodated at the same hotel should book in at the Continental Hotel, corner Bosman and Visagie Street, opposite City Hall. Approximate Tariff, R3.75 per day for dinner, bed and breakfast.

Circular notices with detachable slips will be sent to all members who may wish the Secretary to arrange accommodation for them.

Dr. R. K. Reinecke of the Veterinary Research Institute, Onderstepoort, is visiting Europe during July 1963, and will attend the World Veterinary Congress at Hanover, Western Germany from 14—21 August 1963. He will also attend a Symposium on Anthelmintics promoted by the Society for the Advancement of Parasitology, and arranged to take place at Hanover from 22 and 23 August 1963.

Dr. "Pom" Frean Retires

Dr. J. R. Frean retired on Superannuation on May 7th 1963.

Born in Ventersdorp, he had his schooling in that town, at Grahamstown, and the Boys High School, Potchefstroom, where he matriculated.

He served in the First World War as an officer in the Royal Flying Corps. After the end of the war he entered the Royal (Dick) Veterinary College, Edinburgh, where he obtained his M.R.C.V.S. in 1923.

After qualifying, he was appointed to the staff of the Royal (Dick) College and subsequently took a temporary appointment with the British Ministry of Agriculture and was employed in foot and mouth disease duty.

He became infected with the disease and has the distinction of being one of the few Veterinarians who was placed in "quarantine" as a means of preventing the further spread of the disease.

He joined the Veterinary Service of the South African Department of Agriculture in 1924 and was stationed in no less than 15 different centres in the Veterinary Field Service, which covered the provinces of Natal, the Transvaal and Western Province.

He was transferred to the Onderstepoort Veterinary Research Institute in 1960 as liaison and publicity officer.

Dr. Frean is being retained at Onderstepoort in a temporary capacity.

We wish Mrs. Frean and himself everything of the best and hope their retirement will be long and interesting.

KARL FRIEDRICH MEYER—A TRIBUTE

W. O. Neitz — Veterinary Research Institute, Onderstepoort

K. F. Meyer was born on the 19th May, 1884, at Basel, Switzerland, where he attended the junior and high schools and matriculated in October, 1902. He devoted the winter (1901—02) to private studies in natural sciences, and studied during the ensuing summer in the Faculty of Pilosophy at the University of Basel. He registered at the University of Zurich in 1902 and studied zoology and veterinary science. He spent two semesters (1905—06) at the University of Munich and attended lectures in the Faculties of Medicine and Veterinary Science. He returned to Switzerland in 1906 and followed a course in infectious diseases at the University of Berne. At the University of Zurich he received the Federal State Diploma in Veterinary Medicine in March, 1908, and the degree of Doctor of Medicinal Veterinariae in January 1909.

As a veterinarian Dr. Meyer started his career as pathologist to the Transvaal Department of Agriculture at Onderstepoort from 1908 to 1910. He joined the staff of the University of Pennsylvania, Philadelphia, in 1910, and served as Professor of Pathology and Bacteriology and as Director of the Pennsylvania Livestock Sanitary Board until 1913. At the end of 1913 he accepted the post of Professor of Bacteriology and Protozoology of the Medical School at the University of California. He con-

tinued to work at this University which he served as Associate Professor of Tropical Medicine and Senior member of the George Williams Hooper Foundation of Medical Research; as Professor of Bacteriology and Director of the Foundation. During 1923 he registered once more as a student at the University of Zurich and acquired his doctor's degree in philosophy in 1924. He returned to the United States of America and continued his manifold investigations in infectious diseases, and taught students at the University of California.

During his career he received an honorary degree of Doctor Medicinae for his outstanding work. When he retired he was honoured once more when he was made Director Emeritus of the George Williams Hooper Foundation and Professor Emeritus of Experimental Pathology of the University of California, San Francisco, U.S.A.

Prof. Dr. Meyer is a versatile and tireless research worker. His investigations, amongst many others, included studies on viral encephalitides, sylvatic plague, leptospiroses, botulism and psittacosis. His terrific drive and energy and his training in veterinary and medical science and zoology have made it possible for him to make substantial contributions to our knowledge in bacteriology, virology and protozoology. One discovery was followed by another, and even at present he is continuing his studies. His accomplishments are amazing.

The title of Honorary Associate Member of the South African Veterinary Medical Association was bestowed on Dr. Meyer last year.

Members of the South African Veterinary Medical Association feel highly honoured to meet Prof. Meyer in South Africa after an absence of more than 50 years. It is the sincere wish of our Association that health and happiness accompany Mrs. Meyer and himself during their short stay in Africa. We are convinced that his investigations on this continent will be fruitful.

WORLD VETERINARY ASSOCIATION

History and Evolution

The original name of the Association was "International Veterinary Congresses". The first Congress was held in Hamburg in 1863. It was agreed that the Congress should convene at suitable intervals in the future. Following are the places and years of those held to date:

Ist	*Hamburg*	1863
IInd	*Vienna*	1865
IIIrd	*Zurich*	1867
IVth	*Brussels*	1883
Vth	*Paris*	1889
VIth	*Bern*	1895
VIIth	*Baden-Baden*	1899
VIIIth	*Budapest*	1905
IXth	*The Hague*	1909
Xth	*London*	1914
XIth	*London*	1930
XIIth	*New York*	1934
XIIIth	*Zurich*	1938
XIVth	*London*	1949
XVth	*Stockholm*	1953
XVIth	*Madrid*	1959

During the Congress in 1905 in Budapest a recommendation was adopted to form a Permanent Committee for the planning of the Congresses, consisting of representatives from the participating countries. This Permanent Committee was constituted. Statutes to govern the Congresses were adopted at the ninth Congress in The Hague in 1909.

During the last Congress in 1959 in Madrid the new name World Veterinary Association was adopted. Furthermore a Constitution of the World Veterinary Association was accepted which opens the possibility for world veterinary specialist associations to become associate members of the World Veterinary Association. The following fifteen headings were adopted as sections of Congresses and for the formation of specialist associations:

1. Anatomy.
2. Physiology, Biochemistry, Pharmacology (including Animal Behaviour).
3. Zootechnics (including nutrition, Animal Breeding and Production).
4. Pathology (including Chemical Pathology).
5. Infectious Diseases (including Microbiology and Immunology).
6. Parasitology (including Helminthology, Protozoology and Entomology).
7. Hygiene of Animal Products.

8. Clinical Medicine.
9. Tropical Veterinary Medicine.
10. Surgery (including Anaesthesia and Radiology).
11. Veterinary State Medicine and Veterinary Public Health.
12. Small Animal Specialists.
13. Avian Specialists.
14. Veterinary Education.
15. Professional Interests.

The Congress Fund of the World Veterinary Association is set forth in Article 27 of its Constitution. For the time being the annual contribution has been fixed on the basis of one English shilling or its equivalent per veterinarian.

The Film Committee of the World Veterinary Association recently published a catalogue of veterinary films. Furthermore a "List of Diseases of Animals" is in preparation. The publication of this List is held up for the time being.

The World Veterinary Association is in close contact with the Office Internationale des Epizooties (O.I.E.) in Paris, was granted Specialised Consultative Status with F.A.O. in 1955, and has been in official relationship with the W.H.O. since 1956, and has "observer status" with the International Scientific Film Association (ISFA) since 1960. The W.V.A. is Associate Member of the Council for International Organizations of Medical Sciences (CIOMS).

Membership

Veterinary Associations in the following Countries enjoy ordinary membership of the World Veterinary Association:—

Argentine, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Chili, Cuba, Czechoslovakia, Denmark, Egypt, France, Finland, Great Britain, Germany, Greece, Holland, Hungary, Iran, Ireland, Israel, Italy, Japan, Mexico, Norway, New Zealand, Peru, Poland, Portugal, Roumania, Sweden, Spain, Switzerland, South African Republic, Turkey, U.S.S.R., U.S.A., Uruguay, Yugoslavia.

Contribution was paid for 81,301 Veterinarians in 1962.

Associate Membership

1. World Veterinary Poultry Association.
2. International Federation of Veterinary Zootechnics.
3. World Small Animal Veterinary Association.
4. International Association of Veterinary Anatomists.
5. World Association of Veterinary Food Hygienists.

Bureau

President — Prof. W. I. B. Beveridge, Cambridge.
Zice-President — Prof. Dr. K. Wagener, Hanover.
Secretary-Treasurer — Prof. Dr. Jac. Jansen.

The Permanent Committee consists of Veterinarians representing Members and Associate Members.

It's task is to assist the Bureau in the administration of the Association.

Dr. B. C. Jansen is the member for the S.A.V.M.A. on the Permanent Committee.

XVIIth WORLD VETERINARY CONGRESS

PRELIMINARY TIMETABLE FOR THE SCIENTIFIC PROGRAMME

Wednesday	14.8	10.00–12.15	Opening Session in the Kuppelsaal of the Stadthalle.
		15.00–16.30	Sectional meetings for the sections: 1 Anatomy (4 papers). 10 Avian Diseases (5 papers). 8 Problems of Small Animals (5 papers). 3 Zootechny (5 papers). 5 Infectious Diseases (5 papers). 11 Professional Interests and Veterinary Education (5 papers).
Thursday	15.8	9.00–11.00	Plenary Session. General Topics "Anaesthesia in Animals" (3 papers) and "Comparative Cardiology" (1 paper).
		11.20–12.30	Colour Television demonstrations (Eidophor) concerning small animal subjects: Prof. Völker, Hannover "Pericardium operations in dogs". Prof. Archibald, Guelph/Canada "Prepubic complete prostatectomy". Dr. Singleton, London "Orthopaedic techniques". Dr. Knowles, Miami/U.S.A. "Aspects of plastic and reconstructive surgery".
		15.00–17.30	Sectional meeting for the sections: 7 Hygiene of Animal Products (6 papers). 2 Physiology, Biochemistry, Pharmacology (6 papers). 9 Problems of Large Animals (6 papers). 8 Problems of Small Animals (6 papers). 5 Infectious Diseases (6 papers). 6 Parasitology (6 papers).
		17.30–18.00	Showing of selected films.
Friday	16.8	9.00–12.15	Plenary Session. General Topics "Zoonoses and Anthropozoonoses" (4 papers) and "Biological Standardization" (1 paper).
		15.00–17.30	Sectional Meetings for the sections: 6 Parasitology (6 papers). 3 Zootechny (6 papers). 8 Problems of Small Animals (6 papers). 9 Problems of Large Animals (6 papers). 5 Infectious Diseases (6 papers). 12 Free Papers (6 papers) including discussion on the papers accepted in summary of this section.
		17.30–18.00	Showing of selected films.
Saturday	17.8	9.00–12.15	Sectional meetings for the sections: 5 Infectious Diseases (8 papers). 3 Zootechny (4 papers). 11 Professional Interests and Veterinary Education (4 papers). 7 Hygiene of Animal Products (8 papers). 9 Problems of Large Animals (8 papers). 10 Avian Diseases (8 papers). 4 Pathology (8 papers).

Monday	19.8	9.00–11.00	Plenary Session. General Topic "Metabolic and Deficiency Diseases" (4 papers).
		11.20–12.30	Colour Television demonstrations (Eidophor) concerning large animal subjects: Prof. Esperson, Kopenhagen "Abomasal displacement in cattle". Prof. Diernhofer, Vienna "Lameness in breeding boars". Dr. Miller, Newmarket/England: "Horses". Prof. Rosenberger, Hannover: "Leucosis".
		15.00–17.30	Sectional meeting for the sections: 5 Infectious Diseases (6 papers). 4 Pathology (6 papers). 9 Problems of Large Animals (6 papers). 8 Problems of Small Animals (6 papers). 7 Hygiene of Animal Products (6 papers). 6 Parasitology (6 papers — as well as discussions on the papers accepted in summary of the sections: 3 Zootechny and 11 Professional Interests and Veterinary Education.
		17.30–18.00	Showing of selected films.
Tuesday	20.8	9.00–12.15	Sectional meetings for the sections: 5 Infectious Diseases (8 papers). 10 Avian Diseases (8 papers). 9 Problems of Large Animals (8 papers). 7 Hygiene of Animal Products (8 papers). 2 Physiology, Biochemistry and Pharmacology (8 papers) as well as discussions on the papers accepted in summary of sections 1 Anatomy, 4 Pathology, 6 Parasitology and 8 Problems of Small Animals.
		15.00–17.30	Sectional meetings for the sections: 6 Parasitology (6 papers). 4 Pathology (6 papers). 8 Problems of Small Animals (6 papers). 5 Infectious Diseases (6 papers) including discussion on the papers of this section accepted in summary. Discussion on the papers accepted in summary of sections: 2 Physiology, Biochemistry and Pharmacology, 7 Hygiene of Animal Products, 9 Problems of Large Animals and 10 Avian Diseases.
		17.30–18.00	Showing of selected films.
Wednesday	21.8	9.00–12.15	Showing of films.

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THE WILDLIFE DISEASE ASSOCIATION ITS SCOPE AND PURPOSE

Reproduced by kind permission of The Wildlife Disease Association in confirmation by Mr. D. H. S. DAVIS Ecology Department S.A.I.M.R.

INTRODUCTION

The Wildlife Disease Association (WDA) is an international organization of scientists concerned with diseases of wildlife. The major purpose of the organization is to stimulate interest in and increase knowledge of wildlife diseases. An earlier organization called the "Committee on Wildlife Diseases" was formed by Canadian and American wildlife specialists in March, 1951 at the annual meeting of the North American Wildlife Conference. This group found wide interest in the problems of wildlife disease. In 1952 the name of the organization was changed to The Wildlife Disease Association and an international program was formulated.

SCOPE AND PURPOSE

Since wildlife is found in all natural habitats, the worldwide potentials for research and investigation are unlimited. Inasmuch as the interrelationships of wildlife with man and his domestic animals are infinitely complex and varied, there is need for the broadest spectrum of scientific disciplines within the organization.

The WDA is concerned with all problems related to disease, including basic and applied research, conservation and control porgrams. All forms of disease are encountered in wild animals, including those caused by infectious agents, both macro and microscopic, by genetic and physiologic disorders and by the externally-applied stresses of the environment. Ecologic factors related to both the host and parasite in infectious diseases and to the various populations in all diseases are also recognized as being of vital importance. Knowledge of wildlife disease is both of immediately practical and fundamental importance. Many infectious diseases are of great international importance because of their danger to man or animals, both domestic and wild species. Control of wildlife diseases is an important phase of sound game management. The migratory capabilities of many forms of wildlife add to the need for an international organization of scientists working on wildlife diseases. In some instances diseases have been beneficial in controlling wild populations and for this purpose disease agents have been exchanged on an international basis. The grave problems presented by all aspects of such exchanges require communication between all countries concerned.

Not only are the problems confronting persons interested in wildlife diseases complex, but, at the present time available information is fragmentary and scattered over many disciplines and published in many different journals. The importance of this work demands the highest effort

in codification and arrangement of this information. In many instances the exchange of information should be more prompt than that provided by ordinary journal publication. Such methods as electronic computer analyses and air shipment of sera, antigens and protocols from specialized laboratories are now being utilized or explored by the organization or its members. The Wildlife Disease Association, as an independent, international organization with wide representation from the major scientific disciplines and governmental agencies concerned, is ideally suited to promote and expand the work related to its purpose.

Activities

The implementation of its broad purpose and many specific goals has only started, but several significant steps may be noted:

Membership has been extended to interested workers in all countries.

A permanent journal of wildlife diseases for distribution of knowledge and findings of current research has been established.

A Newsletter is published to maintain communication between members and facilitate exchange of information.

A bibliography committee is actively engaged in bringing together references to the literature on diseases of Cervidae, for use by all members of the Association.

Committees have been established to coordinate research activities in several fields of current major importance; studies are in progress, for instance, on leptospirosis, rabies, the viral encephalitides, and similar wildlife diseases. These Committees serve also as sources of information on specialized subjects for the benefit of the entire membership.

Through its members the WDA maintains a growing bank of wildlife sera for use in research activities.

The development of a clearing center for prompt reception and dispersion of timely information on epizootics or critical situations and the establishment of a roster of available specialists in pertinent branches of research are needs for the immediate future.

Membership

Current dues in the Wildlife Disease Association are four (4.00) Dollars per year in U.S. currency (or equivalent); this entitles members to all publications. WILDLIFE DISEASE was first published experimentally in 1959 with the aid of grants from the Council on Library Resources, Inc. and the National Science Foundation. These grants were made to the American Institute of Biological Sciences, which acted as agent for the Wildlife Disease Asosciation. This journal is now published quarterly on Microcards, 3″ × 5″ cards which contain a maximum of 47 pages per card. Sixteen cards constitute a volume. Special equipment is required for reading this material. It can be read with the aid of a dissecting or stereoscopic microscope or with the various readers currently on the market at prices from d3.00 to d25.00. Accompanying each issue of Microcards, which contain all of the original manuscript, is a leaflet in macroprint which abstracts all papers. In addition to the Microcard

publication, WILDLIFE DISEASE and the leaflets of abstracts, members receive a quarterly NEWSLETTER containing information on the organization's activities and its members. Members are also entitled to all rights to hold office and participate in activities of the Association

APPLICATION FOR MEMBERSHIP

WILDLIFE DISEASE ASSOCIATION

Enclosed is d..... (at rate of d4.00 per year) for membership in the WILDLIFE DISEASE ASSOCIATION.

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Checks should be made payable to the Wildlife Disease Association and mailed to the American Institute of Biological Sciences, 2000 P Street, N.W., Washington 6, D.C.

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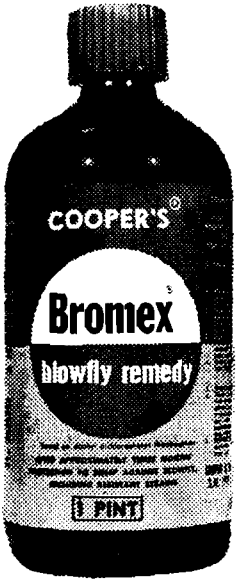

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BOOK REVIEW

AIDS TO BIOCHEMISTRY

S. P. DATTA and J H. OTTAWAY

6th Ed., Bailliere, Tindall and Cox, London, 1962. pp. 327

Published price 15/-

This little book, in convenient pocket sized format is one of the many volumes in the well known student "Aids" series put out by the publishers. A perusal of its contents and later serious study of the material presented by the authors was to us a most pleasant surprise, so much so in fact that we are now prescribing this volume to our students as our standard text book for basic biochemistry for use in the B.V.Sc II and III and M. Med. Vet. courses. Our lectures in theoretical biochemistry will be drawn extensively from the subject matter of this volume.

The material is exceptionally well presented and is singularly free from the mass of historical or physio-chemical data through which students frequently have to wade during study of other standard works, in order to acquire the elements of the subject. The work discussed is remarkably up to date and the figures dealing with metabolic pathways particularly pleasing for student purposes.

The volume, quite naturally, contains very little of the purely physical chemistry necessary for a thorough understanding of biochemical and physiological events in the living body. Sufficient knowledge of this for the average veterinary student or practitioner can easily be obtained by reference to one of the companion volumes in the series viz. "Aids to Physical Chemistry", by R. G. Austin.

Although the work under review deals primarily with human biochemistry, we have no hesitation in recommending it to those members of our profession who are interested in this field and we would particularly recommend it to those who are contemplating post-graduate studies at this faculty. Any differences in the major metabolic pathways exhibited by the various species of domestic animals or other deviations from the classical human biochemistry shown by these animals can be readily found in other larger volumes.

J.M.M.B.

COCCIDIOSIS

S. F. M. DAVIES, L. P. JOYNER and S. B. KENDALS, 1962

Pp. 264, 36 figs.

Published by Oliver and Boyd, Edinburgh & London

This book is a worthy successor to Becker's monograph *Coccidia and Coccidiosis of domesticated game and laboratory animals and of man* (1934), bridging a gap of almost thirty years.

The first four chapters deal with general aspects of coccidiosis such as taxonomy (after Hoare, 1956), life cycle, pathology, immunity and epidemiology of coccidiosis.

The following nine chapters are concerned with the coccidia of various species of domesticated and some wild animals. The comprehensive nature of the chapter on domesticated poultry as compared to those on the majority of other domesticated animals, serves to accentuate the lack of knowledge on the life histories of coccidia parasitizing the latter.

The chapter on chemotherapy is useful to the chemist, pharmaceutist and clinician. There is also an excellent chapter on laboratory methods and techniques used for the diagnosis of coccidiosis, and also for research on the disease.

It is quite evident that the authors are very familiar with their subject matter. They have consequently produced a book which is of particular value to the research worker and teacher, as well as to the clinician and student.

R.D.B.

VETERINARY ANTHELMINTIC MEDICATION

A Review of the Literature up to December 1960 (With Addendum, 1962)
by
T. E Gibson

Technical Communication No. 33 of the Commonwealth Bureau of Helminthology, St. Albans, Herts.

Commonwealth Agricultural Bureaux, Farnham Royal, Bucks, England.
Pp. 172. Fig. 2. Tab. 6.

This excellent publication is divided into nine chapters with an addendum on the most recent anthelmintics. The treatment of parasitic infections in different species of domestic animals is dealth with separately in chapters 1 to 7 viz. horses, cattle, sheep, goats, pigs, dogs and cats and poultry respectively. Methods of administration for each species of animal are enumerated in chapter 8 and an excellent table summarising the best drugs for use in the various animals against specific species of helminth are summarised in tables in chapter 9.

Separate lists of references are conveniently placed at the end of chapters 1 to 7 and the addendum. In addition at the end of the book there is an index of anthelmintics.

This concise, well written little book is one of those rare publications which would be an asset to any veterinarian's bookshelf. The busy practioner will find chapter 9 with its concise tables of inestimable value. On page 165 for instance, the treatment of the common helminths of dogs and cats with the exception of *Filaroides osleri* are summarised in table 4. The subheadings of this table are: parasite, anthelmintic, dose rate and mode of administration. Only the best anthelmintics are mentioned e.g. *Toxocara* spp. and *Toxascaris* spp.; piperazine compounds; 100 mg. per Kg; tablets.

The mode of action of anthelmintics on the parasites where known, may have been included. This minor criticism in no way detracts from the

value of this book, as this information is only really of value to the veterinary parasitologist in the laboratorory.

R. K. R.

PROCEEDINGS OF THE SEVENTH INTERNATIONAL CONGRESS FOR MICROBIOLOGICAL STANDARDIZATION, LONDON, 1961

by A. F. B. STANDFAST, D. G. EVANS, and B. G. F. WEITZ, for Int. Ass. of Microbiol. Societies, Royal Med. 8vo, pp.. vii + 568, Fig. 186.

Price: R13.00

LIVINGSTONE, EDINBURGH, 1962.

This volume is a record of the Aug. 1961 Congress held in London and it is published in conventional form with soft cover and a bare list of sections preceding the text. There is no subject index, nor a list of the papers; although at the back the participants from different countries and the authors are given briefly.

Three addresses effectively introduce the reader to the present state of biological standardization in the world.

Preparation, use and international application of Biological Standard Materials comprise 4, 10 and 3 articles respectively. These emphasize the motivation for standards e.g. the O.I.E. international anti-*Brucella abortus* serum referred to by Stableforth, which provides for comparable results in spite of differences in technique. One article on the protective value of veterinary clostridial antisera and vaccines by Sterne dramatically demonstrates the marked differences in effectiveness of vaccines with the same description but from different sources. A summary of these contributions may be consulted by the reader by turning to the end of the book (p. 533) under the heading "Reports of Sessions".

A wealth of information on recent work is presented in eleven sessions. Eight articles each on B.C.G and on staphylococcal products, and 4 each on tuberculin and on helminth immunity demonstrate the extent to which the congress embraces human- and veterinary microbiology as well as parasitology. Four sessions on the modern developments in virology contribute 20 papers, notably on poliomyelitis, foot and mouth, and canine distemper vaccines. The session: "Adventitiuos Viruses" under the chairmanship of Dr. L. Greenberg of Ottawa, is particularly well presented. He is also responsible for the article on the importance of cellular immunity to staphylococcus infection. Again in the absence of a list of contents the reader has to discover the summary of this work at the back of the book (p. 535) instead of before the session. Reports on important Round Table Discussions at the time of the Congress are included viz. *Brucella*-phage, foot and mouth vaccines, sterility testing and tuberculin.

No doubt the contributors to this work will obtain support, enabling the organizers of a future 8th Congress to produce an appropriate, more useful, and altogether modern publication. This is undoubtedly the most fruitful field of activity the the United Nations Organization and a worthy object for W.H.O., F.A.O., O.I.E., and U.N.E.S.C.O.

G. C. van D.

The following are some of our latest acquisitions of new titles and new editions of well known old titles:

VETERINARY PROTOZOOLOGY, Richardson & Kendall; completely revised third (1963) edition; 311 pp; 37 plates; R3-25.

COCCIDIOSIS, Davis, Joyner & Kendall; a new and most useful publication for research workers, clinicians and students; 264 pp; 36 illus., R4-50.

EQUINE MEDICINE & SURGERY, 65 authors; published by American Veterinary Publications; 30 chapters covering every aspect of surgery. medicine, reproduction and management. A few advance copies have now been received. This is an indispensable book in equine practice: 815 pp; fully illustrated; R14-65.

DISEASE OF CATTLE. Copies of the newly revised second edition of this book by the same publishers are expected any time. R14-65.

TIERARZTLICHE OPERATIONSLEHRE, Berge und Westhues. The fact that this has now reached the 28th edition speaks for itself. 309 pp; 282 illus; R7-75.

LEHRBUCH DER SPEZIELLEN PATHOLOGISCHEN ANATOMIE DER HAUSTIRE, Nieberle und Cohrs; 4th (1962) edition; 1067 pp; 727 illus. R19-00.

THE BEHAVIOUR OF DOMESTIC ANIMALS; edited by E. S. E. Hafez; the most comprehensive book yet published on a new field for the veterinarian and animal husbandryman; 619 pp; profusely illustrated; R8-00.

THE VETERINARY ANNUAL; W. A. Pool. The 1962 edition of this review of the most important publications on all aspects of veterinary science is now available. R4-50.

GENETIC ASPECTS OF DAIRY CATTLE BREEDING; by Ivor Johansson, an international authority on animal genetics; 259 pp; 30 figs. R4-30.

THE DOG OWNER'S GUIDE; by J. P. Volrath M.R.C.V.S. published by Universities Federation for Animal Welfare (UFAW), this little book can be recommended to every dog owner; 82 pp; 7 figs. 27 plates R0-80.

BEEF ON RANCH AND FARM, L. T. Tracey; deals specially with beef farming in Southern Africa; 114 pp; many diagrams; R1-80.

Prices quoted include postage.

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