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OMGEWINGSBESOEDELING EN DIE VEEARTS

Omgewingsbesoedeling is die algemeenste wagwoord vandag. Die rol van die veeartsenykundige beroep in hierdie verband behoort dus aan 'n kritiese en objektiewe waardebepaling onderwerp te word. Eties gesproke is ons seer seker verantwoordelik vir die beskerming van die mens, dier en omgewing teen die gevare van omgewingsbesoedeling. In die praktyk speel die veearts 'n belangrike rol: hy het direk te make met verskeie huisdier- en wildsoorte wat by blootstelling en as gevolg van 'n besondere spesiesvatbaarheid as vroeë aanwysers van gevare vir die mens kan dien. Hy is betrokke by navorsing t.o.v. die toets en evaluering van besoedelingstowwe en die vervanging van ongewenste samestellings. Bowendien moet hy praktiese advies aan die publiek verskaf aangaande die gebruik van pesweerders by vee en troeteldiere en moet hy gesondheidsowerhede met raad bedien aangaande die belangrikheid van bepaalde besoedelingstowwe op die gebied van vleis- en melkhigiëne. Tenslotte is die veearts betrokke by wildbewaring diep gemoeid met die moontlike uitwerking van besoedelingstowwe op wild.

Wat besoedelingstowwe betref is die veearts hoofsaaklik gemoeid met pesweerders, omskrywe as stowwe vir die vernietiging of afweer van knaagdiere, insekte, swamme, onkruid en ander vorms van plant- of dierlewe, of vir die voorbehoeding of demping van hul skadelike uitwerking. Die mees gebruikte middels is die insekte-, swam- en onkruiddoders: hierdie drie groepe is by uitstek betrokke by omgewingsbesoedeling.

Die ideale pesweerder behoort aan die volgende vereistes te voldoen: dit moet goedkoop wees en maklik om te vervaardig; dit moet hoogs selektief wees, t.w. hoog giftig vir die beoogde slagofferspesies, organisme of plant, maar betreklik onskadelik vir die gasheer en soogdiere; dit moet stabiel genoeg wees met voldoende nawerking ten einde die gewenste uitwerking te hê en tog moet dit natuur-aftakelbaar wees om nie in 'n ophopende smetprobleem te ontaaard nie.

Dis juis omrede hul feilbaarheid t.o.v. laasgenoemde vereiste dat die gechlorineerde koolwaterstofinsektedoders (bv. DDT, BHC en dieldrin), kwik en sy verbindings, en in

ENVIRONMENTAL POLLUTION AND THE VETERINARIAN

At present much is being written and said about environmental pollution. The role of the veterinary profession in this regard should be evaluated critically and objectively. From an ethical viewpoint we certainly are responsible for the protection of man, animals and the environment from the hazards of pollution. In practice the veterinarian plays an important role in detection of environmental pollution, as he deals directly with the different species of domestic and wild animals, which, upon exposure and owing to individual species succeptibility, may serve as early indicators of possible hazards to man. He is involved in research on the testing and evaluation of environmental contaminants and the replacement of undesirable compounds. Furthermore, the veterinarian has to give practical advice to the public on the use of pesticides in regard to stock and pets and has to advise health authorities on the importance of specific contaminants in the field of meat and milk hygiene. Finally, the veterinarian involved in nature conservation is vitally concerned with the possible effects of pollutants on wild life.

Concerning pollutants, the veterinarian deals mainly with pesticides, which are defined as substances for the destruction or repulsion of rodents, insects, nematodes, fungi, weeds and other forms of plant or animal life, or for the prevention or mitigation of their harmful effects. Those most extensively used are the insecticides, fungicides and herbicides; these three groups feature most prominently as environmental contaminants.

The ideal pesticides should have the following characteristics: it must be cheap and easily produced; it must have a high selectivity, i.e. a high toxicity for the target species, organism or plant, but a low host and mammalian toxicity; it must have enough stability and residual action to exert the required effect and yet it must be biodegradable so as not to constitute a cumulative contamination problem.

It is because they are defective in the latter respect that the chlorinated hydrocarbon insecticides (e.g. DDT, BHC and dieldrin), mercury and mercury compounds and

'n mindere mate lood en arseen en hul verbindings, sulke opvallende mikrochemiese ontreinigers is. Tesame met 'n uiters langsame natuurlike aftakelbaarheid, beskik hierdie stowwe oor 'n hoëgraadse biologiese spesifisiteit en kan hulle hul uitwerking in die omgewing in konsentrasies van minder as 1 dpm teweeg bring. Hul lipied-oplosbaarheid is 'n belangrike kenmerk, gevolglik samel hulle in logaritmiese konsentrasies aan in die lipiede van opeenvolgende diersoorte in natuurlike voedselkettings. Bewys is gelewer, byvoorbeeld in meer Michigan, dat DDT, wat in ongeveer 1 deel per biljoen in die water voorkom, met 'n faktor van 1×10^8 gekonsentreer word deur crustaceae en vis tot 'n finale konsentrasie van 100 dpm in meeue.

DDT is eintlik 'n baie veilige en goedkoop insektedoder; groot meningsverskil heers oor sy veronderstelde skadelike uitwerking op mens en dier. Die enigste oortuigende bewys tot dusver is die vermindering van eierdopdikte by sekere roofvoëls, wat dan tot 'n vermindering in hul getalle gelei het. Daarbenewens is dit 'n bewese kragtige ensiem-induseerder, veral van die hidroksilases, en dit kan 'n merkbare uitwerking op geneesmiddelmetabolisme in alle spesies tot gevolg hê.

Die skadelike uitwerking van ophoping van die hoogs giftige, lipied-oplosbare, gechlorineerde koolwaterstofinsektedoders, soos dieldrin en metielkwikverbindings, is egter bo alle twyfel bewys. Die onoordeelkundige gebruik van hierdie nie-aftakelbare lipied-oplosbare verbindings word nou onder Artikel 32 van Wet 36 van 1947 sterk aan bande gelê. Waar doenlik, sal hulle deur meer aanneemlike stowwe vervang moet word.

Die onlangse aanstelling van 'n interdepartementele komitee om advies te gee en beheer uit te oefen oor die veiligheid en doeltreffendheid van alle produkte wat onder die Wet op Misstowwe, Veevoedsel en Veemiddels en Landboumiddels (Wet 36 van 1947) geregistreer is, was 'n stap in die regte rigting. Die veeartsenykundige beroep geniet goeie verteenwoordiging op hierdie komitee, veral op die Onderkomitee oor Veemiddels: die Suid-Afrikaanse Veterinêre Vereniging is by name verteenwoordig.

Die juiste vereistes vir doeltreffendheid en veiligheid van dipstowwe, wurmmiddels en ander veemiddels word nog bepaal. Goeie vordering is gemaak in oorlegpleging tussen

to a lesser extent lead and arsenic and their combinations, feature prominently as microchemical pollutants. In addition to very slow biodegradability, these compounds have a high degree of biological specificity and may exert their effects in the environment at concentrations of less than 1 ppm. An important property of such compounds is their lipid solubility. Consequently they accumulate *in the lipids of successive species in* natural food chains in logarithmic steps. In Lake Michigan, for instance, it has been proved that DDT, occurring in the range of 1 part per billion in the water, is concentrated by a factor of 1×10^8 through crustaceans and fish to a final concentration of 100 ppm in gulls.

DDT is actually a very safe and cheap insecticide and much controversy exists as *to its supposed deleterious effects on man* and animals. The only conclusive proof presented thus far is that it affects the egg shell thickness of certain predator birds and has consequently led to a reduction in their numbers. In addition, it has been proved to be a potent enzyme inductor, especially of hydroxylases, and this can have a marked effect on drug metabolism in all species.

The deleterious effects of accumulation of the highly toxic lipid soluble chlorinated hydrocarbon insecticides like dieldrin and *methyl-mercury compounds*, however, have been proved beyond all doubt. The indiscriminate use of these non-degradable lipid soluble compounds is now restricted under Article 32 of Act 36 of 1947. Wherever feasible, they have been replaced by more acceptable compounds.

The recent establishment of an interdepartmental committee to give advice and to control the safety and efficacy of all products sold under the Fertilizer, Farm Feeds, Stock Remedies and Agricultural Remedies Act (Act 36 of 1947) has been a step in the right direction. The veterinary profession is well represented on this committee and especially on the Subcommittee on Stock Remedies; the South African Veterinary Association is specifically represented.

The exact requirements for efficacy and safety of dips, anthelmintics and other stock remedies are still being determined. Good headway has been made in a dialogue between the veterinarians in industry and the technical advisers to the Registering Officer under this Act in establishing sound

veeartse in die nywerheid en tegniese raadgewers van die Registrasie-beampte onder hierdie wet, ten einde suiwere en tog realistiese standaarde te skep. Dit was lankal nodig en sal beide die boer en geneesmiddelfirma's van aansien ten goede strek.

Pesweerders het onontbeerlik geword. Hulle is van opperste belang in siektebeheer van beide mens en dier en verseker voldoende voedselproduksie in die hedendaagse wêreld. Omrede die enorme hoeveelhede wat gebruik word, is dit gebiedend dat stowwe wat, hetsy omrede hul betreklike ondoeltreffendheid of giftigheid, hetsy omrede hul omgewingsverontreinigende potensiaal, volgens huidige kennis ongewens geag word, deur meer geskiktes vervang word. Dit kan nie onoordeelkundig geskied nie maar slegs na fyn uitwan van die voor- en nadele van elk, hul beskikbaarheid en die prys van plaasvervangers: 'n mens kelder nie 'n skip om van sy rotte ontslae te raak nie.

and yet realistic standards. These have long been due and will be of benefit both to the farmer and to reputable drug firms.

Pesticides definitely have come to stay. They play a role of paramount importance in disease control in both man and animals and ensure adequate food production in the world today. Because of the enormous quantities of pesticides involved, it is imperative that those compounds which are undesirable according to present knowledge, because of their relative inefficacy or toxicity, or which constitute environmental pollution hazards, be replaced by more desirable compounds. This must not be done indiscriminately but only after very careful consideration and evaluation of the advantages and disadvantages of such compounds, their availability and especially the cost of suitable substitutes. Great care must be exercised to ensure that the ship is not sunk in order to kill the rats.

BOOK REVIEW — BOEKRESENSIE

THE SUCCESSFUL PROFESSIONAL PRACTICE

ROBERT P. LEVOY

Prentice Hall, Englewood Cliffs, N.J. 1970.

Pp. 193. Various diagrams and lists.

The task that the author had, was to present his advice in such a way that his reader, who is a professional and expert in his own field, would accept it. This was probably the reason for the extensive display of the author's credentials on the dustjacket of the book.

This is not a textbook but rather a philosophical treatise presented in a factual way. The author sets out to convince the reader that a successful practice is always orientated toward people. He is then motivated by a carrot and whip method and some brainwashing to review his attitude towards his P/C (patient-client relationship) so that he produces **enthusiastic** P/Cs instead of satisfied P/Cs. The advice given is often disturbing, because the author probes the sensitive areas of the "ivory tower" practitioner. This book will give the reader an insight into himself and his professional motives, whether he is a new or seasoned practitioner, that he is unlikely to find in any other current volume. As the author points out, technical competence is expected of all professional men, but the extras spell the difference between a practioner and a **successful** practitioner.

P.H. le R.

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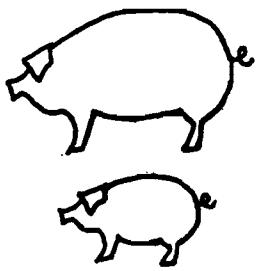

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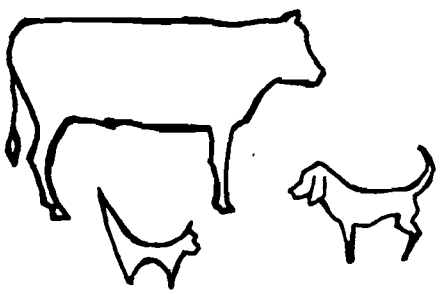

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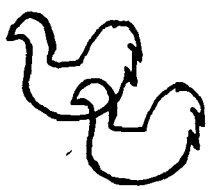

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Opening van die Tweejaarlikse Wetenskaplike Kongres en 66ste Algemene Jaarvergadering van die Suid-Afrikaanse Veterinêr-Mediese Vereniging te Oos-Londen, 13 - 17 September 1971

VOORSTELLING VAN ADJUNK-MINISTER HENDRIK SCHOEMAN DEUR DIE PRESIDENT VAN DIE VERENIGING

Geagte Burgemeester, Burgemeestersvrou, geëerde gaste, kollegas, medekongresgangers, dames en here!

Oor die jare heen was dit die voorreg van hierdie Vereniging om 'n groot verskeidenheid gerespekteerde en hoogaangeskrewe persone te vind om ons Kongresse te open — hieronder tel ons twee vorige Eerste Ministers. Die veeartsenyberoep staan nader aan die landbou as aan enige ander sektor van die samelewing, en dis dan heel natuurlik dat ons ons herhaaldelik wend tot daardie lede van die Kabinet wat vir die portefeulje Landbou verantwoordelik is. Enkele jare gelede het Senator Uys ons Kongres geopen. Vandag is dit ons voorreg om die Adjunk-Minister, Sy Edele Hendrik Schoeman in ons midde te verwelkom, nadat hy goedgunstiglik tyd kon vind en ingestem het om hierdie Kongres te open.

Dis ongetwyfeld onnodig om so 'n geëerde en welbekende persoon aan Kongresgangers voor te stel. Wat wel van belang is, is dat Sy Edele Minister Schoeman nie om politieke redes as Adjunk-Minister van Landbou benoem is nie, maar wel omdat hy in die landbou groot geword het en omdat hy sedert vroeë leeftyd 'n besondere liefde vir en kennis van die landbou geopenbaar het. Hy is self hart en siel 'n boer. Hy besit 'n diepgaande gevoel vir die land, die grond, die boer en die veenywerheid. Hy ken die talle probleme wat so inherent deel is van die landbou in Suid-Afrika. By hom bestaan daar die besondere kombinasie van idealisme en praktyk, en dit spruit uit skerpsinnigheid en 'n intuïtiewe persepsie van dit wat werklik tel en van belang is.

Suid-Afrika is inderdaad gelukkig om 'n persoon van hierdie kaliber in sy diens te hê, en ons is gelukkig om vandag nader met hom kennis te kan maak. Mnr. Schoeman het reeds duidelik getoon waartoe hy alles in staat is, en op grond daarvan, en die vertroue wat duidelik in hoër kringe in hom gestel word, is dit ook klinkklaar dat hy gaandeweg 'n steeds belangriker rol in die landbouaangeleenthede van die Republiek sal speel.

Mnr. Schoeman, namens hierdie Vereniging en al die Kongresgangers wil ek u vandag van harte welkom in ons midde heet. Ons vertrou dat vandag die begin is van 'n baie lang en vrugbare verhouding tussen u en die veeartsprofessie as geheel. Ek nooi u nou om ons toe te spreek.

OPENINGSTOESPRAAK DEUR SY EDELE H. SCHOEMAN, ADJUNK-MINISTER VAN LANDBOU

Meneer die President, dit is vir my en my Departement bemoedigend om te weet dat u as veeartsenykundige professie die welsyn van die land se kleinveebedryf so belangrik beskou dat u die hele program van u kongres daarvoor afgesonder het. Die kleinveebedryf was nog altyd een van die steunpilare van die Suid-Afrikaanse landbou, en ten spyte van die ekonomiese terugslae wat die bedryf gedurende die afgelope dekade moes verduur as gevolg van die knellende droogtes, siekteprobleme en dalende wolpryse, is die bruto inkomste uit kleinveeproduksie nog steeds 'n belangrike faktor in die landbouekonomie. Trouens die grootste deel van die land is weens die klimaat en ander faktore slegs vir veeboerdery geskik en 'n groot deel van ons

boerende bevolking is vir 'n bestaan van dié bedryf afhanklik. Die belangrikheid van veeboerdery in die Republiek word onderstreep deur die feit dat dit in 1969/70 nagenoeg R550 miljoen bygedra het tot die bruto waarde van landbouproduksie, wat in daardie jaar op bykans R1 336 miljoen te staan gekom het. Hiervan het die kleinveebedryf R174 miljoen bygedra — 'n inkomste wat verkry is van die sowat 27 miljoen Merino-skape, 8 miljoen nie-wolskape en 5 miljoen bokke in die land.

As 'n mens die groot kleinveegetalle in aanmerking neem, asook die groot gebied van Suid-Afrika met sy wisselende boerderyomstandighede waarin met kleinvee geboer word, die menige siekte- en ander probleme wat invloed uitoefen op die welsyn van die bedryf, dan besef ons hoe belangrik dit is dat alle moontlike hulp aan dié bedryf gegee moet word. U is gemoeid met die gesondheidsaspek van die bedryf, een van die belangrikste aspekte van die veebedryf en een wat ten nouste gekoppel is aan die uiteindelike ekonomiese resultaat wat met veeboerdery behaal word. Met die steeds groter klem wat daar vandag op boerderydoeltreffendheid geplaas word, word die gesondheidstoestand van ons plaasdiere des te belangriker met die oog op maksimumproduktiwiteit. Daarom sal daar 'n al hoe groter aanvraag vir u dienste wees.

Veeartse se plig

Dit is juis in dié verband dat u as veeartse, hetsy in private praktyk of in diens van die Departement, openbare instansie of nywerheid, 'n dure plig het om te vervul en 'n daadwerklike bydrae kan lewer in die uitbouing van 'n gesonde en produktiewe kleinveebedryf. U beskik oor die deskundige kennis om die boer van advies te bedien oor die bestuurspraktyke wat gevolg moet word om die gesondheid en derhalwe die produktiwiteit van sy veestapel te bevorder. Die doel hiermee is nie net om die regstreekse verliese as gevolg van siektes en vrektes tot 'n minimum te beperk nie, maar veral ook om die onregstreekse verliese te bekamp, soos verliese aan groei en aanteel waarvan die boer baie dikwels nie bewus is nie.

Weens sy uitstekende opleiding is die veearts in Suid-Afrika toegerus om die meeste van die siekte- en gesondheidsprobleme te hanteer waarmee die veebedryf te kampe het. Die akute infeksie-siektes kan toereikend beheer word met die beskikbare entstowwe en daar is 'n enorme hoeveelheid inligting tot die boer se beskikking. Nogtans is dit verontrustend dat ten spyte van al dié kennis baie diere nog steeds beswyk weens besmetlike siektes, plantevergiftiging en parasiete en dat produktiwiteit belemmer word deur probleme van reproduksie en wanvoeding. Baie van dié probleme kan voorkom word deur gesonde vee- en veldbestuur, deur produksiebeplanning en bewaringsboerdery.

In this regard the veterinary profession can make a positive contribution to the welfare of the stock industry by taking an active part in extension work, teaching farmers the correct use of vaccines and remedies against insects and worms, and enlightening them regarding wider aspects of stockfarming. Perhaps more attention should be given to extension work in the training of veterinarians. One can well ask whether the farmer is failing to make use of available knowledge, and whether the fault lies in lack of communication of this knowledge. This is a question to which you may well give more attention.

Small Stock Diseases

The small stock industry in the Republic from its inception has been subject to a host of diseases that have hampered production. Some of these diseases for many years were native to the African Continent. The South African sheep farmer has been faced regularly with the problem of infectious diseases such as blue tongue, Rift Valley fever and Wesselsbron disease, unlike his Australian counterpart to whom these diseases are unknown.

The extent and severity of these diseases are indicated by the fact that direct and indirect losses from blue tongue and the cost of immunization against it costs the small stock industry an estimated half million rand a year. Although Rift Valley fever and Wesselsbron disease only occasionally assume epidemic proportions, it is estimated that at least 100 000 head of small stock died from Rift Valley fever during the 1950/51 season.

Other deadly infectious diseases such as pulpy kidney disease, lamb dysentry and quarter-evil also cause considerable stock losses every year, but thanks to the help of your profession and in particular the Division of Veterinary Services and the research

scientists at Onderstepoort, most of the acute infectious diseases can now be controlled effectively.

Vaccines against the diseases are available and it is significant that 16 out of the 28 vaccines produced by Onderstepoort are used for small stock, and that about 63 per cent of the total number of doses out of the 100 million issued yearly are used by the small stock industry. In this connection I would like to mention the vital role which Onderstepoort plays in providing vaccines to countries abroad, and particularly to countries in Africa. In 1969/70, for instance, about $6\frac{3}{4}$ million doses of vaccine were supplied to African countries and more than 36 thousand to countries overseas.

Quite apart from its production of vaccines, the Department is continually engaged in investigating the health condition of cattle in the veld and in conducting further research work on a priority basis in order to overcome problems, develop new vaccines and improve existing ones.

But the problems of the small stock industry, as you know, are by no means solved. A recent survey by the Division of Veterinary Services revealed that there are still many problems facing the stock farmer which require further investigation and clearing up. For instance in the Karoo, our principal small stock area, tribulosis is the most important disease, causing serious losses among sheep and depleting the production potential of the industry. It is estimated that in the Middelburg (Cape) district alone more than 40 000 sheep have been affected by tribulosis in the past year.

Infertility

There is also the serious question of infertility which causes incalculable loss to our sheep farming industry every year. I believe this is a problem particularly in the Karoo Region, the Northwestern Cape and the Free State, but there is surely no region in the Republic that is untouched. There are also the problems of abortions and of sicknesses that cause a high percentage of deaths in lambs before weaning age, which are losses that no stock industry can afford. We also have to cope constantly with particularly troublesome diseases like heartwater, but fortunately significant progress against this particular disease has been made with the cultivation of the disease-causing organism in the laboratory.

Ek wou dié enkele aspekte noem, al is huile aan u ewe goed bekend, net om 'n aanduiding te gee van die probleme waarmee die veebedryf nog te kampe het, watter belangrike vordering reeds in dié verband gemaak is en om só die belangrikheid van u beroep weer te beklemtoon. Die aansien van u professie is in 'n groot mate te danke aan die doelgerigte wyse waarop u as veeartse, deur navorsing en siektebeheer, die groot getal veesiektes onder die knie gekry het en voorbehoedende geneeskunde op 'n hegte grondslag geplaas het.

Maar ons leef in 'n tyd van gedurige verandering en waar die Staat voorheen feitlik die enigste instansie was wat verantwoordelik was vir veeartsenydienste, het daar in die afgelope twee, drie dekades ondernemings ontstaan wat die boerdery op veeartsenygebied bedien, en het ook die private praktyk vir baie veeartse 'n lonende onderneming geword. Uit die oogpunt van die boerdery is dit ongelukkig so dat die mees lonende privaatpraktyke in die stede geleë is, waar veeartsenykunde hoofsaaklik op troeteldiere toegepas word en waar die veeartse dus nie regstreeks met die veeboerderybedryf te doen het nie.

Getal veeartse

Ons vind byvoorbeeld dat van die 643 veeartse wat gedurende 1970 aktief veeartsenykundige werk gedoen het, ongeveer 61 persent in die privaatpraktyk was, 29 persent in diens van die Staat, 6 persent verbonde aan openbare liggame en 4 persent aan handelsinstansies. Meer as 50 persent van die privaat-praktiserende veeartse, met ander woorde, nagenoeg 200 uit die totaal van 643, is in stedelike gebiede gevestig.

Wat die bediening van die veebedryf as sodanig betref, het ons dus die toestand dat die meer as 52 miljoen stuks groot- en kleinvee in Suid-frika deur 'n beperkte getal veeartse bedien word — of anders gestel, deur slegs sowat 60 persent van die beskikbare veeartsenymag in die land. In vergelyking met ander lande is dit 'n relatiewe klein getal veeartse wat 'n enorme taak het om te verrig. Boonop kan aanvaar word dat namate die veeboerdery meer intensief beoefen word en die gehalte van die diere styg, die behoefte aan veeartse se dienste ook sal toeneem.

Die Regering is deeglik bewus van dié ongunstige toestand in ons veebedryf en, soos u weet, is daar dan ook al besluit om die opleidingsgeriewe vir veeartse aanmerk-

lik uit te brei. So word onder meer beoog om 90 nuwe studente per jaar op Onderstepoort te akkommodeer teenoor die huidige 45 per jaar. Dit beteken dat dubbel soveel veeartse mettertyd opgelei sal kan word as wat tans die geval is, en ek vertrou dat dit sal meehelp om die bestaande en verwagte behoefte aan veeartsenydienste in die eerste plek in die boerderybedryf aan te vul.

Ek wil u vereniging 'n baie suksesvolle kongres en jaarvergadering toewens en die hoop uitspreek dat u beraadslagings besonder vrugbaar sal wees.

Dit doen my genoeë om die verrigtinge ope te verklaar.

VOTE OF THANKS TO MINISTER SCHOEMAN BY THE PRESIDENT OF THE ASSOCIATION

Mr. Minister we have listened with great attention and interest to your opening address, and wish to assure you that we will take to heart what you have said.

We have become aware of your particularly acute perception not only of those matters which are of vital importance to agriculture generally but also more specifically to the veterinary profession and to the service which we try to render. We look forward to a long and fruitful association with yourself and the Government, and we are greatly pleased that you have expressed yourself in no uncertain manner to be in favour of such collaboration. To my colleagues I would say that I sincerely believe we have found in Mr. Schoeman a knowledgeable, sincere, and sympathetic person who can be relied upon to ensure that the opinions of this Association and thus of the veterinary profession as a whole, are given the most objective and careful consideration in Government circles, a need which is most acutely felt.

On behalf of this Association and this Congress, may I therefore thank you for your address and wish you continued success in the great work you are doing in the interests of the country and, more specifically, of South African Agriculture.

Jl S. Afr. vet. med. Ass. 42 (4): 285-288 1971

BIENNIAL SCIENTIFIC CONGRESS AND 66th ANNUAL GENERAL MEETING, EAST LONDON, 13 - 17 SEPTEMBER, 1971

ADDRESS BY THE PRESIDENT

DR. L. W. VAN DEN HEEVER

At a Congress such as this it is the privilege of the President of the Association to address those gathered here on matters relevant to the profession it represents and, in so doing, to give expression to some personal thoughts and opinions. In accordance with our custom of using the official languages alternately, I will deliver this address in English.

One of the important objects of this Association is to diffuse information on all matters affecting the veterinary profession and to improve and elevate the general and technical knowledge of its members. The main theme of this Congress is "Veterinary Science and the Small Stock Industry". It forms a major portion of the broad front on which veterinarians serve, and it is on some aspects of veterinary service to the country community and agriculture that I wish to speak.

We live in a rapidly developing country and a constantly changing world which is beset with problems of increasing magnitude and complexity. This profession has its share of these problems. If we are to remain of service, the profession must remain viable; this requires constant adaptation to new demands on our knowledge and skills and on finding new ways to serve the community. In order to meet the demands of tomorrow, we require the wisdom, foresight and courage to make changes today. One of the important matters which require urgent consideration is that of the training of veterinary scientists.

Since formal education of veterinarians was first instituted in Lyon, France, in 1762, and even since our own Faculty was first constituted half a century ago, great changes have come about. Latterly there has been a tremendous scientific and technological explosion, as evidenced by the huge volume of current literature. This has given great impetus to modern veterinary science, but also added considerably to the volume of knowledge which the veterinarian must screen, condense, understand, evaluate and retain. But this is not the only problem. The end product of training must be a graduate who is fully capable of performing any of the numerous tasks expected of a veterinarian and he must qualify for registration as such. When one looks at the diversity of ways in which veterinarians serve the community, it immediately becomes apparent that their basic training is highly complex, and that increasingly difficult decisions have to be made regarding the nature and extent of such training.

A whole series of questions require to be answered: What are the truly minimum requirements for registration as a veterinarian? Should undergraduate training be general and deal broadly with basic biological and veterinary matters, or should the new graduate also be expected to have specialized knowledge? If basic undergraduate training is to be specialized, just how specialized must it be? Every lecturer would, of course, like to see students become highly skilled and proficient in the particular subject which he teaches, but there is no time for this within an already grossly overcrowded training period. What role should post-graduate training and continued education play? Today most veterinarians are engaged in private practice. Does this justify emphasis on clinical work at the expense of other subjects in undergraduate training? What should be the ratio of teaching times spent on small animal in relation to large animal work, and how does this ratio influence the post-graduate work of the graduate? Should veterinary science be taught as a type of animal and agricultural science, or should it be considered as veterinary medicine, and thus remain more closely allied to

the other medical sciences? How necessary, desirable, and practical is it to require a period of "housemanship" or assistantship before a graduate is registered and authorized to practice on his own ?

And when satisfactory answers have been found to all these and similar questions, one must ask the next; is it adequate to register a veterinarian only once in a lifetime, or should he be called upon to give proof of continued post-graduate education in his field of choice from time to time?

The Faculty has alway been acutely aware of these questions and has continually adjusted its training programmes. It has now come to the conclusion that a period of five years is inadequate for basic minimal veterinary training. This decision is endorsed by this Association as a most necessary development if we are to keep our standards equal to those of the international veterinary fraternity — a matter of the utmost importance for a country engaged in international trade and for the interchange of veterinary personnel. Just how the suggested six-year training period is to be utilized must yet be decided. I believe that the time has now arrived for a searching and full scale investigation to be made into the requirements of veterinary training and registration and into the future role and educational needs of the veterinary profession in South Africa, so as to ensure that future graduates can meet the challenges which the veterinarian of tomorrow will have to face.

Another matter of concern is the shortage of veterinarians. As long ago as 1962 this Association pointed out the necessity for a material increase in the number of veterinarians graduating annually. Since then the Association has consistently urged that a second faculty be established for this purpose Instead, the existing single faculty is now to be enlarged to double the present undergraduate training facilities. As matters now stand, there will be no significant increase in the number of annual graduates until about 1980 — a matter of some 18 years after the Association's first call for the creation of additional facilities. This Association has been told that a second faculty will be established some time in the future. Just when this will happen is not clear, but in view of the inevitably protracted period required for an idea to become fact, it is clearly not too early to start to plan and site such a second faculty now. On occasion, one is asked whether a shortage of veterinarians really exists, and if so, why the profession is so concerned about the shortage. Let me try and answer the second question first. A prolonged shortage of registered members of a profession may have the following effects:

The profession may encounter relatively few real challenges and may consequently tend to become relatively complacent. Members of the profession readily obtain employment and earn a reasonably good income. Being human, they naturally tend to select those tasks which are the least demanding, the most pleasant and the most rewarding, and certain spheres of professional activity and responsibility may become neglected.

An unfavourable geographic distribution of members, relative to a national service, easily follows. These factors combine to create a vacuum, and inevitably others who are not well or even specifically trained, are drawn to such work. This situation readily lends itself to exploitation. Attempts may even be made to sweep aside legally established principles by the argument that the profession is not available for or interested in such work. The community, and even the State, may begin to accept that such work is done by non-veterinarians. Unknowingly, they also begin to accept what must logically be regarded as an inferior service if it is acknowledged, as it must obviously be, that the veterinarian is the only person who is properly qualified to deal with veterinary matters. Under such circumstances the shortage of veterinarians becomes less apparent, and the community unwittingly suffers.

Exploitation of the shortage of veterinarians has other facets which are perhaps not generally appreciated. Numerous commercial concerns employ representatives and field men to visit farmers, discuss their animal health problems and advise them on therapy, prevention and control of animal diseases and parasites. In contrast, the veterinarian's code of ethical conduct precludes him from advertising his presence in a town or district or from offering his services; the veterinarian who is trying to establish himself in rural practice thus frequently finds himself at a distinct disadvantage. Farmers may be under the impression that the services rendered by field representatives of commercial concerns are free. In fact, they pay for such services by buying the firm's products. Let it not be forgotten, however, that the veteri-

narian's code of ethics is officially recognized in terms of the Veterinary Act. Both the veterinarian and the owner of animals is fully entitled to protection against those who would do the work of a veterinarian without being registered as such.

I am, of course, fully aware of the important and valuable work which the veterinary assistant can and does perform. By the proper and controlled use of para-veterinary personnel, and with the aid of suitably trained assistants the veterinarian can extend his services far beyond the area which he could serve if working alone. As is the case with the auxilliaries to other professions, it is essential that they be given the protection and security, as well as an ethical code, by becoming officially registered, and it is fortunate that the Veterinary Act provides for such registration. This matter is presently receiving serious consideration by the Association.

I have already expressed the Association's strong conviction that the establishment of an additional faculty of veterinary science is highly desirable. This, however, in no way detracts from the Association's close ties with the existing faculty at Onderstepoort and its deep interest in its affairs.

The Association is certainly proud of the Faculty's status and record, and is particularly grateful for the institution, comparatively recently, of a wide range of postgraduate academic and refresher courses. For this, the Dean, Professor Hofmeyr deserves special mention.

Maintenance of the existing standard of training is vital to our country and our profession. It is alarming to note, therefore, the gradual but consistent relative decrease in the salaries of teaching personnel when compared to the income of veterinarians working in other branches of veterinary service, including the State Service. From the fact that vacant Faculty posts are frequently advertised on several successive occasions, it is clear that the present salary scales are not always drawing a sufficient number of suitable applicants. Faculty has been fortunate, to date, of eventually obtaining the services of enthusiastic and dedicated men and women, but this situation cannot be expected to prevail in the future.

If the Faculty is eventually to become completely independent of the Department of Agriculture, it will also have to replace the services of several highly specialized persons attached to the Veterinary Research Institute at Onderstepoort who presently lecture on a part-time basis. It is fully appreciated that matters are now static, pending a decision on the eventual status of the Faculty, but to ensure the best of training for future veterinary graduates it is of cardinal importance that the Faculty must be able to draw the most competent teachers from the body of the profession in this or other suitable countries. I must issue an urgent warning that unless the salaries of Faculty staff are considerably improved, the training of veterinarians at the present, at an enlarged or at a second faculty may be seriously jeopardized.

It is less than a century ago that a handful of well-known and distinguished individuals whose names have become part of South African history, first began to render veterinary service to this country. They were remarkably successful and they set a fine example, establishing a tradition of which the profession is justifiably proud and which must be maintained at all costs.

At first the growth of the profession was painfully slow, but gradually the country became more and more veterinary-conscious. Only in 1936 was the name of the hundredth veterinarian placed upon the Register; today there are over 700. Naturally, this increase was accompanied by profound changes. One notable change was the sudden realization of the diverse and numerous ways in which the veterinarian could serve the community. This resulted in members of the profession entering private practice and fields such as animal production and artificial insemination, the pharmaceutical and feed industries, nature conservation, public health and medical research, veterinary and agricultural education.

The State Service, once the almost exclusive employer of veterinarians, now engages less than 30% of the total profession. The State Service of which we are all justifiably proud, has itself undergone important changes, and having eradicated or successfully controlled most of the major epizootic diseases, it can now devote more time to regional diagnosis and survey work, erosion

diseases and meat hygiene.

Nevertheless, the profession as a body continues to render a veterinary service, regardless of the sphere of activity in which the individual members are engaged. It is of the utmost importance that this *unity of service* be recognized and acknowledged by the public, by the authorities and, for that matter, by members of the profession themselves. All veterinarians have the same basic training and have the same primary objective, i.e. service to mankind. All have the same ability to serve, all have the welfare of the country, the community and animal industry at heart.

The extent to, and the manner in which the profession is called upon to serve the country, lies entirely in the hands of others. It is often said that most veterinarians confine themselves to small animal practice and are thus lost to the farm livestock owner. A recent official Government reply to a suggestion that the State make use of rural practitioners stated that "practitioners are almost exclusively located in large towns and cities". It cannot be denied that those in small animal practice render a most essential service by caring for the animals of owners who do not expect the State to provide such services. Let it not be forgotten that, in many instances, the pet owner makes it possible for the practitioner to be available to owners of farm livestock, nor that a very large proportion of practitioners located in the cities and large towns do, in fact, spend a considerable amount of their time on farm animal work.

In addition, there are altogether more than 160 rural veterinary practitioners in places from Alexandria to Zeerust who are almost exclusively farm animal practitioners.

It is extremely gratifying to note that the progress which the State has made latterly in getting the bovine tuberculosis eradication scheme under way by engaging practitioners to undertake tuberculin tests and associated work. It is earnestly hoped that this is just the beginning of greater collaboration between the State and the profession as a whole. There is a great deal to be said for more extensive use of practitioners by the State, even if only to make full use of available trained manpower. But there are other obvious advantages to be gained, with benefits for all concerned. The State could overcome the chronic manpower shortage and obtain the services of veterinarians on a part-time basis in most parts of the country at a cost far lower than that of engaging full-time personnel. The veterinarian who prefers farm animal work (and there are many) would be given the security and incentive to establish himself in practice in an area where the livestock industry may not yet be sufficiently developed or advanced enough to support a practitioner. The community could have the benefit of a meat hygiene service under veterinary supervision. The farm livestock owner could obtain clinical and prophylactic veterinary services without the crippling cost of the long distances of travel which so often make it uneconomical to call a veterinarian. Farm livestock owners could then make use of of confining their use of his servces to the single valuable animal. They could then afford to call the veterinarian immediately instead of first resorting to their own efforts and those of various untrained persons. They would then not expect the veterinarian to perform a miracle when he is eventually called upon to salvage an already moribund animal to which all the available registered stock remedies have already been administered.

It is largely up to the State and organized agriculture to take the steps which will further extend veterinary services, in its very broadest sense, to all parts of the country, and the Association will certainly do all it can to promote such schemes by providing information and assistance wherever possible. We would welcome discussions aimed at promoting the establishment of a system equivalent to that of the district surgeoncies instituted by the Department of Health. We consider the ideal to be a veterinarian in every community and within reasonable travelling distance of all who can benefit by his services, as only then can a full, broad and efficient veterinary service be rendered. I have no doubt whatsoever that, in time, this will come about. In the meantime, we in the veterinary profession must maintain our past standards and traditions and rededicate ourselves anew, to serving mankind by our services to animals.

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REFRESHER COURSES IN PHARMACOLOGY

5. THE EXCRETION OF DRUGS

W. L. JENKINS*

INTRODUCTION

There are three major processes whereby the concentration of a drug at responsive receptor sites within the tissues may be reduced and thus the effect of the drug terminated. Two of these mechanisms, namely intracorporeal binding and biotransformation, have been discussed previously in this series. The third process is by the excretion of the drug or its metabolites from the body.

The principal route of elimination of foreign compounds is via the urine. In some instances, however, the biliary system, the lungs and the intestine may play significant rôles. Drugs may also be excreted in milk, saliva, sweat and even in tears.

The basic principles involved in drug elimination via the above routes and the factors which may influence the rate of excretion will be reviewed here.

DRUG EXCRETION IN THE URINE

The normal function of the kidney provides an excellent system by which foreign compounds or their more polar metabolites may be eliminated from the body. The rate and extent of the urinary excretion of drugs is governed by three main factors, namely:

(a) *Glomerular filtration*

Any compound which has a molecular size smaller than that of plasma albumin will be readily filtered through the glomerular membrane. Its subsequent concentration in the ultrafiltrate will be approximately the same as in plasma water. It is important to note, however, that it is only the free drug in the plasma and not the fraction which is bound to the plasma proteins which can pass into the renal tubules. Thus the main determinant factors which affect the glomerular filtration of a drug include the glomerular filtration rate, the molecular weight of the compound and the concentration of unbound drug in the plasma.

The *clinical situations* in which the glomerular filtration rate is reduced, e.g. acute glomerular nephritis or shock, will also alter the degree of drug excretion by this mechanism.

(b) *Passive tubular transfer*

The renal tubular epithelium acts as a lipoprotein barrier and the factors which govern the distribution of drugs across such membranes play a vital rôle. Thus, nonionized lipid-soluble molucules in the glomerular filtrate will diffuse across the tubular epithelium and will be reabsorbed into the blood stream whereas ionized or hydrophilic molecules will not. Conversely drugs may diffuse from the blood stream into the tubules where they may become trapped in the ionized form and will consequently be excreted in the urine.

Passive tubular reabsorption, therefore, depends primarily on the lipid solubility of the drug at the particular pH of the tubular fluid; changes in pH may markedly influence the net excretion of drug. Thus, when urine is acid, basic drugs are more highly ionized and are excreted to a greater extent than in alkaline urine. Similarly acidic drugs are more highly ionized in alkaline urine. These effects are generally only of clinical significance if the pKa of the drug is in the range of about 7,5 to 10,5 for bases and 3,0 to 8,5 for acids.

A practical example of the use to which such principles may be applied is in the treatment of pentobarbitone (pKa 8,1) overdosage with sodium bicarbonate in order to alkalinize the urine. This increases the rate of excretion of pentobarbitone and promotes recovery.

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(c) *Active tubular secretion*

The epithelium of the proximal renal tubules possesses at least two specialized mechanisms for transporting drugs from plasma into the tubular fluid. One of these is for organic anions and the other for organic cations.

Examples of common acidic drugs and drug metabolites which are actively excreted into the renal tubules include salicylic acid, hippuric acids, phenolsulphonphthalein, sulphonic acids, sulphonamide, acetazolamide, probenecid, phenylbutazone, oxyphenbutazone, sulphinpyrazone, indomethacin, penicillins, thiazide diuretics, chlorpropamide, glucuronides (esters and ethers), sulphate esters and amino acid conjugates.

Examples of common basic drugs which are also actively excreted include tetra-alkylammonium compounds, choline, hexamethonium, histamine, guanidine, thiamine, 5-hydroxytryptamine, mecamylamine and quinine.

Compounds transported by the same mechanism compete with each other and may inhibit the transport of one another. One drug may therefore potentiate the action of another by inhibition of its tubular secretion. Perhaps the best known example of this phenomenon is the inhibition of the tubular secretion of penicillin by probenecid. This mechanism, in fact, represents an important potential site of interaction which should always be borne in mind when drugs are used in combination.

It is also of clinical significance that in the neonate the renal tubular secretory mechanisms are incompletely developed and are, therefore, inefficient. Thus a reduction of drug dosage rate in new-born animals is often essential if toxicity is to be avoided.

In summary then, the relatively polar, lipid-insoluble drugs, drug metabolites and conjugates are more readily excreted by the kidneys than are the original non-polar lipid-soluble foreign compounds. The renal excretory mechanisms consist of glomerular filtration, tubular reabsorption and tubular secretion or any combination thereof. The net effect is to eliminate a constant fraction of the drug present in renal arterial blood.

It must always be borne in mind that any impairment of renal function may drastically alter the efficiency of drug excretion by this route. Thus, when conditions such as glomerular or interstitial nephritis, shock and congenital renal disease are diagnosed, care should be exercised with repetitive drug administration.

BILIARY EXCRETION OF DRUGS

Foreign compounds may be presented to the hepatic parenchymal cells either via the portal vein or hepatic artery. These drugs may then be transferred, as metabolites or conjugates, into the bile, or they may be returned to the systemic circulation via the central vein ultimately to be excreted by the kidneys.

The membranous boundaries between the hepatic sinusoidal blood and bile are highly porous in nature and permit the passage of most molecules and ions smaller than protein. Thus even large lipid-insoluble drugs may be excreted in bile, although the hepatic parenchymal cell is generally more permeable to lipid-soluble substances.

An important aspect of the biliary route of drug excretion is the elimination of certain organic anions and cations by specific carrier-mediated active transport processes. Among the organic acids transferred in this manner are the following: sulphobromophthalein (BSP), phenolsulphonphthalein, fluorescein, penicillin, bile acids, bilirubin glucuronides, drug conjugates with glucuronic acid and iodine-containing radio-opaque substances. The bases which are transported by a distinct, specific mechanism include procaineamide ethobromide, mepiperphenidol, benzomethamine, oxyphenonium and tubocurarine. A great many other drugs are excreted to a greater or lesser extent in bile. Examples include the digitalis glycosides, mercuhydrin, streptomycin, the tetracyclines and steroid hormones.

Biliary excretion is often dependent on molecular size and increases as the molecular weight of the drug increases. In fact, this increase in biliary excretion is often paralleled by a decrease in excretion in the urine.

A drug excreted into the bile and which passes into the intestine may possess the properties which favour intestinal absorption. A cycle may then result in which biliary secretion and intestinal reabsorption continue until metabolic degradation or urinary excretion eventually eliminates the drug from the body. This phenomenon is known as the enterohepatic cycle. Glucuronides may be

hydrolyzed in the gut and if the products are non-polar they, too, may undergo an enterohepatic circulation. Examples of compounds which may have this fate include the glucuronides of phenol, oestriol and chloramphenicol.

The rate of biliary excretion and the presence of an enterohepatic cycle varies from species to species. These differences in biliary excretion may in some cases be responsible for the different plasma halflives of a drug observed in different species.

Many forms of liver damage will markedly alter the efficiency of the biliary excretory mechanisms and this should always be considered in treating a case under such circumstances.

EXCRETION OF DRUGS INTO THE GASTRO-INTESTINAL TRACT

The factors which are responsible for the absorption and distribution of drugs in the body are also concerned in the elimination of drugs and their metabolites in the faeces. The principles involved have been discussed previously and only the implications of this excretory route will be reviewed here.

In monogastric animals, organic bases such as strychnine, aminopyrine, levorphanol and mecamylamine are secreted from the plasma into the stomach to degrees which are commensurate with the pH-partition hypothesis. These compounds, however, may be reabsorbed further down the intestinal tract as the pH of the contents increases.

Similarly, drugs may be transported into the intestine by simple nonionic diffusion. The quantity of a drug ultimately eliminated in the faeces will depend greatly on the concentration gradient between plasma and the contents of the various segments of the intestinal tract.

One may expect considerable variation in this route of excretion between various compounds. Furthermore, the anatomical and functional differences in the digestive tracts of the domesticated animal species will also lead to species differences in the faecal elimination of drugs.

DRUG ELIMINATION VIA THE LUNGS

Gaseous and volatile anaesthetics are eliminated from the body in the same way as they are absorbed, namely, by diffusion through the alveolar epithelium in accord with their concentration gradients.

DRUG EXCRETION IN MILK

The lactating animal may excrete considerable quantities of drug in milk. The pH of cow's milk is about 6,7 and this represents an ion-trapping mechanism for many drugs. Thus organic bases often concentrate in milk and organic acids attain predictable levels in many instances. There are, however, exceptions, e.g. the tetracyclines, which attain higher concentrations than the predicted ratio.

The transfer mechanism is once again predominantly passive diffusion of the nonionized drug moiety and there is close agreement in many instances between observed experimental ratios and theoretically calculated values. Thus erythromycin, a base (pKa 8,8), attains a milk to plasma ratio of about 7, whereas acidic drugs such as benzyl penicillin (pKa 2,7) and several sulphonamides (pKa 7,1—7,4) attain ratios of less than unity. Nonionized compounds such as ethanol and antipyrine distribute evenly between milk and plasma.

It should be emphasized that a large number of drugs and pesticide residues are known to be excreted in milk of both man and animals. This should always be borne in mind when treating a lactating dam.

DRUG EXCRETION IN SALIVA

There are noteworthy species differences in the amount and pH of saliva. Ruminants secrete huge quantities of saliva with a pH value of about one unit higher than in other species; consequently the salivary secretion of drugs may be significant in the ruminant.

The transfer of drugs between plasma and saliva depends once again upon the pKa and the lipid solubility of the drug. Saliva, however, does not stagnate within the gland, as does milk, and equilibrium is not reached.

DRUG EXCRETION IN SWEAT

Drugs may be excreted in sweat by passive transfer of the nonionized molecules but this route of drug excretion is of very minor and little clinical significance.

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BOOK REVIEW BOEKRESENSIE

GUIDE TO SANITATION IN NATURAL DISASTERS

M. ASSAR

World Health Organization, Geneva, 1971

This useful and instructive guide covers a far wider field than its title would indicate.

The types of disaster which might occur are classified. The hazards which have to be met and counteracted with each are described. Possible sources of help are mentioned. There are chapters on precautionary measures which should be taken in case disaster strikes, including the organization of agencies responsible for relief work and control of disease. The personnel, equipment and supplies needed are listed so that provision can be made for them to be readily available in case of need. The importance of planning in advance so that the necessary relief, sanitary and rehabilitation measures can be instituted rapidly and efficiently is stressed.

Sanitation is covered comprehensively. The layout and management of camps and shelters, the facilities required, such as latrines, waste collection, and disposed units, laundries and disinfection units are described. Particulars about the quantity of water required, possible sources of supply, vehicles for tranport of water and how to render water supplies safe by chlorination and other methods are given.

Plans of simple, practical structures for the protection of wells and springs, chlorination of water, construction of latrines and showers and the destruction of refuse are provided. The handling and disposal of refuse, manure, animal carcases and waste water is dealt with. The problem of damaged town sewers and sewage pollution is discussed. The running of a satisfactory mortuary service is described.

A list of vermin likely to be encountered, the diseases they transmit and methods for their control both on people and in the environment are given. One of the insecticides recommended is DDT. This might not be acceptable in countries where laws against its use have been made.

The danger of eating damaged or contaminated food is mentioned. Food sanitation is described fully and deals with the supervision, inspection, facilities, handling methods and cleanliness necessary to ensure the provision of clean, healthy food.

The human factor is not overlooked and the necessity for instructing people in the use of the facilities provided and telling them of the importance of strict attention to hygiene is stressed.

A short chapter on rehabilitation measures is included. There are a number of annexes at the end of the guide in which useful information is summarized.

This guide supplies invaluable information not only for use during disasters but also for every day ue in the control of pollution and disease. G.D.S.

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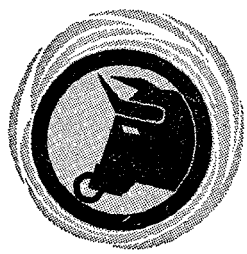

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Rhodesiese navrae: Posbus 2781, Salisbury, Rhodesië.

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CONGENITAL GOITRE IN SOUTH AFRICAN BOER GOATS

P. VAN JAARSVELD*, C. THERON, B. VAN DER WALT AND A. VAN ZYL**

SUMMARY

The thyroidal iodoproteins of a congenital goitre in Boer goats in the district of Grootfontein, S.W.A., have been investigated physico-chemically in order to clarify the aetiology of the disease. A normal iodoprotein pattern was found in the goitrous material but the 19S thyroglobulin polymers were present in relatively low concentrations with a tendency of thyroglobulin to dissociate into its subunits, of which the presence of a 12S component was a distinct feature. Extraction and purification of the 12S component was unsuccessful, probably because of an association-dissociation equilibrium with 19S thyroglobulin.

A thyroidal iodine content of approximately 0,3% can be regarded as the lower limit of normally iodinated thyroglobulin in the thyroid of Boer goats since this concentration resulted in an elevated MIT/DIT*** ratio and a low circulating thyroxine level.

From the protein-bound iodine values found in goitrous and non-goitrous animals, it was clear that the goitre could be ascribed to an environment relatively poor in iodine, a state to which the Boer goat species is highly sensitive; nevertheless, a genetic factor cannot be excluded.

The selection of breeding stock not susceptible to an iodine-poor environment may result in eliminating the rapidly growing members of the species and is not recommended.

INTRODUCTION

Sporadic congenital goitre in livestock sometimes presents serious economic problems to farmers. Congenital thyroid abnormalities are not always due to a relative iodine deficiency and in some cases it is difficult to understand the aetiology of the disease. A genetically determined congenital goitre which appeared in a stud of Afrikander cattle [1], proved to be such a case. A study of the iodine metabolism in these animals led van Zyl, Schultz, Wilson & Pansegrouw [3] to the conclusion that the abnormality could not be classified under any of those inherited thyroid disorders which are known to occur in man and animals [3]. Upon further investigation Robbins, van Zyl & van der Walt [4] showed that 19S thyroglobulin was absent in the Afrikander cattle goitre and they postulated the existence of an abnormal form of thyroglobulin. This protein, together with other abnormal iodoproteins, were subsequently isolated and purified [5]. Apart from economical considerations, the abnormal and unusual iodoproteins in the cattle goitre provide a unique opportunity to study abnormal thyroxine biosynthesis.

In the district of Grootfontein, S.W.A., the occurrence of congenital goitre in Boer goats has been noted recently. We are indebted to Mr. E. Freyer, Principal, Neudam Agricultural College and Prof. C. van Niekerk, Head of the Department of Animal Physiology, University of Stellenbosch, who directed our attention to this problem. This report describes the investigation of the abnormality with respect to the thyroid proteins. The normal family of thyroidal proteins was found in the goitre but they differed in their stability towards dissociation from those of non-goitrous kids.

It is highly probable that a relative lack

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ABBREVIATIONS
***MIT: 3-monoiodo-L-tyrosine
DIT: 3,5-diiodo-L-tyrosine
T_3: 3,5,3′-triiodo-L-thyronine
T_4: L-thyroxine
TSH: thyroid stimulating hormone
PBI: protein-bound iodine

in dietary iodine is not the only cause of this congenital abnormality. A genetic factor at least in part may be responsible, since an adequate iodine supply does not totally prevent the occurrence of the defect.

MATERIALS AND METHODS

At the Uitkomst Experimental Farm, Grootfontein, S.W.A., three normal and ten goitrous kids, approximately 3 weeks old, were given 100 μc carrier-free Na ^{125}I (Amersham, England) intravenously. The animals were bled to death 24 hours later and the thyroids ablated immediately. They were kept on ice for another 24 hours after which period they were frozen on dry ice until used for further investigation.

Representative samples of venous blood for PBI analysis of the adult goats and kids at the Uitkomst Experimental Farm were collected in specially cleaned, evacuated glass test tubes.

For histological examination normal and goitrous tissues were fixed in formalin. Paraffin sections were prepared and stained with with haematoxylin and eosin according to standard techniques.

Preparation of the Crude Thyroid and Goitre Extracts

After partial thawing, the glands were sliced thinly and extracted with 1 ml 0,1M KCl+0.02M phosphate buffer of pH 7,4 (hereafter referred to as "standard buffer") per g of fresh tissue by slow mechanical stirring at +4° for 1 hours. The crude extract was filtered through several layers of glass wool to remove fat and the gross cell debris. A second extraction with the same ratio of standard buffer was carried out on the remaining cell debris in a similar way. The combined extracts were subsequently centrifuged at 30,000×g for 1 hour and then at 105,000×g for another hour. The clear supernatants were then exhaustively dialyzed at +4° against several changes of standard buffer and concentrated afterwards by vacuum filtration.

The soluble extract of normal thyroids contained not less than 60 mg total protein/g thyroid tissue (fresh weight) while the goitrous tissue yielded 40 mg total protein/g of tissue. In both cases more than 90% of the radioactivity present in the tissue prior to extraction was present in the soluble protein fraction.

Purification of Thyroidal Iodoproteins

The proteins of the crude extracts were fractionated by gel chromatography on Sephadex G-200 (Pharmacia, Uppsala) according to previously described methods [6]. Fractions collected from the columns were concentrated to the desired concentration by vacuum filtration.

Sucrose density gradient ultracentrifugation of protein preparations obtained by gel chromatography was performed essentially as described by Salvatore, Salvatore, Cahnmann & Robbins [7]. Linear gradients of 5—28% sucrose were used in the SW 25.1 rotor of a Spinco Model L ultracentrifuge.

Analytical Procedures

Protein concentration measurements were made by using an $E^{1\%}_{1cm}$ value of 10 at 80 nm. In the case of preparations having a relatively high 414 nm absorbancy a microbiuret method was used to determine the total protein concentration [8].

Analytical ultracentrifugation of protein samples in standard buffer at 20° was carried out with a Spinco Model E analytical ultracentrifuge. Double sector cells were used and sedimentation rates were computed by standard moving boundary methods of the Schlieren optical system. Percentage composition of protein components in heterogeneous preparations were calculated from the areas under the Schlieren peaks without correcting for the Johnson-Ogston effect or radial dilution.

Iodine Analyses

Radioactive counting (^{125}I) was performed in a well-type scintillation counter equipped with an automatic sample changer.

Stable iodine (^{127}I) and *protein bound iodine (PBI)* were determined by an alkaline ashing method described by Wilson and Van Zyl [9].

Iodoamino acids of purified protein preparations were either determined spectrophotometrically according to a spectral titration technique [10], or by pronase digestion of the proteins followed by separation of the radioamino acids on Sephadex G-25 (Pharmacia, Uppsala). Pronase (Miles Seravac, Cape Town) digestion was carried out at 37° for 16 hours under nitrogen according to Tong and Chaikoff [11]. Radioamino acid composition of the digests were determined by

separation on Sephadex G-25 according to Osborn and Simpson [12]. The total counts eluted in the various iodoamino acid fractions were used to calculate the composition of the proteins as a percentage of the total counts eluted from the column. The absence of any ^{125}I peak indicated complete hydrolysis. The eluted iodoamino acid fractions were identified by comparing their radioactive positions with the locations of known stable markers on one-dimensional paper chromatograms using butanol : acetic acid : water.

RESULTS

Clinical Appearance of Animals and their Circulating Hormonal Level

The palpability of the thyroids of members of the herd with congenital goitre as compared to normal ones of the same kidding season (March/April, 1969) indicated that regression of the goitres did not occur fully. Despite the somewhat enlarged glands these animals appeared physically in a similar euthyroid condition as the members without congenital goitre. Table 1 summarizes some features of the kids taken from the 1970 season for experimental material.

Table 1: WEIGHT OF KIDS AND THEIR THYROIDS AND THE PBI VALUES COMPARED TO THOSE OF THEIR MOTHERS

	Weight (g)		PBI (μg/100 ml)	
	Kid	Thyroid	Kid	Mother
Normal	4290	1,8	5,82	3,15
	5560	1,9	3,32	2,15
	5160	2,0	4,35	2,15
Average	5003	1,9	4,49	2,48
Goitrous	5860	64	1,50	2,90
	7300	46	2,30	2,90
	4300	30	1,50	2,12
	6640	27	1,02	2,12
	6210	35	1,50	2,30
	6790	19	2,77	2,50
	5180	40	1,82	2,27
Average	6040	37	1,73	2,44

The average weights of normal and goitrous kids (σ 3 weeks old) indicate that the affected animals were physically comparable to the non-affected animals. Their thyroids, however, were grossly enlarged and the PBI values were lower than the normal ones. It is of interest that the PBI values of the mothers of both normal and goitrous kids did not differ greatly.

Histology of the Glands

Fig. 1, upper and lower part, shows the histological appearance of the normal and goitrous tissue respectively.

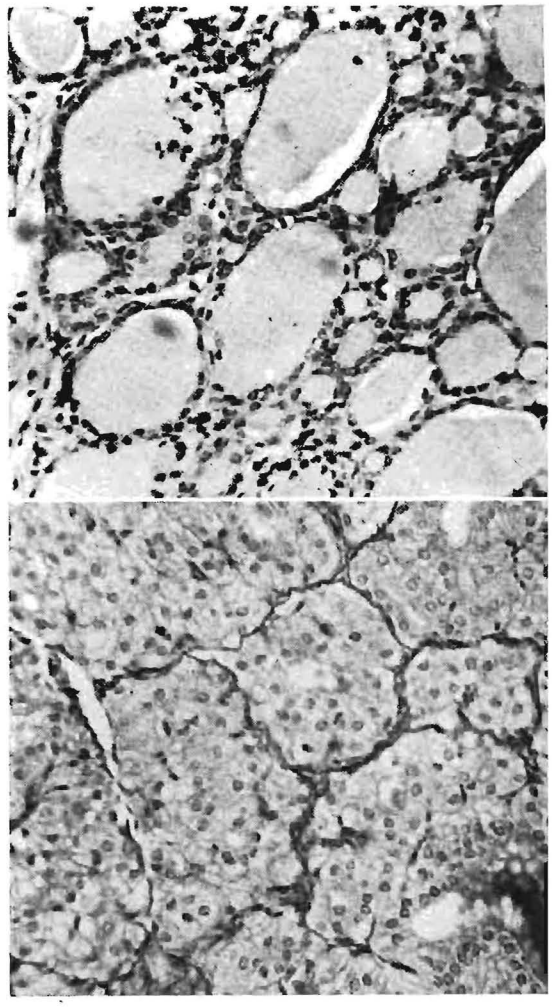

Fig. 1: Histology of normal (top) and congenital Boer goat goitre (bottom). The tissue was fixed in formalin and stained with haematoxylin and eosin. (Magnification: $\times$450).

The high epithelium and lack of colloid in the goitrous tissue are well-known features of chronic TSH stimulation.

Soluble Thyroidal Proteins

The soluble extracts of both normal and goitrous tissue were fractionated by gel chromatography. The results are presented in Figs. 2 and 3.

It is evident that from the goitre extract (Fig. 3) relatively more material was eluted after the main radioactive peak than from the normal thyroid extract (Fig. 2). In both cases, however, the bulk of 280 nm absorbing material and radioactivity were eluted at almost similar exclusion volumes. Fractions I, II and III, both of the normal and goitre fractionations, were pooled as indicated in Figs. 2 and 3. The pooled fractions were brought to the desired concentrations by vacuum filtration and analyzed ultracentrifugally (Fig. 4).

The fractionation of the normal extract followed the well-established behaviour of thyroid iodoproteins on gel filtration media [6,7]. The earliest eluted fraction contained 19S thyroglobulin as well as faster sedimenting polymers, i.e. 27S and 32S proteins (Fig. 4, Normal, fraction I). After the exclusion of these faster sedimenting polymers by ultracentrifugation, homogeneous 19S thyroglobulin was obtained (Fig. 4, Normal, fraction III). The pooled fractions obtained from the fractionation of the goitre extract, however, showed the prominent presence of components with lower sedimenting coefficients than 19S, i.e. 12S, 7S and 4S (Fig. 4, Goitre, fractions II and III) and a relative lack of faster sedimenting iodoproteins such as 27S and 32S components (Fig. 4, Normal and Goitre, fractions I and II).

Fig. 5 shows a sucrose gradient separation of the components present in fraction II of the goitre extract (Fig. 4). It is evident that the 12S sedimenting species, which is known to constitute the half molecule subunit of thyroglobulin [13], formed a well separated band in the gradient. When the fractions of this band were collected, concentrated, dialyzed against standard buffer and analyzed ultracentrifugally, it was found that the preparation consisted of 50% 12S species and 50% 19S species. A second gradient separation on this 50 : 50 mixture was carried out. The 12S sedimenting material from this separation, however, showed by analytical

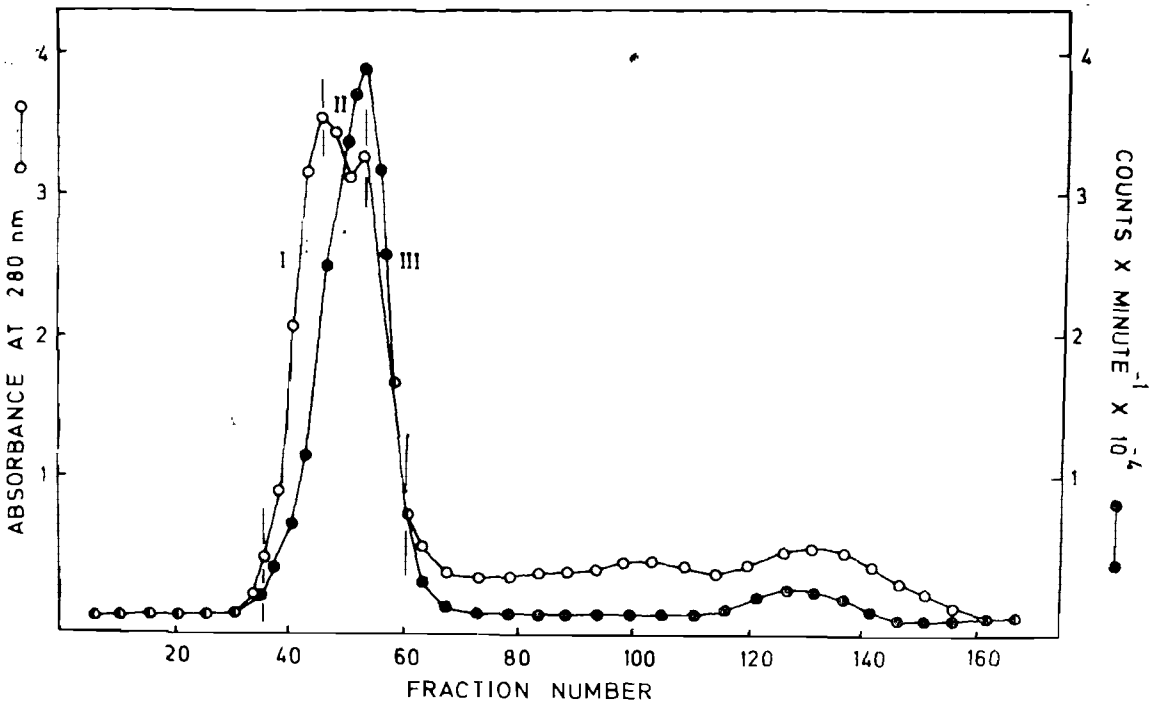

Fig. 2: Fractionation of normal thyroid extract on Sephadex G-200. Bed volume 900 ml; diameter to height ratio 1 : 20. Total protein was 900 mg in 40 ml of 0,1 M KCl + 0,02 M phosphate buffer, pH 7,4. Elution was done at +4° with the same buffer; 7 ml fractions: flow-rate, 1 ml per cm^2 per hour. Vertical lines separate fractions I, II and III which were pooled.

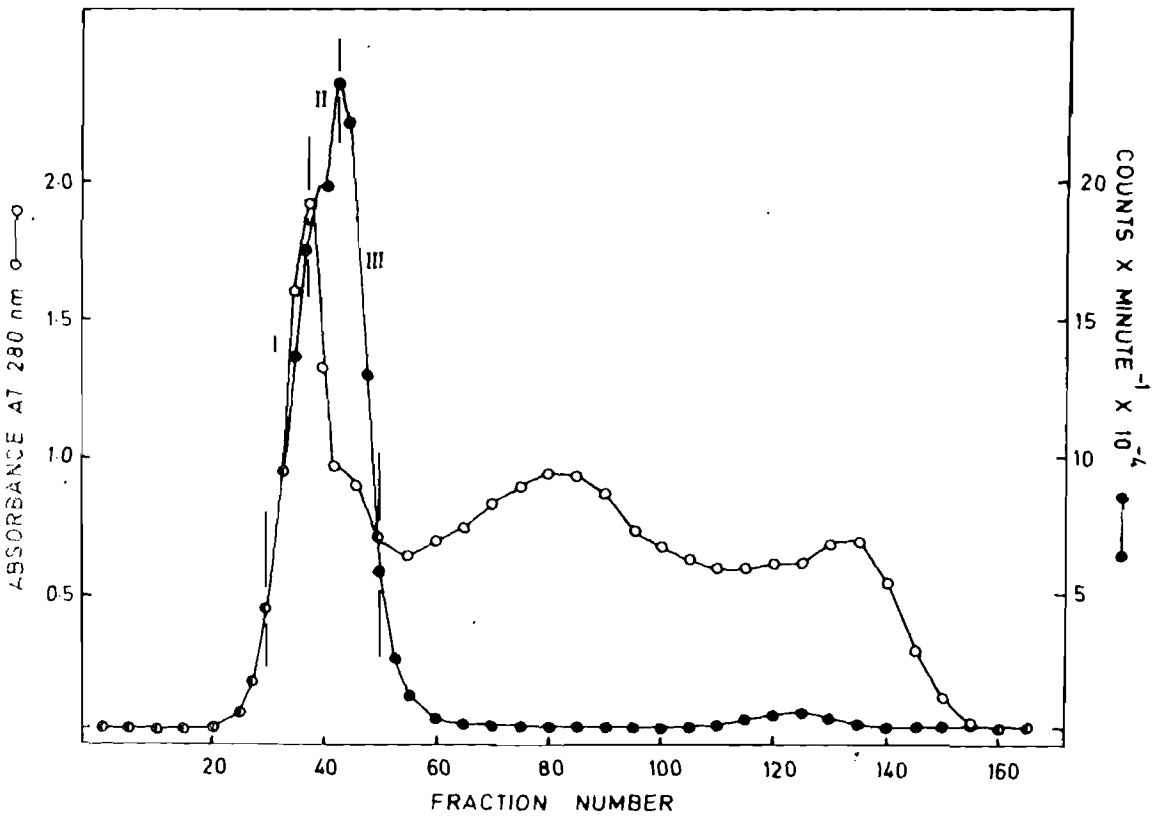

Fig. 3: Fractionation of goitre extract on Sephadex G-200. Experimental details are similar to those illustrated in Fig. 2.

ultracentrifugation no difference with that of the first gradient separation. It was therethere-fore evident that the well-known 2.12S $\rightleftharpoons$ 19S equilibrium which exists between thyroglobulin and its half molecule subunit[14] did not permit the isolation of a native stable 12S species.

Iodine Content and the Iodoamino Acids of the Thyroidal Proteins

The stable iodine (^{127}I) content of the pooled fractions I, II and III obtained by gel chromatography of normal and goitre extracts (Figs. 2 and 3) is summarized in Table 2. The average iodine content of the fractions obtained from the normal extract was lower than the average of the fractions from the goitre extract (0,287% vs. 0,416%).

Table 3 summarizes the data obtained by spectral titration for the iodoamino acid composition of ultracentrifugally homogeneous 19S thyroglobulin from normal and goitrous glands. In both cases the relatively

Table 2: IODINE CONTENT (^{127}I) OF THE IODOPROTEIN COMPONENTS FRACTIONED BY GEL CHROMATOGRAPHY (Figs. 2+3)

Extract	Iodine content of fractions (%)			Average
	I	II	III	
Normal	0,298	0,243	0,320	0,287
Goitre	0,406	0,444	0,400	0,416

high MIT/DIT ratio points to the low level of iodination of thyroglobulin which is further supported by the calculated and measured contents of (^{127}I) iodine. As a consequence only trace amounts of thyroxine were detectable in the thyroglobulin preparations.

To obtain further information on the iodoamino acid composition of 19S thyroglobulin from normal and goitrous glands, the protein preparations were digested with

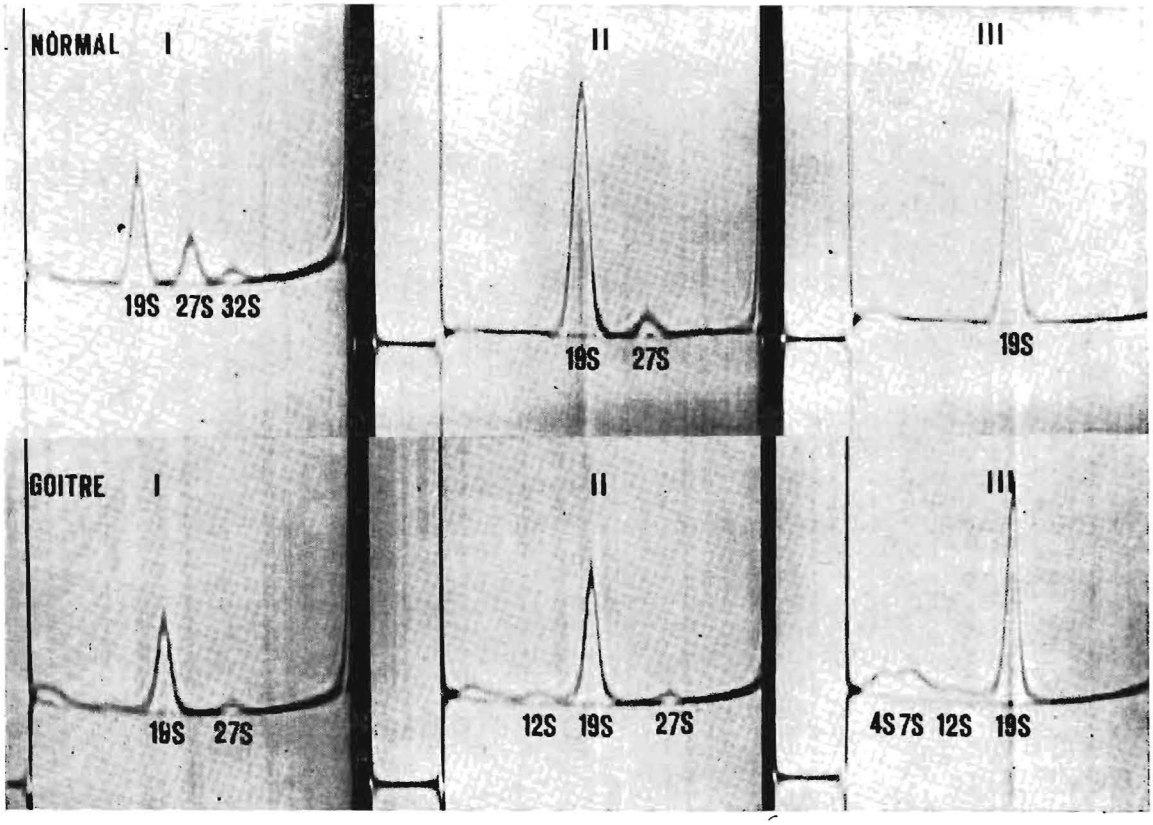

Fig. 4 Ultracentrifugal analyses (Schlieren patterns) of fractions I, II and III collected by gel chromatography of normal thyroid extract (Fig. 2) and goitre extract (Fig. 3). The photos were taken after 24 min at 56 000 rpm in the Spinco Model E ultracentrifuge at 20°: phase plate angle, 60°, double sector cells; protein concentration, 0.6—0,9%.

pronase and the (^{125}I) iodoamino acid composition analyzed by separation on Sephadex G-2 (Table 4). The results summarized in Table 4 also indicate a high MIT/DIT ratio

Table 3: IODOAMINO ACID COMPOSITION AND TOTAL IODINE CONTENT OF ULTRACENTRIFUGALLY HOMOGENOUS 19S THYROGLOBULIN FROM NORMAL AND GOITROUS GLANDS

Preparation	Residues per 660 000g				Total ^{127}I(%)	
	Tyr	MIT	DIT	T4	Measured	Calculated*
Normal	158	7,9	2,7	0,76	0,307	0,288
Goitre	156	9,1	0,96	0,22	0,330	0,346

*The iodoamino acid residues were taken to the nearest integer for the calculation of atoms iodine per mole thyroglobulin.

Table 4: ^{125}I-IODOAMINO ACID COMPOSITION OF ULTRACENTRIFUGALLY HOMOGENOUS 19S THYROGLOBULIN OBTAINED FROM NORMAL AND GOITROUS GLANDS

Preparation	Percent composition of		
	MIT	DIT	T4
Normal	60	25	15
Goitre	70	23	7

Purified preparations were digested with pronase at 37° for 16 hours according to Tong and Chaikoff [11]. Iodoamino acids were separated on Sephadex G-25 according to Osborn and Simpson [12]. Counts eluted in the various iodoamino acid fractions are expressed as a percentage of total counts eluted from the column.

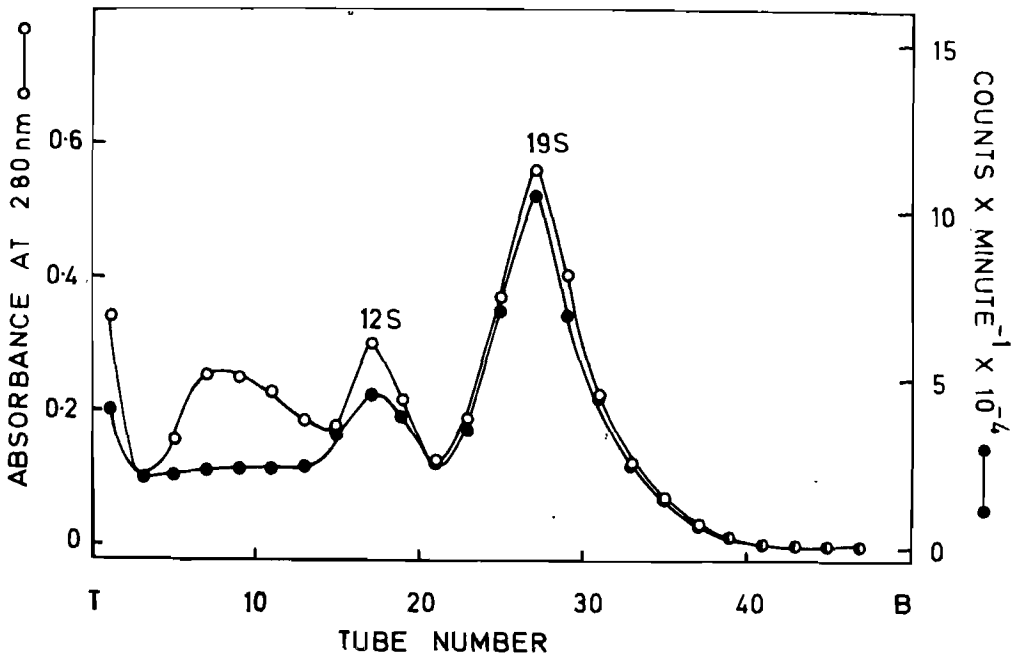

Fig. 5: Preparative density gradient ultracentrifugation of goitre fraction III (cf. Figs. 3 and 4). Sucrose gradient, 5 to 28%; rotor, SW 25.1 (Spinco Model L); equivalent time of centrifugation, 25 hours. T and B indicate top and bottom of the tube respectively.

for both normal and goitrous material. The higher percentage ^{125}I in the thyronine fraction of normal 19S thyroglobulin in comparison with goitre 19S thyroglobulin is in agreement with the results obtained by spectral titration (Table 3).

Dietary Conditions

Further investigation concerning the aetiology of the disorder was hampered considerably since the herd at Uitkomst received a dietary supplement consisting of salt, calcium phosphate and fish meal (3 : 3 : 4) from April, 1970. Nevertheless, when blood was collected from 40 members of the herd during November, 1970, a mean PBI value of 7,2 μg/100 ml was found as compared to the mean PBI value of 2,4 μg/100 ml found earlier for the nanny-goats which had normal and goitrous kids during the March 1970 kidding season (Table 1). In spite of this increase in PBI value, 6 out of 34 kids born during the March 1971 season had congenital goitre.

DISCUSSION

Thyroglobulin, by definition the 19S ultracentrifugal component, is the major protein of normal thyroid glands. It contains more than 80% of the thyroidal iodine and is the chief source of thyroid hormones[15].

Since the iodoamino acids of thyroglobulin are formed by iodination of tyrosine residues after the protein has been synthesized, a variable iodine content and iodoamino acid distribution is usually found in thyroglobulin. Even in a single thyroid gland the iodine content of thyroglobulin can vary from 0,18—0,87%[16]. In both the normal and goitrous goats the iodine content of thyroglobulin was found to be in the region of 0,3% which can be regarded as the lower limit of normally iodinated thyroglobulin. Such a low iodination level also results in a higher MIT/DIT ratio as compared to thyroglobulin iodinated to the maximum level of practically 1%. It is at these higher levels of iodination where the functional contribution of the fine structure of thyroglobulin distinguishes itself from other non-thyroidal

proteins which also form thyroxine when iodinated heavily [17]. Non-thyroidal proteins, however, still display a high MIT/DIT ratio at high iodine levels, whereas in thyroglobulin the MIT/DIT ratio declines with increasing iodine content. This decline in the MIT/DIT ratio is accompanied by an increase in the T_4 content of thyroglobulin. Therefore, apart from the relatively low PBI values of the nannies which had normal, as well as those which had goitrous kids (Table 1), it is certain that all these animals suffered from a relative lack in dietary iodine. The thyroglobulin of both the normal and goitrous kids had a high MIT/DIT ratio and contained very little T_4 (Tables 3 and 4).

Chronic TSH stimulation in the goitrous glands, as shown by their histology, explains by and large the the thyroidal hypertrophy (Fig. 1). The increased iodine turnover rate in the goitrous animals is also reflected by the lower iodine content of the components fractionated from the normal thyroid extract versus the comparable components of the goitre extract (Table 2). In the goitrous glands, the follicular content is almost negligible in comparison with the normal glands (Fig. 1). This indicates that thyroglobulin undergoes proteolysis soon after it has been iodinated and as a consequence, since no thyroglobulin goes to the follicular stores, a higher average iodine content is found in the thyroglobulin of stimulated glands as compared to the normal glands which have follicular stores of thyroglobulin.

Thyroglobulin consists of two non-covalently linked half molecules (12S, mol wt= 330,000) which are in turn made up by two polypeptide chains whose sedimentation coefficient, when in a globular form, approximates 6S [18]. Apart from the higher density iodine confers to highly iodinated thyroglobulin molecules, it also contributes by oxidation of free SH-groups to the stability and compactness of the molecule [19]. Relative lowly iodinated thyroglobulin (0,2% or lower) is considered to be more labile than highly iodinated thyroglobulin. Although the thyroglobulin of both normal and goitrous glands had approximately the same iodine content (0,3%), the thyroglobulin from normal glands was more stable towards dissociation.

The observed greater lability towards dissociation of the thyroglobulin obtained from goitrous glands as compared to the normal glands (Fig. 4) may, however, be a consequence of the TSH stimulation. Because of the higher levels of TSH and the consequent higher turnover rate of proteins of the goitrous glands, a higher proteolytic activity certainly prevailed in the goitrous tissue. It is known that thyroglobulin, which had been exposed to proteolytic activity, is more labile to a dissociating environment than thyroglobulin not exposed to proteolytic activity [20]. Therefore, under conditions of similar treatment, the protein components of the goitrous tissue formed 12S, 7S and 4S dissociation products (Fig. 4). Because of its intrinsic ability to associate to 19S thyroglobulin, the 12S half molecule subunit could not be isolated.

Congenital goitre in Boer goats in the district of Grootfontein had been noted to occur more frequently in twins and in triplets [2]. This may be explained in terms of a relatively higher iodine demand the foetus sets to the mother. In the course of this investigation the PBI level of the herd was raised to three times its original value by a dietary supplement; nevertheless, the occurrence of congenital goitre was not suppressed totally. Other animals, such as game, sheep and cattle, apparently are not affected by the probably iodine-poor environment. It is also unlikely that some plant containing an antithyroid substance constitutes an important part of the diet of the Boer goats. The only reasonable possibility is that in an iodine-poor environment this stud of Boer goats is genetically more susceptible to congenital goitre, particularly during periods of rapid growth, than other animals.

It may be argued that the progeny of stud animals should be carefully selected in order to obtain an inbred herd which is not so vulnerable to a low iodine environment. One of the reasons for the extraordinary susceptibility of the Boer goat species to a lack of iodine, however, may be sought in their rapid growth rates and consequently higher iodine requirements in comparison to other animals. It follows, therefore, that the selection of breeding stock which is less susceptible to an iodine-poor environment may eventually result in the elimination of the more economic and rapid growers. In fact, susceptibility to iodine lack may be an indicator of the fast growing members of the herd. If this is true, it follows that the growth rate may be speeded up extensively by iodine supplementation to kids and that congenital goitre may be reduced extensively or even totally eliminated by iodide therapy

of nannies before and during early pregnancy.

The beneficial influence of iodide supplementation during periods of rapid growth, such as in pregnancy and during the neonatal period, can be inferred from the findings that the new-born are affected to a greater extent than adult animals and that the goitre regressed somewhat as the animals matured. Furthermore, the Grootfontein area can be regarded as a relative endemic iodine-poor region, identified as such only by a species which is particularly susceptible to an iodine lack. The contribution of mammary concentration and secretion of available iodide in milk to general health and as a growth stimulant is also obvious in cases of multiplets in which the exogenous supply of iodine in mothers' milk was totally insufficient.

Since this study was undertaken, another outbreak of goitre among new-born Boer goat kids was observed in the district of Vanrhynsdorp. Although this herd was not studied biochemically, the goitrous features were macroscopically obvious and easily palpable, while other species had no signs of thyroid hypertrophy.

It is concluded that, in comparison to other animals, Boer goats are highly susceptible to a relative deficiency of iodine, which exerts itself particularly during phases of rapid growth. This results in the formation of a congenital goitre containing an iodine-poor thyroglobulin, which tends to dissociate into 19S thyroglobulin-subunits—a feature which is most uncommon in other animal species.

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We are indebted to the Head, Agricultural Technical Services, Windhoek, S.W.A. for permission to obtain material for this investigation and to Mr. G. Engelbrecht and the staff of the Uitkomst Experimental Farm for collection of the blood samples at different times. The help of Dr. E. Redelinghuys, State Veterinarian, Grootfontein, S.W.A., with the thyroidectomies, as well as his interest in this problem, is greatfully acknowledged.

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MALNUTRITION OF THE FOETUS AS A CAUSE OF ABORTION*

S. J. VAN RENSBURG**

SUMMARY

Collective consideration of the results of many studies on the problem of recurrent abortion in Angora goats, leads to the conclusion that the phenomenon is a metabolic-nutritional disease affecting individuals having a congenital predisposition. Afflicted individuals exhibit an extraordinarily high productivity for mohair and a low level of adrenal function. Transfer of nutrients to the foetus is impeded by spontaneous failure of the essential level of adrenal steroid secretion, which results in degeneration of the maternal placentome leading to a foetal nutritional crisis and the initiation of the expulsion process by the afflicted foeto-placental unit.

INTRODUCTION

The comprehensive observations of van Heerden[1] demonstrated that the serious occurrence of abortion in Angora goat flocks was not due to an infectious disease but could be ascribed to an "inherent weakness" in the constitution of some nanny-goats. Simple elimination of affected female animals had been disappointing as a method of eradicating the problem. Because of this fact and the intrinsic research value of a statistically adequate number of aborters, a series of detailed studies[2] was initiated in an attempt to elucidate the nature of the constitutional defect. Aspects particularly studied were the sexual behaviour and breeding performance, clinical and pathological changes in nanny-goats, foetuses and kids and the relationship between mohair growth and reproduction. Detailed endocrine studies were performed to assess luteal function and to study the metabolism of oestrogens and cortisol. Investigation of possible factors influencing the time of termination of gestation resulted in the experimental reproduction of most of the syndrome in other breeds. In this paper the salient features of the disease are discussed and its pathogenesis is proposed.

Angora goats are kept for their ability to produce large quantities of high quality hair; an understanding of the mechanisms controlling both hair and foetal growth is necessary. The amount of hair produced is mainly dependent on feed intake, conversion efficiency and the rate of nitrogen retention. The remarkable inhibitory influence of the adrenal cortex on hair growth was demonstrated some 30 years ago. The suppressive effects of underfeeding were found to be abolished by adrenalectomy. Hair growth, therefore, seems to have an inherently high metabolic priority, which is altered by adrenocortical hormones under circumstances such as underfeeding. Excessive adrenal function has been demonstrated to reduce both fibre diameter and length; furthermore, the levels of cortisol in the blood necessary to cause inhibition are within physiological limits. By virtue of metabolic priority, gestation generally depresses the rate of hair growth and the demands of lactation are quantitatively even greater than those of foetal growth.

Experimentally, there seems little doubt that adequate corticosteroids, together with a high level of sex steroids, are necessary to protect the foetus from a nutritional crisis. If the diet contains no protein, only animals which receive supplementary progesterone can maintain pregnancy. Even when progesterone is supplemented, adrenalectomized animals on a protein-free diet invariably abort, unless cortisone is also administered. Corticosteroids probably act by assisting transfer of maternal protein to the developing foetus, and their role in carbohydrate metabolism is well known. The additional progesterone may increase placental efficiency, although this hormone or its metabolites are also known to have anabolic effects. Adrenal glands of ruminant animals particularly seem to secrete large amounts of

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progesterone and it is likely that this source is of physiological importance.

OBSERVATIONS AND DISCUSSION

Clinical aspects of the abortion syndrome

The majority of abortions was found to occur between the 90th and 110th days of the normal 150-day gestation period. Abortion, however, did occur at most stages of gestation and a minor peak of very early abortions was evident between the 34th and 46th day of gestation.

Characteristically, every foetus was severely retarded in growth for its gestational age. Older foetuses tended to be expelled more rapidly after death *in utero*, but younger foetuses were frequently retained at least a month or more and consequently were presented in a mummified form. Foetal maceration and consequent slow discharge of debris were also observed.

In view of the apparent growth retardation, live foetuses were examined a few days prior to the estimated time of abortion. They were weaker than normal foetuses, were anaemic and had an increased sedimentation rate; their livers had unusually low levels of elements such as iron and copper. *Post-mortem* examination of these and aborted foetuses revealed regular adrenocortical hyperplasia, and, in occasional individuals, anasarca or evidence of clotting defects were also present.

Many females which aborted marasmic foetuses were in excellent condition and thriving; it could be concluded that some form of placental dysfunction or block to the transfer of nutrients was present.

Characteristics of aborter animals

The accumulated evidence shows that the immature animal destined to perpetuate the abortion defect is outstanding in several respects. New-born kids tend to be heavier and have finer birthcoats. The quantity of valuable kid mohair produced during the first 18 months is exceptional. Young males produce an average of 30 per cent more mohair than usual, which is a quantity easily assessed by subjective means; furthermore, this excellent production rate is maintained to at least 3 to 5 years of age. The "aborter" maiden nannies in the experimental flock not only produced 10 per cent more mohair than normal controls, but also tended to come into oestrum, conceive and breed better during the first breeding season. Thus the conscientious breeder, who is anxious to increase the production potential of his stock, will inadvertently select for the abortion defect, regardless of the time when he selects his breeding stock.

Selection for breeding purposes of outstanding young mature males, whose dams in the experimental flock were generally aborters, may be the main reason why the abortion tendency is not more self-limiting. Limited studies on such billy-goats revealed that their adrenal glands were smaller than normal; similarly, maiden nannies destined to abort later tended to have low blood cortisol levels.

After a nanny had bred a few times and had become an established aborter, some of these characteristics change to the opposite extreme of normality. The hair growth rate was less than usual and of a finer nature. Anoestrous and cycling aborters had increased levels of plasma cortisol which were consistently raised to levels higher than in normal animals by ACTH administration. Dissection revealed pituitary hypertrophy, involving both the neurohypophysis and adenohypophysis, in conjunction with consistent adrenocortical hypertrophy. On a weight basis, the enlarged adrenal cortices of established aborters synthesized cortisol with increased efficiency.

The adrenal hypertrophy in older aborters was considered to represent a physiological adaptation to metabolic stress, whereby a genetically induced excessive production tendency was suppressed in favour of more essential physiological functions. Comparative studies showed that, as a breed, the Angora has a relatively low level of adrenal function, which may account for its lack of resistance to inclement weather when calorific demands are suddenly increased, such as is caused by simultaneous rain and cold. The level of adrenal function in "adapted" aborter Angora goats with adrenal hypertrophy is similar, in fact, to that of hardy Boer goat types.

Pathogenesis of abortion

Abortion was seldom observed during the first gestation period. The majority of nannies will commence to abort during their fourth or fifth year of life, approximately at the time when physical maturity is reached and weight gains cease. Factors causing growth in young vigorous goats may confer some protection to the developing

foetus and placentome; certainly senility and senescence are accompanied by a tremendous increase in the incidence of abortion.

A minor abortion peak during the second month of gestation was evident, and the breeding records of these early aborters suggested that they did not always display the typical characteristics of established aborters, such as short oestrous cycles and fine hair growth. Their outstanding feature was an exceedingly high rate of hair growth from which it may be inferred that a low level of adrenal function existed. The same animals may later maintain a gestation into the fourth month but during such a pregnancy the hair growth rate will be reduced.

The first half of pregnancy in typical regular aborters is characterized by high blood cortisol levels and abnormal oestrogen excretion. During gestations ending in the first and second abortions, oestrogen excretion tends to be excessive but later it decreases and the usual increase associated with pregnancy may be absent in older animals. Conversely, blood cortisol levels tend to be normal during the first gestation ending in abortion. The level tends to rise progressively with each successive abortion undergone by an individual. The only acceptable explanation for the unusual patterns of oestrogen excretion is an altered supply of adrenal oestrogen precursors on which the placenta is dependent for its synthetic activity. Alterations in the excretion of pregnane-derivatives also suggested qualitative changes in the adrenal biosynthetic pathways concurrent with the onset of adrenal hypertrophy.

The most consistent aberration found in all animals that aborted was a severe reduction in the level of plasma cortisol at least 10 days prior to the mishap. Marked maternal adrenocortical atrophy occurred at this time and histologically regressive changes in the fascicular zone were advanced. In the majority, this period coincided with the normal time of cessation of placental growth and the onset of a more rapid rate of foetal growth. Regular aborters, which maintained a high level of adrenal function at this time of increasing foetal metabolic demand, failed to abort and produced viable kids. In one experiment[3] where the nutritional level was exceptionally high, the majority of regular aborters reacted in this way.

Soon after the collapse of maternal adrenal function, histologically apparent degenerative changes occurred in the maternal component of the placentome. Fragmentation of the reticulum network on the periphery of the maternal villi was followed by regression of the maternal vascular capillary bed and progressive hyaline degeneration of all the supporting connective tissue. In contrast, the foetal villi were well preserved and foci of proliferating trophoblast cells attempted to invade the degenerated maternal villi. Live but weak and marasmic foetuses were found when degeneration of the maternal component of the placentome had reached a remarkably advanced stage.

Foetuses studied prior to the onset of placentome degeneration were quite normal. Hormonal, electrolyte and morphological studies demonstrated that the foetus becomes acutely distressed by the onset of maternal adrenal atrophy. In response to the nutritional crisis and the lack of maternal cortisol on which it is normally dependent at this stage, the foetal adrenal cortices undergo marked hyperplasia and create a state of hypercortisolism. If adequately pronounced and maintained for a sufficient period, this state in itself initiates luteal regression and consequently expulsion of the foetus. Sustained foetal hypercortisolism appears to be the normal mechanism whereby labour and birth are induced[4]. A less frequent outcome of the placental insufficiency is that the foetus dies without initiating the expulsion process. This usually takes place with smaller foetuses and they may then be retained for many weeks and become mummified or macerated. Occasional foetuses seem to survive a nutritional crisis, only to succumb shortly after birth at normal term from severe adrenocortical hyperplasia.

Careful assessment of ovarian luteal function did not reveal any change prior to foetal death. Peripheral blood concentrations of progesterone, however, did decrease appreciably at the time of collapse of maternal adrenal function, due to failure of this source. Reduced oestrogen excretion could also only be ascribed to a deficient supply of oestrogen precursors from the maternal adrenal.

CONCLUSION

The failure of all the endocrine factors —adequate glucocorticosteroid and high

levels of sex steroids—which normally ensure a good foetal nutritional status have been demonstrated to occur. The essential mechanism is failure of the necessary level of maternal adrenal function in response to increasing metabolic demands by the foetus. In the animals studied, the problem manifested itself when metabolic competition arose due to a genetically determined high rate of hair growth. The evidence indicates that the severity of abortions in a flock may also be influenced by the level of nutrition available and the calorific demands of the environment.

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BOOK REVIEW BOEKRESENSIE

EVALUATING THE SAFETY OF FOOD CHEMICALS

SUBCOMMITTEE ON TOXICOLOGY, FOOD PROTECTION, NATIONAL ACADEMY OF SCIENCES
National Academy of Sciences, Washington D.C. 1970. Pp. 55, 69 References. Price $2.50.

This is not a handbook but a concise and objective review of the purposes and value of conventional procedures, as well as an evaluation of the contribution more recently proposed procedures might make to ensure the safety of food for man. Ten leading American toxiologists constitute the subcommittee who compiled this work.

The booklet concerns those substances added to food either directly and intentionally for a functional purpose, or which may incidentally contaminate food during some phase of production.

New chemicals are being synthesized daily by the score: a considerable number may eventually find, or could conceivably find, its way into man's food. It is, therefore, essential that such substances should be subjected to stringent tests before the public is exposed to them.

An evaluation of the conventional methods which have been used to date is followed by a thought-provoking chapter on some recent approaches to safety evaluation. Advances in scientific knowledge have compounded the procedure of toxicity testing and the practical feasibility of such tests must be weighed carefully against the actual advantages.

Evaluation for carcinogenic potential is a very topical subject which is well discussed. Throughout this review the complexity of tests done *in vitro* and *in vivo* on different species of laboratory animals and the problems involved in extrapolating the results to possible effects on man are brought out and thoroughly discussed.

This is a well-balanced evaluation of a pressing and very complex problem. Those persons especially concerned with food hygiene and the residues of drugs, anthelmintics and insecticides used in or on animals in eventual food products will find it very enlightening.

T.N.

Jl S. Afr. vet. med. Ass. 42 (4): 309-313 1971

MACROGLOBULINAEMIA IN THE DOG, THE CANINE ANALOGUE OF GAMMA M MONOCLONAL GAMMOPATHY

R. R. H. Hill and R. H. Clatworthy*

SUMMARY

An account is given of the diagnosis, in two dogs, of a plasma cell proliferative disease showing the characteristics of macroglobulinaemia (Waldenström) of human medicine. The M protein demonstrated in sera from both cases is propounded to be the canine analogue of gamma-M globulin.

INTRODUCTION

Monoclonal gammopathies are well documented in human medicine, with standard methods for their detection and an ever-increasing battery of techniques for their elucidation. As research tools they have contributed a great deal to fundamental knowledge in the expanding field of immunology. There is every reason to believe that the full spectrum of protein dyscrasias could be found in animals other than man, but the normal process of veterinary diagnosis, particularly where clinical pathology facilities are lacking, somewhat precludes their detection. Since 1945 there have been sporadic reports of conditions in a variety of domestic animals wherein the neoplastic proliferation of plasma cells is accompanied by the production of non-functional M protein. Osteolytic lesions have been a variable feature, but only in recent years could advantage be taken of newer techniques to attempt to identify the M protein in terms of the serum globulins. The references to monoclonal gammopathy in dogs are few and are scattered throughout international literature, so that we have had to content ourselves with abstracts in most cases. Even this information presents the complexity of the subject quite forcibly as shown by terminology alone. Plasma cell mlyeloma [1, 2, 3], multiple myeloma [4, 5], plasma cell reticulosis [6] and plasmacytoma [7, 8, 9] have all been used to describe the condition. In the parlance of modern human medicine, myeloma is applied to cases involving bone lesions associated with gamma G, gamma A or gamma D globulins. Macroglobulinaemia is used in gamma M globulin dyscrasias, without osteolytic lesions but complicated by a bleeding tendency and lymphadenopathy.

This paper reports the findings in dogs of two almost identical cases of plasma cell proliferative disease, the characteristics of which justify the diagnosis of gamma M monoclonal gammopathy, or macroglobulinaemia.

TECHNIQUES

Both cases were investigated according to the classical method of human medicine, with the initial observation of increased rouleaux formation in the blood film leading to the demonstration of raised erythrocyte sedimentation rates. Serum protein analysis by the biuret method revealed raised globulin levels and hypoalbumenaemia. Bone marrow aspiration demonstrated the plasma cell proliferation which confirmed the diagnosis (see Table 1).

Slight differences between the two cases and elucidation of the condition were indicated by supplementary techniques: roentgenography, electrophoresis, immunoelectrophoresis, urinalysis and *post-mortem* examination.

CASE HISTORIES

B269 was a six years old bull terrier-cross, used by the BSA Police as a guard dog. He was presented for examination with no history further than inappetence and poor condition; clinical examination showed emaciation, anaemia, elevated temperature and splenomegaly with slight abdominal tenderness. With babesiasis excluded by blood film examination, he was regarded as a case of "pyrexia of unknown origin" and given antibiotic treatment: penicillin/streptomycin for two days followed by oxytetracycline for five days. There was a promising initial

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response, the temperature returning to normal and the appetite being regained; nevertheless he remained thin and anaemic. By this time haematological and biochemical examinations had indicated the nature of the disease and bone marrow aspiration had confirmed the diagnosis. Roentgenographs were negative for osteolytic lesions, the urine was strongly positive for Bence-Jones protein and the serum gave a positive Sia water test for macroglobulins. Generalized haemorrhages were a feature of this case, contributing to the anaemia concomitant with the disease: although platelets were present in fair number, they were bizarre and probably of poor functional ability. On his condition again deteriorating, an attempt was made to treat him with cyclophosphamide (Endoxan, Noristan Laboratories). Two 500 mg oral doses successfully brought the leucocyte count down to below 2000/mm^3, but it soon became obvious that the neoplastic process was beyond control and euthanasia was carried out. *Post-mortem* examination revealed generalized lymph node involvement, gross splenomegaly, petechial haemorrhages throughout and ulceration of the large intestine.

B283 was a six years old Mastiff × Boxer dog, a private practice patient. Routine haematological examination gave an indication that myeloma may have been present but before this was confirmed the owner requested euthanasia in view of the intense pain suffered by the animal. The dog was found to be in good condition at autopsy, with no bleeding tendencies. There was the same involvement of lymph nodes and spleen as in B269, with patchy congestion of the pancreas superimposed. Apart from haemorrhage at the renal pelvis, which was common to both animals, B283 was free of haemorrhagic complications. There was no opportunity for radiological examination of this subject.

RESULTS

Haematological and biochemical findings are presented in the table, where the only significant difference between the two cases lies in the presence of Bence-Jones protein. There was insufficient serum from B283 for the Sia water test, but the precipitate from 1,0 ml of B269 serum was soluble in 3,7 ml of saline.

Electrophoretograms of the two sera, together with that from a normal dog, are reproduced in figure 1. The tall, narrow, M protein peak is seen in the gamma-globulin position on the left of the two abnormal patterns.

Table: LABORATORY FINDINGS IN TWO CASES OF MACROGLOBULINAEMIA

Examination	Units	B269	B283
Haemoglobin	g/100ml	7,3	6,8
PCV	%	19	18
Leucocytes	No./mm^3	9 300	15 700
ESR (Westergren)	mm/hour	157	163
Total Proteins	g/100ml	11,2	9,2
Albumen	g/100ml	1,8	1,8
Globulin	g/100ml	9,4	7,4
Urinary Protein	mg/100ml	300	100
Bence-Jones Protein		Positive	Negative
Water Test for Macroglobulins		Positive	Insufficient

Critical evaluation of the M proteins requires serum immunoelectrophoresis against specific antisera to canine IgG, IgA, and IgM, reagents which were not available to us. The use of anti-canine globulin serum, however, gave useful results which serve to illustrate the identity of the two M proteins and indicated that the gamma M globulin was not typical. Immunoelectrophoresis patterns from both samples showed an IgG deficiency, normal IgA and enhanced precipitation in the area where the IgM line might be expected (see Figure 2). In the absence of specific sera, the identity of the lines is assumed from human patterns and is therefore somewhat presumptive.

Microscopic examination of films and sections showed widespread proliferation of plasma cells and lymphocytes with the greatest density in the lymph nodes, bone marrow and spleen. The methyl-green pyronin technique demonstrated the plasma cells well, although Giemsa staining of films allowed easy differentiation (see Figures 3 and 4). Most tissues were also affected by the deposition of proteinaceous material which occluded the smaller vessels. The material was particularly noticeable in the renal tubules, where slight calcification had taken place in the glomerular capsules, pancreas of B283 and lymph nodes of B269.

DISCUSSION

It is significant that the results of the clinical pathological studies on these dogs fulfil the requirements for the diagnosis of

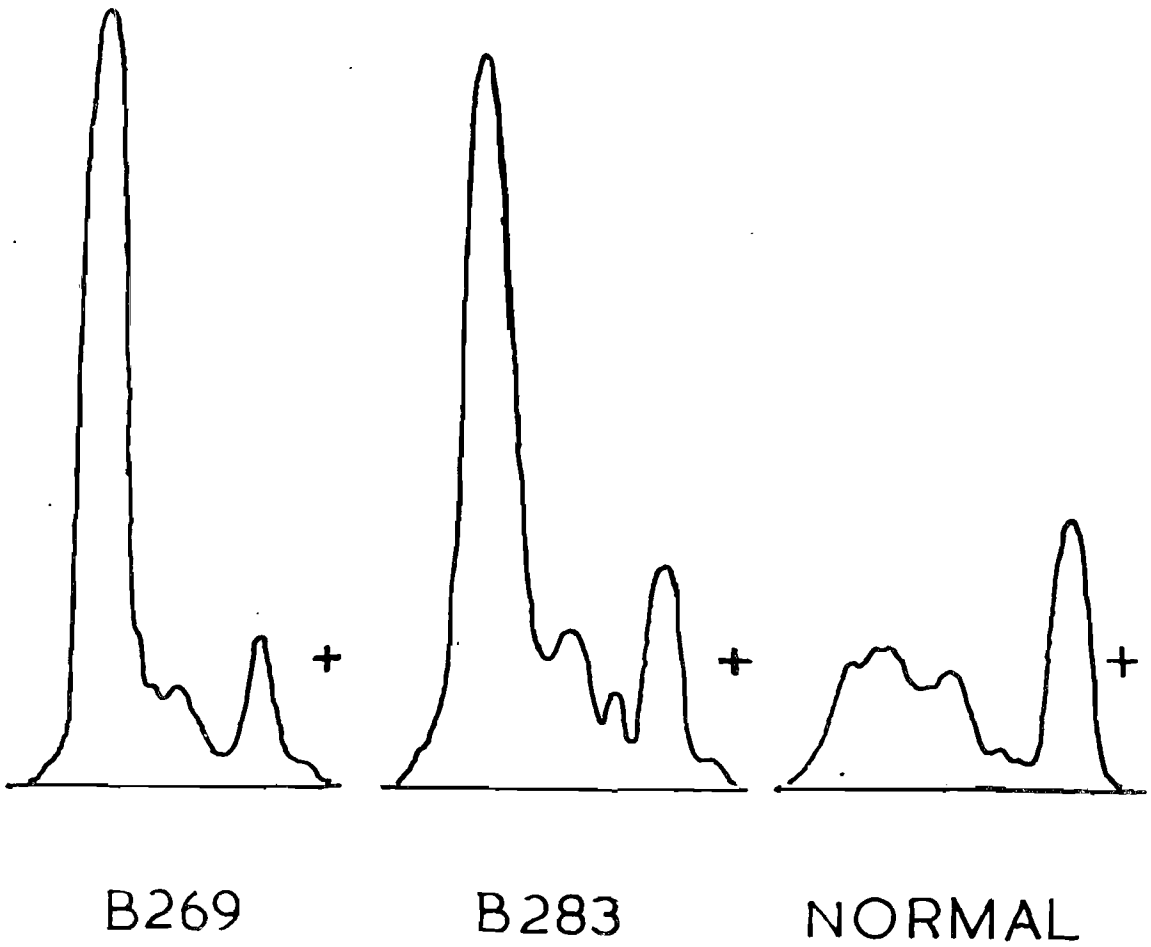

Fig. 1. Serum electrophoresis on cellulose acetate with veronal buffer at pH 8,6.

the condition known in human medicine as macroglobulinaemia (Waldenström). In the practical sense, a diagnosis of plasma cell neoplasia in animals, with the prognosis of inevitable death, is as far as the practitioner need go, as treatment with cytotoxic drugs is expensive, with no guaranteed success, and complicated by the necessity for laboratory control. Nevertheless, it is interesting to conjecture whether the same spectrum of human protein diseases can be revealed in domestic animals when the sophisticated techniques now available are applied to the subject.

Unfortunately, the clinical examinations of the two dogs yielded rather non-specific findings; enlarged spleen, generalized but only mildly enlarged lymph nodes, moderate to severe anaemia and the probability of bleeding tendency in the terminal stages. High serum concentrations of M protein lead to a compensatory paresis of functional immunoglobulins and hypoalbumenaemia, leaving the patient with impaired defence against infections. This was so with B269, which, when presented, was clearly suffering from secondary infection which responded to straght antibiotic therapy. His relapse might probably have been ascribed to renal decompensation, a suspicion that would have been reinforced by simple urinalysis.

Raised blood urea levels in human gammopathies are taken as prognostic criteria after diagnosis, but analyses for urea were not carried out on the two cases under review. Renal lesions were present at autopsy in both animals; a suspicion of kidney disease would have been supported by limited laboratory examinations

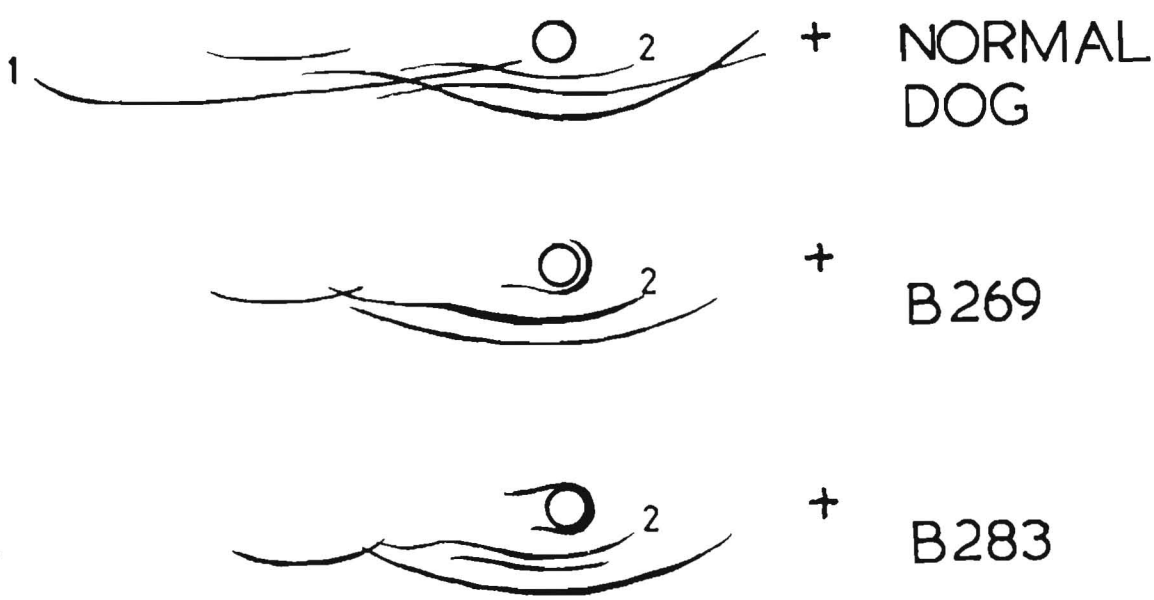

Fig. 2. Serum immunoelectrophoresis patterns against anti-canine globulin serum. The identification of the lines is presumed from human patterns.

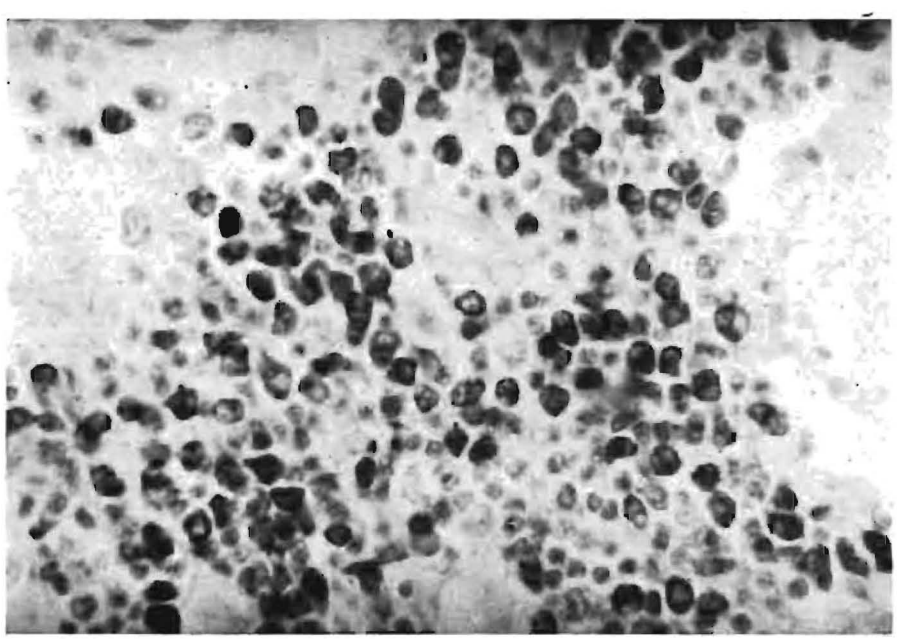

Fig. 4. Plasma cells in spleen. Giemsa.

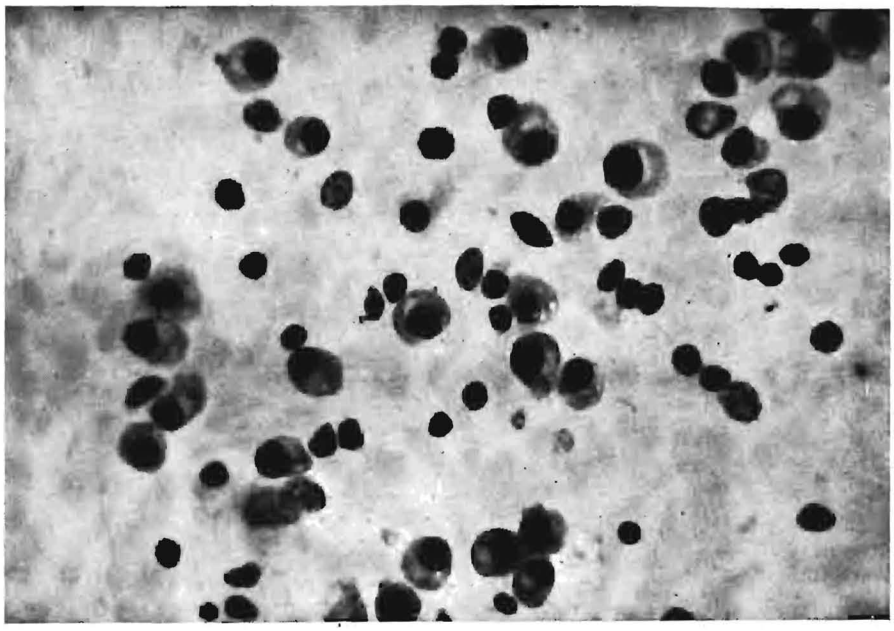

Fig. 3. Plasma cells in lymph node. Methyl-green-pyronin.

There are other diseases that could simulate the clinical picture outlined above, e.g. cirrhosis of the liver, where serum protein examination would reveal a less marked but similar electrophoretic pattern. Even routine haematological examination may fail to detect the condition, as plasma cells were rare in the peripheral blood picture. Only if serum protein analyses form part of preliminary laboratory examinations will plasma cell diseases be detected accurately.

Since the preparation of this paper for publication, an account of an article by J. D. Cabra and A. I. Harvitz has come to our notice. (*J. Immun.* 1970, 105 : 949. *Vet. Bull.* Vol. 41, abstract 1846). The authors report a case of canine macroglobulinaemis in which the M protein is identified as IgM, with reciprocal immunological relationship with human IgM system. In contrast, during our investigations, we found that the sera from the two cases reviewed above, as well as normal dog sera, failed to give precipitation in commercial radial diffusion plates containing specific anti-human immunoglobulins (Tri-Partigan, Behringwerke).

ACKNOWLEDGEMENTS

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Jl S. Afr. vet. med. Ass. 42 (4): 315-318 1971

IMPACTION OF THE RUMEN IN CATTLE DUE TO THE INGESTION OF THE COCOONS OF THE MOLOPO CATERPILLAR *GONOMETA POSTICA* (WALKER)

INGOLF ZUMPT*

SUMMARY

During 1970 large numbers of cattle died in the North-Western Cape due to the ingestion of cocoons of the Molopo moth *Gonometa postica* (Walker). Rumenotomy on affected cases was found to be the only remedy.

INTRODUCTION

During the latter months of the year 1970 an increasing number of cattle was lost from rumen impaction in the North-Western Cape. Similar losses, reported by Edwards[1] from the Northern Transvaal in 1935, were caused by cocoons of the moth *Gonometa rufubrennea*. A related moth of the same genus, *Gonometa postica* (Walker) (fig. 1) occurs in the North-Western Cape, namely north of an imaginary line drawn from Mafeking to Vryburg, Kuruman, Upington and Karasburg, and in the southern parts of Botswana and South West Africa. The caterpillars of the *G. postica* appear shortly after the first summer rains. They live on thorn trees, especially on the black thorn and the camel thorn. The cocoons, five by two cm in size, are light grey in colour and covered with tiny, short, black spicules (fig. 1).

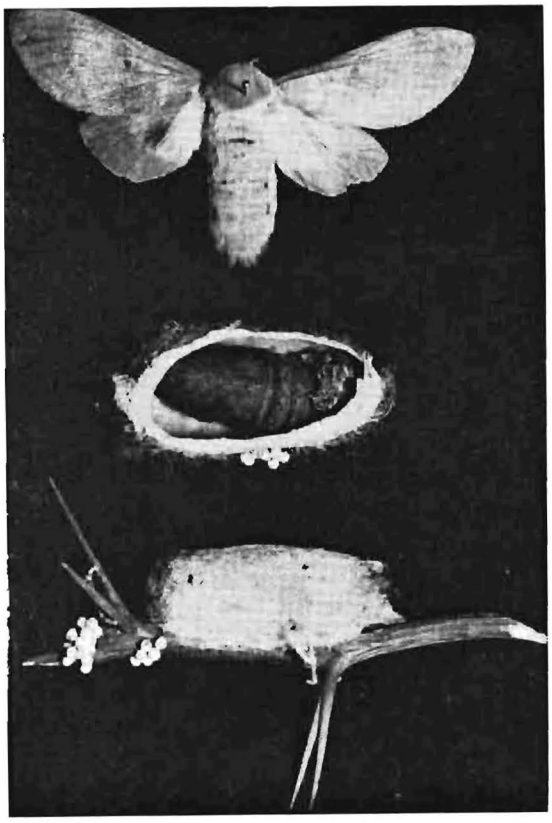

Fig. 1
Gonometa postica: Moth, opened and entire cocoon.

This specific study was conducted in the Vryburg and Molopo areas, as result of reports of extensive mortality.

MATERIALS AND METHODS

Of 41 cases which were regarded as typical of the cases of ruminal impaction seen and reported in the area and at the time mentioned, the origin, history, body mass and symptoms of each were recorded. By means of rumenotomy the impacted rumen ingesta were removed in all these cases, weighed and then repeatedly washed in cold water to remove as much of the food particles as was possible. The excess water was drained off and the remaining moist mass weighed again. To identify the fibrous material as originating from cocoons of the Molopo moth, samples from ten such specimens were subjected to the effects of concentrated H_2SO_4, HNO_3 and glacial acetic acid, and the thickness of the individual threads was measured. Similar tests were performed on samples of silk from the cocoons of *G. postica* and from the nest of the spider of a species of *Stegodyphus*.

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The rumenotomies performed at the same time afforded an opportunity to compare this procedure as a form of therapy against purely medical treatment tried on previous cases, such as various dilutions of surface tension reducing agents, as well as mixtures of vinegar, sugar and yeast.

Despite the large number of animals reported to have died from this condition, an opportunity to conduct an autopsy only presented itself in three cases: most carcases were only discovered days later, when usually only the impacted ingesta and skeletal remains were found.

Efforts were made to determine how the animals had gained access to the cocoons; this involved doing counts of cocoons in calf kraals. To verify the conclusions arrived at experimentally, two calves were dosed with cocoons and observed until typical symptoms were noticed, when they were subjected to operation and the typical impacted ruminal contents were found.

OBSERVATIONS

Animals Affected

Only cattle were found to be affected. Records are available of 41 cases, although several hundred had been reported to have died. No specific breed or class of animal was found to be more prone to this condition than any other. All animals were from seven months to four years of age; the majority was one to two years old.

Symptoms

All cases had a history of poor weight gain or gradual falling off in condition, which most farmers attributed to drought and lack of feed or supplements. Typical symptoms of the selected animals were anaemia, dehydration, long, lustreless, loose hair coat and difficult, laboured gait. The patients were in poor to extremely poor condition, stunted in growth and pot-bellied. What was of particular diagnostic importance, when viewed from the rear, was that the animals looked slightly bloated; the distension of the left side was an even semicircular line, whereas the right side was more distended on the lower side of the semicircle (Fig. 2). Where the impacted mass is small, animals show only slight or sporadic symptoms of digestive disorders.

Fig. 2

Affected animal seen from the rear.

(Photograph reversed. Ed.)

Autopsy

The three cases mentioned were emaciated, the rumen containing a single mass of impacted ingesta, the wet mass being 45, 71 and 82 lbs respectively. Examination of the lungs showed oedema, emphysema, petechiae and ecchymoses with froth in the trachea. The heart was covered with petechiae and ecchymoses with froth in the epi- and endocardium. Abomasal folds were oedematous. Isolated areas of remaining fat had undergone serous degeneration. Anasarca, hydrothorax and anaemia were found in all cases.

Impacted Ingesta (removed operatively)

In each instance this was a solid interwoven mass of ingesta particles adhering to fine silky strands (Fig. 3). The masses weighed from four to 78 lbs; the average mass of 41 cases was 34 lbs. When this condition was first encountered, various materials were thought to be responsible. The majority of farmers thought that it was caused by the ingestion of brain bags, string, fibrous plant material or spider-webs (*Stegodyphus* sp.) As the fine silky strands of the latter closely resemble those found in the impacted ingesta, several tests had to be performed as described above.

Results of Tests

The results of the tests performed on ten different samples are indicated in the table below.

The rumen content contained no traces of scelerotised cuticle from the insect prey which is usually incorporated in the nests of sociable spiders.

When the impacted ingested material was washed repeatedly in clean water a 50% reduction in wet weight resulted. The remaining rumen ingesta particles could not be dislodged by any means of force such as repeated beating.

Pathogenesis

When cattle ingest the cocoons, the fibres swell and particles of ingesta adhere to, and lodge between them. Progressive enlargement of this mass is accomplished by gradual addition of more ingesta particles as the fine silk strands stretch increasingly. The

Fig. 3
Impacted rumen material.

Table: TESTS ON THREADS FOUND IN THE RUMEN MASS, COMPARED TO THOSE ON SILK FROM NESTS OF STEGODYPHUS AND THESE ON COCOON SILK

Nature of test	Silk from Molopo worm cocoon (1)	Silk from Stegodyphus sp. (Spider) nest (2)	Silk found in rumen content
Addition of concentrated H_2SO_4	Swells, contracts and curls but does not dissolve	Dissolves within 30 seconds into an amorphous mass	same as (1)
Addition of concentrated HNO_3	Swells, contracts and curls considerably but does not dissolve	Dissolves within 30 seconds into an amorphous mass	same as (1)
Addition of glacial acetic acid	no effect	no effect	no effect
Width of individual silk threads	0,025 mm i.e 10× thicker than (2)	0,0025 mm i.e. $^1/_{10}$ thickness of (1)	95% of silk threads = 0,025 mm i.e. same as (1)

ingested material, combined with ingesta clumped together in a large mass, causes rumen impaction and thus impairs ruminal contractions and rumination. Animals emaciate progressively, weaken, and eventually die.

Treatment

Removal of the impacted ingesta-mass was found to be the only remedy. Various dilutions of surface reducing agents as well as mixtures of vinegar—sugar—yeast were tried without success. In two cases the latter treatment caused acute death. It was found that some impacted material—but still part of the mass in the rumen—had lodged in and blocked the ventricular (oesophageal) groove.

Aetiology and prophylaxis

From case histories it appears that the period of ingestion of these cocoons occurred most probably during the weaning stage. Calves are normally kraaled-off under thorn trees and thus come into contact with large numbers of cocoons which had dropped off from the trees. In some counts done in calf-kraals, it was found that over 60% of these cocoons had been parasitized. It is probable that parsitized cocoons dry out quickly and thus break off easily during spring winds.

The only practical prophylactic measure would be the collection of all cocoons in weaning kraals prior to occupation. The destruction of the caterpillars, cocoons or moths seems to be unpractical and an enormous task.

DISCUSSION AND CONCLUSION

In the Northern Transvaal outbreak of 1934, the incidence of rumen impaction only lasted two seasons, while—according to Edwards[1]—parasitization of cocoons was at its peak. This theory can be applicable to the North Western Cape outbreak as well. The reasons why it occurred, seem complex.

Lack of feed or supplements apparently had little effect, as several of the animals concerned were kept under ideal conditions. A likely explanation is that calves, which pick up and lick many foreign objects during their weaning period, also ingested the cocoons at that stage.

The control of this condition will be complex and expensive, if attempted. Of greater importance is that farmers know the implications so that they can act if another outbreak occurs.

It is anticipated that cases of rumen impaction will decrease rapidly.

ACKNOWLEDGEMENTS

Mr. B. H. Lamoral of the Natal Museum, Pietermaritzburg, Mr. E. M. Nevill and Prof. T. F. Adelaar of Onderstepoort are thanked for tests and identifications carried out. The photograph of the moth and cocoon is contributed by Mr. A. M. de Bruyn of Onderstepoort. The Mafeking field staff is thanked for their work and interest.

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BOOK REVIEW — BOEKRESENSIE

THE VETERINARY CLINICS OF NORTH AMERICA: SYMPOSIUM ON FELINE MEDICINE

ROBERT G. STANSBURY, Guest Editor

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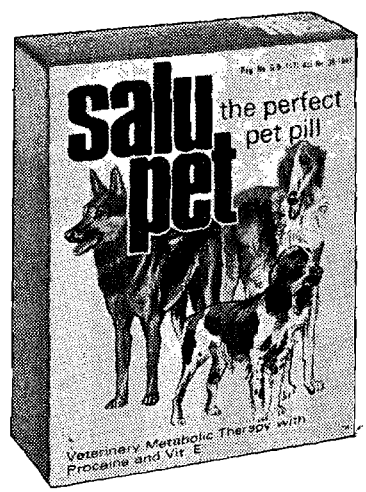

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OBSERVATIONS ON THE EFFECT OF TICK-BORNE FEVER (*CYTOECETES PHAGOCYTOPHILA* FOGGIE, 1949) ON THE SPERMATOGENESIS OF BULLS

G. P. RETIEF*, W. O. NEITZ** AND I. S. MCFARLANE***

SUMMARY

Of two bulls infected with *Cytoecetes phagocytophila* by means of blood from infected sheep, only one developed a temperature reaction four days after inoculation with a concomitant microscopically detectable parasitaemia. The spermatozoa of both bulls showed marked morphological deviations from the normal picture about 3 to 4 weeks after inoculation and this peristed for 15 weeks. The rise in abnormal spermatozoa in both bulls suggested an impairment of spermatogenesis. The results of this preliminary investigation indicate that further studies on this subject would be of considerable interest.

INTRODUCTION

Tick-borne fever (TBF) is a febrile condition of sheep, cattle and other domestic animals, transmitted by ticks. The disease was first discovered by Macleod [1] in 1932, during the course of studies on louping ill in Scotland. In 1940, Gordon, Brownlee & Wilson [2] described the parasite as specific bodies in the phagocytizing blood cells of infected sheep. It was later found by Hudson [3] to occur in cattle as well. TBF was first recorded in South Africa by Neitz [4] in 1969 on farms in the coastal region of the Port Elizabeth and Humansdorp districts. *Ixodes ricinus* was incriminated as the vector in Great Britain [5]. This tick does not occur in South Africa [6] and so far the vector in this country has not been determined.

The disease in cattle takes a mild form with a febrile reaction of from two to eight days' duration, after an incubation period of four days [3, 7]. Coughing was reported in 40% of the cases observed in Finland [7], but most of the cases described in the literature showed no appreciable symptoms other than fever, inappetence and a drop in milk yield.

The present study was prompted by reports which seemed to indicate an effect of the disease on the reproductive systems of both male and female animals affected. For instance, Venn & Woodford [8] described infertility and early embryonic death during an outbreak of TBF in a herd of cattle in South West England. Stewart [9] first described abortions associated with the disease in ewes, and this was later confirmed both in naturally occurring and experimental cases [10-15]. Watson [16] demonstrated transient infertility in diseased and experimentally infected rams. His examination of the testes and epididymides of these rams revealed histological changes suggestive of impairment of spermatogenesis. It was decided, therefore, to do a preliminary investigation on the effect of the disease on the spermatogenesis of two bulls by means of regular semen examination.

MATERIALS AND METHODS

Two healthy, mature bulls, a Bonsmara (No. 7231) and a Hereford (No. 7236), were used in the experiment. Bull 7231 was inoculated intravenously with 20 ml *C. phagocytophila* infected blood from sheep, and Bull 7236 with 40 ml. The rectal temperature of the bulls was taken daily for 18 weeks. Their semen was collected by rectal massage and/or electro-ejaculation for one week (two collections) before inoculation and thereafter at least once a week for 15 weeks. A final ejaculate was obtained from Bull 7236, 18 weeks after inoculation. Semen smears were made on warm slides and stained with nigrosin-eosin. The percentage of eosinophilic and abnormal sperm was then determined. The abnormalities were cate-

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gorized according to Haq[17] into primary abnormalities of head, mid-piece and neck, and tail, tailless spermatozoa and spermatozoa with protoplasmic droplets.

RESULTS

Bull 7231 had a temperature reaction of 40,1°C four days after inoculation; this persisted at approximately this level for 8 days. Bloodsmears revealed a parasitaemia from Day 4 to Day 7 after inoculation. Apart from lethargy, the animal showed no other clinical symptoms. Bull 7236 had no temperature reaction and had no microscopically detectable parasitaemia throughout the period.

The results obtained with regard to volume and density of the ejaculates, and motility and percentage of live sperm were extremely variable, possibly due to the methods of collection. No valid conclusions could be drawn from them.

Abnormal Spermatozoa

The results of abnormal spermatozoal counts are represented by graphs in Figs. 1 to 4. Both bulls had a dramatic rise in total abnormal sperm three to four weeks after inoculation. The results of Watson[16], obtained from an experimentally infected Hampshire ram, were very similar and are included in Fig. 1 for comparison. The time of onset and the length of time in which there was a rise in primary head abnormalities and tailless spermatozoa in both bulls were very similar. In Bull 7231, however, there was an earlier rise in tailless spermatozoa than in Bull 7236 (Figs. 2 and 3). The latter bull seemed to have a tendency towards mid-piece abnormalities in his semen (Fig. 4).

DISCUSSION

The fact that both bulls had abnormal spermatozoa of a similar nature over vir-

FIG.1: TOTAL ABNORMAL SPERM PER CENT OF BOTH BULLS AND HAMPSHIRE RAM (WATSON 1964)

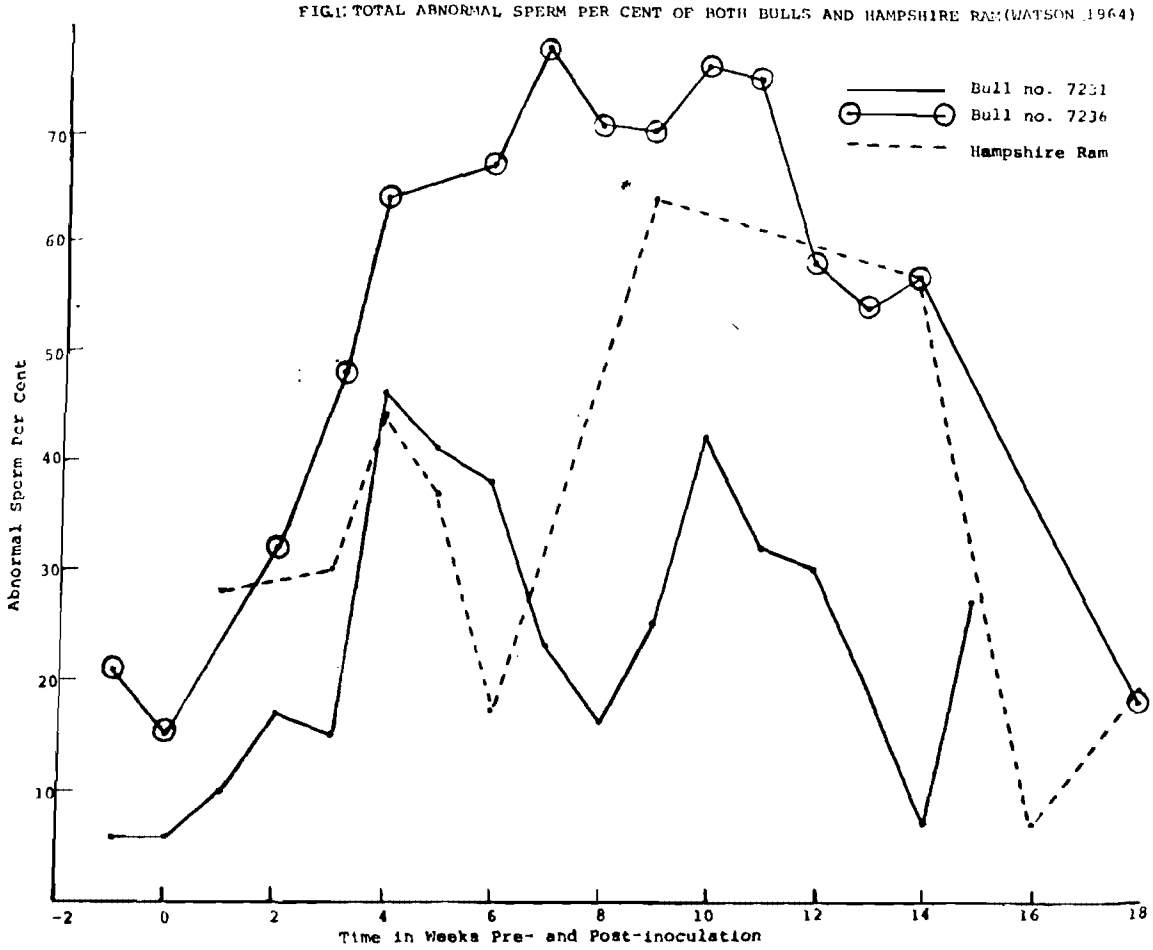


FIG. 2: PRIMARY HEAD ABNORMALITIES AND TAILLESS SPERM OF BULL NO. 7231

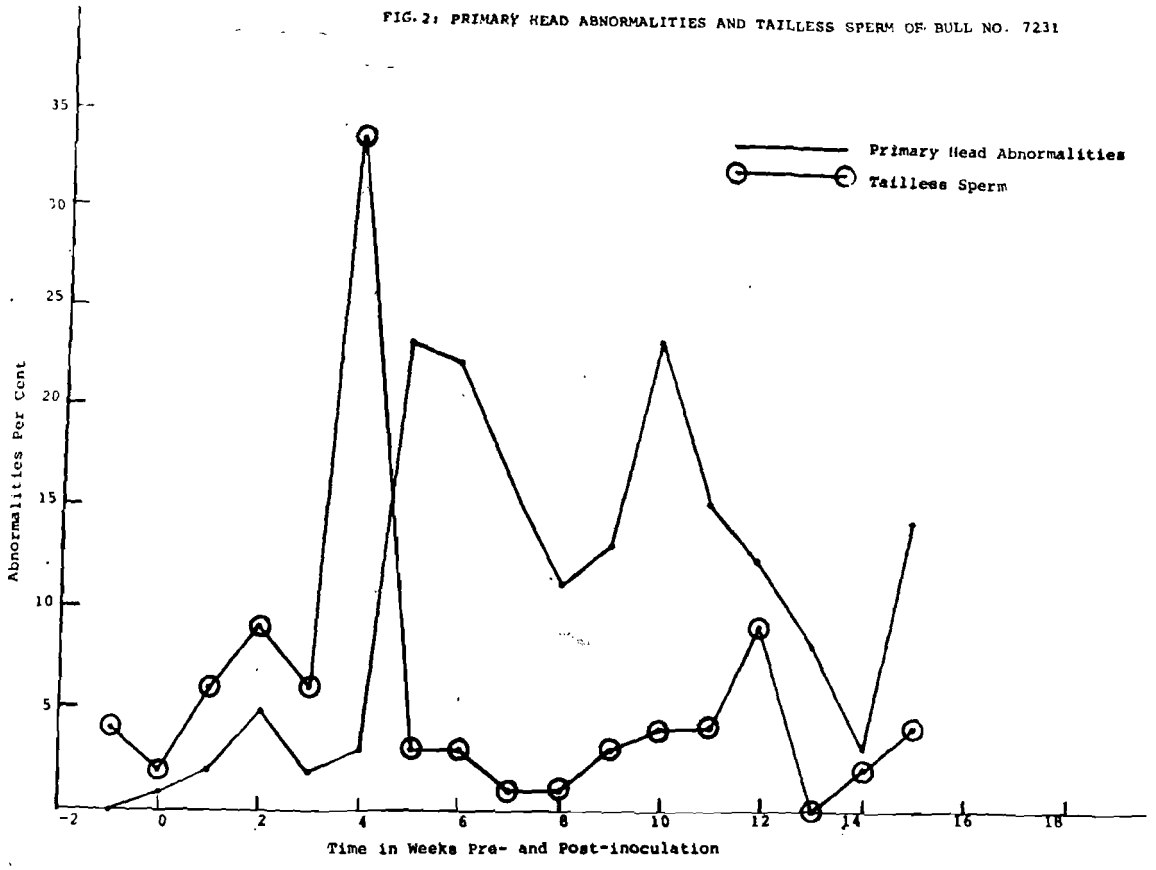


FIG. 3: PRIMARY HEAD ABNORMALITIES AND TAILLESS SPERM OF BULL NO. 7236

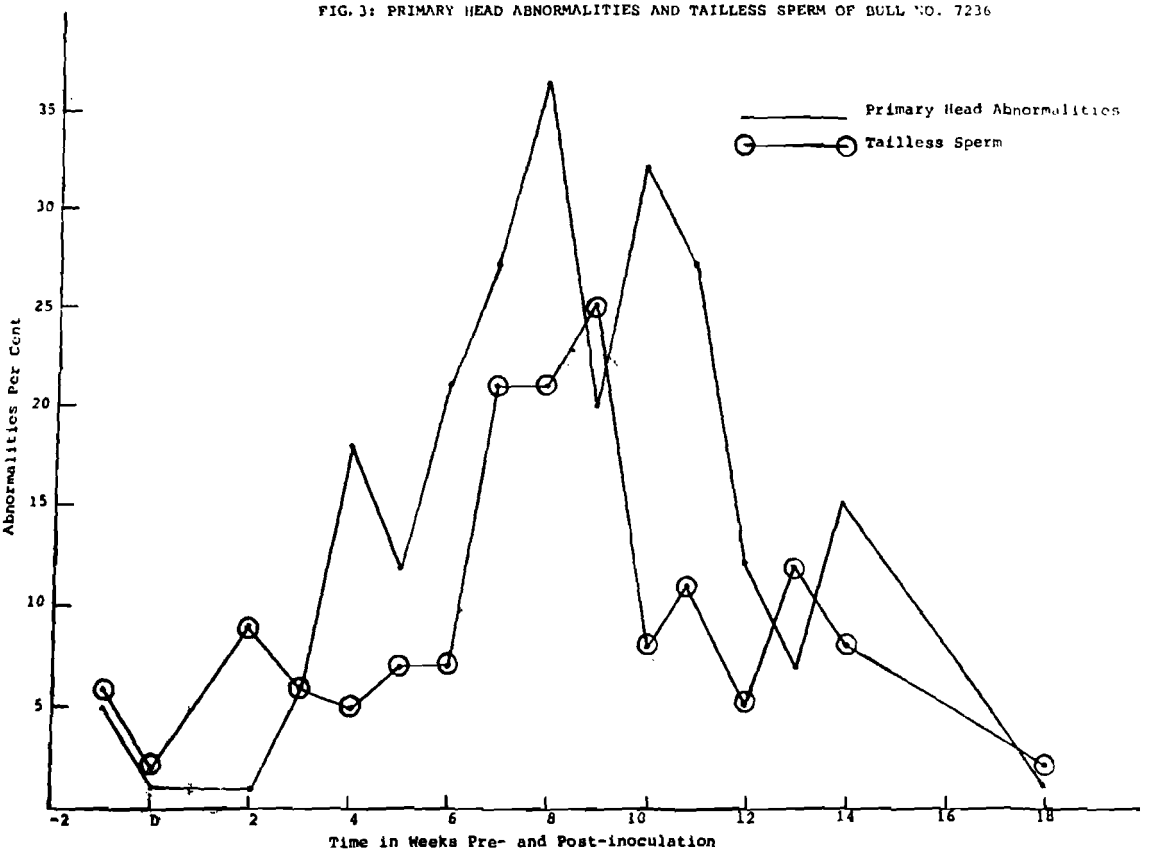
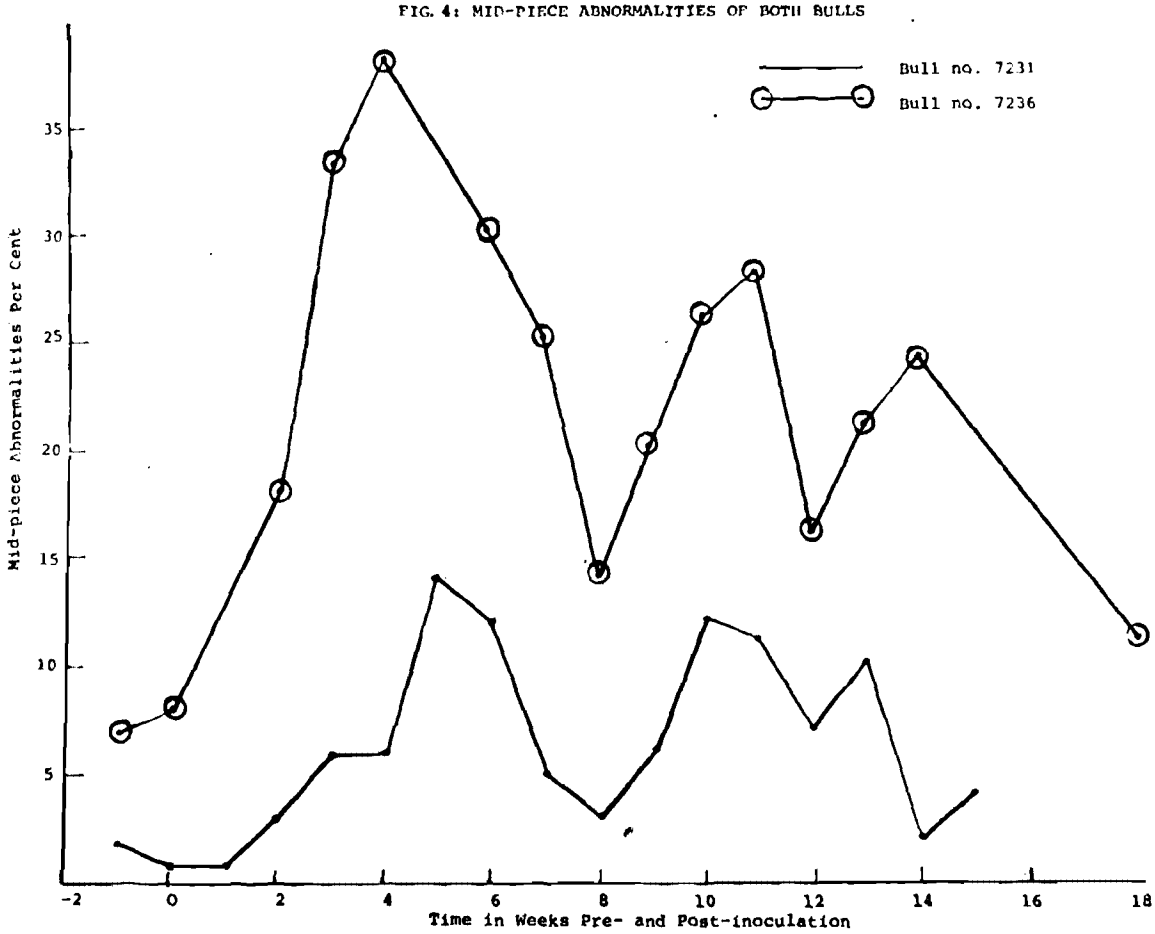


FIG. 4: MID-PIECE ABNORMALITIES OF BOTH BULLS



tually the same period after inoculation, seems to indicate that the pathogen was responsible for this reaction. The similarity of Watson's [16] findings strengthens this argument.

Milovanov [18] states that primary abnormalities of spermatozoa originate from faulty spermiogenesis. Blom [19] regards all abnormal heads as primary abnormalities, and tailless sperm and "bent tails" as secondary, i.e. those resulting from retention in the epididymis or through faulty ejaculation [18]. He suggests 15% as the upper limit for primary abnormalities of semen intended for dilution and insemination, while Lagerlöf [20] regards a figure of 18% and over for this category as a grave sign when the fertility of a bull is to be judged. The primary head abnormalities of both bulls were well over this limit for a period of about 6 weeks, which suggests a definite impairment of spermiogenesis and fertility (Figs. 2 and 3).

The position regarding secondary abnormalities is less clear, but Blom [19] suggests 10% as the upper limit for tailless spermatozoa. Bull 7231 showed a sharp rise of up to 33% in tailless sperm over a period of two weeks (4 ejaculates) (Fig. 2) and Bull 7236 had over 10% tailless sperm for four weeks. The same author [19] regards 25% as the limit for "bent tails". From his description of this type of abnormality, it is evident that it would include most of the abnormalities counted as abnormal mid-pieces in this study. Fig. 4 shows that Bull 7231 had a rise in percentage of this type of sperm, but did not exceed the limit, while Bull 7236 was over the limit for most of the period.

Watson [16] suggests that the infertility he observed in infected rams could be due to the febrile reaction. Many workers have found that high temperatures of the testes can affect spermatogenesis and semen quality [21-29] and a marked rise in body temperature through disease can increase testicular temperature and thus affect spermatogenesis [30]. Bull 7231 showed a rise in abnormal spermatozoa shortly after the tempera-

ture reaction (Fig. 1), and this could be attributed to the effect on spermatogenesis as described above. Bull 7236, however, had no temperature reaction, and yet showed a much higher abormal sperm count after inoculation. This suggests an effect on spermatogenesis in the absence of a systemic reaction. It might alo explain the differences between the reactions of the two bulls. Bull 7231 might have reacted to both the high temperature and to the organism, while Bull 7236 could possibly have only reacted to the organism. As no C. *phagocytophila* were found in the bloodsmears of this bull, it opens up the interesting speculation that the organisms might have been confined to the testicular and epididymal tissues. It certainly seems as though this aspect needs further study.

It appears, then, that TBF could have a marked transient effect on the fertility of infected bulls, and further controlled experiments should be done with greater numbers of bulls using more natural methods of semen collection.

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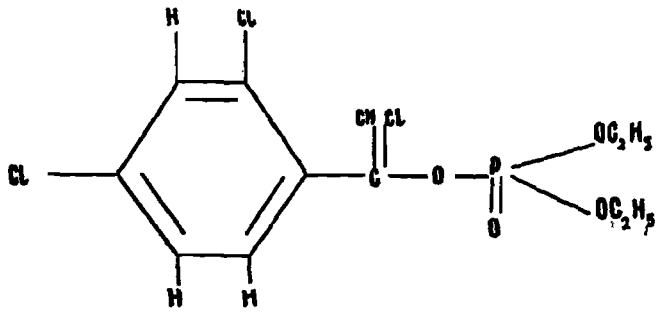

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Jl S. Afr. vet. med. Ass. 42 (4): 327-331 1971

NOSEMATOSIS IN A CAT: A CASE REPORT

I. B. J. VAN RENSBURG* AND J. L. DU PLESSIS*

SUMMARY

Nosema cuniculi infection, previously recorded in rodents, dogs and man, is reported in a Siamese kitten. Nervous symptoms had been observed in three littermate kittens from one of which specimens were submitted for examination. The most significant histopathological lesions were non-purulent meningoencephalitis and interstitial nephritis. Spores of *N. cuniculi* were observed in brain, kidney, spleen and lymph node; the tunica media of some of the blood vessels in all organs examined, except the intestine, was parasitized.

INTRODUCTION

Encephalitozoon infection (Nosematosis) has been reported in mice [1, 2], rats [1, 3], rabbits [2,4,5], a guineapig [1], dogs [6,7,8] and man [9]. The infection has been transmitted experimentally to mice [1, 3], white rats [1], Syrian hamsters [1] and white New Zealand rabbits [1].

Lainson *et al.* [3] concluded from studies on the developmental cycle and morphology of the causative agent that the designation *Nosema* is more appropriate than *Encephalitozoon.*

This report describes the condition in a kitten. To our knowledge the condition has not been diagnosed previously in cats.

MATERIAL

Specimens from the brain, kidney, liver, spleen, lymph node, myocardium and intestine from a Siamese kitten were collected in 10% buffered formalin by a veterinary clinician from Bellville, Cape Province and submitted to the Pathology Section, Veterinary Research Institute, Onderstepoort.

Blocks from these tissues were embedded in paraffin wax, sectioned at 4 μm thickness and the sections were stained with haematoxylin and eosin (HE), and with Giemsa and Gram stains.

The history accompanying these specimens was that three littermate kittens became ill simultaneously and exhibited severe spasms and twitching of muscles and depression. Specimens from one of these cases were received.

RESULTS

Kidney

A mild interstitial nephritis characterized by focal infiltration of lymphocytes, plasma cells and monocytes into the cortex was present. These cells also extended into and accentuated the medullary rays. On high magnification small groups of free-lying organisms were distinguishable in several of these foci (Fig. B4). They were more clearly seen in Giemsa stained sections (Fig. B7) and also stained positively with Gram's stain. In HE sections the organisms were pale blue and poorly visible, whereas with Giemsa they were readily observed, staining an intense blue with polar vacuoles (Fig. B2). In sections which were better differentiated, the organism stained metachromatically and assumed a purplish colour against a blue background. They appeared to be short, blunt ended rods (1 μm×2,3 μm), sometimes slightly curved, and often occurred in dense cyst-like clusters, without being surrounded by a definite cyst wall. Numerous cyst-like clusters of organisms (10 to 100 μm) were observed in the absence of cellular infiltration; they occurred either free in the lumina of the tubuli, or were seen in the cytoplasm of epithelial cells, even indenting some of the nuclei of the host cells (Fig. B8). Ruptured parasitized epithelial cells with subsequent discharge of organisms into the lumen of the tubule were seen in some areas. Thus many stages in the developmental cycle as described by Lainson *et al.*[3] could be seen in this section. A large number of "cysts", confined to the thin limb of Henle's loop was observed in the outer zone of the medulla. A cluster of parasites

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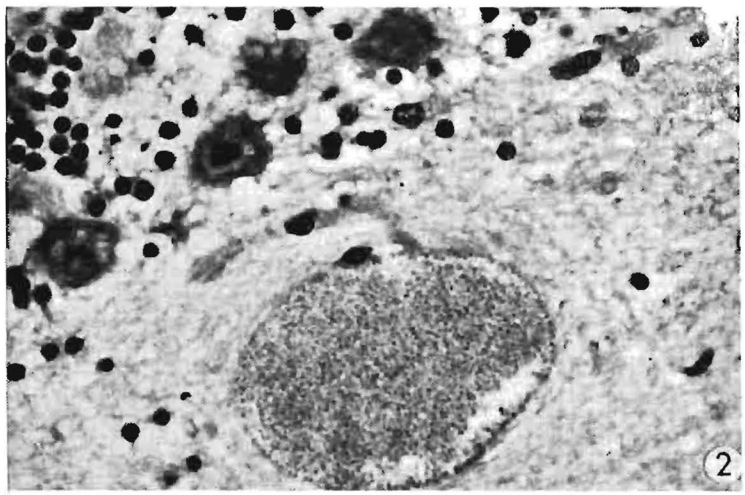
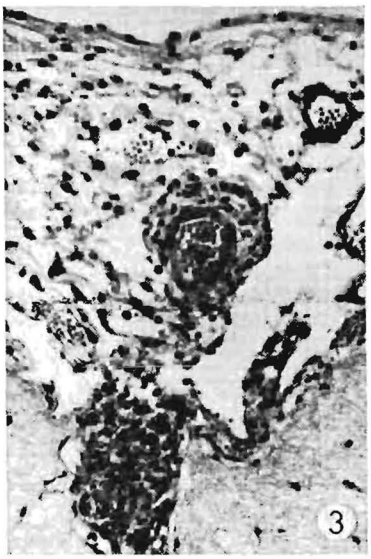
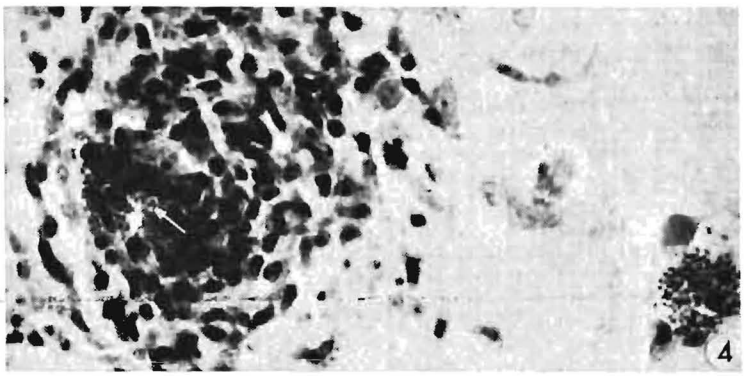
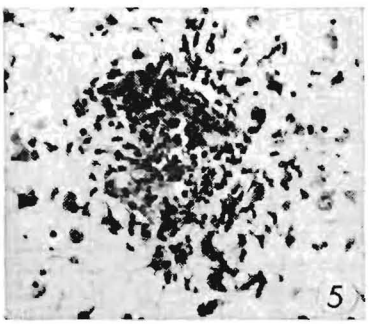
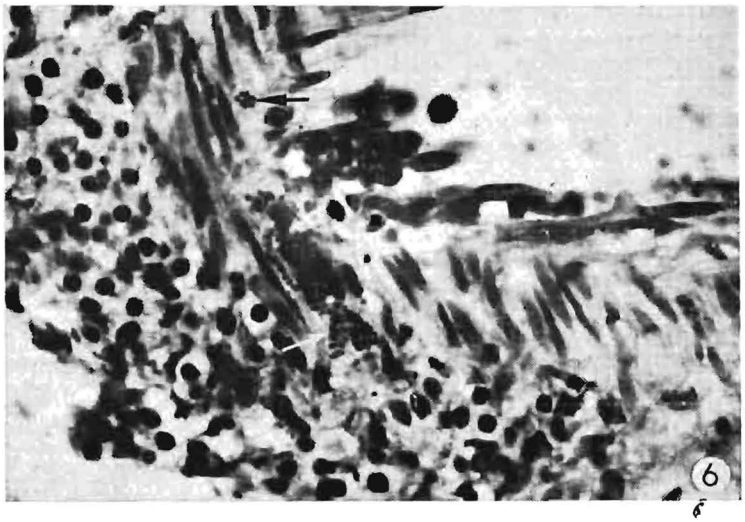










was observed in the tunica media of an arcuate artery.

Although the glomeruli generally were unaffected, a cluster of organisms was seen to be confined to a glomerular capillary in one instance and to Bowman's space in another in the absence of any host response (Fig. B5).

Brain

Congestion of the meningeal blood vessels was present. In some areas a slight perivascular round cell infiltration was seen in the leptomeninges (Fig. A3). In the walls of a few larger arteries in this area there was a distinct focal round cell reaction, involving chiefly the tunica adventitia and adjacent loose connective tissue (Fig. A1). Occasionally some round cells adhered to the intima underlying the affected zone of the vessel wall (Fig. A6). "Cysts" without any cellular response were demonstrable in these foci (Fig. A6) as well as in the tunica media of several of these vessels.

The brain substance was congested and numerous microscopic haemorrhages were present. There was a very mild round cell cuffing of a relatively small number of blood vessels. Focal microgranulomata of glial cell proliferation were consistently present and particularly abundant in the cerebral cortex and brain stem. Parasitic "cysts", with staining characteristics as already described and unaccompanied by any cellular reaction, were observed regularly in the brain substance. The "cysts" did not appear to have a proper wall, but the compressed surrounding tissue stained somewhat darker. The size of the "cysts" varied tremendously and attained a diameter of up to approximately 200 μm (Fig. A2).

In the brain stem an area of gliosis contained extracellular organisms arranged in small groups (Fig. B10). A blood vessel in this focus harboured a large "cyst" intraendothelially, while free organisms were present in the lumen of the vessel, as well as in the adjoining brain substance (Fig. B2). Some of the blood vessels with an intramural and perivascular cellular reaction also contained parasites in their walls.

Lymph node

The lymph nodules were hyperplastic with well developed germinal centres. The medulla was congested. The capsule was infiltrated focally with round cells and rarely contained small colonies of organisms. Similar colonies were also demonstrable extracellularly in the subcapsular sinuses (Fig. B3) and less frequently in the cytoplasm of macrophages in this space (Fig. B12). In addition, organisms were found in the tunica media of some of the medium-sized arteries. In some of these vessels a round cell infiltration was present.

Spleen

The spleen was atrophic, and aggregations of parasites were observed in the smooth muscle layer of the capsule, in the trabeculae (Fig. B11) and in the walls of the trabecular and larger branches of the splenic artery (Fig. B12).

Myocardium

Apart from organisms seen in the smooth muscle layer of a medium-sized artery just below the epicardium, no pathological changes were noticed.

Lung

No significant lesions were observed; nevertheless organisms were present in the tunica media of a large blood vessel.

Liver

In a few portal triads mild bile duct proliferation accompanied by a very mild round cell infiltration was present.

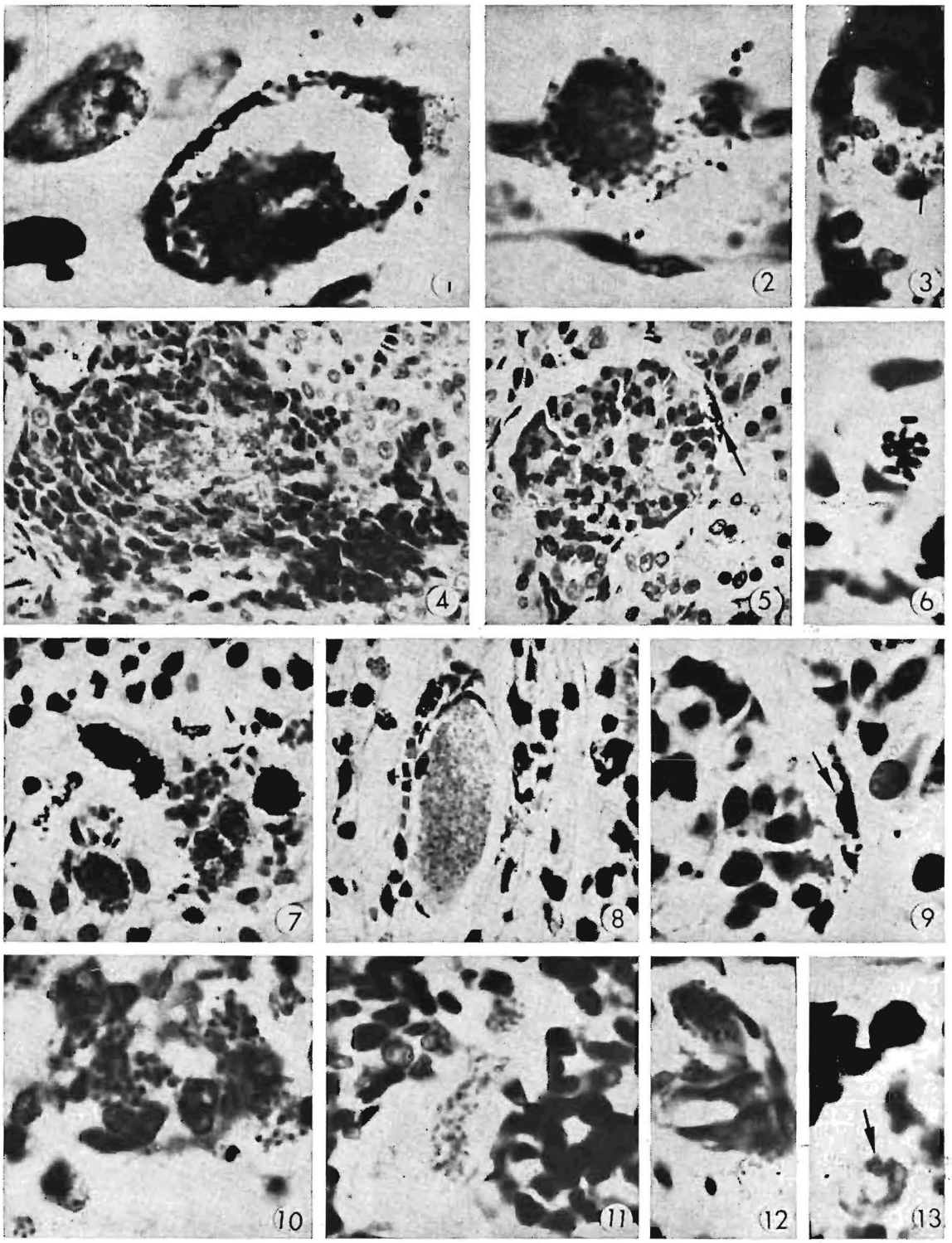
The wall of one of the larger blood vessels contained a small colony of organisms.

Intestine

No lesions were observed.

PLATE A

1. Congestion and slight round cell infiltration of leptomeninges. At arrow a round cell reaction in the adventitia of a medium sized artery. HE X 75.
2. Large cyst-like aggregation of parasites in the cerebellum. HE X 500.
3. Round cell infiltration in leptomeninges. HE X 200.
4. Microgranuloma in the brain with extracellular organisms at arrow. At lower right hand corner is a parasitic "cyst". Giemsa X 500.
5. Microgranuloma without organisms. HE X 200.
6. Medium-sized artery in leptomeninges with round cell infiltration and organisms visible in the tunica media (arrows). Giemsa X 770.



DISCUSSION

From a diagnostic viewpoint the lesions and parasites observed in this case necessitated differentiation from those of toxoplasmosis. The characteristic meningoencephalitis-nephritis syndrome accompanied by the morphological and tinctorial characteristics of the organism, however, justify a diagnosis of nosematosis, even though the organism was not isolated.

An interesting observation was the apparent predilection of the parasite for smooth muscle fibres. This has also been seen by Plowright[7]. The parasites were present in the smooth muscles of the splenic capsule and trabeculae and in the tunica media of the blood vessels in every organ examined, with the exception of those in the intestine. The parasites elicited an inflammatory reaction in the walls of some of these vessels. At the same time leucocytes adhered to the intima in juxtaposition to the parasites. This lesion conceivably could have been a precursor stage to the thrombosis described by Basson *et al.*[6] in their case of canine nosematosis. The impression was gained in our case that extracellular organisms evoked a more severe host response than the intracellular "cystic" stage.

Although perivascular cuffing of the brain vessels was demonstrable, it was inconsistent and of a mild degree and, whenever obvious, it was usually due to the presence of parasites in the wall of the vessel concerned.

An important tinctorial feature was the metachromatic staining with Giemsa whenever sections were well differentiated. This made it easier to recognise the purplish-red organism against a blue background.

In all cases with an encephalopathy-nephropathy syndrome in litters, whether kittens or puppies, nosematosis should be considered as a differential diagnosis.

ACKNOWLEDGEMENTS

We thank Dr. W. A. Peters of Bellville, Cape Province, for having submitted the case to us for examination and the staff in the Sections of Photography and Pathology for their technical assistance.

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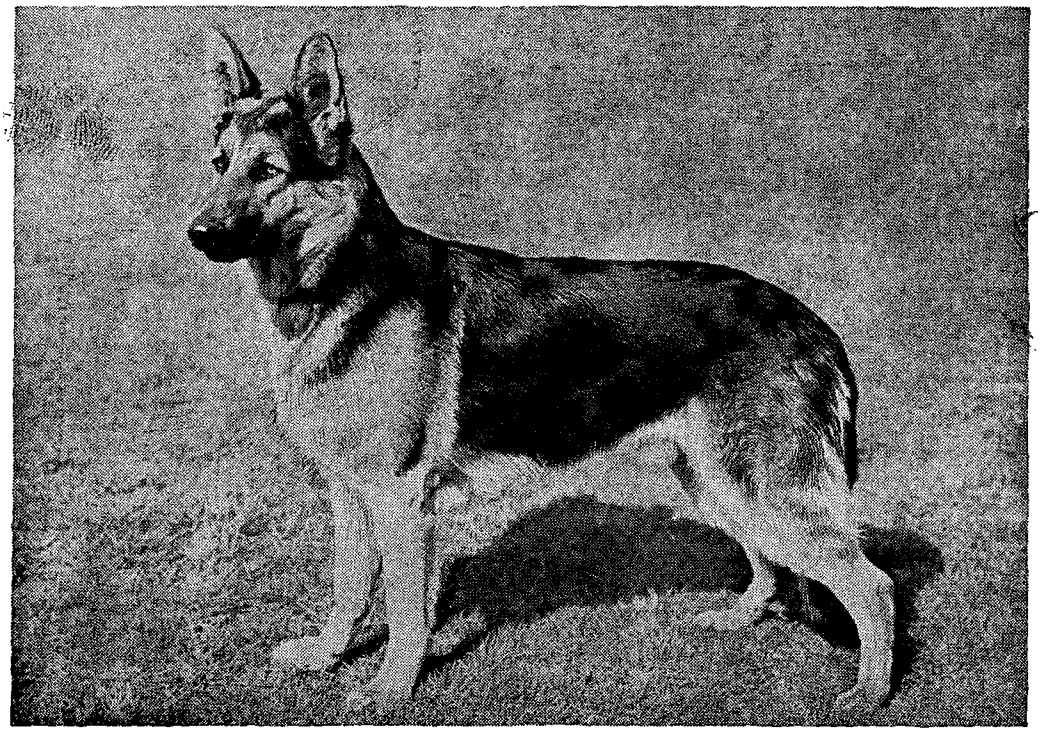
1. "Cyst" in brain with compression of host cell nucleus. Giema X 1200.
2. "Cyst" in an endothelial cell with free organisms in brain substance and vascular lumen. Note characteristic polar vacuoles. Giemsa X 1200.
3. Free lying organisms in subcapsular sinus of lymph node. Giemsa X 1200.
4. Extracellular organisms in focus of round cell nephritis. Giemsa X 500.
5. Cluster of organisms in Bowman's space in glomerulus. Giemsa X 500.
6. Group of organisms in tubular lumen in renal medulla. Gram X 1200.
7. Number of "cysts" in renal medulla. Giemsa X 770.
8. "Cyst" in tubular epithelial cell in kidney medulla. HE X 770.
9. Cluster of organisms in Bowman's space. Giemsa X 850.
10. Groups of extracellular organisms in area of encephalitis. Giemsa X 1200.
11. Organisms in splenic trabecula. Giemsa X 850.
12. Organisms in trabecular artery of the spleen. Giemsa X 850.
13. Organisms in macrophage in lymph node. Giemsa X 1200.



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A BRIEF REVIEW OF THE GENUS *ARGAS* (IXODOIDEA: ARGASIDEA) IN SOUTHERN AFRICA

E. B. EASTWOOD*

SUMMARY

The taxonomic position of the genus *Argas* and the species which occur in southern Africa are discussed with reference to their epidemiological significance, distribution and host affinities. The paper is intended to bring to the notice of veterinarians the recent work done in this field.

INTRODUCTION

Ticks of the genus *Argas* Latreille, 1796, or "tampans" as they are sometimes called, are widely distributed on a variety of hosts in southern Africa. Thirteen species have been recorded in this region, some of which are of significant veterinary importance, particularly those parasitic on poultry.

In recent years much progress has been made on the taxonomy and biology of *Argas*, notably by Hoogstraal and his co-workers at the United States Naval Medical Research Unit No. 3, Cairo, Egypt. Much of the information in text-books and in the older literature is now out-of-date and of little value to the veterinarian. In this paper therefore, a short review is given of recent advances in our knowledge of *Argas* species, especially in southern Africa, in the hope that veterinarians will be encouraged to collect and send in living specimens to research centres.

Adult and nymphal *Argas* feed on their hosts for short periods and are usually found secreted in cracks, under bark and among debris in the immediate vicinity of their hosts' resting or breeding places. Larvae may take a few days to feed and may be transported to new areas on their hosts. Larvae, preferably laboratory-reared specimens, are especially valuable for taxonomic studies, since their morphological characters are ofter more distinct than those of the adults. Consequently, when adults are found they should be dispatched, alive if possible, in a glass tube containing dry tissue paper and tightly stoppered with cotton wool to a research centre. Full details of host, locality, date of collection and collector's name should be given with each batch of specimens.

TAXONOMY

The family Argasidae Canestrini, 1890 has been reclassified several times in the past. Bedford[1] considered that the family consisted of only one genus, *Argas*, containing 10 species, only three of which are now regarded as valid members of this genus. He sank *Ornithodoros* Koch, 1844 as a synonym of *Argas*. All subsequent workers rejected the idea of a single genus: Pospelova-Shtrom[2] recognized seven and Clifford *et al.*[3] four genera. Most Western workers follow the latter arrangement.

Thirty-six species of *Argas* are now recognized of which 13, in six subgenera, occur in southern Africa, as follows:

1. Subgenus *Persicargas* Kaiser, Hoogstraal & Kohls, 1964

These are avian parasites, and present records suggest that they are fairly host-specific. Previously all forms now included in this subgenus were considered to belong to one species, *A. pericus* (Oken, 1818). A significant discovery, which led to a more intensive study of the subgenus, was the observation by Hoogstraal and his co-workers that hatching larvae from a dometic fowl strain were positively geotropic while those from cattle egrets *(Bubulcus ibis)* were negatively geotropic[4]. This led to a critical analysis of bird argasids, taking into account physiological, ecological and morphological factors, with the result that *Persicargas* was found to consist of a complex of species[5].

A. arboreus Kaiser, Hoogstraal & Kohls, 1964 is a parasite of herons and egrets. It is found in their nests, under tree bark and under accumulated dry guano at the base of nesting trees. It has been collected at

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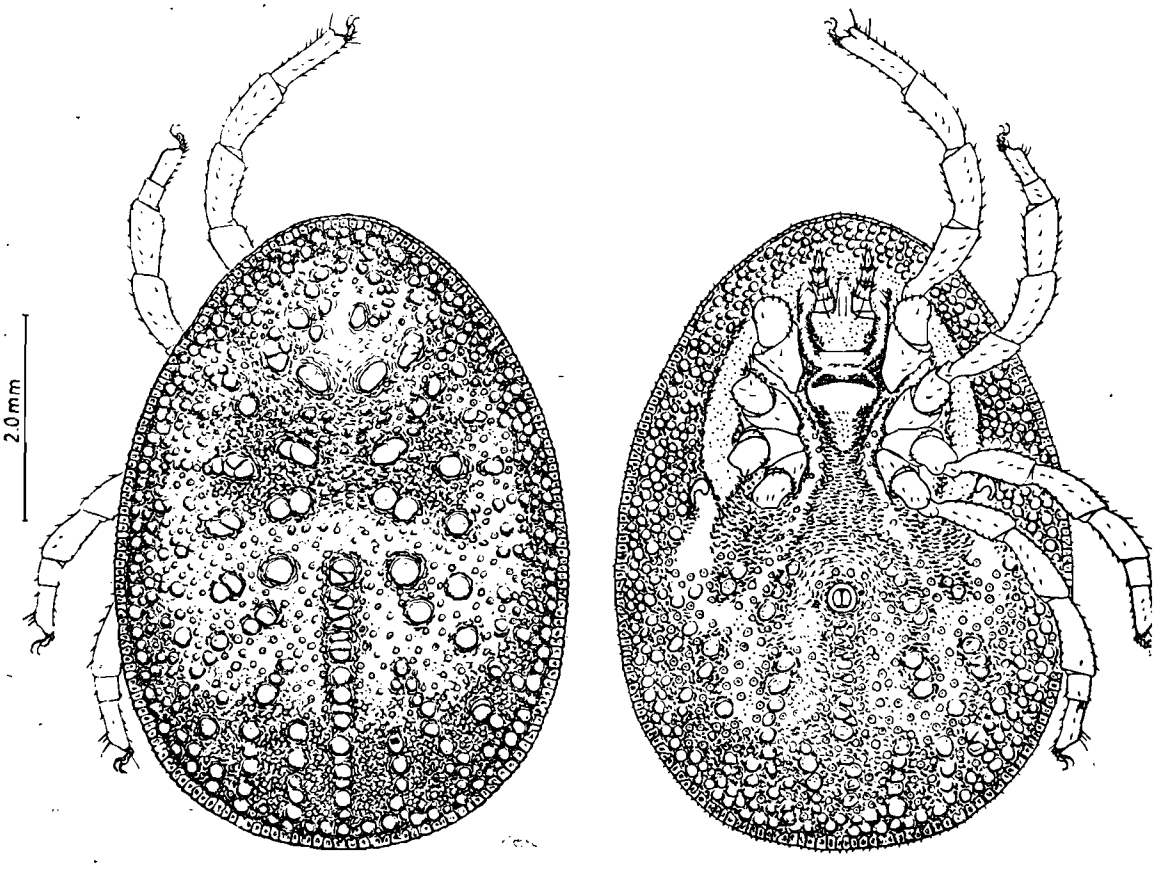
Naboomspruit (Transvaal) from trees supporting the nests of the cattle egret and at Mafeking (Cape Province) from nests of the black-headed heron *(Ardea melanocephala)*. Studies on Egyptian specimens have shown that *A. arboreus* serves as a host of a bacterium, *Salmonella typhimurium*, and a rickettsia-like organism, *Wohlbachia persica;* it was also found to be naturally infected by Quaranfil and Nyamanini viruses[6].

A. persicus, the fowl tick, was formerly considered to be widely distributed in southern Africa but subsequent work has shown that these records probably pertain in fact to a new species, *A. walkerae* Kaiser & Hoogstraal, 1969. These authors expressed doubt as to the presence of *A. persicus* in this area[7], but recently a number of specimens from Windhoek (South West Africa) were rechecked and found to belong to this species. No date or host data were provided and it can only be assumed that the specimens were collected from domestic fowl runs. This is the first authentic record of *A. persicus* from southern Africa[8]. This tick transmits spirochaetosis *(Borrelia anserina)* of chickens, ducks, turkeys and canaries, and fowl piroplasmosis *(Aegyptianella pullorum)*. Fowls may develop chicken cholera or fowl plague *(Pasteurella avicida)* after eating infected ticks. Fowl paralysis may result from bites, due possibly to toxins from the tick[9].

A. walkerae is widespread in Southern Africa, parasitizing domestic fowls. Whether it was introduced or is an endemic parasite of wild birds that has adapted to fowls is unknown[7]. Specimens have been collected at Fort Beaufort and Queenstown (Cape Province), Onderstepoort, Pretoria North and Louis Trichardt (Transvaal), Beit Bridge (Rhodesia), Windhoek and Omaruru (South



Argas (Persicargas) walkerae, female, dorsal and ventral views (after Kaiser & Hoogstraal, 1969).

West Africa) and Maseru (Lesotho). Most work done on *"persicus"* in South Africa pertains probably to *A. walkerae* and, until expermental studies are done on correctly identified specimens, these results must remain suspect.

A. streptopelia Kaiser, Hoogstraal & Horner, 1970 is a parasite of resident and migrating doves in Africa and Cyprus, first discovered in the larval stage on the bodies of its hosts. In southern Africa it is only known from the Tsumeb area (South West Africa) from unknown avian hosts, most probably doves. It is a likely vector of a Quaranfil group virus (Q 3255) which has been isolated from a northward-migrating dove, *Streptopelia turtur* [10].

A. theilerae Hoogstraal & Kaiser, 1970 is a parasite of the white-backed vulture *(Gyps africanus)*. Specimens were collected from under the bark of a tree below a vulture's nest. The only record is from near Kimberley (Cape Province) [11].

A. zumpti Hoogstraal, Kaiser & Kohls, 1969 parasitizes the Cape vulture *(Gyps coprotheres)*. The only record is from the Rustenburg district (Transvaal), where specimens were taken from cracks above the vulture nests [12].

2. Subgenus *Argas* Latreille, 1796

A. hermanni Audouin, 1827 is a pigeon tick, formerly considered as a subspecies of *A. reflexus* (Fabricius, 1794), and subsequently elevated to specific rank (Hoogstraal, personal communication). Doubt exists as to the true taxonomic status of specimens found in Pretoria (Transvaal) and Stellenbosch (Cape Province) and more material is urgently required to settle this question. Viruses have been isolated from *A. hermanni* in Egypt, including a strain of West Nile virus (No. 1140) [13].

3. Subgenus *Carios* Latreille, 1796

This subgenus is represented by one species parasitic on bats, *A. vespertilionis* (Latreille, 1802). Records are from Dundo (Angola), Moçambique, Rhodesia, Kanye (Botswana), Pretoria and Pietersburg (Transvaal), Grahamstown and Williston district (Cape Province) and Windhoek (South West Africa). Tests for pathogenic organisms were negative [9].

4. Subgenus *Secretargas* Hoogstraal, 1957

A. transgariepinus (White, 1846) is a bat parasite which may feed on geckos in the absence of its usual hosts [9]. It has been collected in "Caffraria" (Eastern Cape) and Johannesburg (Transvaal).

5. Subgenus *Chiropterargas* Hoogstraal, 1955

All species in this subgenus are parasites of bats. *A. boueti* Roubaud & Colas-Belcour, 1933 has been recorded from Humpata (Angola), Windhoek (South West Africa) and Tzaneen (Transvaal).Tests for pathogenic organisms were negative [9].

A. confusus Hoogstraal, 1955 has been collected at Bulawayo (Rhodesia), Nkube (Botswana), Omaruru (South West Africa), Barberton, Onderstepoort, Pretoria. Johannesburg, Sandspruit Caves, Waterberg and Koster (Transvaal), Bulwer, Eshowe and Pietermaritzburg (Natal), Alicedale, Bedford, Grahamstown, Lady Frere, Loveday, Schoombie, Queenstown and Oudtshoorn (Cape Province), Bloemfontein (Orange Free State) and Maseru (Lesotho). Tests for pathogenic organisms were negative [9].

A. cordiformis Hoogstraal & Kohls, 1967 has only been collected in the Omaruru district (South West Africa) and only the immature stages are known [14].

6. Subgenus *Ogadenus* Pospelova-Shtrom, 1946

A. brumpti Neumann, 1907 is a parasite of mammals and reptiles. It has been recorded in the Sofala and Manica districts of Moçambique, Ovamboland, Maltahöhe and Windhoek (South West Africa) and Little Namaqualand and Gordonia (Cape Province). In Kenya and Egypt *A. brumpti* and lizards have been found infested with a haemogregarine, *Hepatozoon argantis* [9].

ACKNOWLEDGEMENTS

I thank Dr. F. Zumpt, Mr. J. Ledger (Entomology Department, South African Institute for Medical Research) and Miss J. Walker (Veterinary Research Institute, Onderstepoort) for their help and guidance in the preparation of this paper, and the Director of the S.A.I.M.R. for library and research facilities.

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TRIALS WITH RAFOXANIDE*

3. EFFICACY OF RAFOXANIDE AGAINST THE LARVAE OF THE SHEEP NASAL BOT FLY *OESTRUS OVIS*, LINNÉ, 1761

I. G. HORAK†, J. P. LOUW† AND S. M. RAYMOND†

SUMMARY

The efficacy of rafoxanide administered intra-ruminally at a dosage rate of 7,5 mg/kg liveweight against naturally acquired larval infestations of *Oestrus ovis* in sheep is described.

Twenty-five sheep with clinical signs of infestation were free from infestation by first, second and third instar larvae of *O. ovis* after intra-ruminal dosage of rafoxanide. Twenty-four of 25 untreated control sheep each harboured one or more larvae of one or more of the various larval stadia.

Although a residual effect preventing reinfestation for a period of at least 11 days seems possible, this could not be conclusively substantiated.

INTRODUCTION

Infestation of the cranial sinuses and nasal passages of sheep with larvae of the nasal bot fly *Oestrus ovis* has enjoyed considerable attention for many years[1]. The importance of this infestation is subject to a great diversity of opinion. Some hold that the parasite is benign and responsible for few ill effects while others feel that infestation may profoundly affect the well-being of sheep[2, 3]. The intense, although temporary, discomfort suffered by humans that have become infested accidentally[1] would support the latter view.

In the past treatment of this infestation relied on contact poisons and carbon bisulphide, tetrachlorethylene and the pure gamma isomer of benzene hexachloride were used. These were introduced either directly into the frontal sinus by means of a small trocar and cannula[4], or into the nasal passages by holding the sheep on its back and introducing the insecticide into the nostrils[2]. The discovery that oral administration of neguvon/asuntol** combination is effective against the larvae of *O. ovis*[5] has eliminated the above rather laborious and dangerous procedure.

The compound rafoxanide*, 3,5-diiodo-3'-chloro-4'-(p-chlorophenoxy)-salicylanilide, has been shown to have anthelmintic activity against *Fasciola hepatica*[6, 7, 8], *Fasciola gigantica*[9] and *Haemonchus contortus*[10]. Recently larvacidal activity against *O. ovis* has also been reported[11] and the present paper describes a trial conducted in naturally infested Merino lambs.

MATERIALS AND METHODS

A farmer in the Bethal district of the Transvaal complained of nasal bot infestation in a flock of six to eight months old Merino lambs. Six of the lambs were sacrificed on the farm and on examination four of them harboured infestations of *O. ovis*. A further 50 lambs were selected on clinical signs of infestation, purchased and transported to the laboratory.

On arrival the lambs were numbered with plastic eartags and were divided into three groups, using tables of random numbers as the method of selection. One group of 12 lambs was slaughtered immediately and examined for infestation. The second group of 25 lambs was treated intra-ruminally with rafoxanide at a dosage rate of 7,5 mg/kg liveweight and slaughtered 10 and 11 days later. The third group of 13 lambs constituted the untreated controls. Eleven of these lambs were slaughtered at the same time as the treated sheep and the remaining two, four days later.

It had been intended to keep all the sheep stabled indoors after treatment to

*"RANIDE": Reg. trademark of MSD (PTY) LTD, Merck Sharp & Dohme International, Division of Merck & Co. Inc., Rahway, N.J., U.S.A.

†MSD Research Centre, Hennops River, P.O. Box 7748, Johannesburg.

prevent reinfestation, but as the lambs were accustomed to grazing they refused hay and concentrates fed in troughs and had to be put out to pasture to forestall deaths.

At slaughter the head was severed from the carcass and the skin removed from the dorsal surface. A sagittal section through the head was made using a saw. All larvae present in and on the mucosa of the nasal septum, nasal passages and nasal conchae were removed before removing the septum and conchae and examining these more closely. Thereafter the sinuses were opened, taking particular care to open the cornual diverticulum of the frontal sinus; all larvae present were removed.

The heads, with cut surfaces upwards, were then laid out on a table in a room with shaded natural light. After a period of two to three hours they were re-examined for larvae which might have moved and become more easily visible.

The larvae were counted under a stereoscopic microscope using reflected light and the characteristics described by Zumpt[1] were used to differentiate them into the three larval stadia. Dead larvae were counted separately.

RESULTS

The numbers of larvae recovered from the sheep in the control and in the treated groups are summarized in the table.

Four of the six sheep slaughtered on the farm, where time precluded a detailed examination, harboured larvae of *O. ovis*. No first instar larvae and a mean of two second and two third instar larvae were recovered.

All 12 sheep slaughtered on the day of treatment were infested. The mean infestation consisted of one first (with a range of nought to four), three second (range nought to eight) and four third (range nought to 11) instar larvae. No dead larvae were recovered from these sheep.

Ten of the 11 untreated sheep, slaughtered at the same time as the treated sheep, were infested. The mean infestation for the group consisted of five first (range nought to 16), five second (range nought to 15) and two third (range nought to five) instar larvae. Three sheep each harboured one dead third instar larva.

Both control sheep slaughtered 15 days after the day of treatment were infested. They each harboured one first instar and four and six second and zero and six third instar larvae respectively. These sheep had been kept partially indoors in a stable for the four days preceding slaughter.

Not one of the 25 treated sheep harboured a living larva at any stage of development. Two each had one dead second instar larva and nine had dead third instar larvae ranging in number from one to five. The dead larvae in these and the control

Table: THE NUMBERS OF LARVAL INSTARS RECOVERED FROM CONTROL AND TREATED SHEEP

No. of Sheep	Mean no. and range of O. ovis larvae recovered			
	1st instar	2nd instar	3rd instar	Total
Sheep slaughtered on the farm				
6	0	2(0—6)	2(0—6)	4(0—11)
Controls slaughtered on day of treatment				
12	1(0—4)	3(0—8)	4(0—11)	8(1—15)
Controls slaughtered 10 and 11 days later				
11	5(0—16)	5(0—15)	2(0—5)	12(0—33)
Controls slaughtered 15 days after day of treatment				
2	1(1,1)	5(4,6)	3(0,6)	9(5,13)
Treated sheep				
25	0	0	0	0

sheep consisted of a more or less intact integumentum containing a liquefied larval body.

The majority of sheep suffered from some form of frontal or maxillary sinusitis, this varied in type from serous to mucopurulent and was still evident in those treated sheep which no longer harboured larvae.

DISCUSSION

The fact that infestation with the larvae of *O. ovis* could be determined in 49 of 50 sheep on the clinical signs of poor condition, rhinitis and conjunctivitis confirms that infestation is not a benign condition and that it can interfere seriously with the health of an animal. The incidence of sinusitis observed *post mortem* in the experimental lambs further confirms this contention.

According to Soulsby[3] the rate of development of the first instar larvae varies considerably, this instar remaining in the nasal passages for two weeks to nine months during the cold months. The second instar passes into the frontal sinuses and may rapidly develop to maturity, leaving the sheep 25 days or considerably longer after infestation.

It would appear from a comparison of the results obtained in the untreated controls slaughtered on the day of treatment and those slaughtered 10 or 11 days later that a number of third instar larvae had matured and left the sheep during the intervening time; the mean number of third instar larvae had decreased from four to two and the highest total number from 11 to five.

At the same time it is possible that new infestations were acquired on the pasture as reflected in the increased burdens of first and second instar larvae in the control sheep slaughtered at the same time as the treated sheep. The combined mean total of first and second instar larvae in the controls slaughtered on the day of treatment was four larvae and the highest individual total was nine larvae. In the sheep slaughtered 10 and 11 days later the combined total had risen to 10 larvae and no fewer than eight of the 11 sheep had combined individual totals of nine or more first and second instar larvae.

If a new infestation was indeed acquired on the pastures at the laboratory this was certainly not reflected in the larval burdens of the treated sheep, all of which were negative for living larvae. Not only is rafoxanide effective against all the larval stadia but it might have a residual effect preventing reinfestation for a period of at least 11 days. The latter contention, however, can not be substantiated conclusively from the present results, which rely heavily on the normal extensive variations which occur in the numbers of larvae recovered from naturally infested sheep. The possibility of such a residual effect certainly warrants further investigation.

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OPSOMMING

SUMMARY

SIMPOSIUM OOR GEVARE EN WANGEBRUIK VAN ANTIBIOTIKA GELEWER BY DIE ALGEMENE JAARVERGADERING VAN DIE TAK WES-TRANSVAAL VAN DIE SAVMV GEHOU TE POTCHEFSTROOM, 29 MEI 1971

1. BIOFARMASEUTIESE EN FARMAKOKINETIESE ASPEKTE VAN ANTIBIOTIKA EN SULFOONAMIEDE

M. C. B. VAN OUDTSHOORN

Departement Farmaseutika, Potchefstroomse Universiteit vir C.H.O.

Die teoretiese en praktiese aspekte van biofarmaseutika en farmakokinetika wat betrekking het op die toediening van antibiotika en sulfoonamiede is bespreek. Hierby is 'n oorsig oor die farmakokinetiese modelle wat van toepassing is en 'n verduideliking van die doseringsintervalteorie gelewer. Die belangrike faktore wat geneesmiddelbeskikbaarheid beïnvloed is genoem en die probleem van generiese ekwivalente is beklemtoon.

(Dit word beoog om hierdie referaat ten volle te publiseer as een van die reeks „Refresher Courses in Pharmacology". Red.)

2. DIE GEVARE EN NADELIGE GEVOLGE BY MENS EN DIER VAN DIE WANGEBRUIK VAN ANTIBIOTIKA

G. F. C. TROSKIE

Destyds President van die Mediese Vereniging van S.A. Mediese praktisyn, Kroonstad.

INLEIDING

Die spreker meen hierdie is 'n wesenlike probleem wat samespreking en samewerking tussen die drie susterprofessies dringend vereis, aangesien al drie in diens van die mensdom staan en eintlik nou verwant is.

Afgesien van swak genetiese eienskappe is infeksies die mees algemene oorsaak van siekte en dood by mens en dier. Die drie professies moet dus saam staan in hul stryd hierteen. Alhoewel groot vooruitgang gemaak is, was dit nie sonder gevaar en nadele vir beide mens en dier nie.

GESKIEDKUNDIGE AGTERGROND

Die spreker het kortliks terug verwys na die ontwikkeling van medikamente oor die afgelope aantal jare. Daar is stelselmatige vooruitgang gemaak, maar elke nuwe middel wat ontwikkel was, het wel tot 'n meerdere of mindere mate sy spesifieke gevare ingehou.

Gelyktydig met bogenoemde het ook die kennis aangaande bakterieë toegeneem, sodat die maniere waarop die ontwikkeling, voortplanting en lewe van die kiem vernietig kan word met minimum beskadiging van menslike/dierlike selle ooreenstemmend toegeneem het.

BASIESE WERKING

'n Antibiotikum word gedefiniëer as 'n chemiese samestelling wat deur mikroorganismes, hoofsaaklik swamme, vervaardig word en die vermoë besit om in klein konsentrasies ander mikro-organismes te inhibeer. Werking is bakteriostaties of bakteriosidies. Sommige antibiotika variëer in werking volgens dosis toegedien.

Sommige kieme besit 'n natuurlike weerstand, ander verwerf 'n weerstand teen 'n

bepaalde antibiotikum. Dit kan geskied volgens i) aanpassing of ii) mutasie, d.i. die gevoeliges word vernietig terwyl die resistentes wat oorbly 'n ongevoelige, virulente stam vorm.

GEVARE VAN ANTIBIOTIKA

Spreker maan om altyd 'n spesifieke diagnose te verkry en daarvolgens te behandel en nie slegs na 'n breëspektrum antibiotikum te gryp en die beste te hoop nie. Hierdie verstandelike traagheid en die doeltreffendheid van hedendaagse antibiotika het daartoe gelei dat pasiënte, boere en selfs aptekers middels vryelik gebruik of voorskryf sonder enige spesifieke diagnose. Hierdie onoordeelkundige gebruik het vele nadele waarop mee tertyd gewys sal word.

Vergiftiging is een van die ernstigste gevare, met onkunde aan die een kant en oorangstigheid aan die ander kant, wat dikwels aanleiding gee tot oordosering. Hier volg etlike moontlike gevolge van bogenoemde:

i) Lokale beskadiging, bv. Aureomycin subkutaan toegedien.

ii) Direkte maagdermkanaalbeskadiging en irritasie; versteuring van normale dermflora met oormatige swamgroei.

iii) Direkte lewerbeskadiging word deur sekere middels bewerkstellig, veral in die geval van swangerskap en nierpatologie.

iv) Nierbeskadiging — sekere middels is direk nefrotoksies.

v) Ingeval van die senuweestelsel, sentraal of perifereel, moet veral streptomisien en chlooramfenikol genoem word.

vi) Die hemopoëtiese stelsel word taamlik algemeen aangetas, met bv. methemoglobinemie, hemolitiese anemie (chlooramfenikol en streptomisien), aplastiese anemie (chlooramfenikol), agranulositose (tetrasikliene) en purpura (penisilliën, tetrasikliene en streptomisien) as gevolg.

vii) Beenbeskadiging — veral fetus en jong kinders/diere is vatbaar, bv. tetrasiklien.

c) Allergiese reaksies is die mees algemene verskynsel. Geen antibiotikum is sonder dié gevaar nie. Dit kan 'n vinnige, dodelike anafilakse wees, soos in geval van penisillien. Die reaksie kan so te sê enige sisteem of orgaan aantas.

d) Weerstandigheid: 'n Weerstandbiedende, virulente kiem ontstaan merendeel a.g.v.

a) te lae dosis,

b) te kort tydperk van toediening,

c) te lang toediening.

Hierdie is 'n wesenlike probleem wat al hoe meer op die voorgrond tree: die vrye, onverantwoordelike gebruik van antibiotika is hiervoor verantwoordelik.

GEVARE EN NEWE-EFFEKTE WAT DIE GEBRUIK VAN ANTIBIOTIKA BY DIE DIER VIR DIE MENS INHOU

Die gebruik van antibiotika by diere geskied:

a) as byvoeging by voeding. Dit is 'n bewese feit dat die byvoeging wel groei tot op 'n sekere punt stimuleer. Meestal word penisilliene, oksitetrasikliene, chloortetrasikliene, tetrasikliene en streptomisien veral by pluimvee, varke en beeste gebruik.

Die konsentrasie is merendeel so laag dat dit nie bakteriosidies kan wees nie, maar wel genoegsaam om 'n gevaarlike, weerstandbiedende kiem te verwek. Andersins is dit egter so laag dat die produk nie genoegsaam antibiotika bevat om 'n wesenlike gevaar in te hou behalwe vir die hipersensitiewe persoon nie.

b) by behandeling van infeksies. As gevolg van die behandeling van siek diere vind ons wel antibiotika in dierlike produkte vir menslike gebruik bedoel.

Melk word die meeste gekontamineer, aangesien mastitisbehandeling baie algemeen is. Konsentrasies is gewoonlik nie voldoende om te vergiftig nie, maar die allergiese persoon kan geweldige reaksie ontwikkel en die herhaalde gebruik van besmette melk gee aanleiding tot ontwikkeling van allergieë.

Vleis is ook dikwels besoedel. Dit word aanbeveel om eers drie dae na behandeling te slag, maar daar is min of meer geen beheer hieroor nie. Meestal, egter, is die konsentrasie laag en kook vernietig die antibiotikum ook tot groot mate, sodat die wesentlike gevaar gering is.

Eiers bevat ook dikwels redelike konsentrasies. Die Wêreld-Gesondheidsorganisasie se komitee oor voedsel het aanbeveel dat geen eiers van pluimvee, met antibiotika behandel, verkoop moet word nie.

Kaas is ook soms besmet, maar aangesien die teenwoordigheid van antibiotika die maak van kaas belemmer, is dit nie vir die verbruiker 'n groot probleem nie.

c) by bewaring en preservering. Vleis, vis en pluimvee word dikwels met antibiotika behandel om langer te hou bv. deur i/v inspuiting kort voor slagting. Weereens ver-

nietig kook die antibiotika in 'n groot mate. Waar egter wel gevaar ontstaan, is dat die antibiotikum die verrottingsmeganismes beperk en sekere *Salmonella* spesies van 'n weerstandbiedende stam dan die voedsel kan betree en aanleiding tot voedselvergiftiging gee. (Die metode word in Suid-Afrika onder die wet verbied).

Moontlike gevare vir die mens:

a) Vergiftiging. Hierop is reeds gewys by direkte gebruik. Ook bestaan die gevaar dat as gevolg van onverantwoordelikheid dit in die hande van kinders kan beland. Van groot en wesentlike belang is die praktyk, wat al hoe meer na vore tree, nl. die gebruik van veeartsenykundige antibiotika wat deur die onkundige boer ter behandeling van sy arbeiders aangewend word, soms met ernstige gevolge.

b) Allergiese reaksies. Selfs die onbewuste hantering kan hiertoe aanleiding gee.

c) Besmetting met weerstandbiedende kieme. Onoordeelkundige en ondoeltreffende aanwending van antibiotika hou werklik 'n groot gevaar vir die mens in wanneer 'n weerstandbiedende kiem in die dier ontstaan en na die mens oorgedra word.

Aanbevelings:

a) Enige een wat antibiotika hanteer moet ten volle op hoogte wees van die nadele en gevare soos hierbo uiteengesit. Die verskaffing van inligting aan leke-gebruikers is noodsaaklik.

b) Steeds diepere navorsing oor al die bogenoemde gevare.

c) Toepassing van wetgewing om bestaande gevare te bekamp.

GEVOLGTREKKINGS

1. Dat daar geweldige vordering gemaak is in die stryd teen bakteriële infeksie deur die gebruik van antibiotika.
2. Dat antibiotika merendeel 'n relatief lae toksisiteit besit.
3. Dat die grootste gevare van antibiotika vir die mens die allergiese reaksies en ontwikkeling van weerstand by kieme is.
4. Dat daar eintlik baie min gevaar vir die mens ontstaan in die gebruik van antibiotika by diere.
5. Dat, nieteenstaande al die dringende waarskuwings, baie meer mense en diere sterf aan infeksies as aan antibiotika.

3. DIE GEVARE EN NADELIGE EFFEKTE VAN WANGEBRUIK VAN ANTIBIOTIKA BY DIERE

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GEBRUIKE VAN ANTIBIOTIKA

A. *As Geneesmiddels:*

Antibiotika is kortliks geklassifiseer en is daarop gewys dat spesifieke siekte-veroorsakende organismes meer vatbaar vir die een as die ander is. Die verskillende werkingswyses van antibiotika is uiteengesit. Dit is beklemtoon dat bakteriedodende en bakteriostatiese middels dikwels antagonisties kan wees. Eiwitbinding en die wyse en spoed van uitskeiding, behoort in gedagte gehou te word by die beslissing van watter middel gebruik moet word in elke besondere geval.

B. *In dierevoedsel en as voedselpreserveermiddels:*

Grootskaalse gebruik (i) in die bestryding, voorbehoeding en genesing van siektes by mens en dier; (ii) as groeistimuleerders; (iii) as voedselpreserveermiddels, skep ernstige en wêreldwye probleme. Veral die volgende hou groot gevaar in: (i) diere gevoer met antibiotiese byvoegsels (kalwers, varke, pluimvee); (ii) diere as sodanig behandel met antibiotika; (iii) tuinboukundige gebruik; en (v) as voedselpreserveermiddels.

DIE GEVOLGE VAN WANGEBRUIK VAN ANTIBIOTIKA

Volgende nadele kan ontstaan as antibiotika gebruik word as groeistimuleerders of preserveermiddels:

(i) resistente patogene kieme (verworwe weerstand);
(ii) moontlike vergiftiging;
(iii) moontlike benadeling van reproduksie;
(iv) tekorte, veral aan die vitamien-B-kompleks a.g.v. selektiewe onderdrukking;
(v) allerhande swamsiektes a.g.v. kiemonderdrukking;
(vi) onderdrukking van nie-virulente besmetting wat immuniteit stimuleer;
(vii) moontlike hormonale versteuring;
(viii) spysverteringsteurnisse, nie net a.g.v. versteuring van maagdermflora nie, maar ook van die dermwand self.

Daar word veral sterk klem gelê op die gevaar wat die ontstaan van kieme met weerstand teen antibiotika vir die mens inhou. Etlike tragiese gevalle is aangehaal. Sulke resistente bakterieë is permanent, daar ontstaan kruisweerstand en behandeling is vrugteloos. Veral die lae-graadse, langdurige toevoeging van antibiotika word as die groot sondaar aangegee, alhoewel selfs gewone terapeutiese behandeling hiertoe aanleiding kan gee.

Die toevoeging van antibiotiese middels by veevoere moet ten alle tye ten strengste afgekeur word. Antibiotika teenwoordig in vleis en melk kan ook groot gevaar vir verbruikers inhou.

DIE NADELIGE NEWE-EFFEKTE VAN ANTIBIOTIKA

Daar bestaan 'n groot aantal ongewenste, nadelige en gevaarlike newe-effekte van antibiotika soos in menslike en dierlike geneeskunde gebruik. Voorbehoedende gebruik en gebruik by jong kinders/diere behoort ten alle tye baie versigtig toegepas te word.

A. *Allergie:*

So te sê alle antibiotika is tot min of meerdere mate hierto in staat, met penisillien die mees algemene: veral in melk kan penisillien e.a. rampspoedige gevolge hê. Baba's met melkonverdraagsaamheid verteenwoordig meestal 'n allergiese reaksie op antibiotiese reste. Penisillien-kontaminasie is in sekere stedelike gebiede tot in 60% van monsters gevind.

B. *Asemhaling*

Sekere antibiotika toon 'n kurariserende werking (streptomisien).

C. *Been*

Tetrasikliene veroorsaak geel verkleuring van bene en tande. Misvorming van tande en bene van die vrug en van kinders tot op 8 jaar ouderdom vind plaas as die antibiotika deur swanger moeders geneem word.

D. Bloed

Hier vind verskeie reaksies plaas bv. aplastiese anemie (chlooramfenikol, neomisien, tetrasikliene e.a.), bloeddrukveranderinge, tromboflebitis, hemolitiese anemie en veranderings in stollingstyd.

E. *Elektrolietversteuring*

F. *Gehoor*

Streptomisien, neomisien e.a. kan die gehoor aantas, veral as nier- en lewerpatologie teenwoordig is. Langdurige toediening moet vermy word.

G. *Lewer*

Tetrasikliene, paromomisien, amfoterisien B, ens., kan lewerskade met geelsug veroorsaak. Griseofulvien staan onder verdenking as 'n moontlike oorsaak van lewerkanker.

H. *Maagdermkanaal*

Behalwe wanbalans in die dermflora, vind direkte aantasting van die dermwand ook plaas.

I. *Niere*

'n Groot aantal middels veroorsaak verskillende tipes patologie van die nier.

J. *Oog*

Chlooramfenikol e.a. kan optiese neuritis veroorsaak, asook periorbitale edeem met komplikasies.

K. *Senuweestelsel*

Penisillien, chlooramfenikol e.a. antibiotika veroorsaak neuritis en verhoogde intrakraniale druk met komplikasies.

L. *Teratisme*

Teratogene werking met gevolglike anatomiese gedrogte en verhoogde sterftesyfer van die fetus met aborsie, is eksperimenteel met verskillende antibiotika behaal, bv. met chlooramfenikol.

M. *Vaginitis*

Dit is bekend dat antibiotika ontstekingsreaksies in dié orgaan kan veroorsaak.

ONDERLINGE WISSELWERKING

Die ingewikkelde probleem van sinergisme of antagonisme van die antibiotiese middels kan ten goede of ten kwade aangewend word. Tetrasiklienpenisilliensaamvoegings moet vermy word.

OPSOMMING EN BESPREKING

Alhoewel antibiotika as waardevolle geneesmiddels 'n onmisbare deel van ons lewe geword het, kan hulle talle gevare en newe-effekte inhou as hule nie op 'n oordeelkundige en wetenskaplike wyse aangewend word nie.

Weereens word benadruk dat die ontstaan van resistente patogene organismes, waarby voedselbyvoegings spesiale aandag trek, een van die uitstaande gevare is wat antibiotika vir ons in die toekoms inhou en die spreker bepleit ernstige aandag aan hierdie saak.

Ter afsluiting beveel die spreker aan dat meer aandag aan die sulfoonamiede gegee moet word want, ten spyte van lang geskrifte oor hul toksisiteit, is die kortwerkende sulfoonamiede besonder veilig vir oud en jonk.

4. DIE GEBRUIK EN MISBRUIK VAN ANTIBIOTIKA EN ANTIBAKTERIESE MIDDELS STAPPE OM GEVARE TE BEKAMP

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INLEIDING

Daar bestaan definitief 'n verskerpte belangstelling in hierdie onderwerp oorsee sowel as plaaslik. Reeds in 1960 is daar in Brittanje 'n komitee saamgestel om die moontlike gevare wat insluiting van antibiotika in veevoere vir die mens mag inhou, te ondersoek. Volgens dié komitee kon hulle geen definitiewe gevare vind nie, maar beveel tog aan dat die saak deeglik dopgehou behoort te word.

So is daar alreeds in 1955 'n besmetlike oordraagbare faktor in *Shigella* spp. in Japan vasgestel en in 1962 'n soortgelyke verskynsel ook in Brittanje. Verskeie ander komitees het deur die jare die saak ondersoek, maar alhoewel daar geen gevare vasgestel kon word nie, het dit wel gelei tot die neerlegging van regulasies hier en oorsee.

GEBRUIKSYFERS VAN ANTIBIOTIKA

Kortliks en d.m.v. tabelle is die massale gebruik van *antibiotika in die wêreld aangedui*. Vir menslike gebruik is bv. in 1970 in Suid-Afrika R8 859 000 se antibiotika gebruik. Veeratsenykundige en landboukundige gebruik van antibiotika word beraam op R1,5 miljoen en word rofweg as volg verdeel:

Veevoere — R480,000
Parenteraal en oraal — R600 000
Mastitis — R250 000
Enteritis — R100 000

Hierdie totaal kan vergelyk word met R1 miljoen vir entstowwe en R3 miljoen vir wurmmiddels.

ANTIBIOTIKA

Die spreker definieer en bespreek kortliks die verskeie werkinge van antibiotika. 'n Groepering van antimikrobiese middels in tabelvorm is aangebied.

MIDDELBESTANDHEID

Minstens drie vorms word herken: 1. verwekking van weerstand deur kontak met 'n middel; 2. natuurlike weerstand waar geen kontak nodig is nie; 3. besmetlike/oordraaglike weerstand. 'n Weerstandoordraagbaarheidsfaktor moet teenwoordig wees om laasgenoemde moontlik te maak. Anders word dit slegs na die nageslag oorgedra. Skynbaar het dit alreeds bestaan voordat antibiotika kommersiël beskikbaar geword het. Die groot gevaar van middelweerstand lê dus by uitstek in die kruisweerstand wat mag ontwikkel of oorgedra word.

DIE GEBRUIK VAN ANTIBIOTIKA

In die meeste lande ter wêreld word antibiotika vir veegesondheid in hoë mate in veevoere gebruik, terwyl die plaaslike veearts meer dink in terme van terapeutiese of parenterale gebruik. Terapeutiese gebruik skakel egter nie die gevare verbonde aan die gebruik van antibiotika, nl. sensitiwiteit of weerstandsontwikkeling, uit nie. So word vermoed dat die weerstand van *Salmonella* spp. in kalwers teen Ampicillin deur terapeutiese en nie deur voergebruik nie, verwek is.

Aangesien daar onvoldoende veeartse in Suid-Afrika is om totale beheer oor dieregesondheid uit te oefen, sal dit dus nodig bly dat antibakteriese middels direk aan die boer beskikbaar gestel moet word. Die aanbeveling dat sensitiwiteitsbepalings terapie moet voorafgaan, is dikwels nie net onprakties nie maar selfs onmoontlik.

Die volgende word voorgestel om die menslike gemeenskap teen middelbestandheid te beskerm:

1. Beperkte gebruik, dws. slegs waar uiters noodsaaklik.
2. Rotasiegebruik van verskeie middels.
3. Vinnigge afwisseling van middels.
4. Kombinasies, veral die wat sinergisties blyk te wees.

Dit wil egter voorkom asof middelweerstand 'n onvermydelike euwel van die gebruik van antibiotika sal bly, of dit nou korrek of verkeerdelik gebruik word.

DIE BEHEER VAN DIE GEBRUIK VAN ANTIBIOTIKA

Selfs die Europese gemeenskapsmark het onlangs beheermaatreëls in hierdie verband ingevoer. Die Britse vereistes stel dit dit duidelik dat sekere antibiotika slegs terapeuties of op spesiale voorskrif in voere gebruik mag word, terwyl andere vryelik gebruik mag word. Die vereistes is egter dat sulke middels (a) nie of selde by mense gebruik word, (b) nie met kruisweerstand geassosiëer word nie, en (c) van werklike ekonomiese belang vir diereproduksie is.

Reeds in 1966 is soortgelyke beginsels in S.A. aanvaar. Drie middels word tans teen groeivlak toegelaat, nl. basitrasien, nitrovien en virginiomisien. Ander middels word slegs teen terapeutiese vlakke toegelaat, dws. voer of water is slegs 'n toedieningsmedium vir 'n bepaalde siektetoestand en vir 'n kort periode.

Verder is daar kortliks gewys op die wette betrokke by registrasie en gebruik van die middels in Suid-Afrika. So is daar in G.K. 1009 van 7 Julie 1967 gespesifiseer dat melk vir 72 uur na die binne-uierse gebruik van antibiotika nie vir menslike gebruik aangewend mag word nie.

Al hierdie wetgewing is egter nutteloos indien dit nie voldoende beheer kan word nie. Dit blyk die grootste enkele tekortkoming op die oomblik te wees. Tog is die veearts wettig aanspreeklik om dié middels slegs vir sy pasiënte voor te skryf en die eienaar aangaande die gevare daaraan verbonde in te lig.

DIE TOEKOMS

Dit is vir almal duidelik dat strenger wêreldwye beheer van antibiotika noodwendig voor die deur staan. Dit moet wetenskaplik georiënteerd wees, liewers as emosioneel. Daar is bv. gevind dat 'n kombinasie van twee middels, wat afsonderlik ondoeltreffend is,

tesame wel teen 'n betrokke stam effektief is. Dan is daar ook nog die nie-antibakteriese middels wat net so wel as groeistimulante bygevoeg kan word, bv. arseen en kopersulfaat.

Meer navorsing aangaande die skadelike effekte deur die gebruik van laboratoriumdiere, veral gnotobiotiese en SPV-diere, kan ook nuwe idees voortbring. Die veearts in die nywerheid het wesentlike belang by hierdie aangeleenthede, werk aktief saam en dien die belange van ons professie in die gemeenskap.

5. DIE PUBLIEK EN DIE VEEARTS IN DIE ONTVANGS EN GEBRUIK VAN VEERATSENYKUNDIGE MIDDELS

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DIE VERLEDE

Die professie het eers 'n minimum kennis en medisyne gehad. Nogtans was die veearts al persoon met nodige vaardigheid en kennis. Hoofdoel was die gesondheid van die veestapel: vir advies is daar na hom opgesien.

DIE HEDE

Vandag is daar 'n massa kennis en medisyne tot ons beskikking. Medisyne het kragtig, doeltreffend en gevaarlik geword. Die kursus vir 'n veearts het ook moeiliker geword en om steeds op hoogte te bly met nuwe ontwikkelinge is 'n voltydse taak.

Die praktisyn is streng gebonde aan etiese kodes en regulasies. Hy is nou hoogs gekwalifiseerd en dien dus as die gewenste middelman tussen die navorser en die publiek: daarvoor moet hy noodwendig op hoogte bly met die nuutste verwikkelinge, asook met die publiek se behoeftes.

So vind ons dit wel in die mediese wêreld, maar beslis nie in ons eie professie nie. Vervolgens word punte aangehaal om lsg. stelling te onderskraag:

1. Praktisyns word nie meer benodig om nuwe produkte aan die publiek bekend te stel nie. Die pers en firmas se agente sorg hiervoor. Yslike advertensieveldtogte word van stapel gestuur en solank as wat 'n middel geregistreer is, kan dit na hartelus opgehemel word; die publiek het egter nie die vaagste benul van die produk se werklike waarde nie.

Selfs 'n veemiddel-indeks is reeds gratis aan die publiek gestuur. So word hulle dus op hoogte gehou van nuwe middels en hoe om hulle te gebruik. Dit gaan tot só ver dat praktisyns soms van 'n nuwe middel via die lekepers verneem.

2. Die praktisyns se diagnose word steeds minder benodig. Siektes word volledig in die lekepers beskryf met oorsaak, simptome, nadoodse letsels en natuurlik die firma se middel vir behandeling. Onderaan sulke advertensies en inligtingspamflette staan dan in klein lettertjies gedruk: „Wanneer daar twyfel bestaan oor u diagnose, raadpleeg u veearts."

Selfs volledige handboeke oor veesiektes word deur sekere firmas uitgegee, terwyl die massa pamflette in die voorligtingsbeampte se kantore die staat se deel tot die inligtingsveldtog is.

3. Dit wil voorkom asof dit in sekere instansies van meer belang is om die publiek as die praktisyns op hoogte van die nuutste navorsingsontwikkelinge te hou.

4. Is daar werklik medisyne wat net aan die veearts beskikbaar is? Meestal kan dieselfde middel in 'n ander vorm vrylik gekoop word. Die mediese praktisyn is tot 'n groot mate beskerm, maar sodra daar gesê word dat 'n middel vir dierlike gebruik verlang word, is dit gou tot die leek se beskikking. Is dit dan ook nie die oorsaak van die toenemende gebruik om veemiddels vir menslike gebruik aan te wend nie? Dikwels word die veearts eers ingeroep as die dier vêr heen is, en dan kan hy slegs weer dieselfde middel as die boer gebruik, maar gelukkig soms in 'n onherkenbare vorm. In die verlede, toe medisyne nog aangemaak was, was die apteker 'n groot hulp. Vandag moet hierdie opgeleide persoon hom egter wend tot ander artikels, want medisyne word voorsien en hy is net daar om dit te oorhandig.

Daarenteen vind ons vandag die koöperasie of algemene handelaar se klerk, met absoluut geen spesifieke opleiding en meestal nie eers veel skoolprestasie nie, wat 'n magdom medisyne, antibiotika en gifstowwe hanteer. Die handelsverteenwoordiger hou hom op hoogte met al die literatuur oor wat nuut op die mark is en hy is dus altyd in staat om die „beste" middel te voorsien. Daar is etlike

gevalle bekend waar vergiftiging voorgekom het a.g.v. die uitgee van verkeerde stowwe, dikwels in ongeïdentifiseerde houers. Dit wil dus voorkom asof die handjievol middels, wat wel wettig beheer word, meer 'n klug in die praktyk is as iets anders.

As 'n jong kollega die volgende reguit vrae aan sy ouer kollegas stel, is 'n direkte antwoord dikwels baie moeilik:

a. Is die gesogte professie waarin hy hom bevind, werklik so gesog?

b. Is al sy kollegas werklik lojaal teenoor mekaar en die professie?

c. Is hy en sy professie werklik beskerm?

d. Word hy en sy professie werklik erken en gebruik vir die doel waarvoor hy gekwalifiseer is?

Daarenteen vind ons dat persone met allerminste kwalifikasies en opleiding dikwels beter besoldig is as die salaristrekkende veearts en die kanse is goed dat daar 'n sterk vakbond bestaan om na eersgenoemde se belange om te sien.

DIE TOEKOMS

Die toekoms berus geheel-en-al by die professie self. As ons op die huidige trant wil voortgaan, sal ons moet begin om die kettingwinkels in die stede toe te laat om, soos die koöperasies op die platteland, alle medisynes, antibiotika, ens., tesame met voorligting aan die publiek te verskaf. Almal sal besef dat dit 'n selfmoordpoging vir ons professie sal wees. Die vraag is nou net hoe vêr het ons reeds op daardie pad gevorder?

Dit word werklik hoog tyd dat die volgende aanbevelings ernstige oorweging geniet:

i. Die professie moet ophou met die uitgebreide opleiding van leke en kwaksalwers.

ii. Daadwerklike hersiening van:—

a. watter middels deur leke versprei mag word;

b. watter middels vrylik aan die publiek beskikbaar gestel mag word.

c. watter middels slegs aan die veearts beskikbaar gestel mag word.

iii. Registrasie van etiese middels. Meeste etiese middels aan die veearts is ongeregistreerd, dus bestaan daar geen sekerheid omtrent kwaliteit en doeltreffendheid nie. Alhoewel meeste firmas dit goed bedoel, maak sekeres wel misbruik hiervan.

iv. Etiese middels se pryse moet gestandaardiseer word.

v. Gekanaliseerde bekendstelling van alle nuwe middels direk aan die veearts, tesame met farmakologie, ens.

vi. Opknappingskursusse in die vorm van liasseerbare literatuur wat gereeld aan die professie gestuur word om sodoende hulle op hoogte te hou met nuwe verwikkelinge.

Dit blyk dus kortliks die stand van die praktisyn in die samelewing te wees. Weereens word gevra: is daar enige ander professie of beroep wat op so 'n georganiseerde en aanvaarde wyse leke oplei ten koste van hulleself?

6. UITSKAKELING VAN WANGEBRUIK EN NADELIGE EFFEKTE VAN ANTIBIOTIKA

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Spreker skets kortliks die gevare verbonde aan wandistribusie van antibiotika en meen dat ons eersdaags op veeartsenykundige terrein met 'n sluimerende gevaarkompleks te kampe gaan hê, sover dit die gebruik, wangebruik en wandistribusie van antibiotika aanbetref.

Die massale gebruik van voer en terapeutiese antibiotika in 'n steeds intensiewer wordende biologiese milieu, wêreldwyd, tesame met nuut verworwe kennis aangaande mikrobiologiese middelbestandheid, kruisweerstandsontwikkeling, ens., laat 'n onbeantwoorde vraag opduik, en is 'n saak van groot belang vir elke lid van die professie.

Die staat verlaat hom enersyds op die integriteit van die professionele persoon om op terapeutiese vlak middelmisbruik en die gevare daaraan verbonde te bekamp, maar laat toe dat leke-misbruik en die ongekanali-

seerde bekombaarheid van middels, produkte vir dierlike oorsprong direk en latent besoedel en skep daardeur 'n toekomstige volksgesondheidsprobleem.

Die farmaseutiese industrie moet nie in oorywer om verkope te stimuleer hom skuldig maak aan wankanalisasie van middels nie.

Direkte benadeling van die professie lê by wankanalisasie van middels, veral antibiotika, wat indirek ook tot lekepraktyk aanleiding gee.

Die professie, wat nog aan opbloei is, word versmoor onder 'n massa handelspropaganda, wat te dikwels die status van die veearts misken en self die leiding wil neem om d.m.v. leke voorligting te gee en deur 'n leke-medium probleme te diagnoseer en te probeer oplos.

Dit is redelik duidelik dat wankanalisasie van 'n middel misbruik daarvan in die hand werk en dat laasgenoemde weer 'n bron van gevaar vir mens en dier skep.

Daar bestaan een belangrike manier om wankanalisasie van antibiotika te voorkom of te verminder en daarmee saam die gevare van misbruik te verminder of uit te skakel, en dit is om van owerheidsweë 'n meer selektiewe distribusiepatroon vir antibiotika te bewerkstellig met daarby meer doelgerigte betrekking van die professie.

Dit is nie die standpunt dat die veeeienaar nie antibiotika mag bekom nie, maar dat hy dit, let wel, sover as wat geografies en praktïes moontlik is, onder jurisdiksie van veterinêre supervisie, of voorligting doen.

Die ontwikkeling van etiese produkte het ten doel die uitskakeling van wankanalisasie en moet ten volle deur die professie ondersteun word.

Die professie moet meer daarop konsentreer om middels self aan kliënte te verskaf, instede daarvan om kliënte van preskripsies te voorsien.

Daar moet 'n voorskrifklassifikasie kom vir antibiotika wat deur handelskanale gehanteer word met 'n keuringstelsel vir handelsinstansies wat antibiotika hanteer.

'n Geografiese afbakening vir verspreiding van antibiotika slegs deur die professie in sekere gebiede moet soos nodig ingestel word.

BOOK REVIEW BOEKRESENSIE

LEHRBUCH DER ALLGEMEINEN CHIRURGIE FÜR TIERÄRZTE

PROF. DR. WALTHER BOLZ UNTER MITARBEIT VON PROF. DR. OLOF DIETZ

V. E. B. Gustav Fischer Verlag, Jena. 1970. Pp. 581. Figs 402 (partly in colour) Price not stated.

This book covers in detail general surgical pathology, e.g. superficial wounds occupy about 80 pages, if space devoted to haemorrhage, pain and functional disturbances is not included. This gives an idea as to the depth of the information given. This is very necessary because it provides the basis of surgical practice. Unfortunately surgical pathology or general surgery, as it is also called, frequently receives but scant attention from those practising or intending to practise advanced surgery. There is, indeed, a definite hiatus in English literature in this respect.

Besides its commendable features, there are certain considerations which could receive attention in a succeeding issue, e.g. more detailed operating theatre organization and technique; the most recent developments regarding shock treatment; including the operation of an intensive care unit. In addition, the views on the pathogenesis of sialocoele differ from those presently accepted. A chapter on snake and insect bites would also be a welcome addition.

The book is printed on excellent paper and the illustrations are good. It is hoped that it will command a wide circle of readers as there is much to commend it.

C.F.B.H.

BOOK REVIEW BOEKRESENSIE

STEREOSCOPIC ATLAS OF CLINICAL OPHTHALMOLOGY OF DOMESTIC ANIMALS

H. E. JENSEN

The C. V. Mosby Company. Saint Louis. 1971. pp. 201. Figs 187 incl. 112 Stereoscopic views in colour on 16 View-Master reels and a View-Master compact viewer. Price $49.50.

This book encompasses 11 chapters beginning with examination of the eye and progressing through the next eight chapters with the pathology of the different anatomical parts. The tenth chapter deals with miscellaneous conditions, the eleventh with ocular therapeutics while a page is given to a short list of recommended reference books.

This is an excellent book. It deals with the various pathological conditions of the eye succinctly and clearly. The black and white photos in the body of the book are clear and illustrate the relevant parts well.

After reading the text the reader comes to the *pièce de resistance*, viz. the 112 stereoscopic slides in colour with viewer. This is a most excellent plan as the three dimensional pictures in colour are indistinguishable from the appearance of the actual living patient. No amount of written or verbal description would approximate the value of the stereoscopic picture. They, by themselves, present a valuable course in ophthalmological diagnosis.

This book is highly recommended to all clinicians taking more than casual interest in ophthalmology.

C.F.B.H.

LETTER TO THE EDITOR

AAN DIE REDAKSIE

CASEOUS LYMPHADENITIS IN SHEEP

Sir,

I wish to congratulate Dr. Nagy on his article "Ticks and Caseous Lymphadenitis in Sheep: Preliminary Observations" in the September issue of this journal (Jl S.A. vet. med. Ass. 42(3):227).

Merinos were found to be more susceptible to caseous lymphadenitis than other breeds or crossbreds. It is concluded that the Merino is more prone to abscess formation.

Although my observations fully support his findings with regard to the higher incidence of abscesses in Merinos, I cannot agree with his conclusion. The fact remains that, in contrast to other breeds and crossbreds, Merinos are regularly subjected to procedures such as shearing, crutching and Mules' operation. Furthermore, the fine body pleats of the more developed Merino predispose to more extensive shearing wounds and abrasions. Other breeds are either not or seldom shorn and are normally devoid of skin folds. By virtue of the common occurrence of skin wounds, Merinos are more exposed to infection of this nature. The common practice of first shearing older sheep, which are more likely to have abscesses, facilitates transmission to the young animals.

The above factors, as well as poor shearing shed hygiene and close contacts between wounds and infective material at this time, lead to a progressively greater incidence of infection.

In the light of the aforesaid, increased exposure rather than inherent susceptibility should be considered.

E. M. van Tonder.

Regional Veterinary Investigation Centre, Middelburg, Cape.

ANNOUNCEMENT

AANKONDIGING

INTERNATIONAL ATOMIC ENERGY AGENCY

SYMPOSIUM ON APPLICATIONS OF NUCLEAR ACTIVATION TECHNIQUES IN LIFE SCIENCES

Date: April 10—14, 1972.
Location: Ljubljana, Yugoslavia.
Organizers: International Atomic Energy Agency.
Scientific Secretaries: Dr. G. B. Cook and Dr. R. M. Parr. P.O. Box 590, A-1011, Vienna, Austria.

The Symposium will be concerned with the applications of nuclear activation techniques in the life sciences and the significance of the results obtained in such applications. It will therefore be concerned both with the techniques themselves and with the interpretation of the data which they yield. A symposium of the same title was held in Amsterdam, Netherlands, in 1967 and this, the second of the series, is intended to cover the advances made in the five year interval.

As regards techniques, topics to be discusses include sample preparation procedures, activation procedures and data processing systems, chemical separation procedures particularly in multicomponent systems, and biological analytical reference materials. As regards interpretation of data, results obtained in studies in both cellular and sub-cellular systems in plants and animals will be discussed. Contributions relating to agriculture, biochemistry, ecology, nutritional studies, pharmaceutics and pharmacology, as well as applications in medical diagnosis, research and therapy, will be included. Contributions relating to human ecology will deal especially with problems of public health, environmental pollution and food additives and contamination.

Further information and forms to accompany abstracts of papers intended for presentation at the Symposium may be obtained from national authorities for atomic energy matters. Abstracts must be submitted through these authorities so as to reach the International Atomic Energy Agency before December 13, 1971.

ABSTRACTS

THE ONDERSTEPOORT JOURNAL OF VETERINARY REASEARCH

Volume 37, Numbers 1, 2, 3 and 4, 1970

S. J. MYBURGH & J. DE V. DU TOIT. The influence of magnesium sulphate on the absorption, excretion and retention of calcium and phosphorus by sheep fed on phosphate supplemented rations. pp. 1-6.

Evidence is put forward showing that continuous excessive intakes of magnesium sulphate by sheep, for example in drinking water, may result in losses of calcium from the body. However, when the intakes of both these minerals are greater than requirements the depressive effect on calcium may be overcome.

Since there is a close relationship between calcium and phosphorus metabolism any factor having a depressive effect on calcium may eventually affect phosphorus utilization.

R. M. McCULLY, M. E. KEEP & P. A. BASSON. Cytauxzoonosis in a giraffe [*Giraffa camelopardalis* (Linnaeus, 1758)] in Zululand. pp. 7—10.

Cytauxzoonosis is reported for the first time in a giraffe [*Giraffa camelopardalis* (Linnaeus, 1758)] that died naturally of the disease. Both histiotropic and erythrocytic parasites were found. The animal was very anaemic and and had marked haemoglobinuria. The most significant lesions were disseminated foci of haemorrhage and necrosis, especially in the liver, spleen and abomasum. Multiple haemorrhages also occurred on both pleura and peritoneum, within and on the entire gastro-intestinal tract, on the surface of the kidneys, subepicardially and in the urinary bladder. Very enlarged and even multinuclear cells heavily parasitized by schizonts were encountered in the lesions.

P. A. BASSON, R. M. McCULLY, S. P. KRUGER, J. W. VAN NIEKERK, E. YOUNG & V. DE VOS. Parasitic and other diseases of the African buffalo in the Kruger National Park. pp. 11—28.

One hundred randomly-collected buffalos [*Syncerus caffer* (Sparrman, 1779)] were autopsied, and tissues and parasites were collected for histopathological studies and identification, Blood mears were prepared from 92 animals, of which 97 per cent proved to be positive for piroplasms of an unidentified *Theileria* sp. Schizonts were found in the lymph nodes, liver, kidneys and myocardium of three young buffaloes. Granulomatous mycotic lymphadenitis of the peripheral lymph nodes occurred in 15 per cent of the animals and 85 per cent contained large sarcosporidial cysts in the oesophageal, pharyngeal and laryngeal musculature. Neoplasia, a squamous cell carcinoma, was encountered in only one animal. The most significant metazoan diseases were pentastomiasis (69 per cent), bilharziasis (62 per cent), cysticercosis (29 per cent), filariasis (16 per cent), hydatidosis (5 per cent) and mange caused by an unidentified *Psoroptes* sp. The nymphs of *Linguatula serrata* Frölich, 1779, were recovered mostly from the hepatic veins, sometimes from the right heart chambers and rarely from the liver substance, lymph nodes and pulmonary artery. *Schistosoma mattheei* Veglia & Le Roux, 1929 was mainly responsible for the bilharzial lesions. However, none of the buffaloes was found to be infected with besnoitiosis. As this disease is very common in antelopes in the same area this finding suggests that the buffalo is not susceptible to it. A list of the intestinal and other helminths encountered is given.

A. J. DE VOS. Studies on the host range of *Eimeria chinchillae* De Vos & Van der Westhuizen, 1968. pp. 29—36.

A case of an *Eimeria* sp. with a lack of host specificity is reported. *Eimeria chinchillae* De Vos & Van der Westhuizen, 1968, originally described from the chinchilla, was successfully transmitted to seven other rodents, *viz. Praomys (Mastomys) natalensis* (Smith, 1847), *Rhabdomys pumilio* (Sparrman, 1784), white mice, *Otomys irroratus* (Brants, 1827), white rats,

Mystromys albicaudatus (Smith, 1834) and *Arvicanthis niloticus* (Desmarest, 1822). Of these, the first four species were more susceptible to infection than the last three and showed symptoms of coccidiosis and even mortality after administration of 400,000 sporulated oocysts. Susceptible chinchillas were infected with oocysts obtained from *P. (M.) natalensis, R. pumilio,* white mice and white rats.

In the chinchilla the endogenous stages were found only in the caecum but in *P. (M.) natalensis, R. pumilio* and white mice small numbers were also found in the small intestine. The prepatent period of the infection in chinchillas was 8 or 9 days as compared to 7 or 8 days in the new hosts. The oocysts discharged by these animals were indistinguishable from those passed by chinchilla.

W. D. MALHERBE. A clinico-pathological study of bilharziasis in sheep. pp. 37—44.

Six healthy sheep were artificially infested through skin exposure with graded doses of cercariae of *Schistosoma mattheei* Veglia & Le Roux, 1929.

By means of laboratory tests the development of lesions due to the disease could be monitored at weekly intervals, so as to shed light on its pathogenesis.

In spite of lowering of the albumin fraction the total serum protein tended to rise, mainly as the result of an increase of beta and gamma globulin concentrations.

Bromsulphalein retention was increased in the more acute cases due to portal venous tree obstruction but transaminase activity and bilirubin concentration rose only occasionally and transiently, indicating minimal and passing hepatocellular damage.

Anaemia developed, normocytic in character, indicating the effect of simple blood loss. Leucocyte counts were not significanty affected but occasional rises of eosinophile percentage indicated transient episodes of sensitivity.

Acid-base disturbances were absent and some loss of sodium and potassium through the bowel wall was demonstrated.

Renal and mineral metabolism were not affected.

McCULLY, R. M., BASSON, P. A., DE VOS, V. and DE VOS, A. J. Uterine coccidiosis of the impala caused by *Eimeria neitzi* spec. nov. pp. 45—58.

Four cases of uterine coccidiosis showing readily-detectable macroscopic lesions were collected over a period of two years during which 451 female impalas [*Aepyceros melampus* (Lichtenstein, 1812)] were examined *post mortem* in the Kruger National Park. This report includes descriptions and illustrations of macroscopic and microscopic lesions and various developmental stages of sexual reproduction of the parasite. Because of certain morphological features of the oocysts, the causative organism was determined by the authors to be a new *Eimeria* for which they propose the name *Eimeria neitzi.* This coccidium parasitizes mainly the distal portions of the uterine glands and the adjacent surface epithelium Another distinctive feature of *Eimeria neitzi* is that sporogony occurs while the oocysts are still within host cells. On the basis of present knowledge, uterine coccidiosis is of very low incidence among impalas in the Kruger National Park and probably of little herd significance under the prevailing veld conditions. Its effect on reproduction was not determined.

HOWELL, P. G., KÜMM, N. A. & BOTHA, M. J. The application of improved techniques to the identification of strains of bluetongue virus. pp. 59—66.

Previously the isolation and identification of strains of bluetongue virus have been tedious, so that the introduction of techniques to shorten the delay was considered highly desirable.

Neutralization tests were conducted on the principle of the inhibition of plaque developments by serum diffusing through an agarose overlay. Fish spine beads filled with serum were placed on the overlaying cells. The utilization of serum mixtures further provided a saving of materials. These techniques when applied to a group of field specimens were found to give reliable results. Similarly homologous antibody in the convalescent serum of recovered donor sheep could be demonstrated by this technique and served to confirm the immunological classification of the samples.

PIENAAR, J. G. Electron microscopy of *Cowdria (Rickettsia) ruminantium* (Cowdry, 1926) in the endothelial cells of the vertebrate host. pp. 68—78.

The ultrastructure of *Cowdria ruminantium* was studied in thin sections of choroid plexus from experimentally infected sheep. Glutaraldehyde fixation and osmium tetroxide postfixation were used. The organism developed within the confines of a membrane-bound vacuole in the cytoplasm of endothelial cells. Four different forms, or particles, of the organism could be identified: small, intermediate, large and very large or giant forms. The various forms differed not only in size but also in the appearance and distribution of the nucleoid and "cytoplasmic" material within their inner structure. Within any one vacuole, in the host cell cytoplasm, the organisms were of the same form or type. Multiplication of the organism took place mainly by binary fission of the small and intermediate forms. Infrequent evidence was found that reproduction may also take place by the process of multiple budding and endosporulation. Small forms of the organism were embedded in a well developed matrix. Small and large forms were seen extracellularly, lying free in the lumen of blood vessels. Rarely small forms were seen in vacuoles in the cytoplasm of monocytes. The taxonomic position of *C. ruminantium* is discussed.

YOUNG, E., BASSON, P. A. & WEISS, K. E. Experimental infection of game animals with lumpy skin disease virus (prototype strain Neethling). pp. 79—88.

Calves of a giraffe, an impala, two buffaloes, and two adult black wildebeests were artificially infected with the Neethling type of lumpy disease virus. The giraffe and impala died with typical symptoms and lesions of the disease. Virological examinations confirmed the presence of lumpy diease virus in lesions of these animals. Histopathological studies revealed microscopic lesions typical of those reported in cattle suffering from lumpy skin disease. Both intracytoplasmic and intranuclear inclusions were noticed in various cell types and some additional histopathological changes are reported. Neither the wildebeests nor the buffaloes reacted clinically to artificial infection and they failed to show a rise in antibody titre subsequently.

DU PLESSIS, J. L. Pathogenesis of heartwater. I. *Cowdria ruminantium* in the lymph nodes of domestic ruminants. pp. 89—96.

The intracellular replication of *Cowdria ruminantium* (Cowdry, 1926) is described in reticulum cells of lymph nodes several days prior to the appearance of rickettsial colonies in vascular endothelial cells. This is suggestive of a developmental cycle of the parasite in the lymph nodes. The subinoculation of suspensions of these glands resulted in tranmission of the disease.

CAMERON, C. M. & SMIT, MARIA, C. Relationship of *Corynebacterium pseudotuberculosis* protoplasmic toxins to the exotoxin. pp. 97—104.

Corynebacterium pseudotuberculosis (Buchanan, 1911) protoplasm was separated into two toxic fractions by means of gel chromatography. Toxin neutralization tests indicated that one of the fractions is probably identical to the exotoxin.

BASSON, P. A., McCULLY, R. M. & BIGALKE, R. D. Observations on the pathogenesis of bovine and antelope strains of *Besnoitia besnoiti* (Marotel, 1912) infection in cattle and rabbits. pp. 105—126.

Histopathological studies were made on cattle and rabbits, artificially infected with either proliferative organisms of low and high passage level bovine strains of *Besnoitia besnoiti* (Marotel, 1912) grown in tissue culture and in rabbits, or cyst organisms from a natural bovine case of besnoitiosis. Rabbits similarly infected with either proliferative organisms of a low level rabbit-passaged blue wildebeest [*Connochaetes taurinus* (Burchell, 1823)] strain or cyst organisms from naturally infected blue wildebeest and impala [*Aepyceros melampus* (Lichtenstein, 1812)] were likewise used for comparative studies. Degenerative and necrotic vascular lesions, vasculitis and thrombosis, mainly of the medium and smaller veins and some arteries, were the most outstanding changes in the acute stages of the disease. These changes coincided with the parasitization of certain cells in the vessels such as the endothelium, where the organisms proliferate before the onset of the cystic stage. These basic lesions were reponsible for oedema, degenerative changes and even infarction, particularly in the testes and skin.

A histiocytic reaction and mild eosinophil infiltration were some of the other characteristic features.

The cystic stage in cattle apparently developed in enlarged histiocytes, which were recognizable 11 days after infection. These host cells became multinuclear and seemed to be responsible for the production of the cyst wall. The cysts reached maturity 71 days after infection. Reactions to cysts apparently commenced before any degeneration changes in the organisms were detectable and could have been preceded by such changes in the cyst wall. The The antelope strains of *B. besnoiti* were only very mildly pathogenic to rabbits, but passage during the acute stage of the disease of this host increased the pathogenicity considerably. Rabbits which were infected with bovine strains developed severe testicular and skin lesions, but these lesions were either absent or relatively mild in rabbits infected with antelope strains. In the latter, lesions were usually confined to internal tissues and organs such as the myocardium, gut and lungs and, more rarely, even in the adrenal, liver, kidneys and urinary bladder. However, cysts were rarely encountered in both these groups.

MYBURGH, S. J. & DU TOIT, J. DE V. A comparative study on the efficiency of water soluble phosphates and a dry phosphate lick for sheep fed on mature grass hay. pp. 127—136.

In a study with adolescent Merino sheep on a diet of mature grass hay, the supplementation with phosphates alone, either in the drinking water or as a dry lick, did not prevent loss of condition. Furthermore, in metabolism studies the phosphorus and nitrogen balances under these conditions were negative.

However, the daily inclusion of small allowances of lucerne hay and maize samp to the diet resulted in increased intakes of protein and carbohydrate and ensured positive metabolism balances for phosphorus and nitrogen. Under these improved feeding conditions body weights increased. The result of feeding this diet suggested that phosphate feeding at certain times may be unnecessary under practical conditions.

OELLERMANN, R. A. Plaque formation by African horsesickness virus and characterization of its RNA. pp. 137—144.

A method of plaque assay for African horsesickness virus (AHSV) is described. Three cell lines were tested of which BHK21 was the most satisfactory.

With an increase in Actinomycin D concentration, an increased inhibition of infective virus production was observed.

Sucrose gradient sedimentation analysis of AHSV-RNA revealed at least six components. Eight components were resolved by polyacrylamide gel electrophoresis. The molecular weight of the components varied from 0.5×10^6 to 2.8×10^6 daltons, with a total molecular weight estimate of 1.5×10^7 daltons for 10 segments in the viral genome. The significance of the relationship between AHSV, bluetongue virus and reovirus is discussed.

J. L. DU PLESSIS. Immunity in heartwater: I. A preliminary note on the role of serum antibiodies. pp. 147—150.

Ammonium sulphate precipitated gamma-globulins obtained from sheep immune to *Cowdria ruminantium* (Cowdry, 1926) failed to protect susceptible sheep against artificial infection by this parasite, irrespective of whether the globulin was given simultaneously with the experimental infection, or 6 days later, or after the commencement of the febrile reaction. This finding was supported by the absence of serum antibodies detectable by indirect immuno-fluorescence.

PROCOS, J., SCHUBERT, ANNETTE & BRIEL, B. J. Changes in the levels of plasma electrolytes and glucose in severe artificially induced acidosis in Merino sheep. pp. 151—156.

Severe acidosis was induced in wethers by the infusion of mineral and organic acids. No clinical signs apart from slight panting, were observed despite a fall in plasma glucose levels which occurred either spontaneously during the infusion of acetoacetic acid, or artificially following administration of insulin in conjuncton with hydrochloric acid infusions. It is suggested that acidosis *per se* is not immediately responsible for the induction of the nervous symptoms displayed by sheep suffering from pregnancy disease.

CAMERON, C. M. & FULS, W. J. P. Immune response to dead and live *Escherichia coli* vaccines and colostral transfer of immunity to calves and lambs. pp. 157—164.

Administration of a single injection of killed polyvalent *Escherichia coli* (Migula, 1895) vaccine to ewes and cows resulted in a marked increase in the mouse protective properties of their sera. Antibodies were effectively transferred via the colostrum and the degree of passive immunity thus obtained was sufficient to protect lambs against colisepticaemia.

Live vaccine prepared from rough strains was able to protect mice against infection but it did not elicit a good antibody response in ewes in terms of OK titres and mouse protecting antibodies.

WETZEL, H., NEVILL, E. M. & ERASMUS, B. J. Studies on the transmission of African horsesickness. pp. 165—168.

Laboratory-reared *Aedes aegupti* (Linnaeus, 1962), *Culex pipiens fatigans* Wiedemann, 1828, and trapcaught *Culicoides* biting midges were fed on African horsesickness (AHS) virus solutions and on horses infected with AHS. Attempts to isolate AHS virus from these insects from 1 to 40 days after feeding by intracerebral inoculation of suckling mice were unsuccessful. The successful artificial infection of mosquitoes with AHS virus and biological transmision of AHS virus by *Culicoides* spp. recorded by other workers could not be repeated. Multiplication of AHS virus in these insects will have to be shown before existing claims of successful biological transmission can be accepted completely.

JANSEN, B. C., KNOETZE, P. C. & VISSER, F. The antigenicity of *Clostridium botulinum* type C toxin administered *per os*. pp. 169—172.

Large quantities of toxoid given to rabbits *per os* did not elicit a primary immune response. Toxin absorbed through the intestinal wall of guinea-pigs and toxoided produced an anamnestic response on injection into basically-immune rabbits, but had no effect on fully susceptible rabbits. By dosing sufficient toxin or toxoid *per os* to basically-immune rabbits anamnestic responses could be produced.

NAUDÉ, T. W., BASSON, P. A. & PIENAAR, J. G. Experimental diamidine poisoning due to commonly used babecides. pp. 173—181.

Forty-four apparently healthy dogs and four normal cattle were given multiple therapeutic, sterilizing or higher dosages of Berenil, Phenamidine and quinoronium sulphate in order to determine the toxic effects of these drugs. The former two drugs produced severe nervous symptoms such as imbalance, rolling movements, extensor rigidity, opisthotonus, nystagmus and terminal paralysis in the majority of the dogs. Prominent haemorrhagic and malacic lesions were encountered in the brain, mainly in the cerebellum, midbrain and thalamus. Two repeated daily doses of 20 mg/kg of Phenamidine caused brain lesions in one dog after a latent period of 2 days. Only mild nervous symptoms were produced in the cattle but none of the brain lesions found in the dogs was noticed. Degenerative lesions, mainly of a fatty nature, occurred in the liver, kidneys, myocardium and skeletal muscles of some of the dogs and cattle, being more prominent in the latter species. None of the animals which received quinoronium sulphate showed similar nervous symptoms or succumbed. The results of the experiment therefore clearly indicate that the diamidines are potently harmful drugs and that their therapeutic dosages should never beexceeded or repeated in the course of treatment of a disease.

DE VOS, A. J. & DOBSON, LYNNE D. *Eimeria chinchillae* De Vos & Van der Westhuizen, 1968 and other *Eimeria* spp. from three South African rodent species. pp. 185—190.

Eimeria chinchillae De Vos & Van der Westhuizen, 1968, an organism originally described from the chinchilla and subsequently shown to be transmissible to other rodents, was found to occur naturally in *Rhabdomys pumilio* (Sparrman, 1784) in South Africa. The morphology of the oocysts, the site of development of the endogenous stages and the prepatent period of the infection were similar to those of *E. chinchillae* obtained from chinchillas and transmitted experimentally to *R. pumilio*. The identity of the organism was confirmed by the successful infection of chinchillas.

Three additional *Eimeria* spp. were found in *R. pumilio*. Oocysts of *Eimeria pumilioi* n. sp. measured 18 by 12 μ, those of *Eimeria rhabdomyis* n. sp., 13 by 12μ and those of *Eimeria pretoriensis* n. sp., 24 by 19 μ. Two *Eimeria* spp. were also found in *Praomys (Mastomys) natalensis* (Smith, 1834). Oocysts of *Eimeria mastomyis* n. sp. measured 27 by 21 μ and those of *Eimeria theileri* n. sp. 20 by 17 μ. A single *Eimeria* sp., *Eimeria otomyis* n. sp., was found in *Otomys irroratus* (Brants, 1827). The oocysts measured 20 by 15 μ.

HUISMANS, H. Macromolecular synthesis in bluetongue virus infected cells 1. Virus-specific ribonucleic acid synthesis. pp. 191—198.

Both virus-specific double-stranded and single-stranded ribonucleic acid (RNA) are synthesized during infection. The single-stranded RNA is formed in a large excess of double-stranded RNA and the rate of synthesis is maximal between 10 and 13 hours after infection. The single-stranded RNA is associated with the polyribosomes and consist of components with sedimentation constants varying between 12S and 22S. Hybridization of single-stranded RNA with double-stranded RNA indicated that the single-stranded RNA is probably messenger RNA. The secondary structure of the double-stranded RNA was verified by optical rotatory dispersion.

HUISMANS, H. Macromolecular synthesis in bluetongue virus infected cells. II. Host cell metabolism. pp. 199—210.

Infection of L-cells with bluetongue virus results in inhibition of protein and deoxyribonucleic acid synthesis shortly after infection. No inhibition of ribonucleic acid synthesis is observed before 7 hours after infection. The length of the lag phase before the initiation of the inhibition of protein synthesis is dependent upon the number of infecting virus particles. An increase in the multiplicity of infection results in a decrease in the length of the lag phase. No new macromolecular synthesis is required for the induction of inhibition. Inhibition of viral replication by interferon or UV inactivation does not prevent the induction of inhibition. Virus neutralized by antiserum or inactivated by heat or acid treatment is unable to induce the changes in host cell metabolism.

GERNEKE, W. H. & COUBROUGH, R. I. Intersexuality in the horse. pp. 211—216.

A cytogenetic and clinical study of an intersexual Arabian horse revealed it to be a genetic female but a gonadal male intersex. This corresponds in general to previously reported cases, which have been genetic females despite the presence of male gonads (or ovotestes). The reliability and ease of polymorph sexing in the horse as a method of determining the genetic sex has been confirmed. Once this is known an easy decision can be made as to the feasibility of castration or not. In the case described castration resulted in an improved feminine appearance.

CAMERON, C. M. & SMIT, GERTRUIDA. Immune response of sheep and mice to polyvalent *Pasteurella vaccine*. pp. 217—224.

A polyvalent alum-precipitated vaccine containing *Pasteurella multocida* (Lehmann & Neuman, 1899) types A and D and four serotypes of *Pasteurella haemolytica* (Newson & Cross, 1932) produced a sound immunity in mice and sheep to challenge with the homologous strains of *P. multocida*. The vaccine also stimulated a marked increase in the haemagglutination titres and passive protection values of the serum to the homologous strains of *P. multocida*.

The antibody response to the *P. haemolytica* strains was poorer but possibly sufficient to contribute to an increase in resistance to infection.

THE ONDERSTEPOORT JOURNAL OF VETERINARY RESEARCH
Volume 38, Numbers 1 and 2, 1971

VAN RENSBURG, S. J. Reproductive physiology and endocrinology of normal and habitually aborting Angora goats. pp. 1—62.

Recurrent abortion of non-infectious or nonorganic origin is exceedingly prevalent in many

species including man, yet virtually no information on possible metabolic and endocrine causes was available. In order to study the pathogenesis of this form of gestational failure, an experimental flock was constituted which consisted of normal and habitually aborting Angora goats, a species in which the high incidence of abortion constitutes a significant economic problem. The investigation was initially complicated by the fact that at the time of its inception there were no acceptable theories regarding the cause of the initiation of normal parturition. For this reason experimental work on relevant fundamental aspects was included in the study.

Comparative studies on normal and aborting goats entailed:

(i) Investigations of sexual behavioural patterns and of breeding performance in mature animals, followed by physiological, clinical and pathological observations on mature does, foetuses and kids.

(ii) Development of suitable methods for the precise chemical assay of steroid hormone metabolism in goats. The methods used facilitated detailed studies on luteal function, cortisol metabolism and the excretionof oestrogens.

(iii) Investigation of the mohair growth rate as well as its fibre characteristics in relation to reproductive capabilities.

(iv) Experimental reproduction in normal animals of the aberrations found and the investigation of the significance of such aberrations in causing gestation termination.

Gestational failure was more prevalent in the heavier, older type of goats which were found to have enlarged pituitaries and which occasionally exhibited clinical signs of disturbed adrenal function. Animals that had aborted exhibited abnormally short oestrous cycles which appeared to be responsible for a lowered conception rate. Their ovaries contained cystic corpora lutea and displayed excessive follicular growth; experimental studies indicated that these changes were secondary to adrenal hyperplasia.

Abortions were most frequent during the early part of the fourth month of gestation, a time which coincided with the most rapid increase in the rate of foetal growth and also with the cessation of placental growth. The condition of the foetus destined to be aborted suggested placental insufficiency; growth was retarded, anaemia was usually present and the concentration of some elements in the liver was abnormally low.

Changes noted prior to abortion included excessive or deficient urinary oestrogen excretion, excessive ovarian follicular growth, the sudden onset of maternal adrenal atrophy, accumulation of excessive foetal fluids and degeneration of the placentomes.

Control of gestation maintenance by the corpus luteum was confirmed; removal of the corpus luteum from Angora goats at any stage of pregnancy resulted in abortion 40 or 60 hours later. Variations in the level of luteal function during gestation are postulated to be due to a placental lactogen-type hormone secreted by the growing placenta. Peripheral plasma levels of progesterone tended to be higher than usual in pregnant aborters, but were depressed shortly prior to abortion in only some individuals. Studies on ovarian secretion rates suggested that this reduction was partly due to a lowered adrenal contribution, which may be expected in view of an observed concurrent adrenal atrophy. Signs of impending abortion were, however, evident while luteal function was still quite normal.

The markedly aberrant oestrogen excretion rate of aborters could only be ascribed to an abnormal supply of steroid precursors resulting from altered metabolism in the maternal adrenal glands.

Newborn kids destined to perpetuate the abortion defect tended to be heavier than normal and had finer birthcoats. The quantity of mohair produced by the young animal born from aborter stock was exceptional and the young males produced 30 per cent more than usual. Adrenal function in young high-producing aborter stock was lower than usual. However, established regular aborters had enlarged adrenal cortices and produced smaller quantities of finer mohair. Such findings are consistent with experimental results obtained with other species, the results demonstrating that corticosteroids inhibit the rate of hair growth and the fibre diameter.

Evidence is presented which suggests that the adrenal enlargement found in aborters is an adaptive response favouring the foetus at the expense of hair production characteristics; aborter does which could maintain a higher level of adrenal function throughout gestation carried their foetuses successfully to term.

Experimental administration of small doses of corticosteroids to goats during pregnancy prolonged gestation by several days, a situation which resembled successfully adapted aborter does. Dose-related prolongation of gestation was also obtained when small amounts of corticosteroid were administered to the sheep or goat foetus but slightly higher dosages lead to rapid expulsion of the foetus. When administered maternally to sheep, these steroids caused a moderate reduction of placental progesterone synthesis. However, the same dosage rate given to the foetus caused a more drastic progesterone block, rapidly followed by expulsion of the foetus. Adrenalectomy of the foetus caused indefinite prolongation of gestation in sheep, but not in goats.

The investigations have contributed to the concept that normal birth is initiated by the foetal hypothalamus-pituitary-adrenal axis; when the hypothalamus is adequately sensitive to ensure viability of the foetus, it responds to the usual prenatal deterioration of the foetal nutritional environment by stimulating the foetal adrenal glands and the elevated steroid secretions have effects on the foetoplacental unit, resulting in the initiation of parturition, possibly by means of blocking both the production and the action of progesterone.

The cause of abortion in Angora goats appears to be intimately related to a high metabolic priority for hair growth, artificially induced by intensive selection and inbreeding. An abnormally low level of adrenal function, coupled with some qualitative changes in adrenal steroid biosynthesis seems to be the responsible mechanism. Physiological adaptation involves adrenal hyperplasia in order to assist the transfer of maternal nutrients to the foetus. Abortion is a consequence of the failure of this mechanism.

VERSTER, ANNA. Preliminary report on the golden hamster as a definitive host of *Taenia solium* Linnaeus, 1758 and *Taenia saginata* Goeze, 1782. pp. 63—64.

Injections of an immunosuppressant drug, methyl prednisolone acetate, increase the susceptibility of golden hamsters to the adult stage of *Taenia solium* Linnaeus, 1758. At dosage rates of 10, 5, 2 and 1 mg per week, 73,9, 80,0,64,3 and 25 per cent respectively of the hamsters became infested. Both male and female genitalia develop but egg production does not occur.

When hamsters are treated with 10 mg of the drug 25 per cent became infested with the adult stage of *Taenia saginata* Goeze, 1782.

NEVILL, E. M. Cattle and *Culicoides* biting midges as possible overwintering hosts of bluetongue virus. pp. 65—72.

Light trap catches over 7 years at the Veterinary Research Institute, Onderstepoort showed that *Culicoides* adults are active on occasional winter nights and in some years remain active almost throughout the winter. *Culicoides* were also found to survive refrigerator temperature for up to 53 days and to survive outdoors during winter for up to 51 days. Moreover, day-time temperatures during winter were high enough to allow continued development throughout this season. Bluetongue virus (BTV) may therefore be able to survive short winters in infected *Culicoides* midges while warmer nights in some years may allow midges to fly and feed and so reinfect new hosts.

By testing large numbers of midges BTV has been shown to be present in *Culicoides* adults at the beginning of October. Apparently BTV does not disappear completely in spring but is present in so few midges as to be difficult to detect.

BTV could only be detected in late November or December in sample groups of five cattle at Onderstepoort. If a high percentage of the cattle population could be tested BTV will almost certainly be isolated at an earlier date and even perhaps in winter.

The results of these investigations support the theory that the biological cycle of BTV can continue in *Culicoides* and/or cattle throughout the winter in the Onderstepoort area.

CAMERON, C. M. & ENGELBRECHT, MARIA, M. Mechanism of immunity to *Corynebacterium pseudotuberculosis* (Buchanan, 1911) in mice using inactivated vaccine. pp. 73—82.

Mice can be passively protected against infection with *Corynebacterium pseudotuberculo-*

sis with hyperimmune rabbit serum prepared against whole bacterial cells. The mechanism of immunity depends on the inhibition of secondary multiplication of the bacteria, not on antitoxic activity or enhanced phagocytosis and destruction.

Passive transfer of macrophages obtained from mice immunized with inactivated vaccine to susceptible mice which were subsequently challenged showed that the macrophages have no specific immunizing properties.

CAMERON, C. M. PURDOM, MARY, R. Immunological and chemical characteristics of *Corynebacterium pseudotuberculosis* cell walls and protoplasm. pp. 83—92.

Successive extraction of purified *Corynebacterium pseudotuberculosis* cell walls with ether: ethanol, cold and hot trichloroacetic acid and crystalline trypsin did not destroy their immunizing potency.

Cell walls were not susceptible to the action of lysozyme unless pre-treated with trichloroacetic acid and NaOH. Treatment with NaOH, however, destroyed the immunizing properties.

Protoplasm also contains immunizing antigen but because of the insolubility of the antigen it could not be purified and characterized.

By gel diffusion it was found that cell walls and a protoplasm fraction contain a common antigen. It could not, however, be proved that this antigen is exclusively responsible for inducing a protective immunity.

JANSEN, B. C. The toxic antigenic factors produced by *Clostridium botlulinum* types C and D. pp. 93—98.

The toxic factors produced by *Clostridium botulinum* (Van Ermengen, 1896), types C. and D were determined. Monospecific antisera were prepared against the different factors. It was shown that type Cα produces factors C_1, C_2 and D; type Cβ produces factor C_2 and type D produces factors C_1 and D. It was also shown that the International Standard Type C Antitoxin contains antibodies against factors C_1, C_2 and D and the International Standard Type D Antitoxin contains antibodies against factors C_1 and D.

CAMERON, C. M. Evaluation of serological tests as criteria for immunity to staphylococcal skin infection in rabbits. pp. 99—110.

Rabbits immunized with killed whole culture vaccine, bacteria alone or bacteria plus toxoid, were markedly more resistant to skin infection than control rabbits. However, the degree of immunity was not related to the antitoxin or haemagglutinating titres, nor to the opsonizing acivity of their sera.

HART, R. J. & WAGNER, ADRIANA, M. The pathological physiology of *Gaigeria pachyscelis* infestation. pp. 111—116.

In two experiments, sheep under controlled conditions were artifically infested with the hookworm *Gaigeria pachyscelis* Railliet & Henry, 1910.

The effects of the helminth infestation on the host's metabolism were monitored by a series of blood, chemical and enzyme analyses.

Significant changes recorded were the development of a macrocytic normochromic anaemia, hypoproteinaemia, hypocalcaemia, hyperglycaemia and eosinophilia.

The disease and death of some of the sheep were due primarily to loss of blood.

McCONNELL, E. E., BASSON, P. A. & PIENAAR, J. G. Pneumocystosis in a domestic goat. pp. 117—126.

A fatal case of an infection by the parasite, *Pneumocystis carinii* Delanoë & Delanoë, 1914, is described in a young domestic goat. The disease was manifested as a severe diffuse interstitial pneumonitis accompanied by filling of the alveolar air spaces by large numbers of orgaisms. Light and electron microscopic studies revealed the parasite to be identical to previously described cases in man and other animals. This is apparently the first case recognized in an animal in Africa.

INFORMATION - INLIGTING

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THE ORIGIN OF THE DOMESTIC ANIMALS OF AFRICA

H. EPSTEIN

Vol. 1:575 pp.; Vol. 2:720 pp. Africana Publishing Corporation, 101 Fifth Ave., New York, N.Y. 10003. 1971. $85.00

An encyclopaedic study of the origin and development of the domestic animals of Africa, this work will not only make a definitive contribution to the sciences of animal genetics, zoology and natural history, but will also aid the anthropologist and archaeologist and will find extensive practical use in animal husbandry and stock-breeding.

THE DOMESTIC ANIMALS OF CHINA

H. EPSTEIN

166 pp. Same publishers as above. 1971. $19.50.

The author describes the origin, distribution, characteristics and performance of Chinese breeds of cattle, yak, yak-cattle hybrids, buffalo, sheep, goat, pig, horse, ass, camel, reindeer and dog. An account is given of the improvement of native stock by selection and of the impact on such stock of imported Western breeds. It is also a record of the many local varieties now on the verge of extinction.

PROBLEME DER GÜLLEWIRTSCHAFT

(Problems related to the handling of excretal slurry)

W. KURZWEG AND K. WINKLER, EDS.

G. Fischer, Jena, 1971, pp. 192. Price not stated.

This booklet, written in German and published in the series APPLIED ANIMAL HYGIENE, consists of an introduction, five main chapters and a subject index.

Apart from an extensive bibliography, the publication offers a wealth of very detailed information concerning a wide range of problems related to different kinds of slurry obtained from intensive keeping of large numbers of pigs and bovines. The composition, compositional changes occurring during storage, processing, disinfection and the disposal of the slurries are examined. The survival of such pathogens as *Salmonella dublin, Salmonella cholerae suis, Brucella abortus* and *Leptospira pomona* is discussed critically and aspects related to fertilization of crop, public health, veterinary and agricultural hygiene are considered. Linguistic difficulties encountered by those not too familiar with the German language should be partially alleviated by the numerous summarizing and explanatory graphs and tables. For those interested in, or actively concerned, with problems related to the handling of slurry, the booklet can certainly be recommended. W.H.G.

JAARKONGRES: GROEP GENEESKUNDE VAN KLEIN HUISDIERE

KONINKLIKE NEDERLANDSE MAATSKAPPY VIR DIERGENEESKUNDE

Datum: 29—30 April 1972.

Plek: R.A.I.-Congrescentrum, Amsterdam.

Alle voordragte word gelyktydig vertaal in Nederlands, Frans, Duits en Engels.

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Om meer inligting, skrywe asb. aan:

J. E. Gajentaan,
Joh. Verhulststraat 115,
Amsterdam — 1007.

In Memoriam

MARGUERITE HENRICI 1893—1971

By training and temperament, the young 29 year old Swiss graduate in the natural sciences, who had specialized in Plant Physiology, was well equipped to carry on where the veterinary-chemical team had left off its studies on "Lamziekte". In 1922 she was appointed to the Veterinary Division, when the Agricultural Department took the unprecedented and bold step of appointing a woman in charge of an outstation—and a new-comer to the country at that—when she was put in charge of Armoedsvlakte and was told to find out the why's and wherefore's of the seasonal occurrence of "Lamziekte", in other words where did the phosphorus go in winter time? These studies at Armoedsvlakte were the forerunners of a whole series of investigations into the food value of the South African grasses and veld types. In 1926 they took her away from Bechuanaland and its cattle to the Highveld and its sheep at Ermelo. In 1929 she was transferred from Onderstepoort to the Staff of the Botany Division, but her studies on the transpiration of plants under arid conditions, and on their food value, went on at the field station at Fauresmith, especially built and equipped for her investigations. It was not long before the farmers of the Brokenveld, as also farmers from the Karoo proper, were calling in on her for advice and to consult her about the carrying capacity of their veld. It is probably the first time in South Africa's history that hard-baked farmers took advice on farming problems from a lady, who was not even a veterinarian!

The farmers showed their appreciation by presenting her with an illuminated address in 1968. Her old Alma Mater, the University of Basel, accorded her an Honorary Doctorate in 1969, thus also acknowledging its appreciation of her pioneer work in this field of research. In July this year, the South African Association of Botanists honoured her by electing her an honorary life member.

Though fully occupied in the laboratory, she yet found time to serve on committees of the local women's organisations and of the library.

Those of us who knew her, will miss her kindliness and her gay humour, which stayed with her even during the last few years when her health began to deteriorate. She died on July 29th in her seventy-eighth year. We offer our sympathies to her relatives in Switzerland. G.T.

In Memoriam

JOHN ALBERT THORBURN
1903-1971

John Albert Thorburn was born on the 28th March 1903. He spent his early years in Johannesburg.

He graduated in 1928 as one of the early veterinarians to emerge from the Veterinary Faculty at Onderstepoort. He entered government service in January 1929 and from then until 1945 he served in the Northern Cape, Zululand, Transkei and Eastern Cape Province. He played a big part in the East Coast fever control campaign and his exploits are still recounted by the farmers of the Peddie area.

At the beginning of the Second Wold War he endeavoured to join the forces but was classified as a key man and placed on the reserve list of officers.

In July, 1945. Jack Thorburn joined Cooper & Nephews, the first South African trained veterinarian to enter the commercial field. He was immediately associated with Whitnall in the development of the first synthetic cattle dip which was urgently required to combat the arsenic resistant blue tick. He formed Coopers' Veterinary Research Team in East London and guided its early years.

In June, 1949, he moved to Johannesburg and took up the position of Veterinary Adviser to the Company with specific responsibilities for the Rhodesias, Congo and East Africa. He moved to Salisbury in 1962 and in 1963 was appointed Technical Director of Cooper, McDougall & Robertson, Central Africa. He retired at the age of 65 in September, 1968, but requested a re-appointment as a Research Scientist at Coopers' Research Station in East London. He continued working in this position until a few weeks before his death on 10 October, 1971.

Jack Thorburn was a man of great vitality, enthusiasm, energy and uncompromising integrity. During his working life he proved to be an outstanding veterinarian with great experience of parasite control. He must rate as one of the most widely known veterinarians in South and Central Africa, becoming almost a legend in the large ranching areas of Zambia and Rhodesia.

He leaves a widow, Erica, whom he married in 1931, and two sons, Eric, a practising dentist, and Peter, a civil engineer, to whom we extend our sympathy.

G.E.T.

In Memoriam

MIECZYSLAW JAN DE SAS KROPIWNICKI 1912—1971

Mieczyslaw Jan de Sas Kropiwnicki was born in Nizniów, Poland, on 24 February, 1912. After graduating in Veterinary Science in Poland, he went to England and qualified for Membership of the Royal College of Veterinary Surgeons at Glasgow. He came to South Africa in 1948, where he started practice in the Transvaal. Subsequently he practised at Tweespruit and Ladybrand in the Orange Free State and at Barkly East in the Northern Eastern Cape, where he was active from 1952 until 1966. From that year until 1969 he was a Veterinary Officer in Botswana, when a severe stroke in that year forced him to retire. He went to East London, where he passed away on 15 August, 1971.

While in practice in Barkly East he performed a caesarian section on a brood mare, at that time (1958) the second successful one to be done in the world. He described the operation in Vol. 70 No. 27 of the *Veterinary Record*. He bridged the gap between his country of origin and his country of adoption by writing on "Pestis Equorum" and "Anaphylaxis in Cattle" in the Polish veterinary journal *Medycyna Weterynaryjna* (No. 12 of December, 1960, and No. 2 of February, 1962, respectively). In March, 1964, his contribution entitled "Surgical Treatment of Volvulus and Tympany of the Caecum in the Cow" was published in Vol. 12, No. 1 of the *Quarterly Bulletin of the Eastern Cape Branch of the SAVMA*, and in the same year his paper on "Unilateral Ovariectomy in a Mare" appeared in Vol. 144, No. 12, of the *Journal of the American Veterinary Medical Association*.

He was a member of the SAVMA since his arrival in South Africa in 1948.

We honour a colleague who served his profession and his country of adoption with a high sense of duty and idealism and tender our sincere sympathy to his widow, who faithfully stood by him, and to his son and daughter.

H.P.A. de B.

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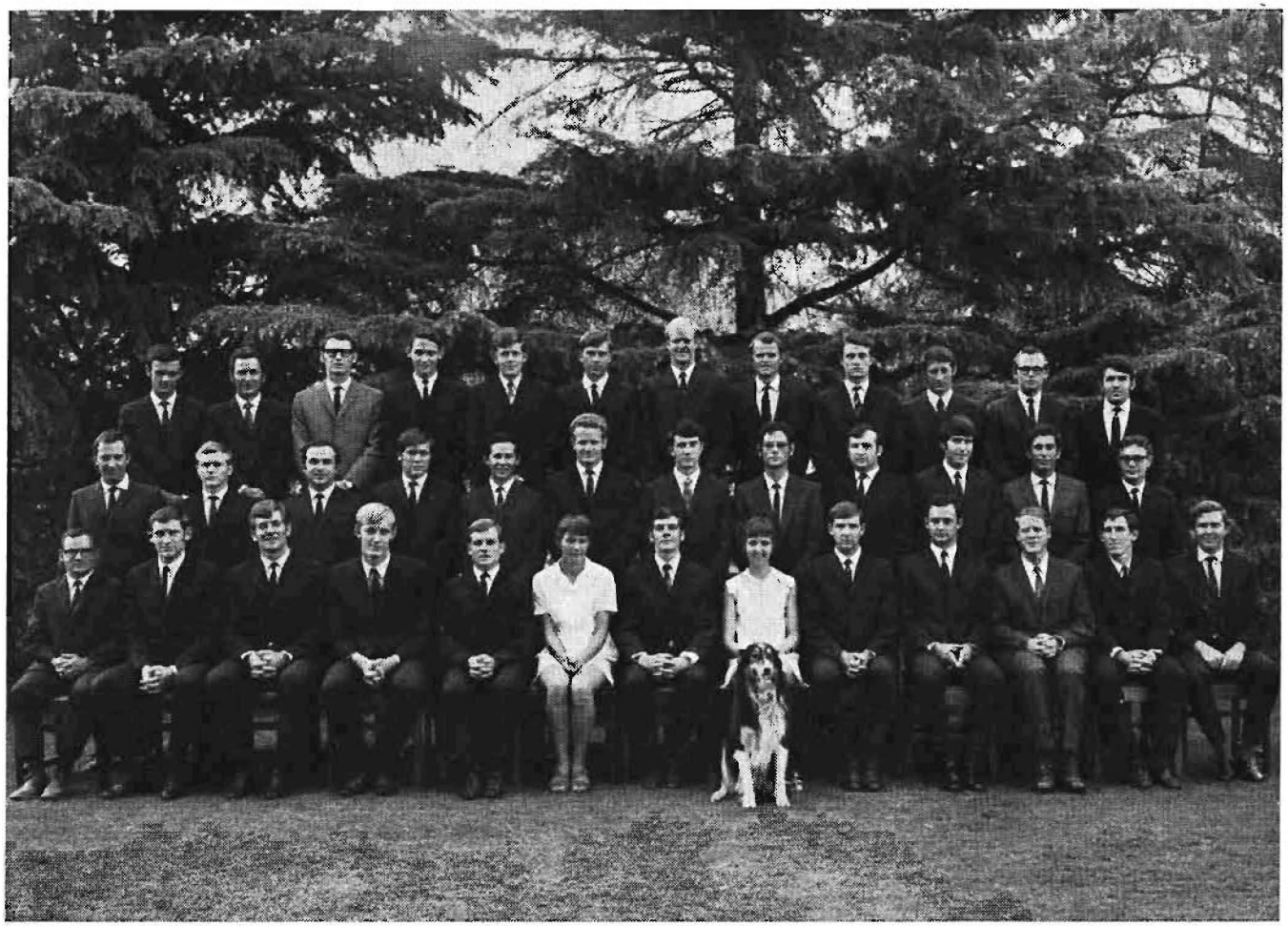

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JOURNAL of the SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION

VOLUME 42 JAARGANG

TYDSKRIF van die SUID-AFRIKAANSE VETERINÊR-MEDIESE VERENIGING

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Physiology and Physiological Chemistry

Protophytology and Protophytal Diseases

Protozoology and Protozoal Diseases

Surgery

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JOURNAL OF THE SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION

TYDSKRIF VAN DIE SUID-AFRIKAANSE VETERINÊR-MEDIESE VERENIGING

THE JOURNAL OF THE S.A.V.M.A. is owned and published by the South African Veterinary Medical Association, of which it is the official organ. It appears quarterly and is devoted to matters of veterinary importance generally.

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CORRESPONDENCE AND CONTRIBUTIONS should be addressed to the Editor, Jl S. Afr. vet. med. Ass., P.O. Box 2460, Pretoria (Tel. 4-4964).

CORRIGENDA

Volume Number

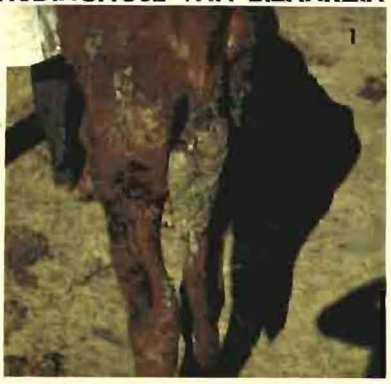
The volume number on the front cover of Volume 42, No. 3 was inadvertently printed as Vol. 43, No. 3.

STAGGERS SYNDROME IN EXPERIMENTAL SCHISTOSOMIASIS
Vol. 42, No. 3, p. 274

Owing to an error of conversion, the number of cercariae used for experimental infestation of the oxen concerned was given as 7,5 and 90 cercariae per kg biomass respectively, instead of 36 and 436 cercariae per kg biomass.

TREFFERBLAD - FEATURE PAGE

KITSDIAGNOSE VAN BILHARZIA



Beeld 1: Bees met 'n swaar **S. mattheei** besmetting.
Beeld 2: Saamgeperste bloed met **S. mattheei** eiers (uit ontlasting) vir diagnose (50 × vergr.).
Beeld 3: Petechiae onder rektale slymvlies.
Beeld 4: Saamgeperste skraapsel van die dermwand. Let op verkalkte (swart) eiers (35 × vergr.).

INLEIDING

Voor- en nadoodse diagnose van Bilharzia is tydrowend, ontoereikend en onbevredigend. Met standaard metodes van misondersoek word soms so min as 10% van die bilharzia-eiers in die monster gevind. Groot getalle eiers beweeg deur die dermwand na die dermlumen en veroorsaak bloedings. Baie eiers word deur die bloedstolsels of slym vasgevang en met die mis uitgeskei. Nadoods word wurms deur gestolde bloed bedek, terwyl pseudomelanose die grys pigmentasie van die lewer en longe, wat deur bilharzia veroorsaak word, verbloem.

DIAGNOSTIESE SNELMETODE

Skei 'n bloedstolsel of slym van die mis en pers dit tussen twee smeerglasies. Maak nadoods skraapsels van die rektum- en duodenumslymvlies (verkieslik by puntbloedings — sien beeld 3) en ondersoek soos bloedstolsels. Die eiers is in hierdie monsters gekonsentreer en 'n snelle mikroskopiese diagnose is moontlik (sien beelde 2 en 4).

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RAPID DIAGNOSIS OF BILHARZIA

Fig. 1: Ox heavily infested with schistosomiasis.
Fig. 2: Compressed blood from faeces containing **S. mattheei** eggs (50 × enl.)
Fig. 3: Petechiae under rectal mucosa.
Fig. 4: Compressed tissue from scraping of intestinal wall. Note calcified black eggs (35 × enl.)

INTRODUCTION

The diagnosis of bilharzia ante- and post-mortem is unsatisfactory and time consuming. As few as 10% of worm eggs are visible microscopically by standard methods of faecal examination. Large numbers of eggs pass through the gut wall into the lumen causing haemorrhages. Many eggs are trapped in blood clots and/or mucus passed with the faeces. Post mortem clotting of blood conceals the schistosomes and pseudomelanosis obscures bilharzia pigmentation of the lungs and the liver.

RAPID DIAGNOSTIC METHOD

Separate blood clots or mucus from the faeces and squash between two microscopic slides. At autopsy scrape the mucosa of the duodenum or rectum particularly at the site of petechiae or ecchymoses (see Plate 3) and compress between two slides. The eggs are concentrated in these specimens and a rapid microscopic diagnosis can be made (see Plates 2 and 4).

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