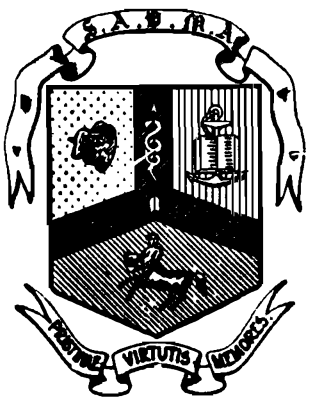
JOURNAL

OF

THE SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION

VOLUME 37 NUMBER 4
JAARGANG NOMMER

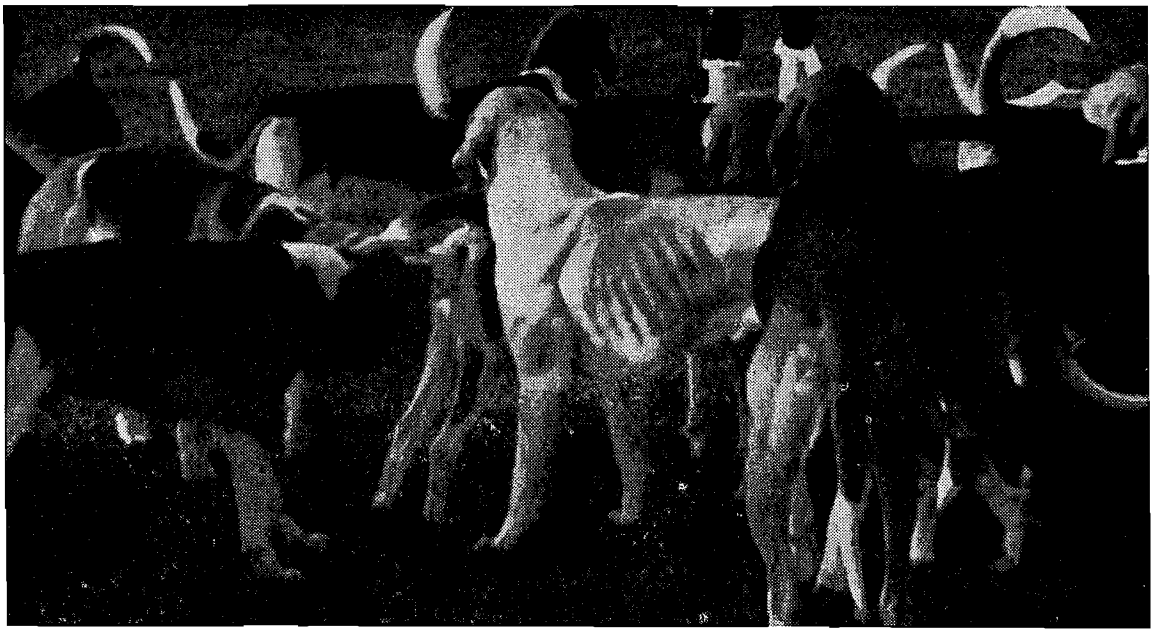
DECEMBER 1966
DESEMBER



TYDSKRIF

VAN

DIE SUID-AFRIKAANSE VETERINÊR-MEDIESE VERENIGING



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EDITORIAL/REDAKSIONEEL

RESPONSIBILITIES OF THE VETERINARY PROFESSION

The following inspiring address (abridged) was delivered by Dr. F. W. B. du Casse, chairman of the Natal Branch on the occasion of that Branch-meeting at Pietermaritzburg on the 16th of June, 1966.

CHAIRMAN'S ADDRESS

Dr. F. B. W. du Casse.

It is now my duty and privilege, — to report to you on the stewardship of your Branch of the Association over the past year.

Your committee met twice during this period, the main matters dealt with being the revision of the code of ethics and the proposed Veterinary Foundation. Both these are of vital importance to us and to our profession and all members of the branch were accordingly circularised regarding them. As is the way in most professions, these circulars were greeted with a vast aura of silence — a silence which your committee assumed to indicate your approval of their suggestions as a basis for future action. Both these matters are due for discussion today but I think we can look with cautious satisfaction on what has already been achieved and regard it as a safe springboard for further progress.

We, in company with other professions, have, by legislation, been granted a special status and special privileges but the law in turn, demands of us prudence and skill in comparable measure, and conduct befitting such a status. Our code of ethics forms the accepted basis of such professional conduct and as such is of very vital import to all of us — both legally and morally.

The proposed Veterinary Foundation is something which I am sure, will play an enormously important future rôle in our profession. The world's population is said to be increasing by some 160,000 souls per day — a population which is crying out for food and clothing. In response to this, Agriculture is making tremendous advances in all its fields — nutrition, genetics, housing and management to mention but a few — all subjects with which today's Veterinarian must be fully familiar.

VERANTWOORDELIKHEDE VAN DIE VEEARTSENYKUNDIGE PROFESSIE.

'n Deel van die besielende rede gelewer deur die Voorsitter van die Natalse tak, Dr. F. W. B. du Casse, op hul jaarvergadering van 16 Junie 1966 word hiermee weergegee:—

„Dit is nou my plig en voorreg om verantwoording te doen oor die bestuur van u tak van die vereniging vir die afgelope jaar.

U komitee het tweemaal gedurende die tydperk vergader, die vernaamste sake wat behandel is, is die hersiening van die gedragskode en die voorgestelde Veterinêre Stigting. Beide is vir ons en ons professie lewensbelangrik en omsendbriewe is aan alle lede gerig in verband hiermee.

Soos dit in meeste professies die geval is, het die omsendbriewe slegs 'n wolk van stilte ontlok, 'n swye wat u komitee aangeneem het as goedkeuring van hulle aanbevelings vir toekomstige aksie. Al twee onderwerpe sal vandag bespreek word maar ek meen dat ons met 'n mate van satisfaksie kan terug kyk op wat alreeds bereik is en dit beskou as 'n wegspringplek vir toekomstige vordering. Aan ons, soos aan ander professies, is deur wetgewing 'n spesiale status en spesiale voorregte geskenk, maar die wet vereis andersyds, in ooreenstemmende mate, die verantwoordelikheid, bekwaamheid en gedrag, wat die status betaam. Ons gedragskode is die aangenome basis van ons professionele doen en late en as sulks is dit wetlik en sedelik, lewensbelangrik vir almal van ons.

Ek is seker dat die voorgestelde Veterinêre Stigting 'n instelling is wat in die toekoms 'n enorme belangrike rol gaan speel in ons professie. Die wêreldbevolking word veronderstel om met 160,000 siele daagliks te vermeerder, 'n bevolking smekende om voedsel en kleding.

In antwoord hierop maak die Landbou geweldige vooruitgang in alle vertakkings — voeding, genetika, behuising en bestuur om slegs enkele te noem, maar alger onderwerpe waarmee die huidige veearts volkome op hoogte moet wees.

Daarby nog sien ons die toewysing aan ons van voltydse veterinêre beheer van die Vleis inspeksie dienste; die moontlike beheer van melk higiëne; die moontlike toekomstige verwesenliking van skema's vir die uitroeiing van bru-

In addition we have the acceptance of full time Veterinary Supervision of the Meat Inspection Service; the possible control of milk hygiene; the possible future realisation of schemes for the eradication of brucellosis and tuberculosis; the development of the fur industry — rabbits, mink and chinchillas; the possibilities of fish farming and the diseases of fish; and the vast complex of the pet industry including cage birds, to mention but a few.

In short it is very evident that the Winds of progress are blowing through our profession — and ruffling the surface of conservative thinking; it is also evident that the future is to make tremendous demands on our professional skill and knowledge, and that this will have to be matched by the dissemination and practical application of new knowledge flowing from laboratories and research institutes throughout the world, together with the need for increased research. In addition, the evolving rôle of the profession makes pertinent the objective, dispassionate examination of contentious problems such as the University curriculum, post-graduate education and specialisation within the profession.

We must move forward and widen our horizons, either by choice or compulsion, in the very sure knowledge that any gaps we leave will be filled by charlatans and others. It is unfortunate, as has been so rightly said by others more able than I, that our future does not rest on professional preferences alone but that the dire need for human food will help to control our destiny. Our progress, which is therefore not accidental, but of necessity, requires carefully piloting through the years ahead — and it is here, that a Veterinary Foundation, with its avowed objects of promoting things Veterinary, can, and I am sure will, play a very vital rôle in the future of our profession.

POSTSCRIPT.

After discussing the Veterinary Foundation, the meeting decided to follow the example of the Witwatersrand Branch and to contribute R10 per member. Suiting the action to the word, the 55 members of the Natal Branch contributed their R550 within three months.

EDITOR.

cellose en tuberkulose; die ontwikkeling van die pels industrie — konyne, wesels en chinchillas; die moontlikhede van visboerdery en die siektes van die vis; en die geweldige omvang van die troeteldier versorging insluitende Kooivoëltjies om slegs 'n enkele diersoort te noem.

Kortliks, dit is baie duidelik dat die winde van vooruitgang tans deur die professie waai en rimpels maak in die gladde oppervlaktes van ons konservatisme. Dit is ook duidelik dat die toekoms hoë eise gaan stel aan ons professionele bekwaamheid en kennis en dat ooreenkomstig gesorg moet word om die nuwere wetenskap, afkomstig van laboratoria en navorsingsinstitute dwarsdeur die wêreld, te versprei, prakties in toepassing te bring en die behoefte aan meer navorsing te beklemtoon.

Verder maak die evolusionêre arbeidsveld van die professie die objektiewe, besadigde ondersoek van betwisbare probleme soos die Universiteitskursus, nagraadse opvoeding en spesialisasie binne die professie, gebiedend noodsaaklik.

Ons sal met vooruitgang moet tred hou en ons gesigsveld vrywillig of noodgedwonge wyer maak, welwetende, dat enige gapings wat oopgelaat word in ons arbeidsveld, gevul sal word deur kwaksalwers en ander. Dit is betreurenswaardig dat, soos alreeds deur ander van meer bekwaamheid dan ek, gesê is, ons toekoms nie alleen sal afhang van die voorliefde wat ons professie mag hê nie, maar dat die voorsiening in die dringende behoefte aan voedsel vir die mens, sal bydra om ons eindbestemming te bepaal.

Ons vooruitgang, nie deur toevalligheid nie, maar as gevolg van noodsaaklikheid, vereis versigtige bestuur vir die jare wat voorlê en dit is in verband hiermee, dat 'n Veterinêre Stigting, met sy doelstelling om die algehele veeartsenykunde te bevorder, myns insiens kan en sal 'n rol speel van die allerhoogste belang vir die toekoms van ons professie".

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OPENINGSREDE WETENSKAPLIKE KONGRES EN SES-EN-SESTIGSTE JAARVERGADERING

VEGGENERAAL E. C. RAYMOND, GENEESHEER-GENERAAL S.A. WEERMAG AAN DIE WOORD

Meneer die President, eregaste, dames en here.

Vir my is dit beslis vanaand 'n besondere eer en voorreg om hierdie openingsplegtigheid van u Vereniging te kan waarneem. Die rede hiervoor kan ek u verseker is nie net 'n gewone hoflikheidsstelling nie maar omdat ek, nie net as individu wat besonder belangstel in u professie en al sy verwante aktiwiteite nie, maar wat veral in my amptelike hoedanigheid as Geneesheergeneraal lankal besef en die noodsaaklikheid aangevoel het dat die tyd aangebreek het dat ons u as suster professie ook in ons weermags-organisasie in die Republiek van S.A. in die Suid Afrikaanse Geneeskundige Diens baie nodig het.

Om later tot hierdie stelling terug te kom is dit interessant om te let tot watter groot mate die vroeë geskiedenis van veeartsenykunde verbonde was aan militêre ontwikkeling. Na die era toe oorloë nog te voet gevoer is het die perd 'n toenemende rol begin speel en was militêre oormag in 'n groot mate afhanklik van berede troepe. In hierdie tydperk het militêre veeartsenykunde dan ook sy groot ontwikkeling beleef. Reeds so vroeg as 1800 v.C. het 'n Babiloniese heerser en wetgewer wette uitgevaardig wat die etiese gedrag van veeartse bepaal het.

In 1900 v.C. het veeartsenykunde 'n hoë peil bereik in die magtige ryk van die Hetiete en dit is interessant dat Koning Hiskia van Juda dieselfde behandeling vir sy swere ontvang het as wat gebruiklik was vir perde in daardie tyd.

Sedert hierdie tydperk is daar 'n besonder interessante geskiedkundige verloop van die veeartsenykundige professie maar laat ons nader terugkom tot die geskiedkundige verloop in ons eie land en hier sien ons ook onmiddellik die militêre verband.

The first Veterinary Surgeon to come to South Africa was Thomas Burrows in 1799 who was attached to the "*8th Light Dragoons*". Of the 45 Veterinary Surgeons that worked in this country until 1881 no less than 36 were military Veterinary Surgeons and in 1851 the first scientific Veterinary paper in South Africa by James Thacker, was published.

During the 1899/1902 war no less than 300 British Army Veterinary Officers served in South Africa. On the Boer side there was only one Veterinary Surgeon, — the wellknown Arnold Theiler, the founder of Onderstepoort.

In July 1899 the Veterinary Department of the Natal Volunteer Service, was created and the brass cap badge incorporated the crest of the Royal College of Veterinary Surgeons of LONDON.

In the Transvaal, after the 1899 — 1902 War Veterinary Surgeons were appointed regimentally, and in 1909 the Transvaal Veterinary Corps was formed with central control. Both the Natal and Transvaal Units were disbanded in 1913 since the Units were excluded from the Union Defence Force under the South African Defence Act of 1912.

The newly constituted Permanent Force did however retain one Veterinary Officer, — that of the Veterinary Officer to the Natal Police. He was transferred to Pretoria, and was placed in charge of the combined training depot for the South African Mounted Rifles and the South African Police and acted in an advisory capacity to the Inspector-General.

At the outbreak of World War I the then — Union Defence Force Veterinary Organisation, — comprised the above officer, one corporal clerk and one civilian storeman.

On mobilisation the total animal establishment numbered 8,000, which increased to 160,000 at the peak.

Officers of the Old Transvaal Veterinary Corps were called in to create the necessary veterinary organisation.

A total of 47 Veterinary Officers and 450 men were appointed and within 8 weeks, 8 base veterinary hospitals, 15 mobile veterinary sections as well as personnel for remount and transfer depots were provided.

In the German East African Campaign, 47 Veterinary Officers and 1,079 men served, 3 Veterinary hospitals, 4 mobile veterinary sections and personnel for 10 mounted regiments were sent up north. Others accompanied transports from Durban to Mombasa and other East African ports.

Of 31,000 horses and 33,000 mules used in the East African Campaign less than 1,000 of each remained at the end, losses being largely caused by the tsetse fly.

As with many other corps the Veterinary Corps practically did not exist between the wars.

Since the beginning of 1941 Veterinary Officers were employed on meat and milk inspection prior to issue to the troops during the War and from May 1942 the Veterinary and Remount Services were amalgamated under one Directorate and was administrated by, and under the control of, the Quartermaster-General.

Although it appeared as if the importance of the Veterinary Service diminished with military mechanisation the profession proceeded to fulfil a most important role in the control of food from animal sources.

Met hierdie ontwikkeling het die veeartsenykundige diens mynsinsiens nog 'n groter fase van vooruitgang deurgemaak in die natuurlike aanvulling van die mediese professie deurdat daar nou 'n essensiële bykomstige professionele diens gelewer is. Op hul eie terrein word daar nie net gesorg vir die beskerming en voortbestaan van die dier as menslike voedselbron nie bv. die voorkoming van vernietigende dieresiekte epidemies nie, maar deur die daadwerklike keuring daarvan, vir menslike gebruik, waar te neem. Dit is dan ook op hierdie tydstip vanpas om hierdie Universiteit van harte geluk te wens met die daarstelling van 'n nagraadse kursus vir die Diploma in V.V.G. wat gelykstaande is aan die Mediese D.V.G. Hierdie ontwikkeling is voorwaar 'n prysenswaardige stap. Soos alle professies vanaf hul begin deur moeilike ontwikkelingsjare gaan, nie net wat die eie wetenskaplike aspek betref nie — want dit is iets wat in elk geval voortdurend is — maar veral met betrekking tot die aanvaarding daarvan deur die publiek daarbuite, was u professie dan ook in geen mate uitgesluit nie, inteendeel het u miskien, ten spyte van die geweldige diens wat u aan die bevolking lewer, 'n moeilike en opdraende stryd gehad en moontlik nog. As dit nie was vir die volgehoue, pligsgetroue en hoogstaande wetenskaplike navorsingswerk van u professie wat die doeltreffende voorkomende en behandelende teenmiddels ontdek het teen baie verwoestende dieresiektes nie, en die uitstekende georganiseerde veeartsenykundige Velddienste met sy beheermaatreels met die onlangse bek en klouseer toestande nie, kon dit lei tot toestande van ellende en ondergang van duisende boere met die gevolge daarvan op die land se ekonomie en vooruitgang. Baie van die wetenskaplike ontdekkings was nie net 'n uitredding in ons land nie maar vir baie ander state.

Hoe tragies is dit nie dat ons vandag nog vind dat mense nie gebruik maak van hierdie beskikbare wetenskaplike diens met al sy hulpmiddels nie? Ons besef dat geweldig baie van staatsweë gedoen word, maar die vraag ontstaan of die fasiliteite en middele toereikend by die Veeartsenykundige fakulteit beskikbaar gestel word om aan die land se behoefte aan veeartsenykundiges te voldoen.

Die vraag ontstaan ou watter belang het die weermag vandag in die veeartsenydiens? Ek kan u dadelik verseker Mnr. die President dit is nie omdat daar soms van 'n Weermags-geneesheer as 'n „perdedokter" gepraat is nie. — Die oorsprong vir hierdie gesegde het moontlik wel ontstaan omdat veeartse van die vroegste tye so nou verbonde was met die weermag en dat dit moontlik die enigste hulp was vir die soldaat, en dat moontlik in sommige gevalle 'n te drastiese behandeling toegepas is — hier verwys ek natuurlik na dosering, en nie na die drastiese lydingsversagtingsmiddel, die koeël nie. Indien ons in die weermag wel hierdie benaming van ons vroeëre veearts kollegas om dié rede ge-erf het, vergeef ons die huidiges dit.

Soos in algemene geneeskunde as gevolg van sy integreerde funksie in die militêre organisasie daar vir die menslike mediese wetenskap geweldige vooruitgang was soos bv. die ontdekking en eventuele feitlike vernietiging van baie aansteeklike en oordraagbare siektes, geweldige vooruitgang op die gebied van traumatiese, plastiese en rekonstruktiewe chirurgie, tot die huidige geweldige vooruitgang in die menslike fisiologie soos toegepas in supersoniese lugvaart, het van die belangrikste ontwikkelinge en vooruitgang dan ook in u professie geskied as gevolg van die militêre assosiasie deurdat die militêre veearts ook betrokke was in die basiese aandeel van die wetenskaplike navorsing in baie van hierdie verskillende rigtings.

Die veeartseny professie onderskraag dus nie net wetenskaplike ontwikkeling van militêre belang nie, maar vul ook 'n onafskeibare rol in die navorsing wat vir die mediese probleme van die mens gedoen word.

Dit is dan op hierdie grondslag van ko-ordinering en integrering van verwante professionele groepe wat die meeste bereik kan word en waarop ek u professionele rol sien as geintegreerde diens wat die Suid Afrikaanse Geneeskundige Diens aan die Weermag moet lewer.

Soos die Suid Afrikaanse Geneeskundige Diens vandag bestaan uit professies soos Medici, Verpleegsters, Tandheelkundiges, en ander paramediese groepe, almal met 'n eie identiteit, het die tyd aangebreek, dat u professie ook hierby ingeskakel word *in professionele en militêre belang.*

Soos daar met die vinnige militêre vooruitgang sekere eenhede wat bestaan het, verander moes word om in te pas by die meer moderne patroon weens die verandering van die wapens, so sien ek die nuwe inskakeling van die veeartsenydiens in ons moderne militêre struktuur. In ons eie land bv. sal die dier mynsinsiens nog vir baie jare sy militêre plek moet volstaan in 'n beperkte rol bv., waghonde, en die gebruik van perde, en hiervoor is u direk nodig, maar uit die aard van meganisasie sal hierdie deel relatief klein wees, maar ons het u nodig in 'n veel groter rol, *nl* die *voorkomende* gesondheids-aspekte en *navorsing.* Met u professionele agtergrond kan u in die hantering van massa ongevalle ook 'n groot diens verrig. Dit is met die volle erkenning van u *akademiese bevoegdheid,* dat ek, met vrymoedigheid, hierdie stelling maak, maar aangesien daar sommiges is wat skynbaar beswaar sal wil opper dat u ook in hierdie rol 'n bydrae lewer, kan ek net sê dat met u professionele kennis, wat op dieselfde grondslag as dié van die medikus gegrond is, u seer sekerlik in noodtoestande 'n groter bydrae kan maak as iemand met of sonder 'n noodhulp-sertifikaat. Die voorbeeld wat ons het in die Akademie vir Wetenskap en Kuns waarin die Mediese en Veeartsenykundige professies in een afdeling saam is, en die voordeel wat daaruit spruit, kan ons ook hier daadwerklik toepas.

Dit is dan ook op hierdie grondslag van koordinering van professionele groepe wat mekaar kan aanvul en 'n aanvullende diens kan lewer dat ek die veeartsenykorps nie as afsonderlike korps onder 'n leke beheer laat herheef het nie maar as integreerde deel van ons SAGD organisasie wat 'n diens aan die hele Weermag moet lewer. Hierdeur gaan ons nie net verhoed dat *Kosbare professionele mannekrag* verkwis word, deurdat hulle ingedeel word by eenhedewat deur 'n nie-professionele persoon gevul kan word nie, — maar ons kan die Suid Afrikaanse Geneeskundige Diens aanvul met professionele mannekrag, waarvan daar reeds 'n groot tekort in ons gesondheids en navorsings-eenhede is. Hierdeur gaan ons ook verseker dat die veearts, *as professionele persoon,* sy regmatige plek inneem. So het ek dan reeds aan die hoof van my Burgermag Veeartseny organisasie, wat nou aan die Suid-Afrikaanse Geneeskundige Diens toegewys is op *gelyke status vlak* met die ander professionele groepe, 'n veearts, met Kolonels-rang, wat sal optree as my adviseur.

Die nou kontak tussen u professie en militêre ontwikkeling is baie kenmerkend en waar die veeartsenykorps in die verlede, tussen oorloë, feitlik ontbind en doodgeloop het, het ons nou gekom by die tydperk, soos ek dit sien, dat, ten spyte van die geweldige verandering in ons militêre organisasie deur meganisasie, die militêre veeartsenydiens weer herleef, en by veranderde omstandighede aangepas het, om, as ge-integreerde deel van die Suid-Afrikaanse Geneeskundige Diens, met sy eie identiteit, te bly voortbestaan en sy bydrae van dag tot dag met groter professionele erkenning te lewer.

Waar die militêre veearts in die verlede, slegs sporadies vir beperkte doelstellings gebruik is, beslis nie met erkenning van sy professionele vermoë nie, is dit my sienswyse, dat u professie nou in die huidige bedeling, met *volle professionele status* op gelyke vlak met u mediese kollegas geplaas word en kan u professionele wetenskaplike potensiaal doeltreffend benut word.

In die RSA moet ons vandag ten alle koste verhoed dat professionele mannekrag dupliseer of verkwis word en daarom moet verwante professies mekaar aanvul. Wat die militêre-geneeskunde betref, en die Geneeskundige Diens as korps, wil ons u van harte verwelkom om u professionele kragte en vermoë by ons in te span vir navorsing en diens aan ons land.

Mnr. die President dit is vir my aangenaam om u vrugbare besprekings en 'n suksesvolle kongres toe te wens, en om nou die 61ste Veeartsenykundige Kongres amptelik geopen te verklaar.

Mr. President in wishing you every success in your deliberations it is my honour to now declare the 61st Veterinary Congress as officially opened.

TOEKOMSTIGE VLEISPRODUKSIE IN VERBAND MET DROOGTEVRAAGSTUKKE

W. A. VERBEEK

Vleisverbruik in Suid-Afrika

Vleis speel 'n baie belangrike rol in die dieet van Suid-Afrikaners en wat betref die blanke bevolkingsdeel is die jaarlikse verbruik van die hoogste in die wêreld. Die besteding aan vleis deur blankes beloop naasteby 25 persent van die totale voedseluitgawe, soos ook in die V.S.A. die geval is. Dit is 'n redelike verwagting dat die totale verbruik van vleis progressief sal toeneem in verhouding tot die vermeerdering van die landsbevolking en na gelang die lewenspeil, veral van die nie-blanke bevolking, styg en die per kapita verbruik toeneem.

Die verbruik van vleis per persoon volgens die jongste beramings van die Afdeling Landbou-ekonomiese Navorsing vir 1964/65 is soos volg:

Beesvleis	67.7 lb
Skaap- en bokvleis	20.1 lb
Varkvleis	6.9 lb
Totaal	94.7 lb

Die beraamde verbruik per persoon in die nege beheerde gebiede vir die tydperk 1964/65 beloop 133 lb. In Australië en die V.S.A. was die gemiddelde verbruik in 1964, 177 en 175 lb, onderskeidelik. Die verbruik van bokvleis is betreklik laag en in die beheerde gebiede het dit slegs 3.7 persent beloop van die totale lam-, skaap- en bokvleis wat vir distribusie beskikbaar was. Die verbruik van pluimveevleis het aansienlik toegeneem in die jongste aantal jare, maar geen gegewens van produksie en verbruik is beskikbaar nie. Na skatting is die verhoudelike verbruik van die verskillende vleissoorte die volgende:

	Persent
Beesvleis	68
Skaap- en bokvleis	19
Varkvleis	7
Pluimveevleis	6

Die vraag na vleis in die Republiek is tot dusver bevredig met behulp van voorrade uit S.W.A., Botswana, Swasieland en Lesotho. Gedurende 1964/65 is 235,329 beeste (en beeskarkasse) en 98,738 lammers, skape en bokke uit die aangrensende gebiede ingevoer. Die hoeveelheid vleis wat uitgevoer is, is betreklik gering en in 1964/65 was dit 2,500 ton beesvleis en 1.5 ton lam-, skaap- en bokkarkasse. 'n Sekere hoeveelheid wildsvleis word ook verbruik maar die hoeveelhede is nie bekend nie. Na skatting word 1,500,000 lb biltong jaarliks verbruik wat ongeveer 4,300,000 lb rouvleis verteenwoordig (Van den Heever, 1965). Die geleidelike en bestendige verhoging van bees-(kalfs-) vleis en skaap-(bok-) vleis sedert 1947/48 word in grafiek I aangetoon.

Die produksie van vark- en pluimveevleis kan betreklik vinnig vermeerder of verminder word na gelang die aanvraag en prysverhoudings. Voersoorte vir hierdie plaasdiere is ruimskoots beskikbaar in Suid-Afrika en die moontlikhede van 'n verhoging van hierdie vleissoorte is besonder groot. Wat varkvleis betref is Suid-Afrikaners teësinnig om meer daarvan te eet ten spyte van gunstige pryse in vergelyking met bees- en skaapvleis, soos op die oomblik die geval is. Tans is daar 'n oorproduksie van varkvleis wat uitgevoer moet word. Die verbruik van pluimveevleis neem nog steeds toe en te oordeel na die verbruikspatroon in Europa, die Verenigde Koninkryk en die V.S.A. kan verwag word dat die per kapita-verbruik van hierdie vleissoort nog heelwat sal styg eer die versadigingspunt bereik word. Vark- en pluimveeproduksie is nie tot enige noemenswaardige mate onderhewig aan droogtetoestande nie en gevolglik word geen verdere oorweging daaraan geskenk nie.

Die getalle en samestelling van veebevolking

Soos algemeen bekend is, het die totale bees- en skaapgetalle gedurende die afgelope 25 jaar nie wesentlik gestyg nie, hoewel daar van jaar tot jaar aansienlike skommelings voorgekom het. Die getal bokke daarenteë het effens afgeneem en eers in die laaste paar jaar min of meer konstant gebly. Die getalle vee volgens die jongste beskikbare sensusgegewens (1961/62) is soos volg:

	Totaal	In blanke besit, %
Beeste	12,550,000	60
Skape	39,428,000	90
Bokke	5,461,000	41

Volgens skattings deur die Afdeling Landbou-ekonomiese Navorsing van die bees- en skaapbevolkings op plase van blankes, het die getal beeste met 3 persent verminder terwyl die getal skape met 12 persent vermeerder het in die tydperk

Tendense In die S.A. Beesbevolking 1949/50 tot 1961/62
(S.P. van Wyk)

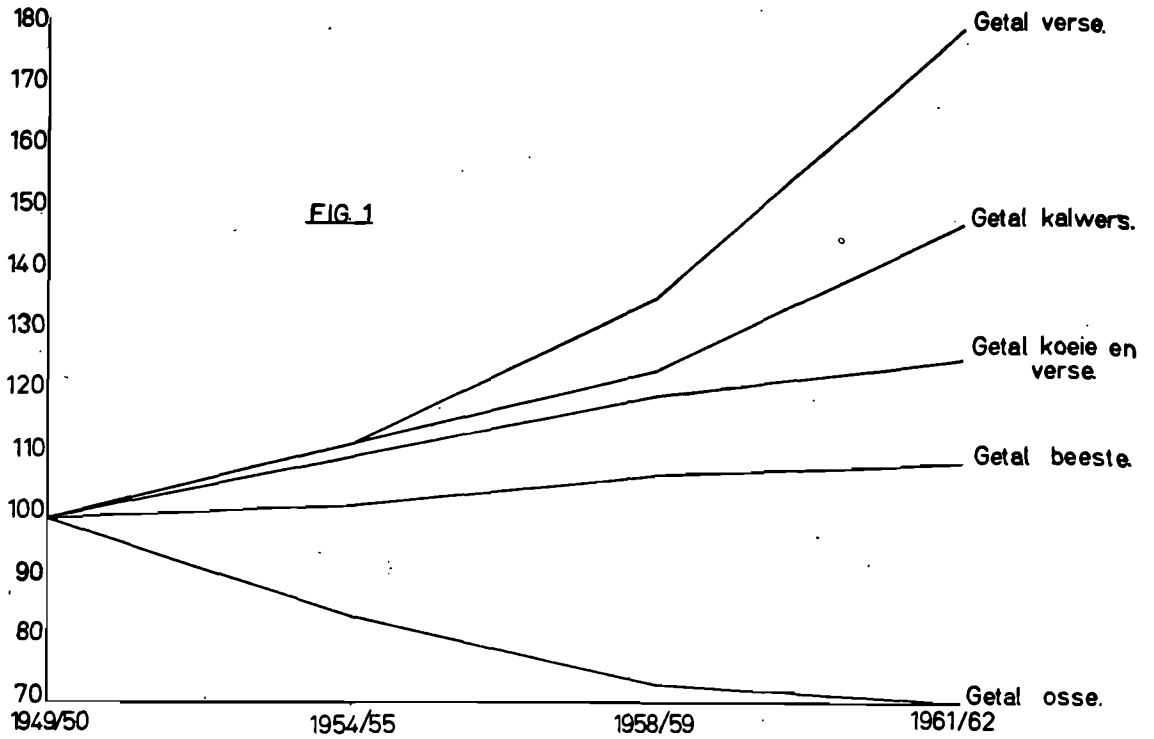


FIG. 1

Tendense in die S.A. Beesnywerheid 1947/48 tot 1964/65.

(S.P. van Wyk.)

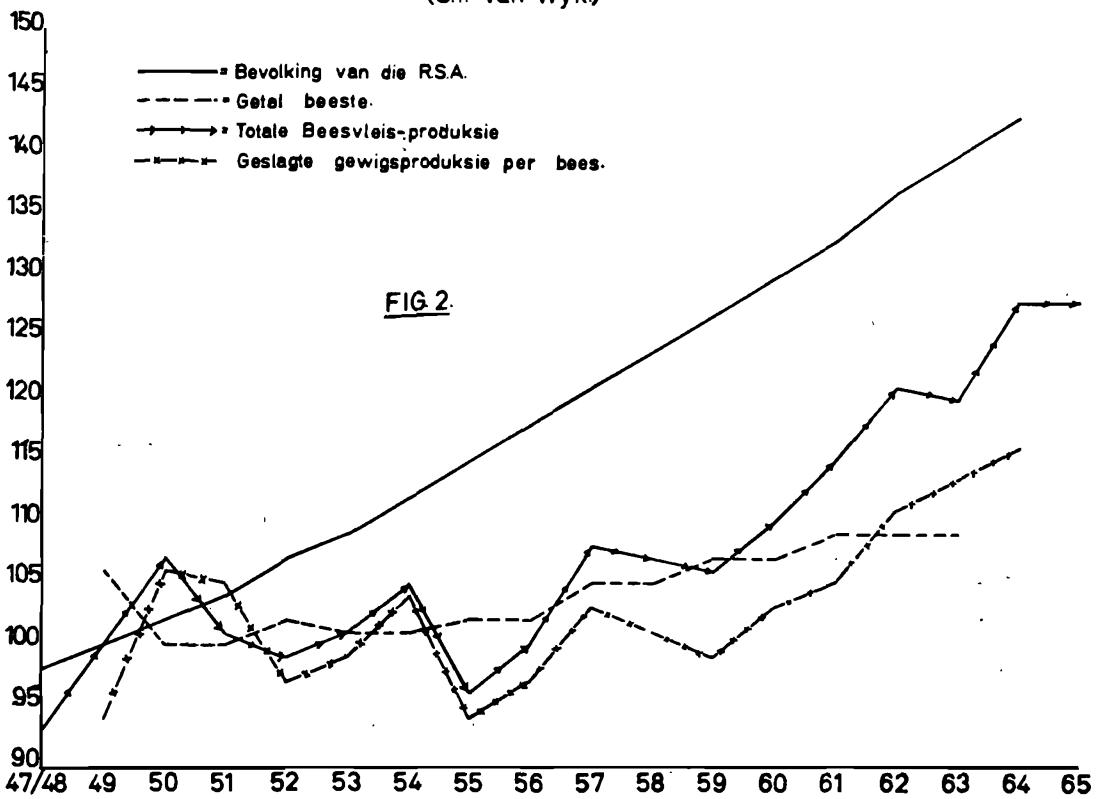


FIG. 2.

vanaf Julie 1963 tot Julie 1966. Die getal skape volgens hierdie skatting is die hoogste sedert die rekordgetal van 1931/32.

Die samestelling van die beesbevolking (1961/62) is die volgende:—

Persentasie koeie aangehou hoofsaaklik vir		Koeie en verse as persentasie van alle beeste	Osse as persentasie van alle beeste
Melk	Ander doeleindes		
55.5	44.5	61.3	19.1

Die persentasie koeie en verse wat hoofsaaklik vir melkproduksiedoeleindes aangehou word, is hoog in verhouding tot alle koeie en verse en ook tot die totale melkproduksie in die land. In die V.S.A. wat min of meer dieselfde verhouding beeste tot mense as die Republiek het beloop die melkkoeie en verse maar 36 persent van die totale koeie en verse. Groot veranderings in die samestelling van die beesbevolking het plaasgevind gedurende die tydperk 1949/50 tot 1961/62 soos aangedui word in grafiek 1 (opgestel deur S.P. van Wyk, 1966). Daarvolgens het die getal osse gedaal met 30 persent, die getal koeie en verse 2 jaar en ouer gestyg met 26 persent, die getal verse 1-2 jaar gestyg met 80 persent en die getal kalwers gestyg met 48 persent. In grafiek 2 word sekere tendense in die beesnywerheid aangetoon oor die tydperk 1947/48 tot 1961/62 (opgestel deur S.P. van Wyk, 1966). Die produksie van beesvleis het hiervolgens blykbaar nie tred gehou met die toename in die bevolking nie, met die gevolg dat die per kapita-verbruik van beesvleis met sowat 15 persent gedaal het.

Die belangrikste beesrasse volgens getalsterkte is die Afrikaner (33 persent), Fries (20 persent) en Jersey (12 persent). Verder is feitlik alle beesrasse van betekenis in die wêreld verteenwoordig in Suid-Afrika. Wat betref skape in blanke besit is die verhoudelike samestelling soos volg:

	Persent
Wolskape	83.0
Nie-wolskape	13.5
Karakoelskape	3.5

Naasteby 80 persent van die wolskape bestaan uit Merinos, terwyl die Dorper die belangrikste nie-wolskaap is.

Volgens die geografiese verspreiding van beeste, skape en bokke is dit duidelik dat in sekere gebiede oorwegend beestes, en in ander hoofsaaklik skape en bokke aangehou word. Die konsentrasie van vee is oorwegend in die oostelike deel van die land. Die Vleisraad het die Republiek in 12 produksiegebiede ingedeel en die belangrikheid van die verskillende gebiede as oorsprong van slagvee vir die beheerde gebiede kan afgelei word van die volgende:

Beeste

Gebied	Persentasie van totale bemarking in die beheerde gebiede (1964/65)	Getal koeie en verse 2 jaar en ouer aangehou vir vleisproduksie as persentasie van S.A. totaal (1961/62)
Bosveld-Laeveld	18	30.2
Betsjoeanaland-Griekwaland-wes	16	15.4
Oostelike Mieliestreek	12	13.9
Natal	7	16.3
(S.W.A.	17)	
Ander	30	24.2

Skape

Gebied	Persentasie van totale bemarking in die beheerde gebiede (1964/65)	Getal skape as persentasie van S.A. totaal (1961/62)
Sentraal-Kaap en Suidwestelike O.V.S.	24	21.0
Sentrale en Suidelike O.V.S.	15	10.0
Oostelike Kaap	12	19.3
Betsjoeanaland-Griekwalandwes	11	10.5
Ander	38	39.2

Skaapvleis is hoofsaaklik 'n aanvullende produk van die wolbedryf, terwyl lamvleis tot 'n groot mate afkomstig is van Dorpers en Dorperkruise. Die gehalte volgens die graderingsresultate van skaap- en lamkarkasse is deurgaans heelwat gunstiger as dié van beeskarkasse. Van die skaap- en lamkarkasse val 75 persent in die Super-, Prima- en Graad 1 klas (Superlammers 15.5 persent, Primaskape 7.6 persent) teenoor 25 persent in grade 2 en 3. Wat beeskarkasse betref behaal slegs 27.6 persent van die karkasse grade Super, Prima, en 1, terwyl grade 2, 3 en 4 die res uitmaak. Die beeskarkasgrade Super en Prima verteenwoordig slegs 10 persent van alle beeskarkasse en aangesien daardie karkasse van goed afgeronde beeste afkomstig is beklemtoon dit dat betreklik min beeste op jong ouderdom intensief afgerond word, 'n toestand wat oor die afgelope 20 jaar nog nie verander het nie.

Geen betroubare statistieke is beskikbaar oor kalfpersentasie van die vleisbeeskuddes nie maar volgens 'n aantal opnames deur verskillende instansies kan die gemiddelde kalfpersentasie gestel word op tussen 60 en 65 persent wat onbevredigend is. Wat Merinoskape betref het 'n landswye opname getoon dat gemiddeld 77.2 persent ooie lam en dat 65.6 persent lammers gemiddeld gespeen word. Die mortaliteit met en net na geboorte tot speenouderdom van Merinolammers is hoog en beloop gemiddeld 15 persent. Dit wissel van gemiddeld 9.6 persent in die Natalstreek tot 23.11 persent in die O.V.S.-streek. Die mortaliteit vanaf speen tot tweetand beloop gemiddeld 3.7 persent. Die algemene posisie by Dorperskape is gunstiger ten opsigte van sowel lampersentasie as mortaliteit.

Weidings- en Voerbronne

Die hoeveelheid weiding en voer wat beskikbaar is of geproduseer kan word bepaal in die eerste plek die produksiepotensiaal van herbivore in Suid-Afrika. Die belangrikste bron van voer in die Republiek is die natuurlike weidings, bestaande uit grasse, bossies, struike en bome, wat 'n oppervlakte bedek van 86 persent van die land. Bewerkte grond wat 10.4 persent (1960) van die land se oppervlakte beslaan is 'n bykomstige en vername bron van voer. Mielies word op naasteby 40 persent van die bewerkte grond verbou en die produksie was nog altyd hoër as die benodigdhede vir regstreekse menslike verbruik, selfs gedurende die droogtejare. Met toenemende toepassing van tegnologiese hulpmiddels kan aansienlike verhogings in die produksie van mielies en ook ander grane verwag word en sodoende steeds meer vir dierevoeding beskikbaar sal kom. Besproeiingsgronde lewer 'n aansienlike deel van die voer wat in die Republiek geproduseer word, by uitstek lusernhooi waarvan die geskatte produksie ongeveer 300,000 ton beloop. Die groot uitbreidings van waterskemas soos die Oranje Rivier Projek en in die Makatinivlakte stel in die vooruitsigte die produksie van aansienlike hoeveelhede lusern en die beraamde produksie wat na voltooiing van die eerste fase van die O.R.P. oor omtrent 10 jaar verkry kan word, is 231,000 ton. Ander voersoorte wat beskikbaar is, behels 'n verskeidenheid van neweprodukte soos o.a. grondbone-, sonneblom- en katoensaadkoekmeel, karkasmeel, melasse, semels, vrugte-afval, brouersgis en menige ander fabrieksprodukte, insluitende ureum. Hierdie voerprodukte vervul 'n belangrike funksie om die natuurlike voersoorte aan te vul.

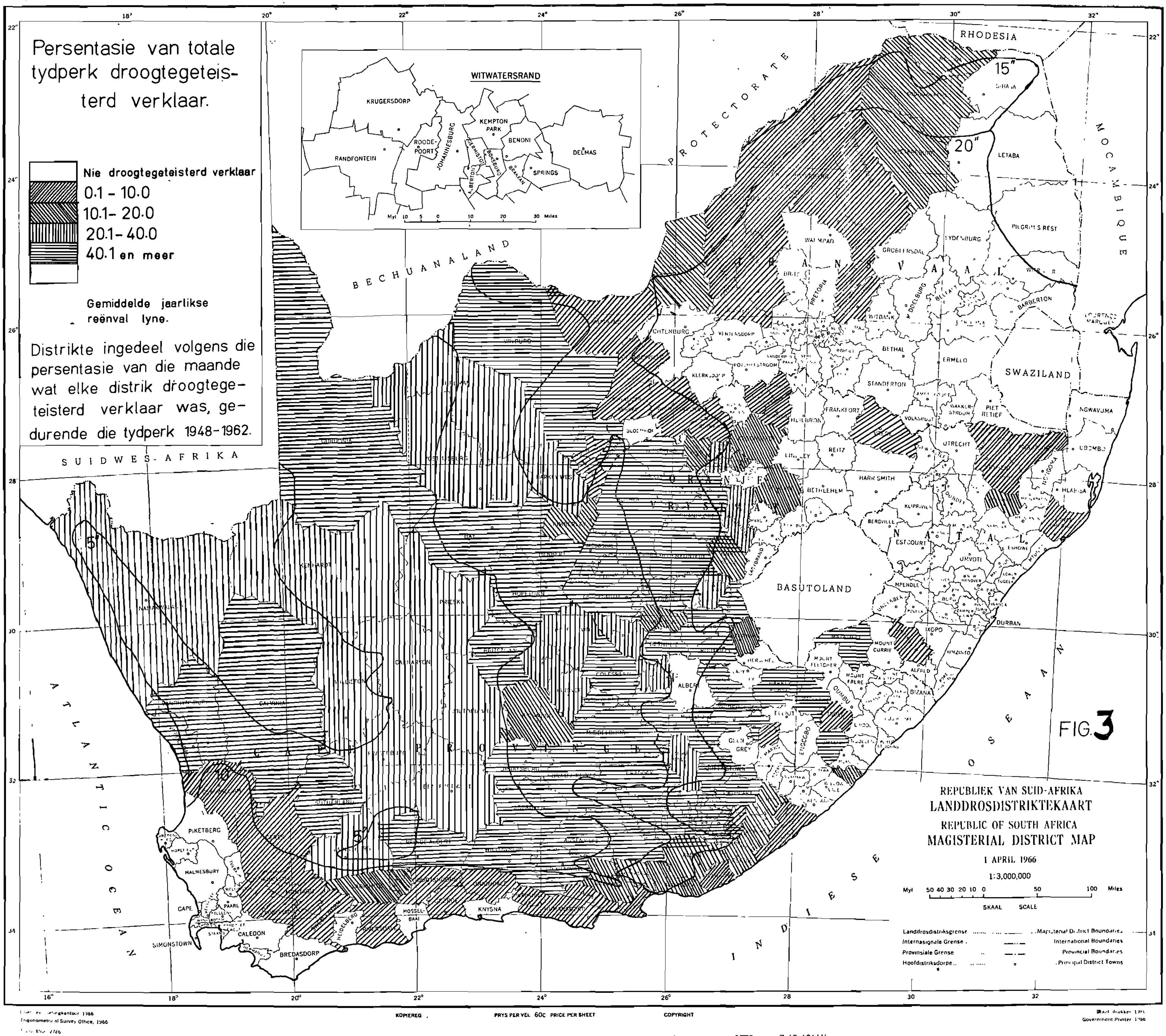
Die kwantiteit en kwaliteit van die natuurlike weiding word grotendeels bepaal deur die grond, reënval- en ander klimaatstoestande. Ongelukkig is Suid-Afrika nie ryklik bedeel met reënval nie en 'n groot deel (omtrent eenderde) is baie droog soos blyk uit die volgende indeling van die landsoppervlakte volgens gemiddelde reënvalreekse:

Reënval	Persentasie oppervlakte van R.S.A.
Minder as 250 mm.....	30.3
250 tot 500 mm.....	34.4
500 tot 750 mm.....	25.1
750 tot 1,000 mm.....	7.4
Meer as 1,000 mm.....	2.8

In die algemeen is daar 'n geleidelike vermindering van die gemiddelde reënval van oos na wes, behalwe in Noord-Transvaal waar die vermindering van suid na noord is. Met die uitsondering van die smal kusstrook vanaf Kaap Agulhas tot Oos-Londen, is die reënval oor die hele land seisoenaal van aard. Die betroubaarheid van die reënval wissel aansienlik en die variasie neem toe namate die reënval afneem. Wat die weidingsbronne betref kan in hooftrekke die volgende gebiede onderskei word:

1. Die Woestyngrasvelde en aangrensende lae reënvalgebied met 'n reënval van minder as 250 mm waar die drakrag van die veld baie laag is (1 bees of 6 skape per 20 tot 30 morge). Droëlandse voerproduksie kan nie suksesvol in hierdie gebied toegepas word nie.

2. Die halfdorre streke van die gemengde Karoo, soetgrasveld en bosveld met 'n gemiddelde jaarlikse reënval van 250 tot 375 mm waar die drakrag betreklik laag is (1 bees of 6 skape per 8 tot 15 morge). Voergewasproduksie kan in hierdie gebied 'n belangrike bydrae lewer.



„Kaart gereproduseer ingevolge die Staatsdrukker se Outeursregvergunning nommer 3777 van 7-12-1966".

3. Die hoër reënvalstreke waar die drakrag betreklik hoog is en intensiewe gewasverbouing plaasvind. Grootskaalse voerproduksie en die verbetering van die weiveld (kwantitatief en kwalitatief) kan in hierdie gebied geskied. Eksperimentele werk in die Drakensbergweistreek het aangetoon dat veredelde weidings 'n baie hoë drakrag kan oplewer.

Voorkoms van Droogtes en Veldtoestande

Die wisselvalligheid van die reënval is die hoogste in die gebiede met 'n reënval van minder as gemiddeld 250 tot 375 mm per jaar en hierdie dele is die ergste onderhewig aan droogtes. In Suid-Afrika is die voorkoms van droogtes 'n normale en gereëlde verskynsel wat as sulks aanvaar en in aanmerking geneem moet word in die beplanning van diereproduksie. Omdat so 'n groot gedeelte van die landsoppervlakte uit natuurlike weidings bestaan, word die term droogte onwillekeurig geassosieer met weiveld. Die Droogtekommissie van 1923 het van die standpunt uitgegaan dat droogte betrekking het op weiveld en 'n tydperk aandui in die loop waarvan weiding so skaars word of van so 'n aard word as gevolg van 'n gebrek aan reënval of tekortkominge in die klimaat dat verliese ontstaan onder vee wat uitsluitlik van die weiding afhanklik is. In Australië word droogte omskrywe as „a period of rainfall deficiency extending over months or years, of such a nature that crops and pasturage for stock are seriously affected, if not completely burnt up and destroyed, water supplies are seriously depleted or dried up, and sheep and cattle perish". (Foley, 1957).

Dit is uiters moeilik om die voorkoms en intensiteit van droogtes vas te stel volgens reënvalsyfers omdat soveel faktore, wat die grond, plant en dier insluit, daarby betrokke is. Die doeltreffendste maatstaf om die trefwydte, lengte en intensiteit van droogtes aan te dui is die amptelike verklaring van 'n distrik as „droogtegeteisterd" of „droogtegelys", 'n toestand wat ontstaan wanneer daar 'n besliste gebrek aan weiding voorkom. Die benuttingspatroon en in besonder die belading van die veld deur beeste, skape en bokke is ten nouste gekoppel aan die toestand van die weiding (plantemateriaal en groeikrag) onder wisselende reënvalneerslae. 'n Studie van die voorkoms en duurte van droogtegeteisterd-verklaarde distrikte oor die afgelope 40 jaar, dui daarop dat die natuurlike weiding van die Republiek lank reeds ernstig oorbewei word en dat daar in die algemeen, maar veral die gebied met 'n reënval van minder as 500 mm, geen verbetering plaasgevind het ten opsigte van die praktyk van oorbeweiding nie, sedert die ondersoek van die Droogtekommissie van 1923. Figuur III gee 'n beeld van die droogtetoestand vir die tydperke 1947 tot 1962. Genoemde Kommissie het destyds reeds gewaarsku dat „oorstok van plase 'n gewoonte is wat oor die hele Unie heers" en dit beskrywe as 'n euwel met ernstige verreikende gevolge, waaronder die steeds verminderende bruikbaarheid (effektiwiteit) van die reënval. In der waarheid het die praktyk van oorbeweiding of wanbenutting van die natuurlike weiding in die droëre dele van die land vererger, ten spyte van die Grondbewaringswet. Die tegnologiese en ander hulpmiddels (siekte- en parasietbeheer, watervoorsiening, kleiner kampe, byvoeding, roofdierbestryding, ens.) wat algaande aangewend is, het dit moontlik gemaak om die weiding meer volledig te benut en om meer vee aan te hou. In die jongste jaarverslag van die Grondbewaringsraad (1966) word gemeld: „Die Raad is veral daaroor bekommerd dat die toepassing van gesonde veldbeheermaatreëls nog soveel te wense oorlaat en dat oorbeweiding nog soveel bydra tot die agteruitgang en uittrapping van ons veld." Sekere studies oor die toepassing van grondbewaringsbeginsels het aan die lig gebring dat slegs 17 persent van die boere in die betrokke ondersoek wisselweidingstelsels volledig toepas. Die hoofgevolgtrekking waartoe geraak is met die ondersoek na die toestand in die droogtegeteisterde gebied van Noordwes-Transvaal Bosveld is die oorbelading van die gebied met vee (Tomlinson, 1966).

'n Verontrustende verskynsel is dat baie distrikte so dikwels en gereeld droogtegeteisterd verklaar word, nl. sodra die reënval die langtermynse gemiddelde vlak bereik. Die afleiding moet dus gemaak word dat die belading van die veld gedoen word volgens die drakrag gedurende bogemiddelde reënvaltoestande en dat aanvullende voeding uit ander bronne nodig is en ook toegepas word wanneer die neerslae gemiddeld en ondergemiddeld is. So 'n praktyk verteenwoordig eintlik geforseerde intensifikasie met finansiële bystand van staatsweë in die vorm van rabatte wat toegestaan word vir die vervoer van voer en vee wanneer 'n gebied op die amptelike droogtelys geplaas is. Die toestand van langdurige droogtelysting word veral aangetref in die wolproduserende Noordwes-Kaap en Westelike Karoo en ongetwyfeld het die toenemende aanvullende voeding in hierdie gebied 'n bydrae gelewer tot die besonder hoë wolopbrengs van die vorige seisoen.

Gedurende die afgelope 5 jaar (1962 tot 1966) het die Republiek in die algemeen 'n besondere ongunstige reënval ondervind. In die lae reënvalgebied van die land toon reënvalgegewens van 5 weerstasies in die rampdroogtegebied (Messina, Marnitz, Mafeking, Kuruman en Van Wyksvlei)

dat gedurende die 7 reënvalmaande Oktober tot April, die neerslae oor die 5 jaar, 64 persent ondergemiddeld, 8 persent gemiddeld en 28 persent bo-gemiddeld was. Die haglike toestand wat ontstaan het deur die opeenvolgende jare van droogtes het aanleiding gegee tot die instelling van die veldherwinningskema in die rampgebied wat behels finansiële hulp vir die onttrekking van beweiding van dele van plase wat nie onder normale omstandighede en met goeie bestuur weer binne redelike tyd produktief gemaak sal kan word nie. 'n Voorwaarde is dat terselfdertyd oordeelkundige weidingsbeheer op die res van die plaas toegepas moet word. Die langtermyn drakrag van die veld en die maksimum verhouding kleinvee tot beeste in verskillende grondbewaringsdistrikte word vir hierdie doel bepaal volgens hul ware produksievermoë.

Dele van die land wat in die hoër reënvalgebiede val, is ook tot 'n mindere of meerdere mate getref en gekwes deur die droogtes en gepaardgaande oorbeweiding van die veld. Een van die ernstigste nadelige gevolge van hierdie toestande is die afloop van slik van die land se belangrikste dreineergebiede wat veroorsaak dat opgaardamme teen 'n onrusbarende tempo toeslik en ons watervoorrade in ernstige gevaar stel. Reeds het die heersende ontoereikende watervoorrade besproeiing erg benadeel en voergewasverbouing kom al sterker in die gedrang.

In hierdie verband moet spesiale aandag aan die verbouing en benutting van lusern gegee word. Lusernhooi word op grootskaal gebruik as uitsluitlike of hoof-bestanddeel van noodrantsoene vir skape en ook beeste. As gewas het lusern die hoogste waterbehoefte en in terme van waterverbruik is dit dus 'n duur gewas. As voer vir alle klasse van plaasdiere het lusernhooi voortreflike eienskappe en 'n besondere aanvullende waarde as bestanddeel van rantsoene. So waardevol, dat 'n goeie vraag met aantreklike pryse in die buiteland bestaan. Gedurende die afgelope 6 jaar (1960-1965) is 61,394 ton lusernmeel oorsee uitgevoer. Kan Suid-Afrika bekostig om sy skaarste bate — water — op hierdie indirekte wyse uit te voer?

Onafskeibaar van die direkte en indirekte invloed van droogtes op die getalle en produktiwiteit van die bees- en skaapbevolkings is die toename in onekonomiese boerdery-eenhede wat op so 'n groot skaal plaasgevind het. In Noordwes-Transvaal wat agro-ekologies 'n beesboerderystreek is, is gevind dat slegs 12 persent van eiendomme en eenderde van die oppervlakte betrokke groter is as 2,000 morg, 'n grootte wat beskou word nodig te wees om 'n lewe uit beesboerdery alleen te maak. Op die klein, onekonomiese eenhede vind intensifisering plaas met die klem op die produksie van kontantgewasse en ook veldmelkery wat onbestendig en onseker is in marginale ekstensiewe gebiede soos Noord-Transvaal en Noordwes-Kaap. 'n Bykomstige verskynsel is die uitbreiding van skaap- (bok-) getalle wat 'n ongunstige balans tussen bees- en skaapgetalle teweegbring en verdere agteruitgang van die veld in die hand werk, veral in die soetvelddele waar die skaap nog gedy wanneer beeste nie meer staande kan bly nie. Skaapvleisproduksie moet in ieder geval oordeelkundig uitgebrei word. In Suid-Afrika is skaapvleispryse uit verhouding hoog in vergelyking met ons lam- en beesvleispryse en ook met die buitelandse mark waar skaapvleispryse ongeveer 60 persent van die Suid-Afrikaanse prys is. Indien surplusse sou ontstaan, sal dit slegs teen groot verliese uitgevoer kan word.

Produksiebestendiging en -bevordering

Samevattend kan die globale posisie gestel word dat vanweë droogtes en benuttingstelsels die toestand van die natuurlike weiding in die grootste deel van die land van so 'n aard is dat bees- en skaapgetalle verminder sal moet word om herstel en bestendiging van die produksiebronne te bewerkstellig; dat die produksie en reproduksie van ons kuddes op so 'n vlak is dat daar heelwat ruimte is vir verhoging en dat groter veegetalle nie *per se* nodig is om produksie te verhoog nie; dat die moontlikhede van verhoogde veld- en voerproduksie in die hoë reënvalgebiede baie gunstig is; dat graanopbrengste so hoog is dat daar ruimskoots voorrade beskikbaar is vir dierevoeding; dat onekonomiese boerderyeenhede wanbenutting van die bodem veroorsaak en veeboerdery grotendeels uitgeskakel word, en dat nie 'n te hoë verwagting en afhanklikheid van voer- en diere-produksie op besproeiingsgronde gestel kan word nie. Om toekomstige vleisproduksie op 'n hegte grondslag te plaas en te laat uitbou, sal kragdadige en rasionele beplanning en uitvoering daarvan verg ooreenkomstig agro-ekologiese beginsels, d.w.s. bewaringsboerdery. Die inskakeling van beeste, skape en bokke in die voordeligste verhouding volgens die natuurlike weidings- en voergewasproduksiebronne vereis ewewigtige aandag aan die verskillende diereprodukte wat gelewer kan word, nl. melk, vleis, wol, bokhaar en pelse. 'n Gesonde melkbeesboerdery-bedryf is 'n intensiewe onderneming en die tyd het aangebreek dat melkbeesboerdery in daardie verband bestendig moet word. 'n Hoër gemiddelde produksie per koei kan lei tot 'n kleiner melkbeesbevolking wat verhoudelik 'n groter vleis-

beesbevolking sal gee. Die kleinveebevolking kan die vraag na skaap-, lam- en bokvleis betreklik maklik bevredig en vir 'n langtermyn nog ruimte laat vir die verhoging van wol, bokhaar en karakoelpelse. Met die besef dat droogtes, benewens seisoensdroogtes, 'n deel van die boerderypatroon is, moet die opberging van voervoorrade volgens elke plaas se vermoë 'n normale aktiwiteit wees om te voorsien in die behoeftes gedurende voorsienbare droogtes. In gebiede met 'n te lae reënval, selfs vir die aanplanting van droogtebestande plante, moet spaarveld die reserwe bron verteenwoordig. Oor 'n langtermyn is nodig die geleidelike opberging van bykomstige ruvoervoorrade vanuit ander bronne om onberekenbare droogtes te help oorbrug.

Wildsbokke kan in die droë gebiede van die land moontlik 'n belangrike rol speel om die natuurlike weidings doeltreffend te benut vanweë hul aangepastheid en weigewoontes. Ondersoek is egter nodig om die plek en waarde van wild in vergelyking met plaasdiere vir kommersiële vleisprodusseerders vas te stel.

In Suid-Afrika bestaan voortreflike hulpmiddels om boerdery in al sy vertakkings vooruit te help en wat betref diereproduksie in besonder is daar benewens die algemene navorsings- en velddienste ten opsigte van gesondheid, teling, voeding en bestuur, spesiale skemas om bees- en skaapvleisproduksie te bevorder, t.w. die beesvleis- en skaapvleisprestasie-toetsskemas. Die toepassing en implementering van verbeterde praktyke en tegnieke berus egter by die boer wat die nodige kennis, vaardigheid en aanmoediging moet hê om die taak te kan verrig. Die boodskap van 'n Amerikaanse President aan die „Academy of Sciences" is ook van toepassing op Suid-Afrika, nl. „The earth can be an abundant mother if we learn to use her with skill and wisdom — to tend her wounds, replenish her vitality and utilize her potentialities".

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BONE TUMOURS IN THE DOG

ARNOLD THEILER MEMORIAL LECTURE

Pretoria, September, 1966

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Mr. Dean, Ladies and Gentlemen,

I am deeply conscious of the honour of being invited to deliver this third Arnold Theiler Memorial Lecture. I feel how fortunate it was for the whole world that Theiler carried out his main researches in this country where at the time his career commenced the problems of animal disease were scarcely touched. His struggle against Rinderpest in 1896 is legendary. His efforts, relatively early in his career, resulted in the building of this great Veterinary Research Institute and School. His important researches in Virology, Bacteriology and Protozoology, both human and veterinary, revolutionised disease control and prevention.

It is perhaps not so well known that Theiler also made unique contributions to bone pathology. Theiler was also one of the first to recognise the value of the comparative approach and during the past few years many others have awakened to the benefits which may be derived from a study of comparative medicine. The co-operative work of veterinary and medical scientists is greatly to be encouraged and in no field is this more true than Cancer.

A study of bone tumours in the dog can in itself be a profitable exercise in combining clinical and radiological findings with the pathological process but because of the similarity to bone tumours in man the condition assumes greater importance. The rate of growth of tumours, tumour transplantation, and chemotherapeutic treatment may sometimes be difficult to study in man but can frequently be studied in an ethically acceptable manner in the dog and yield information which may be useful both in man and dog.

As we live in an age threatened by radioactive fall-out and where radioactive isotopes are increasingly being used in scientific investigations it has become very necessary to learn more about the behaviour of the bone-seeking isotopes. Most work in this field has been done on the smaller rodents but there is now also available very considerable information on the production of bone tumours in dogs by radioactive materials. While I shall confine most of my talk to bone tumours occurring spontaneously in the dog, in particular the osteosarcoma, I shall also deal briefly with the interesting results which have recently been published by the Utah workers on bone cancer following skeletal irradiation in Beagles.

Incidence

The true incidence of bone tumours in the dog is not known. Various authors give figures from veterinary clinics ranging from 1 in 14,000 to 1 in 350 cases seen. Based on pathological examination of neoplasms Cotchin (1956) found that 4% of his tumour material affected the bones primarily.

Benign tumours of bone are rare and few cases have been recorded. *Osteoma* occurs usually on the skull and facial bones but Mulligan (1949) records a case where a phalanx in a hind limb was involved. Chondroma is very uncommon when compared to the incidence of chondrosarcoma.

Of the malignant bone tumours osteosarcoma is by far the most common. Chondrosarcomas appear much less frequently. Fibrosarcomas and haemangiosarcomas are uncommon tumours and rarely seen are Reticulum cell sarcoma, lymphosarcoma, liposarcoma, synovioma or Adamantinoma. Unlike man where the plasma cell myeloma is more frequently seen than osteosarcoma this is an uncommon tumour in the dog and only a few cases have been recorded.

An osteosarcoma or osteogenic sarcoma is a sarcoma which forms neoplastic osteoid and/or bone during the course of its evolution. The majority of cells produce large amounts of alkaline phosphatase. In the dog it is necessary to be very critical regarding osteoid and bone in a tumour

since by comparison with man there is a much greater tendency to reactive bone formation not produced by tumour cells.

The age incidence of this very malignant tumour of bone is shown in Fig. 1 and it will be noted

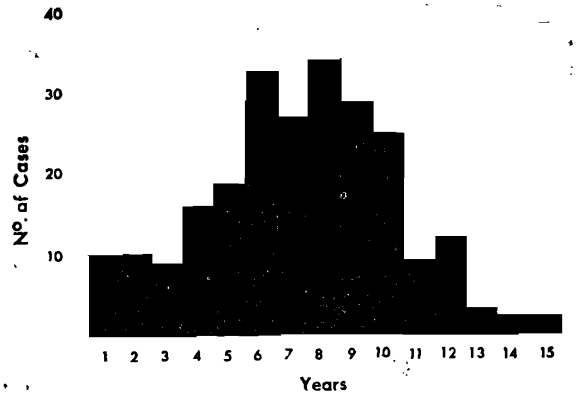

Fig. 1
Age incidence of osteosarcoma in the dog.

that over half the cases occurred in dogs between 5 and 9 years old. Tumours occurring in the first 4 years of life, a period roughly analogous to the first three decades in man, totalled 19% and a large proportion of these were sarcomas of ribs. In man the picture is very different (Fig. 2) as

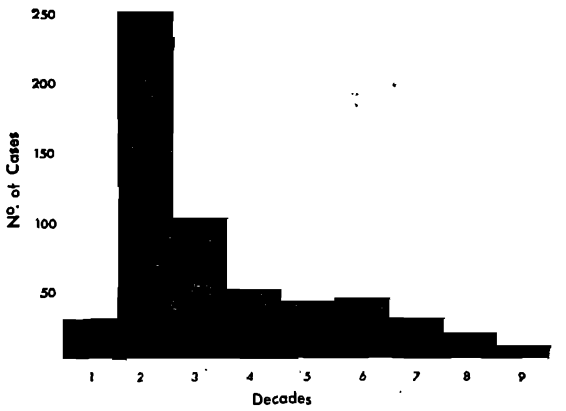

Fig. 2
Age incidence of osteosarcoma in man.

out of a total of 562 tumours, 375 (67%) occurred in the first 3 decades of life. In Britain the age distribution of osteogenic sarcoma in man follow two peak periods, the first in the second decade, and the second after the age of 50 years. This second peak which is due to the high incidence of Paget's disease in Britain is not seen in all countries. Paget's disease or osteitis deformans in which there is a deformity and bowing of the bones, and increased size of the head and a decrease in height has never been described in the dog.

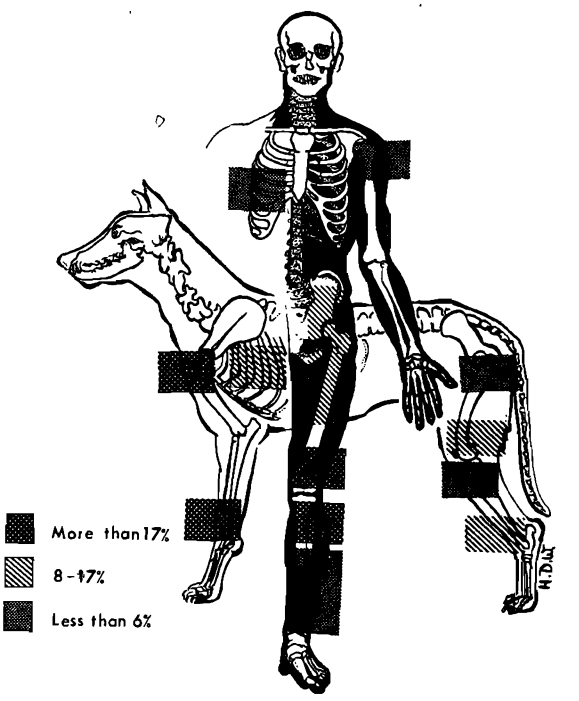

Fig. 3
Main sites of osteosarcoma in man and dog.

From 189 cases in the dog recorded in the literature there is a ratio of 1.4 : 1.0 male to female. Of 560 human cases there is a ratio of 1.65 : 1.0 male to female. While there is thus a distinctly male predominance in man this is not so convincing in the dog as there is a higher percentage of males in the population.

Reports of the sex ratio of dogs being admitted to clinics for all purposes in different countries of the world have varied from a ratio of 1.09 : 1.0 to 1.4 : 1.0 male to female. The number of Great Danes recorded with bone tumours where the sex was also given indicate only a slight male bias but the total figures are relatively small.

Price (1958) has suggested that the higher number of tumours in young human males may be related to the slightly longer period of skeletal growth in the male than the female. As the fully

grown male skeleton is 10% greater than the female there is an additional volume of endochondral bone which may be important.

The great majority of osteosarcomas arise in the metaphysis of a long bone both in dog and man and the distribution is shown in Fig. 3. It can be seen that in the dog common sites are the proximal humerus and distal radius accounting together for more than a third of the total tumours. In man the proximal humerus accounts for 6.5% of tumours and only 1% of tumours occur in the distal radius. Well over half the tumours in man occur in the region of the knee — distal femur and proximal tibia.

Osteosarcomas in the distal humerus or proximal radius of the dog are extremely rare. In the normal dog 70% of the growth of the radius takes place at the distal epiphysis and in the humerus the proximal epiphyseal plate contributes more to the total growth than the distal. The epiphyseal plates of the proximal humerus and the distal radius usually close about 3 months later than the epiphyseal plates of the distal humerus and the proximal radius.

While growth rate and period of growth may be significant, weight bearing factors are very important. The ratio of fore limb to hind limb involvement in the dog has been assessed at 1.6 : 1.0 (Wolke and Nielsen, 1966). In man bone tumours of the leg are more than five times as common as tumours of the arm. Brodey et al. (1963) found that the ratio of long bone to flat bone involvement was very much higher in the Great Dane (21 : 1) St. Bernard and Irish Setter than in the Boxer (1.9 : 1).

It is well known that osteosarcoma is primarily a disease of large dogs. Of 224 cases described in the literature only 6% were in the small breeds. Although the Great Dane is not a popular breed there were 36 cases (16%) in the 224 recorded. Brodey (1963) found that although the Great Dane represented only 0.8% of the dogs seen at the University of Philadelphia Veterinary School it accounted for 17% of the osteosarcomas. It may be that in some strains the tumour is hereditary. The Beagle, which is being studied for the production of osteosarcomas following the administration of radioactive isotopes has a low natural incidence of the condition. Mays and Taylor (1964) have calculated that between 1,000 to 10,000 Beagles of long lifespan would be required to produce a single spontaneous osteosarcoma.

Multiple osteosarcoma of bone in dogs occasionally occurs (Cotchin 1953, Owen 1965). In some cases the same site was affected in the opposite limb. While metastasis cannot be completely excluded it seems more likely that these tumours were of multicentric origin.

Ross (1964) in a record of 98 osteosarcomas in man found that 15% metastasised to other bones. The multiple bone tumours arising in Paget's disease may be of multicentric or metastatic origin. A few genuine primary multicentric osteosarcomas have been described in man but such cases are very rare. Certain benign tumours of bone in man, osteoclastoma, chondroma, fibroma, may be multiple and the condition of multiple cartilaginous exostoses in man is believed to be hereditary. Only one case of multiple cartilaginous exostoses has been described in a dog, but it is of considerable interest that, similar to some cases described in man, one lesion had developed into a chondrosarcoma. There was a lack of adequate information regarding a possible hereditary nature in the dog. (Banks and Bridges, 1956).

The relationship of trauma to tumour formation has led to the publication of numerous articles and even books. Following a history that the man or the dog with a bone tumour was recently involved in some accident one should recall Ewing's observation that 'traumas reveal more malignant tumours than they produce'. There is no evidence that a single act of trauma to healthy tissues can produce neoplasia but trauma may act as a co-carcinogen and lead to the development of tumours in tissues already in a pre-neoplastic state. Huxley's (1958) remarks are very apt.

"We should drop medieval concepts concerning causation and think in terms of multiple correlation".

Radiation induced tumours.

No difference has been found in the concentrations of the radioactive elements Ra^{226}, Ra^{228} or Pb^{210} in the skeletal tissues of persons dying from osteosarcoma when compared with those found in persons of the same age group dying from other causes (Lucas 1964).

The bone tumours arising in dial painters who licked their brushes are well known. The paint contained radium, radiothorium and mesothorium. Malignant bone tumours have also arisen in people given radium orally or by injection in the 1920's and have also occasionally followed the X-ray therapy of benign bone lesions with a variable interval of 4-24 years.

Since 1950 the Radiology Division of the Department of Anatomy in the University of Utah have been studying the biological effects of various

radioactive elements in adult Beagles. Bone tumours have been the chief cause of death and up to September 1965, osteosarcomas were present in 136 of 201 radioactive Beagles. The tumours varied remarkably as to location and growth rate. In some cases the growth rate was very rapid (8-10 days doubling time) while in others it was 3 or 4 months. Multiple tumours frequently occurred. The period from injection to death varied with the radionuclide, and the dose. In dogs injected with Ra^{226} Ra^{228} Pa^{239} or $Th.^{228}$ most of the dose is from α particles and this irradiation produced bone cancers at rates only about 25 times those corresponding to I.C.R.P. maximum permissable body burden for radiation workers. It is possible that osteosarcomas may be produced at even lower levels by these very toxic α particle emitters.

In contrast osteosarcomas were induced in Beagles by β particles from Sr^{90} only at the highest level given and the results suggested that there is no significant hazard to an adult radiation worker at the current permissable level.

Diagnosis

The diagnosis of naturally occurring bone tumours in the dog is based upon clinical, radiographical and histological findings.

Lameness and swelling, particularly in the large breeds in the sites already detailed will cause a suspicion of osteosarcoma. Some of the slower growing tumours and some of the chondrosarcomas appear relatively painless for long periods of time and the tumours may be very large before the owner seeks veterinary advice. Some of the rapidly growing osteolytic tumours on the other hand may be very painful and result in pathological fracture of the affected bone in a few weeks. Oedema is sometimes present and in advanced cases muscle atrophy may be very severe. In a small percentage of cases there is regional-lymph node involvement and the enlarged, sometimes hard, nodes may be palpated. Metastases to the lungs is the common method of spread but only in advanced cases is this *clinically* apparent.

The radiographical appearance of osteosarcomas is very variable but is often helpful in formulating a provisional diagnosis. There is usually evidence of bone destruction and bone production. In the early cases there may only appear an increased density in the metaphysis of a long bone, or a mottling effect due to increased and decreased areas of density. As the tumour grows the cortex becomes ruptured, and the appearance of advanced cases of both osteolytic and osteosclerotic tumours are well known. The 'sun burst' effect is due to periosteal new bone which is laid down. Both osteolytic and osteosclerotic lesions are frequently limited by the epiphyseal plate but in the advanced tumours erosion continues to the joint. The mass of the tumour may be visible on the radio-graph but a clearer definition of the boundaries of the tumour is obtained by arteriography. The radiographical appearance of osteosarcomas in dog and man is strikingly similar. In dogs treatment is not always attempted and if these animals are submitted to serial radiography rapid progress of the lesion indicates high malignancy. If the human patient is unfortunate enough to be subjected to this procedure without treatment a similar effect is observed. The differential diagnosis of osteosarcoma includes not only other tumours of bone but also osteomyelitis, exostoses and the rare bone cysts. With the exception of multiple myeloma in the dog which shows punched out lesions of bone essentially similar to those seen in man there is a lack of information on the radiographical features of other tumours. Chondrosarcomas and haemangiosarcomas are difficult to differentiate from osteosarcomas, advanced cases may destroy the entire affected bone. Fibrosarcomas may only cause periosteal roughening or can produce osteolysis and a moth-eaten appearance of the bone. The radiographical features are quite incomplete when compared with man where a considerable amount of information on these tumours is now available. Metastatic tumours to bone in the dog are very uncommon and while occasional metastasising mammary tumours have been described it is doubtful if there is an authentic case of a prostatic tumour metastasising to bone.

Arteriography of the limb vessels for bone tumours in man was demonstrated by Strickland (1959) to be of some value in that the great majority of malignant bone tumours do show arteriographic evidence of malignancy. Unfortunately, there are a small percentage which do not. The technique has been used in dogs (Owen and Stevenson 1962) and most of the features described as occurring in man occur also in osteosarcoma of the dog. These include the finding of vessels seemingly deployed without purpose, arteriovenous anastomoses, abrupt termination to an otherwise normal artery, the presence of straight veins coursing at right angles to the normal flow of venous blood and nests of small vessels encircling the periphery of an area of relative avascularity.

Radiography of the chest is mandatory in a suspected bone tumour. Metastases are frequently cannon ball in type and may be very dense as is

usually the case in man. Better definition can be obtained by giving the dog a short acting general anaesthetic such as methohexitone sodium and after passing an endotracheal tube manually inflating the breathing bag so that a radiograph can be taken at the time of maximum forced inspiration. In this way small metastases may be more readily identified and a clearer definition of larger tumour masses obtained. Metastases less than 0.5 cms diameter are rarely if ever diagnosed and frequently a diameter of 0.8 cms or even 1.0 cms must be reached before diagnosis is certain. Radiographical examination of the whole skeleton may reveal other tumours in other bones in a small number of cases but as with lungs very early tumours may not be visible.

There are no reports to date of total body scanning with Strontium 85 for the diagnosis of bone disease in dogs. Although the isotope concentrates in areas of active osteogenesis this is not specific for skeletal tumours. However, the method has much to recommend it and merits further investigation.

Biochemistry

Estimation of serum alkaline phosphatase levels is only of limited assistance in the diagnosis of bone tumours. There is an increased level in many bone and liver diseases of man and animals. In normal adult human and dog serum nearly all the activity lies in the alpha-2 globulin fraction and this is also true for cases of bone disease. Extracts of osteosarcoma tissue in dogs have shown two types of activity, one in which there was intense activity in the β-globulin fraction with slight activity in the α2 and a second in which there was more diffuse activity throughout the α and β globulins and albumin.

In the reported cases of the rare plasma cell myeloma in the dog the urine was usually negative for Bence Jones protein in those cases where it was examined. One case however is recorded (Holmes et. al. 1964) in which it was positive. While in another case it was negative the total serum protein was 12.4g. (normal 6g.% approx.) and the globulin 87.6% (normal 21% approx.) (Pennock et. al. 1966).

Biopsy

It is generally agreed among human surgeons that a biopsy and histological diagnosis is always necessary before attempting treatment. Where clinical and radiological findings in the dog point to a malignant bone tumour and there are no metastases visible on radiographical examination of the lungs biopsy may not always be indicated. If the animal is strongly suspect for osteosarcoma on clinical and radiographical grounds and is to be left without treatment it is better to avoid biopsy because of the risk of metastases or possible accelerated local tumour growth. While drill biopsies are frequently used in man and are clinically preferable to open biopsy, they are less satisfactory from the pathologists viewpoint. If biopsy is decided upon in the dog it is best performed under general anaesthesia. Care should be taken to obtain tumour tissue and not simply the periosteal reactive tissue.

The findings of Peterson et. al. (1960) are of interest in relation to biopsy. Before biopsy of an osteosarcoma in the tibia of a Great Dane the blood in the venous return from the tumour was examined and found free from neoplastic cells. After biopsy under tourniquet and release of the tourniquet neoplastic cells were found in the draining blood. The animal's leg was amputated but death occurred later from lung metastases. It is not, of course, known what part the cells released into the circulation at the time of biopsy played in the development of these metastases but because of this risk some authors feel that biopsy should be done under a double tourniquet. If the rapid diagnosis on the frozen biopsy specimen is osteosarcoma they recommend amputation of the limb between the tourniquets. It is however, not always possible for the pathologist to make an exact diagnosis from a frozen section unless he has very considerable experience in bone pathology.

Prognosis and Treatment

Survival rates of dogs with neoplastic diseases are not easy to assess accurately. Much depends upon the wishes of the owner, the apparent degree of pain suffered by the animal and the advice of the veterinary surgeon. In the case of bone tumours which have produced a pathological fracture euthanasia may be performed as soon as a diagnosis is made. In other more slowly growing cartilaginous osteosarcomas the animal may live several months; analgesics being given if required. Many, however, are dead within 3 or 4 months of the first examination. The reason for euthanasia may be because of pain, pathological fracture, gross ulceration and bleeding of the tumour, advanced metastases in the lungs or hypertrophic pulmonary osteoarthropathy (Marie's Disease). The prognosis in chondrosarcoma is better than osteosarcoma as is the case in man.

In Britain limb amputation in dogs is not usually considered favourably by owners especially in

the large breeds of dog. In four cases where this was performed euthanasia was required in less than 3 months because of lung metastases. In America limb amputation is more frequently carried out and Brodey (1964) has published results of amputation for 29 limb osteosarcomas. Within 3½ months, 59% were killed because of lung metastases, Marie's disease or tumour recurrence. Within 7 months 80% were dead. Three dogs lived over a year and one of these was alive after 3½ years. The survival rate was much better after amputation of a hind limb than amputation of a fore limb. In a small number of dogs with chondrosarcoma subjected to surgical ablation the time of survival was much greater as is the case in man.

In a series of 32 human cases reported by Ross 7 patients survived 10 years or more. The histological grade of the tumour greatly influenced the survival rate and it would be valuable to grade for malignancy the tumours seen in the dog. In 430 human cases reported by Coventry and Dahlin (1957) treated usually by amputation with radiation therapy being sometimes used in addition, 19.3% survived 5 years and 15.3% 10 years. The site of the tumour appeared to be important as it seems to be in the dog. The five year survival rate for patients with lesions of the tibia was 34.6% while for patients with lesions of the middle and lower thirds of the femur was only 17%.

Between 1951-1957 at the Westminster Hospital, London, 92 cases of bone sarcoma free from lung metastases when first seen received a tumour dose of 7000r - 8000r from a 2 m.e. V. source at the rate of 1000r per week. Almost half the patients later had amputations usually after at least 3-4 months. Clearly viable tumour cells were found in a third of the cases which came to limb ablation. The 5 year survival rate was 22% which was slightly better than surgical ablation alone. An interesting result was that unlike Coventry and Dahlin's series more Femoral than Tibial sarcomas were saved. Recently a combination of chemotherapy and radiotherapy has been used. During the last two weeks of the radiotherapy course the cytotoxic drug S.P.-1 (ethyl hydrazide of podophyllic acid) was infused into the relevant artery and on a small number of cases an enhanced degree of tumour distinction appeared to be achieved (Newton 1965).

X-irradiation of canine bone tumour has been relatively neglected. Results have been poor although frequently there is a dramatic and valuable relief of pain following treatment. Osteosarcomas in dogs have been considered to be very radiation resistant but no adequate reports are available to compare with the results in man following high dosage super voltage radiotherapy. Further work on X-irradiation in dogs using super voltage therapy with oxygen and other radiosensitizers such as 'Synkavit' would be valuable (Silver and Cater 1964).

In man, irradiation of lung metastases, sometimes in high doses coupled with post-irradiation infusion of the patients own bone marrow, has not usually been successful. Radiation pneumonitis has been a common sequel.

Because most osteosarcomas in man are excised or irradiated immediately after diagnosis there are few reports of the use of tumour inhibiting drugs. Sarcolysin and Ptorphan have been tried using limb perfusion techniques but with rather poor results. Using Sarcolysin as the only form of therapy resulted in the disappearance of pulmonary metasteses for a period of several months in 3 cases of osteosarcoma (Graham, 1966). The alkylating agent Ethoglucid was used by intra-arterial injection or limb perfusion in 17 dogs with malignant bone tumours. (Owen 1964). Regression of the tumours occurred in 12 dogs but was maintained for 2 months or more in only 5 of these. Radiographic changes occurred in the affected bones. The largest period of regression was 5 months. Following perfusion there was alleviation of pain in the tumour area but oedema of the limb was sometimes a serious side effect and resulted in gangrene in 4 cases. Serum alkaline phosphatase values rose rapidly after perfusion and in the more successful cases fell slowly to low values, rising again at the time of tumour recurrence. The radioactive drug tritiated 'Synkavit' produced tumour regression in a few cases of osteosarcoma in dogs. In others it had little effect (Cater and Silver).

The localisation of tetracyclines in bone tumours has been studied in man and dog. While there is a heavy concentration of the drug in newly developed bone there appears to be no selective concentration in the malignant cells. It would not seem likely that the attachment of radioactive isotopes or a cytoxic molecule to the tetracyclines would be valuable in therapy as was at one time thought.

The Future.

As in every field of Biology numerous problems remain.

It would seem profitable to study the pedigree of Great Danes with osteosarcomas and to further study the incidence and site in other breeds. A search for pre-neoplastic changes and earlier

methods of diagnosis including a detailed study of the alkaline phosphatase liberated from tumours would be valuable. A direct histological comparison of canine and human tumours and the grading of canine tumours is required, preferably linked with the growth rate of the tumours and their metastases. Knowledge of the response of tumour vessels to drugs and the distribution of drugs in tumour tissue would help in the development of treatment by chemotherapy. Other possible methods of therapy such as laser radiation, ultrasound and infra red are relatively unexplored.

Advances will be made more quickly if veterinary clinicians take a more active interest in research, if veterinary pathologists are sometimes interested in the live as well as the dead, and if we cooperate fully with the medical profession. Above all is needed the devotion, ability, and capacity for work which was shown by Sir Arnold Theiler.

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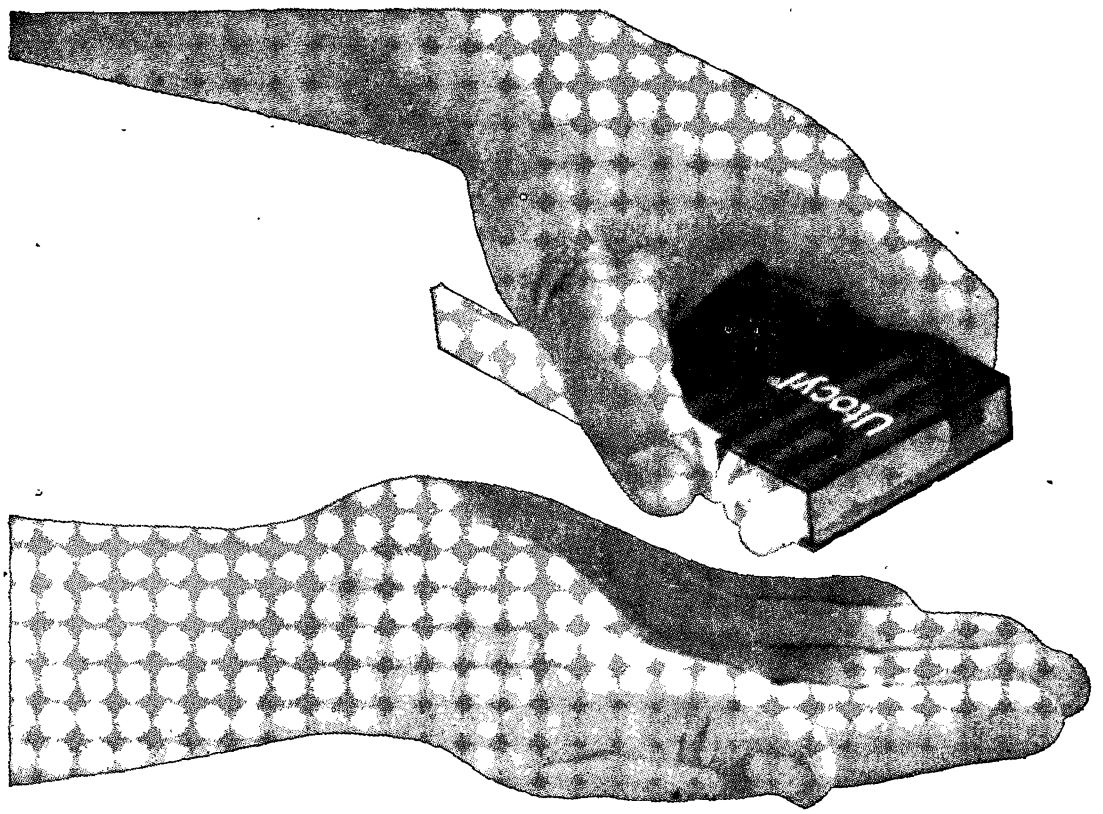

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THE LABORATORY AND FIELD EVALUATION OF THE ANTHELMINTIC TETRAMISOLE IN SHEEP AND CATTLE IN AUSTRALIA†

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ICIANZ Ltd.,

SUMMARY

The results of a series of laboratory and field experiments assessing the value of tetramisole as an anthelmintic in sheep and cattle are described. In these experiments tetramisole at the rate of 15 mg/kg was shown to be highly effective for the control of the common gastro intestinal nematodes and the lungworm *Dictyocaulus* spp.

Production experiments with sheep have shown that in areas where helminths are a problem its regular use results in increased bodyweight gains and wool production, and in this respect it compares favourably with thiabendazole.

Field toxicity experiments involving over 170,000 sheep and 11,000 cattle have shown it to be well tolerated under a wide variety of climatological conditions and husbandry practices. There appear to be no contra-indications to its use in the field.

INTRODUCTION

The development of a new livestock anthelmintic is a time consuming operation. Initially its efficiency against a wide range of mature and immature parasites must be established in a series of laboratory experiments which must be replicated at many dose levels under differing feeding and stress conditions. At the same time its toxicity must be investigated to determine whether it has an adequate margin of safety and is free from undesirable side effects when used at the therapeutic dose rate. Finally its value for keeping livestock healthy and increasing production when used under normal field conditions must be established.

With tetramisole this has been carried out in many countries of the world but because seasonal and climatic conditions as well as husbandry practices vary considerably from continent to continent and country to country it has been necessary to adapt the tetramisole development programme to suit the particular conditions of each and every country.

RESULTS

A. *Sheep*

(1) *Laboratory Studies*

In Australia and New Zealand studies initially were centred on the laboratory and in a series of experiments (Forsyth in press) it was shown that to obtain a consistently high degree of kill of all stages of all the common gastro intestinal nematodes of sheep a dose rate of 15 mg/kg was necessary. This dose rate has now been adopted in most countries of the world.

With regard to individual parasites *Haemonchus contortus* appears to be the most sensitive to the drug for adult forms are eliminated by dose levels as low as 2.5-5.0 mg/kg. Immature stages are somewhat more resistant but at 10-15 mg/kg the efficiency is almost 100 per cent. *Ostertagia* spp. is the most resistant of all parasites but at 10-15 mg/kg the efficiency against adults is 90-100%. Immature *Ostertagia* spp. are more resistant and for high efficiency against these a dose rate of about 20 mg/kg is needed to obtain elimination.

All other parasitic species fall between these two in susceptibility to the drug but of particular interest are *Oesophagostomum columbianum* and *Dictyocaulus* spp. For the former a very high degree of activity has been shown for immature forms by the therapeutic dose rate. This has also been demonstrated by Reinecke (1966) in his

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larval anthelmintic test. For *Dictyocaulus* spp. Walley showed efficiency of from 50% for 3 day old larvae to 90-95% for 7-10 day old larvae. Against mature parasites we have found the therapeutic dose of 15 mg/kg to be 95-99% effective.

(2) *Field Studies*

No matter how thoroughly an anthelmintic has been tested in the laboratory, the hazard still exists of lack of efficiency or toxicity under field conditions. In the past there have been several instances of highly efficient anthelmintics, which have passed every laboratory test, breaking down in the field under certain husbandry conditions with a resultant degree of mortality or morbidity.

Tetramisole has now been thoroughly and successfully field tested in both Australia and New Zealand. This field evaluation was carried out in two ways. Firstly by the production type of experiment, where groups of animals were treated at regular intervals and their bodyweight responses compared with both control groups and groups treated with other anthelmintics, and, secondly by the dosing of many thousand of animals on a large number of farms under a wide variety of climatological conditions and husbandry practices.

The tetramisole used in the field studies was a 6% w/v formulation and to provide a dose of 15 mg/kg the following dose schedule was employed:

Lambs up to 30 lbs	2.5 ml
Sheep 30-50 lbs	5.0 ml
Sheep 50-75 lbs	7.5 ml
Sheep over 75 lbs	10.0 ml

The dose rates administered were in every case arrived at by visual estimation of the average weight of the flock, and for individual animals would have provided a dose range of 12-22 mg/kg within any of the above weight groups. Undoubtedly a small percentage of animals would have been dosed outside this range but the majority would have received a dose within the range stated above.

The administration of the material was by means of an automatic drenching gun capable of being set to deliver any dose volume up to 15 ml. For subcutaneous work a 5% w/v solution was used and this was injected at the rate of 12.5 mg/kg by means of an automatic vaccinating syringe.

(a) *Production Experiments*

Worm parasites are an important cause of economic loss and their control should result in an observable and measurable increase in the animals productivity. The ability to kill a large percentage of the hosts parasitic burden is therefore not the only requisite of an anthelmintic chemical. It must be well tolerated by the animal and it must not interfere with the animals growth pattern or harm its productivity in any way.

In Australia there has been an intensive study of the epidemiology of the parasitic diseases, and this has enabled the farmer to use anthelmintic therapy at strategic times to increase or maintain the productivity of his herd or flocks. Unfortunately not all anthelmintic treatments are carried out as a means of preventing or minimising the loss of production which can be caused by helminths, for outbreaks of clinical parasitism are still relatively common. However, as the farmer becomes better informed on parasite control, so the emphasis shifts from the curing of clinical parasitic disease by random anthelmintic therapy, to the use of anthelmintics as an aid to keeping livestock healthy and maintaining or increasing production.

Our production experiments have therefore aimed at the determination of the productive potential of groups of animals in which the regular use of tetramisole has limited the worm burden. In these experiments the tetramisole has been administered either orally or subcutaneously and these treatments have been compared firstly with a control group for the purpose of determining the extent to which parasites have limited production, and secondly with another type of anthelmintic therapy. For the latter thiabendazole was chosen, for its value in both curing helminth disease and increasing productivity is now well proven and documented.

The treatments used in our production experiments were as follows:—

1. Tetramisole orally every 4 weeks
2. " " " 8 "
3. " by s/c injection every 4 weeks
4. " " " " " 8
5. Thiabendazole orally every 4 weeks
6. " " " 8 "
7. Control

On each property, groups of 30 lambs selected at random when their average age was eight weeks, were used.

The three treatments, which were given every four weeks, were not in any way intended to represent an economic worm control programme, but were rather an attempt to measure differences in group productivity when worm burdens were

kept at very low levels throughout the first year of the animals' life.

The treatments given every eight weeks more closely approached economic worm control but the necessity of their regular timing meant that the normal seasonal pattern of worm populations had to be ignored. The timing of these treatments could therefore have been well astray epidemiologically, but under the circumstances governing the management of the experiment they were the best compromise which could be made.

The control group of animals was run with the treated groups and in so doing acted as a source of reinfestation. This was unavoidable and it could not be ascertained how these sheep affected the experiment. They almost certainly put some degree of stress on each of the treated groups and so should have helped to exaggerate differences in the effects of the various treatments.

At each property all animals were weighed every four weeks and faecal samples were taken from animals in each group as a check on worm populations. For the sake of simplicity the properties concerned with the production trials have been grouped according to their district and climate.

(i) *Western Districts - Victoria* (Two Properties)

These properties are in a typical winter and spring rainfall area with a very dry summer and early autumn. Both properties are sown down to improved pasture which provides excellent green feed during the spring and moderately abundant dry feed during the summer. This dry summer feed may become sparse and be of poor nutritive value if the autumn rains are delayed. Winter pasture is normally short and green and is dependant on the time that the autumn rains occur.

The normal epidemological pattern in this district is for worm burdens to increase during the spring with the main effects of this infestation becoming apparent in the late spring and summer. Once the autumn rains occur the animals will face a further challenge from infective larvae, but in most cases the normal immunological pattern has been established and the animals have a fair degree of immunity. The main parasites present in this area are *Ostertagia* spp., *Trichostrongylus* spp., and *Chabertia ovina*.

From Table 1 it will be seen that during the period of August to December the control group of animals grew at a much slower rate than those in the six treated groups.

This difference although small during the first two months of the experiment was most apparent at the end of the spring. Body-weight gains in the treated groups were uniform during the spring but slight differences between the groups were evident. For example all groups treated every four weeks made slightly better weight gains than those treated every eight weeks and it would appear that the animals treated with tetramisole made better weight gains than those treated with thiabendazole.

During the summer normal nutritive stress factors were responsible for a loss of weight in all groups. This weight loss was greatest in the control animals.

With the advent of the autumn rains in late March weight gains were again recorded but in the period to the end of July there were no differences between any of the groups including the controls.

Worm burdens in the control animals showed a steady increase during the spring but treatment with tetramisole at this time temporarily reduced the population build up. Following the autumn rains in late March the "self cure phenomenum"

TABLE 1—WEIGHT GAINS—WESTERN DISTRICTS

Mean of two properties—60 sheep per group

Treatment	Average Weight Gain (lb)			Total
	Aug.-Dec.	Dec.-March	March-July	
Tetramisole 4 wks	31.6	−2.3	+11.6	40.9
Tetramisole 8 wks	29.7	−2.3	+11.1	38.5
Tetramisole s/c 4 wks	30.2	−3.0	+11.2	38.4
Tetramisole s/c 8 wks	29.2	−2.2	+10.4	37.4
Thiabendazole 4 wks	29.0	−2.2	+11.3	38.1
Thiabendazole 8 wks	27.0	−0.9	+11.4	37.7
Control	+21.0	−4.5	+13.1	29.6

occurred and during the autumn and early winter the worm burden in the control group was light.

The average faecal egg counts for the various treatment groups is shown in Table 2.

From Table 3 it will be seen that only 10% of the control animals had reached 60 lb live weight at 32 weeks of age, whereas substantially more of the treated animals had reached 60 lbs at this time. Initially there was little difference in the numbers

TABLE 2—WESTERN DISTRICTS

Average faecal egg count—Mean of two properties

Month	Control	Tetramisole oral	Tetramisole s/c	Thiabendazole
August	1100	1100	1100	1100
September	1450	1000	1100	550
October	1900	700	800	500
November	3600*	1000	500	700
December	1150	450	400	600
January	1500	550	600	700
February	1900	700	650	500
March	2650	200	500	200
April	490	10	20	150
May	515	20	40	100
June	430	40	60	60
July	300	20	40	100
August	460	10	40	80

*Drenched with tetramisole at owners request to prevent an expected heavy mortality.

There was little difference in the faecal egg counts between any of the treated groups, however, it appeared that animals which were treated every eight weeks may have had slightly greater worm burdens than those which were treated every four. All treatments successfully held the worm populations at much lower levels than those of the control groups. Lungworm was present at both properties during the spring and summer but no quantitative assessments were made of their numbers.

A further assessment of the efficacy of the various treatments is the growth rate of the animals as judged by the percentage that reach a certain weight at various ages.

of animals over 60 lbs in each of the treated groups, but as time progressed the greated percentage of animals was present in the group treated orally with tetramisole. At the end of 52 weeks, apart from the control animals there was no difference between any of the treated groups.

Wool production is another measurement of the value of anthelmintic therapy and at one property (Table 4) it will be seen that although the tetramisole treated groups made slightly greater weight gains than the thiabendazole groups over a six months period, the average weight of wool produced by each treatment was similar. At this property there was a substantial difference in weight gain between the control and the treated groups,

TABLE 3—WESTERN DISTRICTS

Percentage of animals over 60 lb at weeks of age

Treatment	Weeks of age					
	16	20	24	28	32	52
Tetramisole 4 wks	3	35	50	53	56	85
Tetramisole 8 wks	3	20	38	41	45	80
Tetramisole s/c 4 wks	7	28	46	48	48	80
Tetramisole s/c 8 wks	3	30	48	53	53	86
Thiabendazole 4 wks	3	25	33	40	43	83
Thiabendazole 8 wks	5	27	33	38	43	86
Control	1	10	10	10	10	51

TABLE 4—SIX MONTHS PRODUCTIVITY "KULEAH" WESTERN DISTRICTS

Treatment	Sheep in Group	Treatment Intervals	Average Weight Gain (lbs)	Average Wool Production (lbs)
Control	30	Nil	18.72	3.51
Tetramisole oral	30	4 wks	30.13	4.45
Tetramisole oral	30	8 wks	29.80	4.44
Tetramisole s/c	30	4 wks	30.33	4.35
Tetramisole s/c	30	8 wks	29.56	4.38
Thiabendazole	30	4 wks	29.08	4.49
Thiabendazole	30	8 wks	26.39	4.46

together with a loss in wool production of approximately 1 lb per head.

(ii) *Northern Districts* - Victoria and Southern N.S.W.

In many respects conditions in the Northern Districts are very similar to those in the Western Districts although the summer is usually longer and hotter. This too is a winter and spring rainfall area with a spring flush and a declining plane of nutrition throughout the summer.

In the period covered by this experiment conditions were usually dry and worm burdens as judged by faecal egg counts were light. Only once during the observation period did faecal egg counts in the control group rise above 1000 e.p.g.

The effects of these low worm burdens were reflected in the negligible difference in weight gains between the control and treated groups. (See table 5).

Again however, the tetramisole treated groups made slightly greater weight gains than the thiabendazole groups. On both properties lungworms were not diagnosed.

The percentage of animals over 60 lb is also very similar in all groups (see table 6), and it is

TABLE 5—NORTHERN DISTRICTS

Mean of two properties—60 sheep per group

Treatment	Average Weight Gain (lb)			Total
	Sept.–Dec.	Jan.–Mar.	Apr.–Jul.	
Tetramisole 4 wks	20.0	5.0	21.0	46.0
Tetramisole 8 wks	18.9	4.5	22.5	45.9
Tetramisole s/c 4 wks	20.9	4.7	22.3	47.9
Tetramisole s/c 8 wks	19.6	5.7	21.0	46.3
Thiabendazole 4 wks	18.0	2.8	21.2	42.0
Thiabendazole 8 wks	18.9	2.9	21.6	43.4
Control	18.5	3.6	19.5	41.6

TABLE 6—NORTHERN DISTRICTS

Percentage of animals over 60 lb

Treatment	Weeks of age					
	16	20	24	28	32	48
Tetramisole 4 wks	46	53	63	66	75	100
Tetramisole 8 wks	43	45	51	56	60	99
Tetramisole s/c 4 wks	45	48	60	60	68	93
Tetramisole s/c 8 wks	40	43	58	60	65	99
Thiabendazole 4 wks	40	45	55	60	63	93
Thiabendazole 8 wks	35	38	40	56	58	95
Control	33	35	43	50	56	100

doubtful if in this very dry year whether anthelmintic therapy was warranted.

Wool production (Table 7) at the end of a six month period was also similar for all groups including the control animals.

This spring and summer however, the worm populations did not reach the levels anticipated, although the higher faecal egg counts in the control group indicated that sufficient worms may have been present to cause the significantly smaller weight gains made by this group. (See table 8).

TABLE 7—SIX MONTHS PRODUCTIVITY "YACKATOON" NORTHERN DISTRICTS

Treatment	Sheep in Group	Treatment Intervals	Average Weight Gain (lbs)	Average Wool Production (lbs)
Control	30	Nil	24.05	4.53
Tetramisole oral	30	4 wks	25.86	4.57
Tetramisole oral	30	8 wks	22.40	4.61
Tetramisole s/c	30	4 wks	23.30	4.50
Tetramisole s/c	30	8 wks	23.30	4.63
Thiabendazole	30	4 wks	21.70	4.62
Thiabendazole	30	8 wks	22.40	4.47

This experiment, although failing to show the value of anthelmintic therapy has rather conclusively proved that neither tetramisole or thiabendazole are growth stimulants in the absence of worms. It also showed that repeated treatments with tetramisole, either per os or by subcutaneous injection, in no way interfered with the growth pattern of the experimental lambs.

(iii) *Irrigated Pasture* - Victoria and Southern N.S.W.

The two properties surveyed in this area are on open plains type country. The district is again in a winter rainfall region with a very long and very hot summer. At both properties large areas have been sown down to improved pasture which is periodically flooded with water during the summer and autumn months to provide greenfeed for the animals throughout the entire year. Under these conditions parasitism can become a serious problem and a substantial loss of production can be experienced.

Faecal egg counts also showed that all treatments kept worm burdens at very low levels and this was responsible for the fairly even rate of weight gain. There was little or no difference between any of the treatment groups at any stage during the year and at 52 weeks of age there was less than 2 lb live weight separating the various treatments.

In all treated groups the percentage of animals reaching 75 lb live weight was also similar at all times and apart from the control groups there are no significant differences. (See table 9).

The production achieved at the end of the first year on one of the irrigated properties is shown in Table 10. From this table it will be seen that after 343 days the body weight gains made by all the treated groups was similar but these gains exceeded those made by the control group of animals.

Four sheep died from the effects of parasitism in the control group but two lost ear tags further

TABLE 8—IRRIGATED PASTURE

Mean of two properties—60 sheep per group

Treatment	Average Weight Gain (lb)			Total
	Aug.–Dec.	Jan.–Mar.	April–July	
Tetramisole 4 wks	33.7	6 4	20 9	61.0
Tetramisole 8 wks	33.2	7.0	20.9	61.1
Tetramisole s/c 4 wks	34.0	7.6	20.7	62.3
Tetramisole s/c 8 wks	32.2	7.7	20.3	60.2
Thiabendazole 4 wks	32.9	6.8	21.2	60 9
Thiabendazole 8 wks	31.8	7.4	21.7	60.9
Control	27.4	3.9	21.7	53.0

TABLE 9—IRRIGATED PASTURE

Percentage of animals over 75 lb.

Treatment	Weeks of Age					
	16	20	24	28	32	52
Tetramisole 4 wks	12	36	55	65	70	99
Tetramisole 8 wks	11	35	60	65	75	99
Tetramisole s/c 4 wks	11	33	46	58	65	96
Tetramisole s/c 8 wks	12	33	48	55	72	99
Thiabendazole 4 wks	15	30	55	58	70	99
Thiabendazole 8 wks	3	23	40	48	66	96
Control	0	12	20	28	30	85

reduced the number of animals shown in this group to 24. No deaths occurred in any of the other groups but again lost eartags reduced the number identified at shearing to those shown in Table 10.

At shearing the weight of each fleece, excluding the belly, was recorded and a normal classification according to character and length was made. The weight of the fleeces in each class is also shown together with the total wool production and the average fleece weight for each group. Little difference was found between the average fleece weights of any of the treated groups but these all returned a higher average fleece weight than the control group of animals.

TABLE 10—WEIGHT GAINS AND WOOL PRODUCTION—"CARINYA"—IRRIGATED PASTURE

Treatment	Frequency of Treatments	Sheep Shorn	Weight Gain (lb) 343 days	Wool Production (lb) Comeback					Value ($)	
				3A	2A	1A	Total	Av.	Total*	Av.
Control	—	24	46.3	69.0	99.0	39.5	207.5	8.64	145.83	6.07
Tetramisole oral	4	28	54.9	85.5	131.0	50.5	267.0	9.53	187.21	6.69
Tetramisole oral	8	29	53.3	146.0	76.0	46.5	268.5	9.26	194.22	6.70
Tetramisole s/c	4	28	53.3	116.0	116.5	29.5	262.0	9.36	188.57	6.73
Tetramisole s/c	8	29	53.0	85.5	138.5	59.5	283.5	9.77	197.77	6.82
Thiabendazole	4	29	55.0	42.5	160.0	77.0	279.5	9.64	189.75	6.54
Thiabendazole	8	27	54.7	80.5	123.5	46.0	250.0	9.26	175.61	6.50

*Based on prices obtained at 1964–65 wool sales.
3A CBK = 78 cents Australian
2A CBK = 69 cents Australian
1A CBK = 60 cents Australian

Using the previous season's wool prices for the three classes, the total value of the wool produced by each group has been calculated. From this figure the value of the average fleece in each group has been estimated. This latter figure is again very similar for the various treatments, but differences are apparent between the treated and the control group. This difference would have been even greater, if the value of the loss caused by the death of four sheep from the effects of parasitism, had been taken into account.

While this experiment was not intended to represent an economical worm control program, it is interesting to note that the increased average wool value recorded by the treated groups over the control group, would pay for the cost of the treatments used every four weeks. Whilst the data for one year's productivity are not available for all properties, the following points are apparent:

1. In the winter rainfall regions surveyed, helminths exerted their greatest influence on growth rate and productivity during the first spring and summer of the animals life. With the occurrence of autumn rains, the "self cure" phenomenum was observed and an acquired immunity became apparent.
2. Anthelmintic therapy was of greatest value during the spring and early summer, but once a natural immunity was acquired in the

autumn, anthelmintic therapy appeared unnecessary.

3. Even though worm burdens were moderately heavy in two of the districts surveyed, there appeared to be little economic advantage to be gained from treating the animals every four weeks as opposed to every eight.

4. Tetramisole compared very favourably with thiabendazole in keeping livestock healthy and increasing production.

5. Tetramisole given every four or eight weeks either by mouth or by subcutaneous injection, caused no signs of toxicity and was well tolerated by 720 growing sheep.

(b) *Field Toxicity Studies*

The climatic and husbandry patterns of sheep raising varies widely throughout Australia. Mortality and morbidity of stock treated with anthelmintics, have been recorded in the past under drought and dry feeding conditions, where trace element deficiencies were present, in changeable weather, where supplements are being fed, or in association with the use of other chemicals. These and many other field conditions were selected for the intensive field testing of tetramisole throughout Australia. All work including post treatment observations has been under the direct and personal supervision of five of the veterinary surgeons employed by ICIANZ.

The work started during the winter of 1965 and by the end of autumn 1966 over 100,000 sheep on 106 properties had been treated. In New Zealand during this period, 70,000 sheep had been treated by veterinarians employed by veterinary clubs.

The condition of the treated animals varied enormously, from weak emaciated animals in the Northern drought areas where light infestations of *H. contortus, Ostertagia* spp. and *Trichostrongylus* spp. were, on occassion responsible for losses, to animals, in good condition in areas unaffected by the drought. Parasitic burdens were generally moderate although on numerous occasions animals with obvious severe clinical helminthiasis were treated. In several areas notably in the cooler wet districts, clinical lungworm disease was diagnosed.

All types of weather conditions were encountered ranging from hot and dry with dust storms to cold and wet with sleet.

Various husbandry practices were also often associated with the experimental drenching. These included shearing, dipping in arsenical or organophosphorus compounds, jetting with organophosphorus compounds, lamb marking, vaccinating and, on occasions, travelling long distances (up to 15 miles) immediately prior to dosing. Various forms of supplementary feeding, including urea block feeding, were being practised. In Western Australia and also in New Zealand a large number of animals were treated in areas where selenium deficiency and White Muscle disease are a problem.

Overall there was an almost complete absence of observable signs immediately following the treatment. On a few properties there was some lip licking, head and body shaking, and slight stimulation, but even in deliberately double dosed animals this was transitory and would have only been noted by a trained observer watching for these symptoms.

On many properties a marked increase in coughing was noted within 15-20 minutes of drenching and when an examination of the back of the coughing animal's mouth was made, it was often possible to remove expelled lungworms. In all instances it was noted that coughing virtually ceased within 24 hours of dosing, and when a scour caused by parasites was present this stopped within 48 hours. On more than one occasion a stimulation of appetite with a recorded increase in pasture consumption was reported. At nearly every property a marked increase in the bodily condition of the animals was observed, and at several properties the owner was convinced that the sheep treated with tetramisole were superior to those treated at the same time with other anthelmintics including thiabendazole.

No long or short term morbidity was observed and although 22 mortalities were reported following treatment, causes such as enterotoxaemia, fly strike, careless handling, or the effects of drought were shown to be responsible in 20 instances. Two deaths remain unexplained.

All deaths, with the exception of the unexplained cases, occurred more than 48 hours after the treatment and none were considered to be related to dosing with tetramisole. This conclusion would appear to be justified by laboratory experiences which show that tetramisole poisoning is an acute syndrome reaching maximum intensity within one hour, with recovery, depending on the severity of the symptoms in 2-12 hours. No delayed mortality or morbidity has been seen in laboratory experiments.

B. *Cattle*

In both Australia and New Zealand tetramisole has been tested on cattle at the average rate of

13.2 mg/kg. This dose rate was arrived at by using our 6.0% w/v sheep formulation at the rate of 10 ml per 100 lb live weight. It therefore, has been based on convenience rather than scientific fact, but laboratory studies have indicated that the level of 13.2 mg/kg orally should give adequate control in most instances.

(1) *Laboratory Studies*

Experiment 1 — This experiment involved the treatment and slaughter of 17 calves in which an artificial infestation of *Ostertagia* spp. and *Cooperia* spp. was superimposed on a light natural infestation. Groups of calves were treated orally with tetramisole at the rate of 10.0 mg/kg or 13.2 mg/kg and all animals including four untreated controls were killed four days after the treatment were given. The remaining parasites were collected and counted by the accepted sieving and aliquot techniques, but in addition a hydrochloric acid digestion of the abomasum with the sieving of the *digesta* through a 300 mesh sieve was carried out to recover immature forms.

The results of this experiment are shown in Table 11.

The results of this experiment indicate that both dose levels were highly effective against *Dictyocaulus viviperus* and parasites of both the small and large intestines. In the abomasum 10 mg/kg was reasonably effective against both *Ostertagia* spp. and *T. axei,* but against immature forms the activity was poor. In the abomasum at 13.2 mg/kg, the activity against *Ostertagia* spp. and immature worms was better, but against the latter it was by no means perfect.

Experiment 2 — A group of 16 calves with a natural heavy infestation were dosed either with tetramisole orally at the rate of 13.2 mg/kg, tetramisole by subcutaneous injection at the rate of 10 mg/kg, or thiabendazole at the rate of 88 mg/kg. Four days after the treatment all animals were killed and the worms surviving counted. The results of this experiment are shown in Table 12.

The results of this experiment show that tetramisole by subcutaneous injection at the rate of 10

TABLE 11—THE ACTION OF TETRAMISOLE IN CALVES

Treatment	Dose Rate	Mean Number of Worms Remaining							
		O.	Ta.	Imm.	Coop.	C.Onc.	Nem.	Oes.	Dict.
Control—4 calves.....	Nil	18785	5545	8525	1575	24175	700	441	152
Tetramisole.....	10 mg/kg	3470	948	6260	0	0	0	0	3
Percentage efficiency.....		80.1	82.9	26.6	100	100	100	100	98.1
Tetramisole.....	13.2 mg/kg	882	565	2362	0	0	0	0	5
Percentage efficiency.....		95.7	89.8	71.2	100	100	100	100	96.7

O = *Ostertagia* spp.
T.a. = *Trichostrongylus axei*
Imm. = Immature worms (abomasum)
Coop. = *Cooperia* spp.
C.Onc. = *Cooperia oncophora*
Nem. = *Nematodirus* spp.
Oes. = *Oesophagostomum venulosum*
Dict. = *Dictyocaulus viviperus*

TABLE 12—A COMPARISON OF THE EFFICIENCY OF TETRAMISOLE AND THIABENDAZOLE ON WORMS IN CATTLE

Treatment	Rate mg/kg	Mean Number of Worms Remaining							
		4	Ost.	T.a.	Imm. Abom	Coop.	C.o.	Imm. S.Int.	Oes.
Control.....	Nil	23	14650	16730	12360	2870	8930	3660	58
Tetramisole.....	13.2 oral	0	1740	2220	1400	0	0	100	0
Percentage efficiency.....		100	88.2	86.8	88.7	100	100	97.3	100
Tetramisole.....	10.0 s/c	0	1660	1275	1700	10	0	100	0
Percentage efficiency.....		100	88.7	92.4	86.3	99.9	100	97.3	100
Thiabendazole.....	88.0	1	2120	2430	7100	155	655	500	8
Percentage efficiency.....		95.7	85.6	85.5	42.6	94.6	92.7	86.4	86.3

mg/kg is equally effective as 13.2 mg/kg given orally. This result is consistent with the pharmacological studies which have shown that the highest blood levels result from *parenteral* administration. Both treatments appeared to be superior to the thiabendazole treatment, particularly for immature worms of the abomasum, inspite of the double dose of thiabendazole.

(2) *Field Studies*

Approximately 3500 cattle on 94 properties have been dosed in the field at the rate of 13.2 mg/kg orally. This rather arbitrarily chosen dose rate, given by administering 10 mls. of 6% drench per 100 lb live weight, has, in two laboratory experiments, been proved to be highly effective for lungworms, parasites of the small and large intestine, and moderately effective for all stages of all parasites in the abomasum.

In the field testing of tetramisole, a rapid clinical improvement was noted in all treated stock. In most instances scouring stopped after one dose, but in several instances, where clinical osteragiasis was diagnosed, two treatments in fourteen days were necessary to bring the scouring under control. Coughing immediately after drenching was also a constant sign in areas where lungworm was a problem. In every instance coughing ceased within 48 hours.

These treatments were carried out under a wide variety of climatic and feeding conditions. All types of weather from hot and dry to cold and wet were encountered and pastures varied from sparse and dry in drought affected areas where, on occasions, wheat protein meal and hay supplementations were given, to lush green coastal pastures.

Immediate post drenching side effects were more noticeable in cattle than in sheep. These signs consisted of lip licking and salivation, head shaking, skin tremors and increased excitability. This excitability is most noticeable when animals are let out of the yards. Calves, in particular, tend to raise their tails and gallop back to their feeding area where they soon settle down and commence to feed. With an overdose of up to double the therapeutic dose (26.4 mg/kg) these immediate signs are more pronounced and are accompanied by frequent acts of defaecation. Once again these signs are transitory and the animals usually return to normal within one to two hours.

Side effects were in most instances very slight, and on many properties no symptoms at all were seen. When they occurred, in no instance did they give cause for alarm. As a general, but consistent observation, it was noted that the severity of the symptoms was directly related to the bodily condition of the animals. Animals in poor condition usually showed little or no signs of hyperaesthesia, whereas the more severe signs were seen in animals in good condition. On most properties the fleeting mild stimulation was regarded by the owner as a desirable side effect.

Unlike sheep, we have as yet no figures to show how tetramisole increases production in calves, but some observations from New Zealand where over 7000 calves have been treated without loss by 96 veterinarians, indicate the value of tetramisole in curing clinical helminthiasis and increasing production. The results from four farms are shown in Table 13.

Clinical helminthiasis was a problem at all the above farms and following treatment, scouring and coughing stopped. The resultant weight gains are

TABLE 13—THE EFFECT OF TETRAMISOLE ON THE GROWTH RATE OF CALVES NEW ZEALAND

Farm	Treatment	Days Observation	Number of Calves	Number of Treatments	Body weight Increase (lb)
1.	Tetramisole	43	10	2	46.9
	Control	43	10	—	29.9
2.	Tetramisole	43	19	2	88.0
	Control	43	19	—	45.4
3.	Tetramisole	40	10	1	60.5
	Tetramisole + SE	40	10	1	72.7
	Control	40	10	—	33.6
4.	Tetramisole	40	6	1	47.0
	Control	40	6	—	17.0

indicative of the value of tetramisole in limiting the effects of helminthiasis in cattle and so increasing production.

In all, nearly 11,000 calves have been treated with tetramisole in both Australia and New Zealand and to date, three mortalities have been reported. All occurred more than 48 hours after treatment and the cause of the deaths was diagnosed as a enterotoxaemia in one instance and plant poisoning in two.

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THE FIRST OCCURRENCE OF SCRAPIE IN THE REPUBLIC OF SOUTH AFRICA

G. F. VAN DER MERWE*

SUMMARY

The occurrence of scrapie for the first time in the R.S.A. is reported. The disease manifested itself clinically in Hampshire Down ewes in two separate flocks some 14-18 months after being imported into this country from overseas. A brief account is given of the circumstances involved in these cases, of the steps taken by the Division of Veterinary Field Services to determine whether any other foci of infection might be present elsewhere and of the control measures adopted to prevent any further spread of the disease. It being an exotic condition to this country a short description of the symptomatology and epidemiology of scrapie is included.

REPORT ON OCCURRENCE.

Although scrapie has been recognized in Western Europe and Great Britain for over two centuries and its occurrence reported from time to time in various other countries, it has to the best of our knowledge never been present in South Africa prior to 1966.

Mindful of the possibility that the disease, on account of its extremely long incubation period and the fact that it is not reportable in some exporting countries, can readily be introduced by means of sheep imports even though certification of freedom from scrapie in the flock of origin is an import requirement, we have for some considerable time been considering the advisability of imposing a complete prohibition on the importation of sheep and goats from all countries where scrapie is known to occur. Following representations to the Government such a prohibition was duly imposed in April 1965. For some months prior to this, however, import permits were withheld so that the last importations of sheep from such countries took place in January 1965. Subsequent events, as described hereunder, disclosed that the ban was unfortunately beaten by a matter of 4-5 months.

On the 31st March 1966 a private practitioner in Natal was called by a client to examine two imported Hampshire Down ewes which had arrived on the farm from the United Kingdom during December 1964. Both animals were showing pruritis and loss of wool over the hindquarters and base of the tail but without any sign of scurf or external parasites. A tentative diagnosis of allergic photosensitisation was made, suitable treatment prescribed and the owner instructed to keep the animals under cover.

Owing to subsequent absence on holiday the patients were not attended by the practitioner during the next three weeks but on his return he found a marked deterioration in the condition of one of the ewes and no improvement in the other. In addition to the itchiness evidenced by rubbing against objects and biting of the fleece with resultant loss of wool, the former then also showed signs of nervous disorder, locomotory inco-ordination and marked loss of condition.

It became apparent that an unusual and most probably new syndrome had presented itself in his practice and that the initial diagnosis required reassessment. In considering the differential diagnosis the following skin and nervous conditions were taken into account although it was realised that a combination of the two would be required to arrive at a correct decision:—

Skin: 1. Pruritis — external parasites including mites;
— dermatitis from toxic substances;
— urticaria;
— eczema squamosum;
— liver conditions : allergic poisoning : photosensitisation.

2. Alopecia — infectious febrile diseases.

Nervous: 1. Abscess and/or tumour in vertebral canal or cerebral area.

2. *Coenurus cerebralis.*

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3. Encephalitis — Scrapie, Louping Ill, Borna's disease, Listeriosis.
4. Meningitis — often associated with encephalitic conditions;
   — Enterotoxaemia.
5. Chlorinated hydrocarbon poisoning in chronic form.
6. Lupinosis.
7. Rabies.

On the symptoms shown most of the above conditions could be eliminated forthwith and in consideration of the history involved the practitioner came to the conclusion that he was dealing with an exotic condition and that the disease could very probably be scrapie. He thereupon immediately conveyed his suspicions to the Assistant Chief of Veterinary Field Services in the Natal Region who arranged for a State veterinary inspection and the despatch of the two sheep to the Veterinary Research Institute at Onderstepoort on the 4th May 1966. Here the diagnosis of scrapie was accepted on clinical examination and confirmed histo-pathologically some 4 and 14 days later when, respectively, one of the ewes died and the other was killed for postmortem examination.

These two sheep formed part of a consignment of six imported Hampshire Down ewes of which one died on board ship during the voyage out (cause of death unknown) and one succumbed to *Corynebacterium* infection some time after its arrival on the farm whilst the other two remained clinically healthy. Three of the ewes were half-sisters by the same sire and it happened to be two of these that developed scrapie some 16 months after their arrival in South Africa. With the owner's excellent co-operation the entire breeding flock and all in-contact sheep on the farm were officially valuated and slaughtered out on the 9th May 1966. Fortunately the only movements out of the infected flock were from the sale of two year-old rams about a fortnight before the diagnosis of scrapie was made. They were both slaughtered at destination and in view of their age and the fact that herd contacts had in neither case taken place as yet, the chances of transmission of infection are considered to be negligible. Both flocks will nevertheless be kept under strict surveillance for an appropriate safety period.

The Department of Agricultural Technical Services was naturally most concerned over the introduction of this disease as it could seriously menace the sheep and wool industries if it were to become established in the valuable woolled flocks of this country. It was deemed imperative therefore that the extent of its further incidence be determined as quickly as possible and that suitable steps be taken to prevent any further possible spread of the infection. Consequently the following eradication programme and security measures were decided upon and immediately brought into effect by the Division of Veterinary Field Services:

1. Slaughter, under supervision at controlled abattoirs, of infected flocks as well as slaughter of all exposed sheep and immediate progeny moved from such flocks, with payment of compensation in accordance with the provisions of the Animal Diseases and Parasites Act; premises where infected animals are disclosed to be left unstocked with sheep for 12 months, as claims have been advanced that scrapie could be transmitted through soil or pasture.

2. Dissemination of information about the disease over the radio and in the press with an appeal to all importers of sheep during the past 4-5 years and to those who introduced progeny of imported animals into their flocks, to keep a close watch and to report suspicious symptoms resembling scrapie.

3. Dissemination of a complete list of all importations of sheep from overseas through the three official quarantine stations since 1961, to the field inspectorate organization with the directive to:
   — quarantine all the farms concerned for a period of 3-4 years relative to dates of import and the history disclosed in each case;
   — carefully inspect all imported sheep, in-contact animals and their immediate progeny;
   — trace all movements out of such flocks and treat recipient flocks as above;
   — assess the value of each herd visited in order to arrive at an estimate of the financial implication to which the Government would be committed with its intended slaughter policy should any further foci of infection be disclosed;
   — carry out monthly inspections on all farms so quarantined;
   — permit movements out of such flocks for controlled slaughter only; and
   — submit brain specimens for histo-pathological examination wherever suspected cases of scrapie are encountered.

Immediately after the press release one further suspected focus of infection was reported. It transpired that a more or less identical history existed in this case in that two out of six Hampshire Down ewes received from the same breeder in the U.K. in August 1964 developed peculiar nervous symptoms 14 and 18 months after their arrival. Neither of these animals responded to treatment, both got progressively worse and death ensued 10 and 6 weeks after the initial observance of untoward behaviour in the patients. Because of the inco-ordination and final paralysis of the hindquarters in the second case the cause of death at the time was ascribed to a possible injury to or lesion in the vertebral column which exerted pressure on the spinal nerves. Septicaemic arthritic sequelae were incriminated as a possible cause of the impairment of movement of the first patient and in this case the picture was further complicated by concomitant pneumonia and cardiac insufficiency. In retrospect, however, the practitioner who attended these cases, felt that the locomotor disturbances could have been of C.N.S. origin and the obscure affection most probably scrapie. This owner also cooperated very well and agreed to the slaughter of his entire flock of 450 sheep albeit on the evidence of the suspicious history only. There were no movements of sheep for breeding purposes out of this flock.

No further active infection nor suspicious histories have thus far been encountered by the field inspectorate organization during the course of the short-term inspections on the 300 odd suspect flocks covered by it. In a few instances cases of itching or pruritis have been reported but on subsequent checking by veterinarians these have been found to be due to other causes.

These findings are considered as very favourable indeed but we are by no means accepting them as an assurance that the disease has been eradicated by the slaughter of the two infected herds. Subclinical infection may still be present in recent importations or their progeny and these might show up at a later date. Although the initial restrictions have recently been somewhat modified, short-term inspections will in relevant cases still be maintained for the next 3-4 years and all suspect flocks kept under strict surveillance until absolute certainty of complete freedom from scrapie is obtained. As there is no diagnostic test by which sub-clinical infection can be identified in the live animal, we unfortunately have no other alternative but to adopt a wait-and-see policy.

Symptoms and Epidemiology of Scrapie

As scrapie has been declared a disease under the Animal Diseases and Parasites Act (Act No. 13 of 1956) and is as such, notifiable if encountered, the following brief review is timely.

The disease affects the central nervous system and is characterised by an unusually long incubation period which can vary from several months to 3½-4 years. Scrapie seldom appears in sheep under the age of 18 months after which there appears to be no age limit. The onset is generally insidious and the earliest symptoms might not be noticed by an inexperienced person. There may be nervousness, increased excitability in a stupid fashion and slight muscular tremors. The gait may be stilted, with incomplete flexion of the hocks and shortening of step. The head and neck may be carried high and somewhat stiffly while continual grinding of the teeth or smacking of the lips are usually prominent symptoms. The fleece loses its lustre and becomes dry. Itching develops along the back to the root of the tail, later getting more intense and extending to the sides, shoulders and limbs. The animal constantly rubs against fixed objects and/or may bite and pull at its wool with resultant bare patches on the body. Such patches may, however, be absent, but when they occur, the underlying skin is unaffected without any sign of scabs or scurf. Some animals appear to get mad and even aggressive or they may jump around and stagger as if drunk. The animal weakens gradually and loses weight despite a good appetite and an intense thirst which are maintained throughout the course of the disease. In the later stages paralysis, usually a paraplegia, develops and the animal is unable to rise by itself. If lifted it may turn in circles or will only walk a short distance and then go down again. These symptoms get progressively worse and always end fatally. The course of the disease may be anything from 4 weeks to 6 months or even longer. Where the disease is endemic the incidence may vary from very low (1-3%) up to 50% if it is allowed to run its course in a flock.

Scrapie does not appear to be a natural disease in goats but they are nevertheless susceptible as transmission has been produced experimentally in various ways including contact with infected sheep. Symptoms in goats may vary from hyper-excitability in some, to dullness with drowsy eyes and drooping ears, in others. Pruritis and the scratching syndrome are invariably present but whereas

sheep rub or bite to allay the itching, goats scratch with their horns or hind hooves and this can be so persistent that the skin is broken and blood is drawn. The resultant lesions are usually symmetrically situated on both sides of the back of the neck and on the shoulders. Ataxia and complete incoordination precede death.

The aetiology of the disease has not yet been completely clarified. While transmission experiments suggest that scrapie is both an infectious, and possibly also a contagious disease caused by a virus, the transmissible agent has qualities which differ markedly from other known viruses. It can for instance be transmitted in series, indefinitely, from sheep to sheep after having been boiled for 8 hours at 100°C, it is not inactivated in the presence of 3% formalin kept at 37°C for 13 days and no adverse effect could be inflicted on the infectivity of the agent by freezing and thawing it 34 times. Attempts to demonstrate antibodies in infected animals have been unsuccessful. On the other hand the infective agent is filterable, widely dispersed in various body tissues of infected animals and, in experimental transmission, its presence in such tissues has been demonstrated prior to the onset of clinical symptoms.

Scrapie has been transmitted to both sheep and goats by intracerebral and subcutaneous inoculation and also to both species by dosing with infected brain material. Spread by contact has been proved with test mice and is accepted by some workers in respect of goats but the position is still obscure as far as sheep are concerned. Certain observers claim that the disease may sometimes spread from sheep to sheep at pasture, although it has never been possible to transmit scrapie from infected to healthy sheep when housed together indoors.

All breeds of sheep are believed to be susceptible to the disease and both sexes are affected in more or less similar proportions. A wide variation has, however, been found in the susceptibility to experimental infection between different breeds of sheep and also in families within a breed. Progeny born to mothers infected at the time of gestation and suckling are often, though not necessarily always, affected in later life. There is some controversy in regard to the possibility of the disease being hereditary — it has, however, been found that when the disease appears in a flock, the incidence is higher among sheep which are closely related and this relationship can be either from the paternal or the maternal side.

There is no diagnostic test with which the disease can be identified in the live animal. Apart from the clinical symptoms the history is most important. Manual rubbing over the loin or rump of a suspected case will cause a definite socalled "scratch reflex" which manifests itself by nibbling movements of the lips, licking motions of the tongue and wagging of the tail. This symptom may, however, also be present in other diseases.

Post mortem findings are usually negative but definite laboratory confirmation is possible by means of a histopathological examination. Although the medulla and pons are the most suitable parts of the CNS for this purpose it is suggested, and preferred by the Onderstepoort Research Institute, that the entire brain with portion of the medulla oblongata intact be fixed in a large quantity of 10% formalin and submitted as such for sectioning at the laboratory. In addition specimens of other organs should be submitted in the usual manner in order to obtain an alternative diagnosis in the event of a negative scrapie finding.

ACKNOWLEDGEMENTS

Thanks are due to—

1. the Chief: Division of Veterinary Field Services for his permission to publish this report;
2. the Chief: Veterinary Research Institute, Onderstepoort, for his personal assistance in the field examination of suspected cases reported and permission on the occasion of presenting this paper to make use of a film made at the Institute of the two clinically affected sheep; and
3. Mr. A. M. de Bruyn, head of the photography section at Onderstepoort, for showing the film he made.

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HALOXON AS AN ANTHELMINTIC FOR HORSES

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SUMMARY

Critical anthelmintic tests on one horse dosed with c. 56 mg/kg haloxon and four given c 75 mg/kg showed the drug to be 100% efficient against *Parascaris equorum, Oxyuris equi, Probstmayria vivipara, Triodontophorus* spp., *Oesophagodontus* spp, *Craterostomum* spp, and probably against *Strongylus vulgaris;* against *Trichonema* spp and other small strongyles efficiency was in the 91-100% range. Limited evidence indicated about 50-70% removal of *Strongylus equinus* and *S. edentatus. Gastrophilus* larvae were not susceptible to treatment and the common *Habronema* spp remained in some numbers after dosing.

Normal treatments of 156 riding and racehorses with doses of about 60-80 mg/kg haloxon caused no side effects. Eighteen pregnant mares foaled normally. A few emaciated, badly fed animals showed some sluggishness 3-5 days after treatment but these subsequently improved astonishingly.

Two horses were unaffected by doses of 200 mg/kg haloxon in food. Dipping of 47 horses, including eight in-foal mares, in organo-phosphate or organo-phosphate/Toxaphene* dips before or after treatment, mostly with 70-80 mg/kg haloxon, caused no ill effects.

INTRODUCTION

Haloxon (3-chloro-4-methyl-7-coumarinyl di-(2-chloroethyl) phosphate) has a wide spectrum of anthelmintic action against nematodes in ruminants, pigs and dogs. This paper records results of South African trials on horses.

MATERIALS AND METHODS

A 77% w/w wettable powder formulation of haloxon was used. Five critical tests were done in which faecal output was collected at 12 hour intervals for 3 days after treatment and, following thorough mixing of each collection, one hundredth part by weight of it was taken and washed through a 100-mesh-to-the-inch sieve. The worms in the retained material were collected and identified.

A total count of ascarids and bot-fly larvae expelled in faeces was made.

The horses were killed 3, 4 or 5 days after dosing and total ascarid and bot-fly larvae counts made. The walls of the stomach and large bowel were well scrubbed with a nylon brush and the washings added to the ingesta. Aliquots representing one fiftieth part of the stomach contents and one hundredth part of the large bowel contents were examined in the same way as the faeces expelled.

RESULTS

1. *Efficiency.*

Table 1 gives the data obtained regarding the effects of haloxon on the more abundant or readily found parasites.

The drug had no useful effect against bot-fly (*Gastrophilus* spp) larvae nor against *Habronema* spp., if one assumes that at least some expelled worms would have escaped digestion. Live *H. megastoma* were found in tumours of the stomach wall in the first four horses as well as *H. microstoma* and *H. muscae* in the stomach contents.

Haloxon was highly successful in expelling ascarids, oxyurids, *Probstmayria,* and the small and medium size strongyles which constitute the vast bulk of horse worms. Observations were also made on the results against the *Strongylus* spp. As far as the small size of the aliquots allowed a conclusion, it appeared that *Strongylus vulgaris* was highly susceptible but *S. equinus* and *S. edentatus* less so. Numbers of *S. vulgaris* found in the 1/100th aliquots from the five horses were

† *Toxaphene is a Trade Mark of Hercules Incorporated, Wilmington, U.S.A. In South Africa the common name is octachlor camphene (CLC).

TABLE 1.—EFFICIENCY OF HALOXON AGAINST HORSE NEMATODES AND BOTS.

Horse No.	1		2		3		4		5	
Weight Kg.	150		177		ca.320		334		ca.450	
Dose Rate mg/kg Active Ingredient	75		75		ca. 75		75		ca. 56	
Dose Route	Oral drench		Oral drench		Food		Food		Food	
Parasites	Expelled/Total	Effic.	Expelled/Total	Effic.	Expelled/Total	Effic.	Expelled/Total	Effic.	Expelled/Total	Effic.
Gastrophilus larvae	14/121	12%	44/220	20%	22/198	11%	28/222	13%	18/166	11%
Habronema muscae	0/10400	0%	0/2100	0%	0/1200	0%	0/300	0%	0/200	0%
Habronema microstoma	0/5500	0%	0/1300	0%	0/700	0%	0/200	0%	—	—
Parascaris equorum	57/57	100%	12/12	100%	9/9	100%	3/3	100%	—	—
Oxyuris equi	1000/1000	100%	—	—	100/100	100%	—	—	100/100	100%
Trichonema spp	127000/133100	95%	127000/135400	94%	276000/283200	97%	285000/292400	97%	216000/218500*	99%
Triodontophorus spp	4000/4000	100%	4000/4000	100/%	—	—	2000/2000	100%	—	—
Oesophagodontus spp	—	—	—	—	200/2000	100%	—	—	—	—
Craterostomum spp	—	—	—	—	400/4000	100%	—	—	—	—
Probstmayria vivipara	—	—	—	—	—	—	186000/186000	100%	—	—
Other unidentified strongyles	4000/4000	100%	4000/4000	100%	2000/2200	91%	120000/12200	98%	—	—

*Contained a few other strongyle spp.

TABLE II.—SAFETY TRIALS WITH HALOXON AT 60–80 mg/kg IN RIDING AND RACEHORSES

Number of horses	Type of horse	Dates treated 1965	Comments
20	Riding School— Working 5 days weekly. Four in foal.	April 24th, May 29th Oct. 16th	No ill effects. Condition improved. Mares foaled normally.
34	Riding School— Fourteen in foal. Veld grazing + 2 concentrate feeds weekly.	May 10th Oct. 27th	No ill effects. Condition improved despite poor feeding.
50	Veld grazed riding school horses used once weekly.	May 10th. Oct. 27th.	A few of the smaller horses sluggish 3 to 5 days post-dosing. Astonishing improvement in condition thereafter.
15	Racehorses—two years olds.	Sept.	No ill effects. Rapid improvement. Some won races a week post-dosing.
9	Riding School. Quality horses	Oct.	No ill effects. Good response.
28	Riding School. Quality horses.	Sept. Oct.	No ill effects. Good response.

9, 2, 5, 3 and 2 respectively from expelled faeces and nil in retained material. The corresponding figures for *S. equinus* were 1, 1, 3, 1, 1 expelled and 1, 1, 2, 1, 1 left, indicating an efficiency of about 50% compared with 100% for *S. vulgaris*. In the case of *S. edentatus* 3, 1, 6, 3 and 2 worms were found in aliquots of expelled material and 1, 1, 2, 2 and 0 in autopsy samples, indicating an efficiency level of around 70%.

2. Toxicity.

A summary of safety trials carried out on 156 horses in South Africa is given in Table 2.

A standard dose of 32g. of 77% w/w wettable powder haloxon, equivalent to 24.6 g. active ingredient, was given regardless of size, as it was impossible to weigh the horses. The dose rate of active ingredient was estimated to be between 60-80 mg/kg. Apart from a few emaciated, poorly fed horses on one property being rather sluggish 3 to 5 days post-dosing, no ill effects were observed, pregnancy was maintained normally and racing prowess apparently unimpaired. The condition of treated horses improved and, where it was bad beforehand, the improvement was remarkable.

A more strenuous test of haloxon safety, particularly in conjunction with dipping in organophosphates was undertaken. No ill effects occurred after any of the following procedures:

a. *Dipping in approx.* 0.033% *dioxothion* + 0.27% *Toxaphene**

Two six year old stallions were given 200 mg/kg haloxon in food and were dipped 3 weeks later.

Two horses were given 80 and 120 mg/kg haloxon in food and were dipped 8 hours later.

Eight horses were dosed twice, two months apart, with 70-80 mg/kg haloxon, the second dose being followed by dippings 8 hours and one week later.

Thirty-one horses, including eight in-foal, were dosed with 70-80 mg/kg haloxon 4 hours after dipping and were re-dipped a week later.

b. *Dipping in* 0.04% *Supona*† (= *chlorfenvinphos*)

Four horses being dipped fortnightly were dosed with 70-80 mg/kg haloxon prior to a dipping. The procedure was repeated on two of these horses after a two-month interval, using 80-120 mg/kg haloxon and dipping 8 hours later.

Discussion and Conclusions

Haloxon has been shown to be a good anthelmintic against ascarids, oxyurids and strongyles of all types, but not quite so effective against *Strongylus equinus* and *S. edentatus*, which commonly parasitise horses. It is ineffective against bots and appears to give little if any control of *Habronema* spp. It is highly efficient against *Probstmayria vivipara*.

Practical experience with both riding and racehorses indicates that it can be used successfully, and without hazard, under South African conditions. Since these trials were done it is known that several hundred more horses have been treated by veterinarians in South Africa with uniformly satisfactory results.

The toxicity trials done in association with organo-phosphate dipping of 45 horses indicated that no trouble is likely to occur if this type of procedure is carried out.

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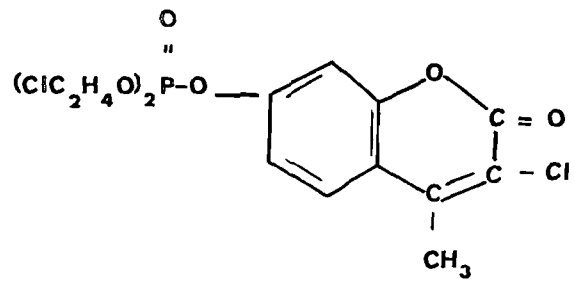

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STUDIES ON PARAMPHISTOMIASIS, VIII. THE PATHOGENESIS AND SYMPTOMS OF THE DISEASE IN SHEEP

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SUMMARY

The symptoms and lesions of paramphistomiasis in sheep are described.

The main changes are anorexia, diarrhoea, a marked drop in total plasma protein concentration, almost entirely due to a drop in plasma albumin concentration and severe parasitic gastro-enteritis.

The pathogenesis of the disease is described based on the symptoms, clinical pathology, pathological anatomy and life cycle of the worm.

INTRODUCTION

The pathogenesis and symptoms of acute paramphistomiasis have been described by Boray[1], Horak[2] and Horak and Clark[3]. This paper is based on their reported findings.

MATERIAL AND METHODS

Sheep bred and reared worm-free were used in these experiments.

They were infected with 170,000 or more metacercariae of *Paramphistomum microbothrium* and their reactions were studied in detail. At death or slaughter the pathological anatomy of the disease was noted.

EXPERIMENTAL OBSERVATIONS

A. *Symptoms*

(1) The animals are listless and a progressive decrease in appetite develops which terminates in complete anorexia.

(2) There is little reduction in total water consumption; sheep stand with their muzzles in the water troughs drinking small quantities of water frequently.

(3) Diarrhoea commences 16 to 28 days after infestation; faeces are extremely fluid, foetid and may contain immature worms. In particularly severe cases the diarrhoea is projectile, but as the disease progresses the rectal contents leak out involuntarily, soiling the hind limbs. After multiple infestations prolonged diarrhoea, accompanied by straining, occurs and fresh blood may be seen in the faeces.

(4) Death can occur as early as 19 days or as late as 36 days after a single massive infestation in sheep. Multiple infestations can result in death at 27 to 71 days after the commencement of infestation.

(5) If death does not supervene, a marked loss in bodyweight persists for several weeks.

(6) Sub-mandibular oedema is rare and anaemia has never been observed.

B. *Clinical Pathology*

Six sheep were each infested with 172,000 ± 3,000 metacercariae and the sequence of changes observed were: a progressive anorexia commencing on the sixth or seventh day, while water consumption remained fairly constant; a fluid, foetid diarrhoea at 16 to 28 days persisting until death, which occurred 22 to 36 days after infestation.

A marked drop in total plasma protein concentration, almost entirely due to a drop in plasma albumin concentration occurred at 14 days and persisted until death. Plasma calcium concentration decreased with plasma albumin concentration. The drop in total plasma protein concentration was frequently followed by a drop in plasma volume and a rise in haemoglobin concentration, packed

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red cell volume, red cell count and total volume of circulating erythrocytes. The latter changes occurred in the terminal stages of the disease.

C. *Pathological Anatomy*

(i). *Macropathology*

When death or disease is due to infestation with immature paramphistomes, the carcass may be in good condition or severely emaciated depending on the duration of infestation. Invariably the hind limbs and the perianal region are soiled with foetid, fluid faeces. Submandibular oedema is rare. If the animal is in good condition there may be fat necrosis, whereas in more chronic cases fatty tissues undergo serous atrophy.

Pulmonary oedema, hydrothorax, hydropericardium and ascites are frequently observed. In chronic cases splenic atrophy, ruminal atony and atrophy may be present. The mesenteric lymph glands are oedematous; the first two to three metres of the small intestine are hyperaemic and oedematous and the larger vessels extremely congested; the mesenteric fat, at the site of attachment of the mesenterium to the affected intestine, is replaced by clear serous fluid.

Young conical fluke may penetrate to just below the serosa and be observed from the peritoneal side of the intestine. The small intestine posterior to the affected portion is distended with fluid and the wall extremely thin. The bile-duct may be enlarged and the gall-bladder distended.

On opening the gastro-intestinal tract immature paramphistomes may be found attached to the epithelium and papillae of the rumen. If large numbers are present these areas appear anaemic, being white in colour when compared with the grey-green of the surrounding tissue. The papillae are often atrophied and their tips sloughed off due to pressure necrosis caused by the acetabula of the numerous paramphistomes attached at their bases.

The rumen contains little ingesta which is frequently very fluid. The walls and rugae of the abomasum are oedematous.

The wall of the first two to three metres of the small intestine is thickened and friable, the mucosa corrugated and often covered by a catarrhal exudate. Large numbers of paramphistomes, similar in appearance to small pink millet seeds, are attached to the surface and deeply embedded in the mucosa.

Numerous erosions, petechiae and ecchymoses are present in the intestine and the ingesta may be slightly haemorrhagic. Posterior to the first three metres of small intestine few paramphistomes are found. Caecal and colonic contents are extremely fluid and in cases that exhibit prolonged diarrhoea, rectal haemorrhages may be present.

On opening the gall-bladder a few paramphistomes may be found attached to the wall. The bile is frequently thick and viscous and superficial necrosis of the gallbladder wall is noticeable.

(ii) *Micropathology*

The young paramphistomes attach themselves to the intestine by means of a plug of mucosa drawn into the acetabulum. This mucosal plug becomes strangulated and necrotic and severing takes place; some of the parasites may penetrate to the peritoneal cavity and cause haemorrhages on the serosa. In massive infestations intestinal villi may be almost completely absent[4].

Discussion

The level of infestation necessary to produce clinical symptoms and death depends on the conditions under which the sheep are kept. Thus the availability of feed, its quantity and quality and the conditions of housing obviously increase the housed sheeps' ability to withstand the pathogenic effects of the worm, when compared with animals in the field.

In sheep, housed under experimental conditions, worm burdens below 20,000 paramphistomes cause some pathological changes but symptoms are not evident. Worm burdens in excess of 40,000, however, invariably result in death in these animals. Under pasture conditions Whitten[5] found that a paramphistome burden of approximately 2,000 worms caused the death of a two-tooth ewe.

Pathogenesis

The author has evolved the following hypothesis on the pathogenesis of acute paramphistomiasis.

The immature worms excyst in the small intestine and attach to the intestinal wall by means of a plug of mucosa drawn into their acetabula. This causes strangulation, necrosis and sloughing of the intestinal mucosa, with the resultant development of erosions and petechiae. These lesions cause intestinal discomfort leading to reduced appetite and eventually complete anorexia.

The anorexia results in decreased total body weight, initially because of reduced ruminal and intestinal contents and in time a reduction in carcass weight due to starvation atrophy. At the same time the function of food assimilation by the severely damaged small intestine is impaired, resulting in further loss of bodyweight.

The severe hyperaemia and oedema of the small intestine lead to partial occlusion of the bile-duct, causing retention of bile with distention of the gall-bladder. The resultant increase in concentration of the bile-salts causes necrosis of the gall-bladder epithelium.

It is presumably through the erosions in the small intestine and abomasum caused by the young worms, that plasma albumin is lost by seepage. This is particularly marked three to four weeks after experimental infestation, and it is at this stage of the life cycle that massive migration of the worms from the small intestine to the rumen commences. This migration causes still further damage to the intestine resulting in marked loss of plasma albumin.

The low intake of solid feed, the continued high water consumption and the decomposition of the plasma proteins in the intestine are responsible for the fluid and foetid nature of the diarrhoea.

The drop in plasma calcium concentration is probably due to a loss into the intestine of albumin-bound calcium and does not reflect a functional hypocalcaemia.

Because of the low plasma protein concentration generalised oedema develops and the plasma volume is reduced masking any further decrease in plasma protein concentration. This oedema is seen as hydropericardium, hydrothorax, pulmonary oedema, ascites and oedema of the mesenterium and abomasum.

The reduced plasma volume leads to a decreased blood volume resulting in retarded circulation and hypoxia. To combat the hypoxia more erythrocytes are brought into circulation causing an increase in the total volume of circulating erythrocytes.

The immediate cause of death would appear to be pulmonary oedema coupled with exhaustion and starvation.

ACKNOWLEDGEMENTS

The Chief, Veterinary Research Institute, Onderstepoort is thanked for facilities to conduct these experiments and permission to publish the results.

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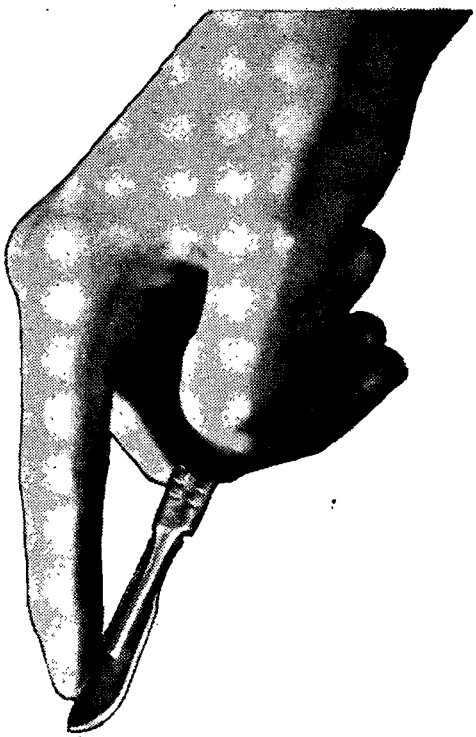

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BROMOPHOS-ETHYL*, A NEW COMPOUND FOR THE CONTROL OF TICKS ON LIVESTOCK

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SUMMARY

Bromophos-ethyl, the new organo-phosphate with its moderate mammalian toxicity, was evaluated on South African cattle ticks, including ear ticks, in laboratory dipping tests and field trials. It was effective against all species, by various methods of application, at a concentration of 0.05% of the active ingredient when used alone, or at 0.03% when applied together with Toxaphene at 0.25%. As it is an inhibitor of cholinesterase, regular sprays at 0.05% strength decreased the activity level of cholinesterase after several weeks, but from then onwards, the level remained stable at 40-50% of the control. Bromophos-ethyl also showed promise as a compound for hand dressing.

INTRODUCTION

Since the advent of Coumaphos (= Asuntol, Bayer 21/199) as the first phosphorus cattle dip, in 1957, several more organo-phosphate insecticides that are capable of controlling the ticks of livestock effectively have been found. The number of organo-phosphate compounds now available for use in dipping tanks however, is still surprisingly small, compared with the scores of new insecticidal compounds that have appeared since 1957. The conditions encountered in the dipping vat, especially in warm climates, necessitate a high standard of stability for a tick killing agent and most of the insecticides cannot fulfill this proviso. In short, an adequate dipping material must, besides being a good acaricide, possess a comparatively high stability against alkaline organic and inorganic matter in an aqueous medium.

The latest addition to the short list of controlling agents for ticks is Bromophos-ethyl*, which is the generic or common name for 0,0-diethyl-0-2,5-dichloro-4-bromophenyl-thionophosphate. The compound is a yellowish liquid which is readily soluble in practically all conventional solvents. Emulsifiable concentrates for use in dipping tanks can thus be formulated without difficulty. Bromophos-ethyl is quite stable in alkaline as well as acid media, showing no signs of decomposition within six days in an aqueous medium at pH 5.9 to pH 8.0 and at a temperature of 50°C (122°F).

LABORATORY TESTS

The acaricidal properties of the new compound were first established in South Africa by in-vitro dipping tests with fully engorged female ticks. The method has been described. (2,3). Some of the results are presented in table 1. Bromophos-ethyl at 200 ppm. proved to be an excellent killer of Blue Ticks (Boophilus decolaratus Koch). In combination with Toxaphene at the officially recommended strength of 0.25% of the active ingredient, deposition of eggs was completely inhibited. At half the concentrations, i.e. Toxaphene at 0.125% and Bromophos-ethyl at 0.01%, only 0.57% of the treated females were able to deposit viable egg batches. In all, Bromophos-ethyl alone and in combination with Toxaphene, represents a highly effective dipping material for this tick species. Against the Bont Tick (Amblyomma hebraeum Koch) Bromophos-ethyl at 200 ppm. also proved to be more effective than Toxaphene. The combination of the two acaricides resulted in a spectacular mortality which strongly suggests a synergistic action between the compounds. Small numbers of other species of South African cattle-ticks such as Bont-legged Ticks (Hyalomma spp.), Red-legged Ticks (Rhipicephalus evertsi Neumann), and Brown Ear Ticks (Rh. appendiculatus Neumann) were also submitted to the in-vitro tests with good results. Unfortunately, their numbers were too small to be represented in the table.

* Developed by CELA, Ingelheim am Rhein, Germany.

TABLE 1—THE EFFECT OF DIPS CONTAINING BROMOPHOS-ETHYL AND TOXAPHENE ON FULLY ENGORGED FEMALE TICKS EXPRESSED AS PERCENTAGE OF VIABLE EGG BATCHES DEPOSITED.

Blue Tick (Boophilus decoloratus) 50 specimens in 7 repetitions.

Dipping material	Percentage concentration	1	2	3	4	5	6	7	Average
Toxaphene.....	0.25	64	34	30	38	74	80	74	56
Bromophos-ethyl.....	0.02	0	0	0	0	4	0	0	0.57
Toxaphene plus Bromophos-ethyl	0.25 + 0.02	0	0	0	0	0	0	0	Nil
	0.125 + 0.01	3	0	0	0	0	0	1	0.57

Bont Tick (Amblyomma hebraeum) 10 specimens in 6 repetitions.

Dipping material	Precentation concentration	1	2	3	4	5	6	Average
Toxaphene.....	0.25	60	60	60	70	20	40	50
Bromophos-ethyl.....	0.02	60	80	12	8	10	50	37
Toxaphene plus Bromophos-ethyl	0.25 + 0 02	0	0	0	4	6	0	1.67

FIELD TESTS

To determine the residual effect of Bromophos-ethyl and the combination of Toxaphene on the hair of cattle, a hand spraying test was conducted while the incidence of blue ticks was at its peak. Three pairs (A,B and C) of Friesland cows were sprayed with 2½ gal. of dipwash and five treatments of the following sprays were applied:

Group A : Toxaphene 0.25% + Bromophos-ethyl 0.02%

Group B : Bromophos-ethyl 0.05%

Group C : Untreated.

The animals were treated at weekly intervals by means of a stirrup pump and a T-jet flat spray delivering coarse droplets. It should be mentioned in this connection that for all hand spraying trials, only animals were selected that showed a more or less even degree of tick infestation according to counts. The cattle were grazed together on natural pasture which was well infested with all species of cattle ticks. Each animal was scraped with a knife, possessing a serrated edge, (grapefruit knife) prior to treatment over an area of about 4 x 6 inches, on the side of the lower neck to remove and collect all developmental stages of Blue Ticks present. A different part of the neck was scraped every week, and thirty strokes with the knife were applied for each scraping. The first scrapings were collected prior to the second treatment. The number of unengorged as well as engorged larvae, nymphs and adults were then counted under a microscope. To determine whether Bromophos-ethyl can eliminate a heavy infestation, the treatments of the groups were changed after five sprays in the following way:

Group A — Untreated

Group B — Toxaphene 0.25% + Bromophos-ethyl 0.02%

Group C — Bromophos-ethyl 0.05%

Six treatments were applied and the results are given in table 2. Both dipping materials are capable by weekly applications of preventing the development of Blue Ticks beyond the larval stage. A heavy infestation will subside after three applications. The combination of Toxaphene and Bromophos-ethyl had a residual effect of at least five days, which is longer than for Bromophos-ethyl alone. The combination also prevented engorgement of the larvae.

TABLE 2.—THE EFFECT OF WEEKLY SPRAYS WITH DIFFERENT ACARICIDES ON THE DEVELOPMENTAL STAGES OF THE BLUE TICK (BOOPHILUS DECOLORATUS)

Number of weekly scrapings	GROUP A: Toxaphene 0.25% + Brom. – ethyl 0.02%							GROUP B: Bromophos – ethyl 0.05%							GROUP C: Untreated						
	Larvae		Nymphs		Females		Males	Larvae		Nymphs		Females		Males	Larvae		Nymphs		Females		Males
	U	E	U	E	U	E		U	E	U	E	U	E		U	E	U	E	U	E	
1	14	1	0	0	0	0	0	6	0	0	0	0	0	0	20	3	5	7	7	2	8
2	Rain: No scrapings taken but animals sprayed.																				
3	9	0	0	0	0	0	0	20	1	2	0	0	0	0	23	8	4	2	5	7	4
4	11	1	0	0	0	0	0	22	5	0	0	0	0	0	15	13	2	10	11	9	18
5	13	0	0	0	0	0	0	24	2	0	0	0	0	0	16	13	31	29	23	21	35
	UNTREATED							Toxaphene 0.25% + Brom. – ethyl 0.02%							Bromophos – ethyl 0.05%						
6	15	8	0	1	0	0	0	16	0	0	0	0	0	0	17	12	0	0	7	0	1
7	2	23	6	20	3	2	1	10	0	0	0	0	0	0	4	3	0	0	2	1	0
8	14	15	5	46	18	5	9	9	0	0	0	0	0	0	2	2	0	0	0	0	0
9	7	14	3	26	4	11	12	6	0	0	0	0	0	0	3	1	0	0	0	0	0
10	4	16	6	21	2	4	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	4	5	11	32	42	33	51	3	0	0	0	0	0	0	3	0	0	0	0	0	0

U = Number of unengorged specimens. E = Number of engorged specimens.

The above findings were confirmed by several field trials where a Bromophos-ethyl 50% emulsifiable concentrate* was applied at 0.05% of the active ingredient in a spray race or by means of hand spraying at weekly intervals. Total elimination of the Blue Ticks and adequate control of Bont Ticks (over 90%), Bont-legged Ticks (over 90%) and Brown Ear Ticks (85%) was always achieved. Due to their short period of attachment on the bare parts of the hindquarters, only about 50% of control of redlegged ticks was obtained. It must be mentioned in this connection that the figures for the control of the Brown Ear Tick only relate to hand spraying trials where great care was taken to thoroughly cover the inside of the ears with the wash.

None of the organo-phosphate dipping materials so far tested, provided adequate control of most species of the multi-host ticks in the warm and humid parts of the South African bushveld, and in the Eastern Coastal areas, when used alone. Bromophos-ethyl was therefore evaluated in the field together with Toxaphene. Considering the results of the preliminary tests and following the example of similar compounds, a combination of 75% Toxaphene and 9% Bromophos-ethyl in the form of an emulsifiable concentrate was decided upon. The dilution rate for this preparation is 1 in 300, and the dipwash then contains 0.25% Toxaphene and 0.03% Bromophos-ethyl. Generally speaking, this combination resulted in a better control of multi-host species than either the phosphorus compound or Toxaphene alone. This was particularly significant for the Red-legged Ticks and due to a longer residual action, as Toxaphene seems to retain Bromophos-ethyl on the animals for a longer period.

Altogether 12 dipping tanks were filled with Bromophos-ethyl plus Toxaphene in different parts of the tick belt from the North Western Transvaal to the Eastern Cape Province, and over 2,500 head of cattle were dipped regularly for periods from six to over 12 months, respectively. Weekly tick counts at the beginning and at the end of the experimental periods demonstrated excellent control of all species of cattle ticks in all regions. It might be added that the farmers concerned were very satisfied with the efficacy of the dip.

Toxicity

With regard to the toxicity of Bromophos-ethyl, it was found that the acute LD_0 for male rats is 112-270 mg. per kilogramme body-weight (1), which means that this compound has a toxicity similar to DDT. One cow of approximately 900 lb. ingested 2½ gallons of spraywash containing 0.05% Bromophos-ethyl which is equivalent to 11 mg/kg. without developing symptoms.

Dermal Toxicity

The dermal toxicity was tested on a number of Friesland and Jersey cows, heifers and calves. These were sprayed up to nine times at weekly intervals with concentrations ranging from 0.1 to 0.5% of the active ingredient, which is twice to ten times the recommended concentrations, without showing any ill effects. One cow was treated for four consecutive weeks with 0.2% when she produced a calf. No disadvantageous effects were observed in either of the animals. In all the field trials with spray races and plunge dips, calves of three months and older were included and received the same regular weekly treatment as the grown-up cattle without showing any symptoms. On one farm on several occasions young calves 1-1½ months old were also sprayed with Bromophos-ethyl and the combination at recommended concentrations, without showing symptoms.

Cholinesterase

Since Bromophos-ethyl is an inhibitor of cholinesterase, a study was undertaken to determine the cumulative effect of regular sprays at weekly intervals on whole-blood cholinesterase levels. Three cattle were included in the experiment, one of which served as a control. The two other animals were sprayed for 14 consecutive weeks with 2½ gallons (11.362 litre) of an emulsion spray, containing 0.02% Bromophos-ethyl for the first two treatments and 0.05% active ingredient for the rest of the trial. Whole-blood cholinesterase activity was determined on three occasions during the two weeks prior to the commencement of spraying. Thereafter, determinations were made immediately before and 24 hours after spraying. In several instances analyses were also done 5 days after application to determine the time-lag for a possible rise in activity.

* Alfadip
** Bosdip

Determination of Cholinesterase

Apparatus: Unicam SP. 300 colorimeter using Ilford 204 filter.

Reagents: (*a*) Dissolve 0.25 g. bromo-thymol blue in 750 ml. freshly boiled distilled water. The solution must be boiled every day before use.

(*b*) Dissolve 0.25 g. acetyl-choline perchlorate in 50 ml. freshly boiled distilled water. This solution must be prepared every day before use.

Adjust both solutions to pH 6.8 prior to use.

Method:

Add 1 ml. of solution (*a*) to each colorimeter tube (capacity 3.5 ml.) and stopper the tubes.

Clean one ear of each animal and open vein with bleeding needle or razorblade. Transfer 0.03 ml. blood sample from each animal to a separate colorimeter tube containing solution (*a*). Stopper again.

Add 1 ml. solution (*b*) to each tube and record the time.

Adjust the absorption on the colorimeter to a value of 0.50 by means of a blank containing 1 ml. solution (*a*) and 1 ml. solution (*b*). Take absorption readings of the samples at 10 minute intervals for a period of 80 minutes, from the recorded time of addition of solution (*b*).

Plot the absorption values against time for each animal. The slope of the line gives a hypothetic figures for the cholinesterase activity.

Results

The results are represented in figure 1. The experiment was conducted over a period of 112 days. Between the 44th and 62nd day the animals were sprayed as usual but due to unforeseen circumstances no analysis could be carried out. This period is marked by dotted lines.

During the first month of weekly spraying, the cholinesterase activity in the treated animals was not persistently lower than in the control. Thereafter, a steady decrease was noted up to the 78th day. Afterwards the cholinesterase activity level of the treated cattle remained more or less stable at 40-50% of that of the control. No ill effects were seen during the observation period. The same animals were included shortly afterwards in spray tests to determine the dermal toxicity of Bromophos-ethyl and they were treated several times with concentrations up to ten times the recommended strength as reported above.

Ear Ticks

As most cattle do not like dipping fluid to get into their ears, they try by all means to prevent this, whilst going through a dip or spray race, and even with hand spraying, it is most difficult to cover the inside of the ears properly, if the

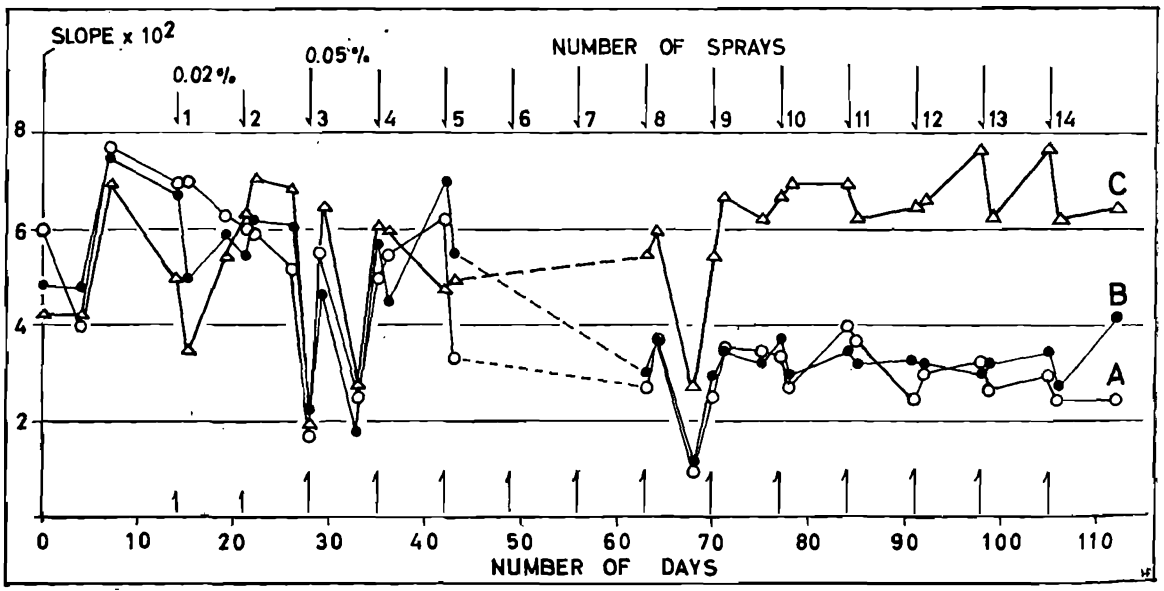

Figure 1. Whole-blood cholinesterase activity in two cattle (A & B) sprayed weekly with Bromophos-ethyl at 0.02% and 0.05% as compared with an untreated animal (C).

TABLE 3.—THE EFFECT OF BROMOPHOS—ETHYL AND TOXAPHENE ON THE BROWN EAR TICK (RHIPICEPHALUS APPENDICULATUS) AND ON THE DEVELOPMENT ALSTAGES OF THE RED-LEGGED TICK (RH. EVERTSI) WHEN APPLIED IN A GREASE TO THE INSIDE OF THE EARS OF CATTLE.

Number of weekly inspections	Treatment	Bromophos—ethyl				Toxaphene				Untreated			
		Brown Ticks			Red Ticks	Brown Ticks			Red Ticks	Brown Ticks			Red Ticks
		T	S	F	LN	T	S	F	LN	T	S	F	LN
1	Spray	127	6	10	8	117	8	1	8	254	21	9	8
2	Spray	174	8	9	8	180	11	8	8	228	13	23	8
3	Spray	429	14	3	8	415	15	1	8	616	35	5	8
4	Grease	152	11	10	8	155	14	7	8	352	9	13	8
5		49	0	1	3	107	0	3	4	416	2	4	8
6	Grease	19	1	2	0	15	0	0	0	175	1	3	8
7		1	0	0	0	2	0	0	0	124	4	6	8
8	Grease	24	0	0	0	16	0	0	0	268	5	3	8
9		4	0	0	0	1	0	0	0	109	4	2	8
10		8	0	0	0	0	0	0	0	51	4	4	8
Totals 5–10:		105	1	3	3	141	0	3	4	1143	20	22	48

T = Total number of ticks in eight ears; S = Number of semi-engorged ticks;
F = Number of fully engorged ticks; LN = Number of ears infested with larvae and nymphs.

head is not securely tethered. For this reason, periodical treatment of the inner ear with acaricidal grease or oil is indicated, to control the ear ticks such as the Brown Ear Ticks and the larvae and nymphs of the Spinose Ear Tick (Otobius megnini Dugés) and of the Red-legged Tick.

Bromophos-ethyl in grease compared to Toxaphene in grease basis.

As in-vitro dipping tests had shown that Bromophos-ethyl seemed to be very active against the Brown Ear Tick, a field test was conducted to compare the action of a tick grease containing 0.5% Bromophos-ethyl, with a registered product of the same formula but containing 2% Toxaphene. The grease with Bromophos-ethyl was applied by means of a swab to the left ear of eight Friesland cows and the Toxaphene grease to the right ear of the same animals. Four untreated Friesland cows served as controls. The animals to be treated with grease had, shortly before, been used in hand spraying tests. The control of ear ticks, however, was not adequate as their heads were not tethered for the spray. The control animals had not been treated at all. Three applications of the grease at 14 day intervals were made. Adults of the Brown Ear Tick as well as larvae and nymphs of the Red-legged Tick were counted at weekly intervals prior to the treatment.

The results are given in table 3. Both types of tick grease rendered equally good results. Engorgement of Brown Ear Ticks was prevented and the developmental stages of the Red-legged Ticks disappeared entirely in both cases. On account of these encouraging results, a grease and an oil that contained 0.25% Bromophos-ethyl and Toxaphene 2%* were evaluated in practical field trials. The control of ear ticks obtained with fortnightly applications was very good and this combination is also capable to affect strains already resistant to Toxaphene.

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* B & T Tick Grease and B & T Tick Oil.

BOOK NEWS

In order to provide practitioners, researchers and students with a comprehensive review of current progress in the science and practice of veterinary medicine, American Veterinary Publications is now issuing the Modern Veterinary Reference Series.

This will eventually comprise ten volumes and will be completed in 1967. These books do not only give coverage of all the significant discoveries published in veterinary journals all over the world, but they are also mighty easy to use as well. The 7200 articles reviewed have been organized into separate volumes according to species. It claims with full justification to be a working library for busy people who need answers instantly.

The first three volumes have already been published, and are now available at R12.75 per copy. They are:—

1. PROGRESS IN EQUINE PRACTICE: 595 pages; 21 chapters; 721 reviews.
2. PROGRESS IN FELINE PRACTICE: 22 chapters; 1006 reviews.
3. PROGRESS IN SWINE PRACTICE: 512 pages; 10 chapters; 824 articles.

Previous textbooks of veterinary parasitology have dealt with parasites from the zoological classification standpoint. In the recently published TEXTBOOK OF VETERINARY CLINICAL PARASITOLOGY; Vol. I by E. J. L. Soulsby they are dealt with under the host animal, and particular emphasis is placed on the disease entity which is caused. This volume consists of 1120 pages and 214 figures. R19.85. Volume 2 which will be published in 1967 will cover the Protozoa and Arthropods.

In INTRODUCTION TO ANIMAL NEUROLOGY by A. C. Palmer the veterinary clinician is provided with a method of examining the central nervous system of domestic animals, and to analyse the significance of his findings; 156 pages; 19 illustrations; R2.75.

The seventh issue of THE VETERINARY ANNUAL by W. A. Pool is now available. Its review of current literature covers over 300 pages. As usual there is a number of specially contributed articles on topical subjects as well as chapters on new drugs and appliances and on new publications. R6.50.

The first edition of LAMENESS IN HORSES by O. R. Adams met with such wide acceptance that, notwithstanding three reprints, this book has been out of print for the past 12 months. We are therefore pleased to announce that the second revised edition has just been published. This has several additional features, and should meet with an even greater demand than the first; 563 pages; numerous illustrations; R10.00.

TOO SHORT A DAY: A WOMAN VET. IN AFRICA, by Susanne Hart, who is well-known to most veterinarians in Southern Africa, is a fascinating and amusing book, which should prove particularly interesting to her colleagues in this country. R2.70.

TYPHLECTOMY IN A HORSE

D. G. STEYN

Faculty of Veterinary Science, Onderstepoort

SUMMARY

The successful treatment of a case of prolapse of the caecum, due to an abdominal wound, by typhlectomy is described.

HISTORY

An eight year old Palamino stallion with a penetrating wound of unknown origin but sustained at least twenty-four hours earlier was presented. On the lower left abdomen, approximately ten cm lateral to the umbilicus, a mass of large intestine 30 cm by 20 cm in extent protruded through a wound ten cm in diameter. The prolapsed bowel was distended and bluish-black due to strangulation. Reddish watery fluid and gas were evacuated by needle puncture. Mild shock, as shown by polypnoea, shivering sweating and abdominal pain, was in evidence.

The wound, prolapsed bowel and surrounding skin were thoroughly washed with hexaclorophene (Gill) soap and normal saline and sprayed with Hibitane solution (I.C.I.) Anaesthesia was induced by 40 gm 10% chloral hydrate solution intravenously and maintained with intravenous injections of pentobarbitone sodium solution (Sagatal M & B). Of the latter 40 ml were necessary to complete the operation. Two litres 5% dextrose saline drip containing five gm chloramphenicol were administered during the operation.

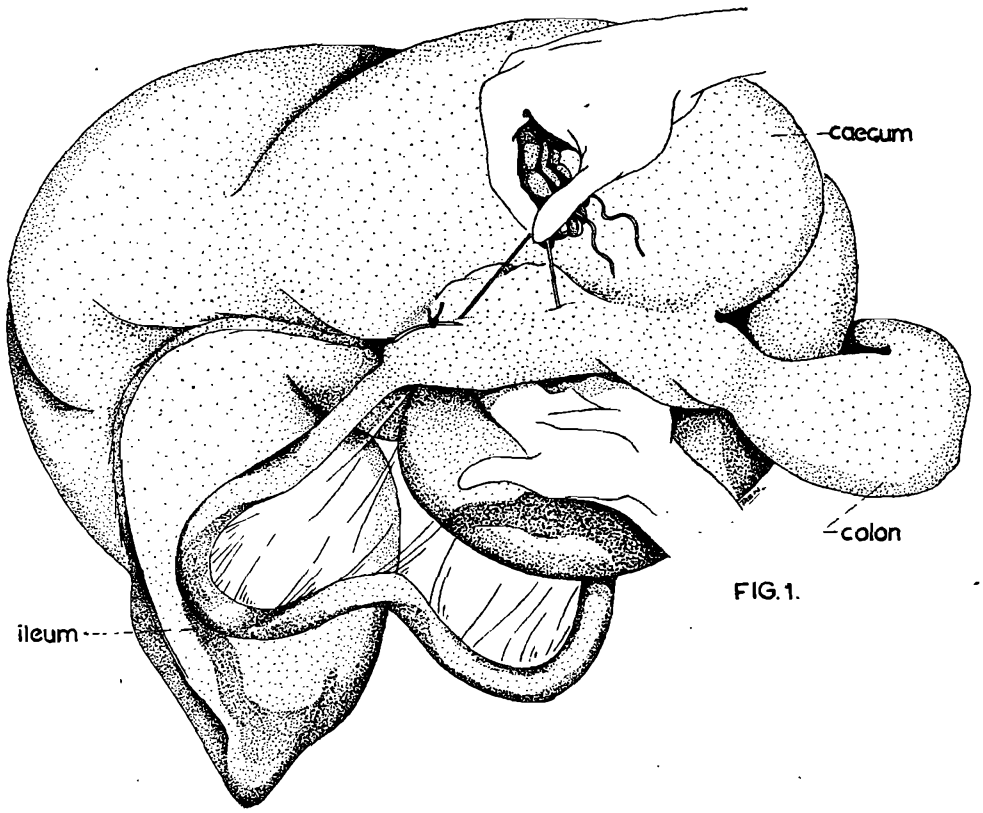

FIG. 1.

Semi-schematic drawing. Sutures being placed in caecum to close off the lumen.

Operative Technique

The wound was enlarged cranially to a total length of about 20 cm. The protruding intestinal mass proved to be a loop of caecum. The apex of the caecum, which was dark blue, could now be withdrawn from the wound. Numerous small caecal puncture wounds without haemorrhage, were evident. The entire caecum, except for about ten cm at the base was necrotic and typhlectomy was considered the only feasible treatment.

Four overlapping mattress type catgut sutures were inserted to close off the caecal lumen and prevent leakage. The two caecal arteries were ligated and the caecum amputated. The caecal stump was closed by means of a single layer of Connell sutures ensuring effective continuity between the ileum and the colon. The lumen of the caecal remnant was about equal to that of the small colon. The peritoneum and muscle layers were closed by a single layer of interrupted catgut sutures and the skin by interrupted silk sutures.

Post-operative Treatment

Aftercare consisted of the daily parenteral administration of 5 gm chloramphenicol and 10 ml streptomycin/penicillin (Cyanamid) until an allergic reaction developed on the fifth day. The antibiotic treatment was then changed to 10 ml pyrrolidinmethyl tetracycline (Reverin, Hoechst A.G. 55 mgm/ml) daily and promethazine hydrochloride (Phenergan M & B) 250 mgm intramuscularly twice daily until the fourteenth post-operative day.

For the first five or six days there was restlessness, anorexia and hypodypsia. Faeces were passed in small quantities ascribed to the low food intake. There was dysuria and frequent passing of bloodstained urine which passed off without treatment. It was suspected that the urethra had also been injured at the time of the accident.

On the sixth day the animal showed acute colic. A dose of 10 ml pethedine (50 mgm/ml Roche) was injected intramuscularly. Twelve hours later the horse was back to normal and the appetite began to improve. No further attacks of colic occurred.

Necrosis of the skin surrounding the wound developed three days after the operation, probably due to pressure exerted on the wound edges by the prolapsed caecum. A skin area about eight cm

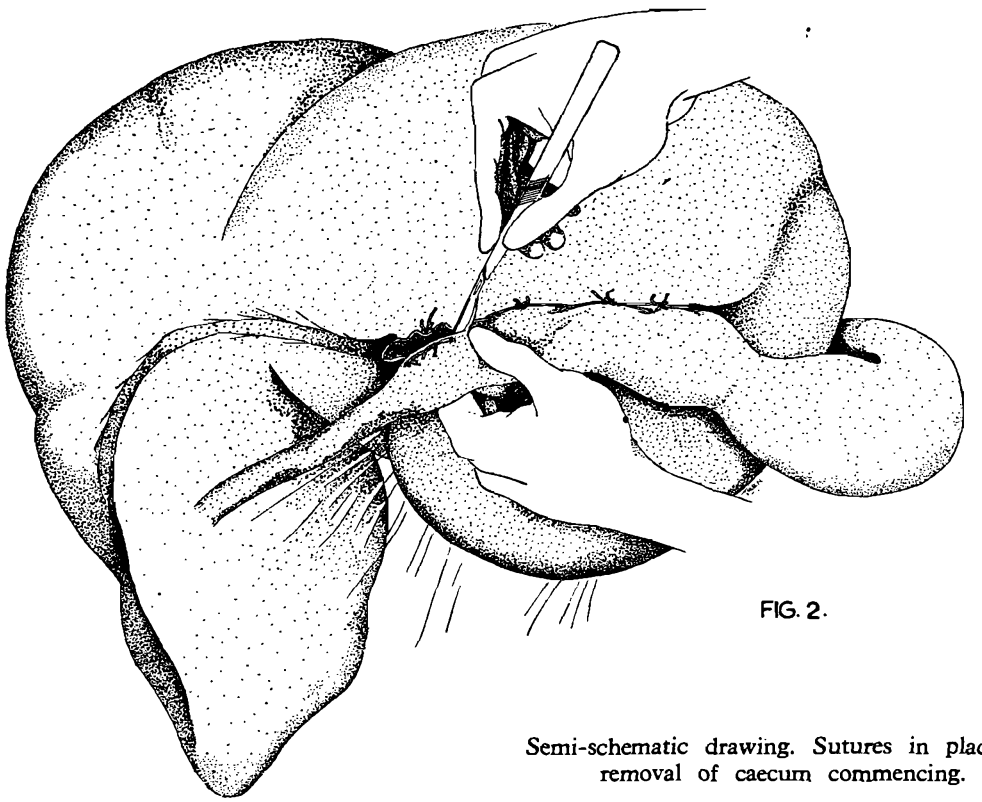

FIG. 2.

Semi-schematic drawing. Sutures in place and removal of caecum commencing.

in diameter eventually sloughed and was treated as an open wound. It was slow in healing and a swelling developed at the site. This proved to be a hernia which was repaired surgically by implanting stainless steel mesh to reinforce the weak muscles. Infection was still present at the time of this operation and the mesh acted as a foreign body with infection persisting despite antibiotic and other treatment. The mesh was eventually removed under general anaesthesia. Connective tissue proliferation that had developed in the meantime effected closure of the hernial opening. The subsequent recovery was uncomplicated.

Discussion

As this case has shown that typhlectomy in the horse is feasible, it is suggested that it may be considered as a method of treatment for caecal impaction and recurrent attacks of colic following thickening of the caecal mucous membrane resulting from constant irritation by sand. Caecal impactions are the most difficult obstructions to treat successfully.[1] Schebitz (1961)[2] states that laparotomy and massage of the mass may cause further irritation and is generally successful only in those cases where the caecum is still functioning. As our case, after recovery, was lively, had a normal appetite and gained weight, it seems as if the operation had no adverse effects on the digestion.

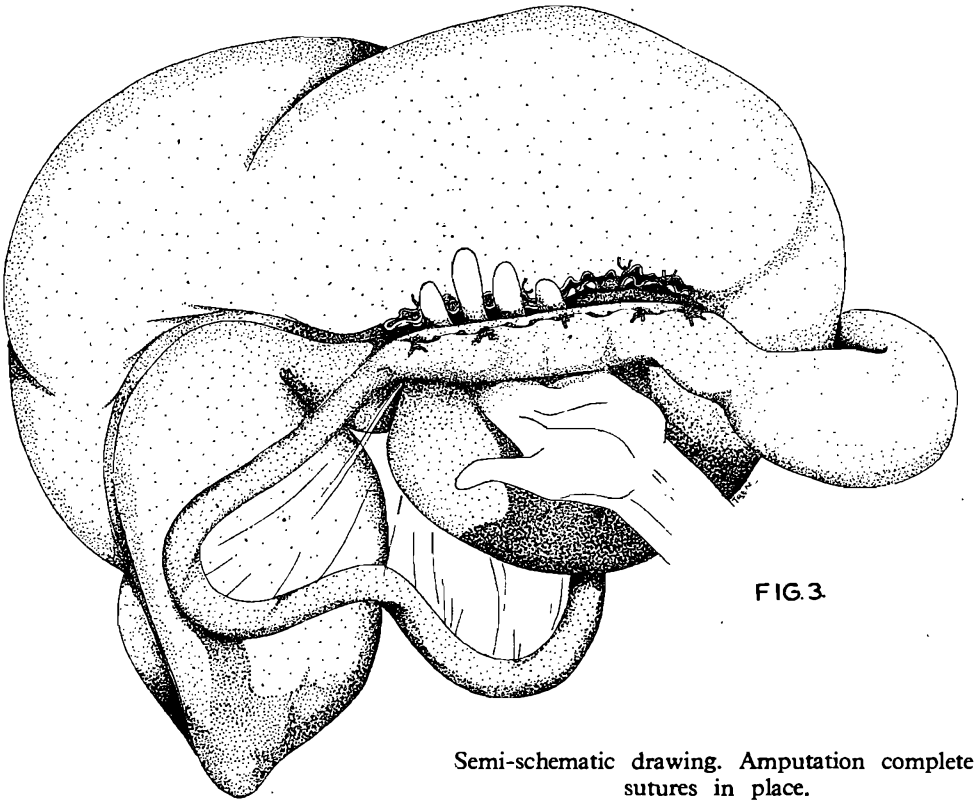

FIG. 3.

Semi-schematic drawing. Amputation completed and sutures in place.

ACKNOWLEDGEMENTS

The Chief, Veterinary Research Institute is thanked for permission to publish this article, Prof. C. F. B. Hofmeyr for help with the manuscript, Dr. C. J. Roos for administering anaesthesia and the technical staff of the Surgery Dept. for assistance with the operation.

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SOME ASPECTS OF ANAESTHESIA IN MERINO SHEEP WITH PARTICULAR REFERENCE TO DOSE AND EFFECT OF PENTOBARBITONE SODIUM ('SAGATAL', MAY & BAKER)

D. H. G. IRWIN and B. J. BRIEL

Veterinary Research Institute, Onderstepoort

SUMMARY

A satisfactory routine for anaesthetising sheep with pentobarbitone sodium, including preliminary starvation, premedication and details of maintaining intravenous access and an airway, is described. Records of 96 anaesthesias induced and maintained with this drug in Merino sheep selected at random showed that:

1. the induction dose varied from 6.8 to 34.3 mg/kg;
2. the total dose required to maintain surgical anaesthesia for 2 hrs varied from 35 to 66.1 mg/kg;
3. duration of surgical anaesthesia following the induction dose varied from 3 to 60 min.

The variations in response to this barbiturate are discussed, and the influence of sedatives on the anaesthesia is noted.

INTRODUCTION

For routine clinical operations on sheep, sedation and local analgesia are probably used more frequently than general anaesthesia, because the cough and swallowing reflexes persist and prevent regurgitation pneumonia. However, our experimental operations required general anaesthesia for several reasons: complete immobility, good relaxation of abdominal muscles, long duration of insensibility and absence of pain when the mesentery is pulled. This communication describes the use of pentobarbitone sodium as a general anaesthetic for sheep in a routine which is safe, efficient and suitable for use in practice. Some effects of sedatives on the anaesthesia produced are also noted.

MATERIAL AND METHODS

Animals. Merino ewes and wethers, four to eight tooth, were chosen at random and maintained in individual pens covered back and top, or in small camps. They were adapted to a diet of chopped lucerne hay and given a mineral supplement ('Phosvita', Agricura) and water. These sheep were shorn and dewormed biannually, vaccinated against bluetongue, anthrax, enterotoxaemia and quarter evil annually, and were clinically healthy when anaesthetised.

Preliminary starvation. Feed and water were withheld for periods varying from 18 to 48 hr before anaesthesia.

Premedication. Salivary secretion was suppressed by atropine sulphate injected in doses of 0.1 to 0.2 mg/kg either intramuscularly 30 to 60 min. before, or intravenously immediately before anaesthesia.

In certain cases indication in the text, sedation was used. This was brought about by intramuscular injection of either chlorpromazine ('Largactil', May & Baker) or acetylpromazine (Boots). Chlorpromazine from water-white 5 ml vials containing 50 mg/ml was injected at doses of 0.5 to 1 mg/kg into either the triceps or the gluteal mass using a 19 B.W.G. needle. Acetylpromazine was given at doses of 0.05 to 0.1 mg/kg. These drugs were administered 30 to 60 min. before a general anaesthetic or local analgesic.

Induction and maintenance of anaesthesia. With the sheep bound in lateral recumbency on a rubber sheet, a plastic cannula ('Braunula', Braun, Melsungen) was placed in the jugular vein and kept patent by slow infusion (1 drop/sec.) of dextrose saline. From then onward all drugs were administered through this drip tube. These included atropine sulphate, if not previously injected in-

Presented in part to the 61st Scientific Conference of the South African Veterinary Medical Association, September 1966.

tramuscularly, followed by pentobarbitone giving about 5 ml (300 mg) initially and amounts of 1 to 2 ml subsequently until it was possible to place an endotracheal Magill tube with the aid of a gag and a laryngoscope. The oral part of the Magill tube was protected by sliding a brass tube (O.D. 19 mm, I.D. 17 mm) 18 cm in length over it. This brass tube was secured to the lower jaw with a tape. The cuff of the Magill tube was inflated, and in order to make the bulb project beyond the brass tube, the tubule connecting the cuff and the bulb was lengthened with a piece of bicycle valve-tubing. The next step was to anchor the cannula in the jugular vein with a ligature.

Anaesthesia was maintained by injecting about 2 ml amounts of pentobarbitone when there were signs of increase in muscle tone or reflex movement by the animal.

Recovery. Upon completion of the operation, the drip tube was removed from the cannula, the ligature was loosened and then used to hold a swab over the venupuncture site. The sheep was unbound, and the rubber sheet on which it was lying was used to lift it to a non-slippery floor. The Magill tube was left in position until the animal showed strong reflex chewing movements, it was then removed. The animal was propped up on its brisket, and watched over and assisted for about 30 to 60 min. until it attained a standing position. Visits were made at about 30 min. intervals until the sheep started feeding at 1 to 3 hr after regaining conciousness.

Results and Discussion

Preliminary starvation. Starving for 18 to 24 hr caused a progressive reduction in both volume and consistence of ruminal ingesta, thereafter the volume diminished slowly if at all, whereas the consistence diminished progressively. Starvation for more than 24 hr increased the hazard of regurgitation without further relieving pressure on the diaphragm or providing more working space in the abdomen. Thus it was decided to starve sheep for not longer than 24 hr.

Control of salivation. Atropine sulphate diminished salivation satisfactorily, and thus helped to prevent fluid loss and aspiration of saliva. Salivary secretion was measured in several anaesthetised sheep. In those previously injected with atropine sulphate 5 ml or less saliva flowed in an hour, whereas in one anaesthetised sheep not premedicated with the drug, 29 ml were secreted in 30 min.

The anaesthesia. The criterion of induction was taken as the point at which the Magill tube could be passed. Damage to this Magill tube by the cheek teeth was effectively prevented by the brass tube surrounding it. This is important since damage to the Magill tube is not only expensive, but can be dangerous through puncture of the cuff tubule and allowing inspiration of ingesta, or even severing of the tube with inspiration of its inner end. The fact that the chewing reflex returned before the cough reflex makes these accidents quite possible.

The records of 96 anaesthesias revealed that the anaesthesia was easily maintained at a satisfactorily even depth by the routine described. The anaesthesia was trouble-free for operations lasting up to at least 5 hr, and muscular relaxation was good.

Dose and duration of effects of pentobarbitone. Fig. 1 shows that there was a 5-fold variation in the dose of pentobarbitone (6.8-34.3 mg/kg) re-

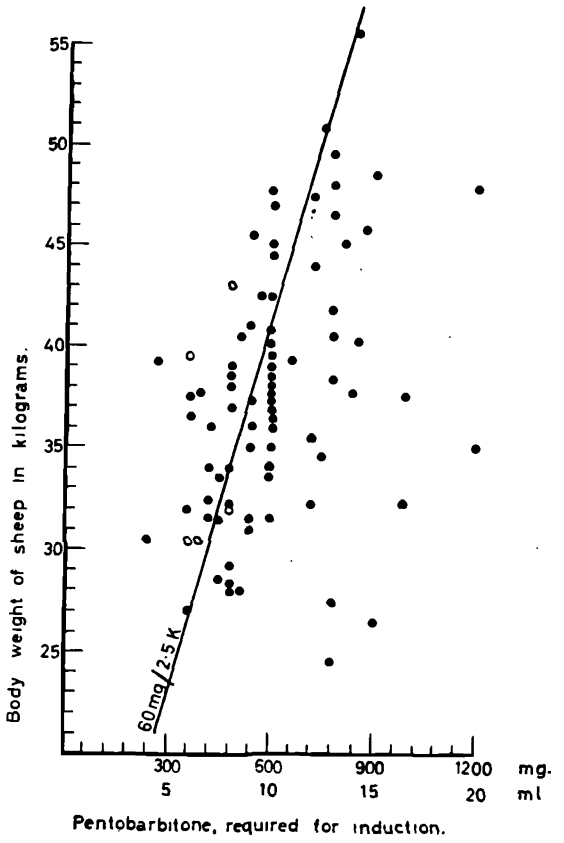

Fig. 1.

Thevariation in dose of pentobarbitone required to induce anaesthesia in Merino sheep. °indicates premedication with a sedative.

quired to induce anaesthesia in different sheep. It would appear, however, that for practical purposes a dose of 10 ml (600 mg) was adequate to induce anaesthesia in many sheep weighing 35 to 40 kg. The dose required to maintain surgical anaesthesia also showed a wide variation (see Fig. 2). The widest variation (2-fold) was observed in 2 sheep weighing 25 and 50 kg, each of which required the same amount (27 ml) of pentobarbitone over a period of 2 hr. From Fig. 3 it can be seen that in general the first maintenance dose was required between 8 and 16 min. after the induction dose. A wide variation (20-fold) was, however, again apparent, in that the shortest interval between induction and first maintenance dose was 3 min. and the longest 62 min.

Several possible reasons exist for these wide variations in dosage in the effect of pentobarbitone in relation to body weight of sheep. Of all domestic animals it is sheep in which true weight (vascularized tissue) and measured weight differ most. The actual difference in one individual varies from time to time according to the length

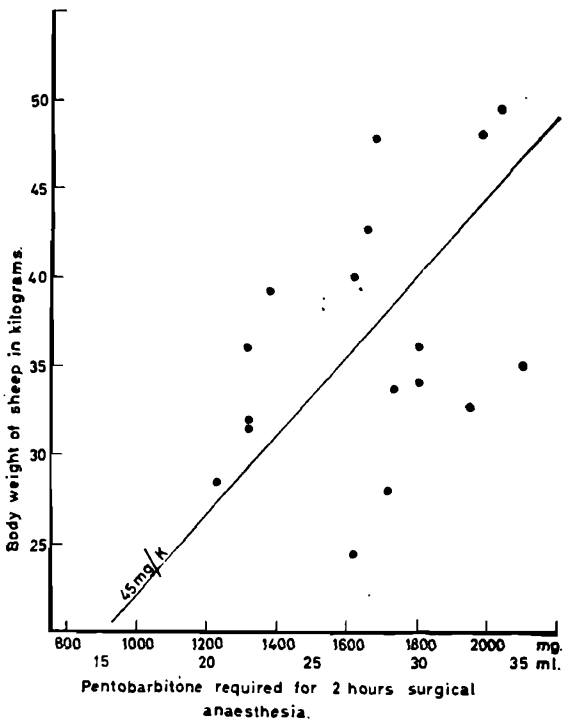

Fig. 2.

The variation in dose of pentobarbitone required to maintain surgical anaesthesia for two hours in Merino sheep.

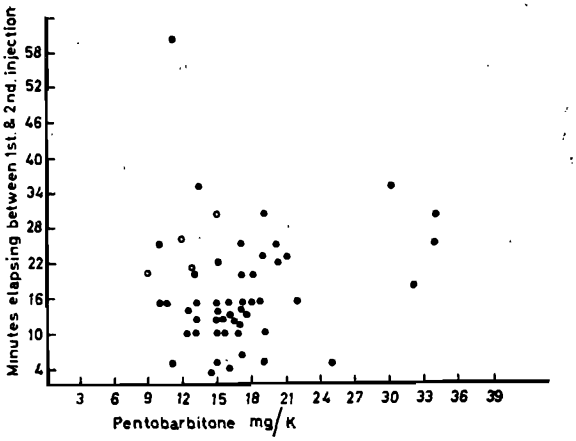

Fig. 3.

The variation in duration of surgical anaesthesia following an induction dose of pentobarbitone in Merino sheep. °indicates premedication with a

of wool and the degree of rumen fill, and the ratio between true and measured weights is not constant for a series of individuals. For example a 30 kg sheep may produce 4.5 kg wool in a year, and depending upon the periodicity of shearing this wool may easily account for ten percent of measured weight. Again, rumen ingesta constituted between 9.6 and 22.4 percent of measured body weight in a series of healthy sheep (Irwin, unpublished data). Furthermore, starving a sheep for 24 hr can change measured weight by ten percent. Nevertheless, wide as these weight variations are, they cannot account for the 3-, 2- and 20- fold differences in the action of unit pentobarbitone dosage per unit weight or unit time shown above. The variations described are more likely to be due to different liver enzyme levels brought about by the stress of pre-operative starvation and differences in environmental background, since no difference on the basis of sex was noted.

The effect of premedication with sedatives. A dose of 1 mg/kg of chlorpromazine reduced the apprehension of the sheep and was adequate to cause them to lie down within 5 min., although they could still be roused to walk about. The dose of pentobarbitone required to induce anaesthesia in sedated animals tended to be smaller (Fig. 1, hollow circles) and to act for a longer period (Fig. 3, hollow circles) compared to that required by sheep not so premedicated (solid circles). Chlorpromazine should nevertheless be used with caution. Of 14 sheep injected with chlorpromazine, 9 showed discomfort and aberration in movement

of the injected limb either immediately or within 5 min. of injection. Hypermeteria and paresis (knuckling of the fetlock and dragging) occurred. Five sheep were lame 48 hr or longer and one showed paralysis of the peroneus nerve for 20 wk. after injection, with severe wasting of the anterior tibial muscles.

Two further sheep were investigated in greater detail. The left triceps mass of each sheep was injected with 2.5 ml of chlorpromazine, whereas the right triceps mass of one animal received 1.25 ml of this drug while that of the other animal received 1.25 ml of the drug diluted with an equal volume of distilled water. Next day both sheep were sacrificed. Autopsy revealed a 3 cm area of necrosis and a 6 cm area of surrounding oedema in the left triceps mass of both sheep. The right triceps mass of the one which was injected with undiluted drug, presented a 2 cm area of necrosis and a 4 cm area of oedema, whereas in the other, which was given the diluted drug, only a 2 cm area of oedema was present. The oedema collected subcutaneously and in the intermuscular septa. The necrosis appeared as an irregularly ellipsoidal area with the appearance of 'boiled meat'. Histological section of affected muscle showed haemorrhage, loss of striation and lacking of sarcoplasm, karyorrhexis and karyolysis of muscle nuclei, and heavy neutrophilic infiltration. Since acids are known to bring about similar necrosis (Sutton[1]), and since the pH of chlorpromazine was found to be 4.50, 5.55 and 5.65 in 3 different phials, it is possible that the damage was caused by the acidity of the chlorpromazine. The fact that very much less damage was caused when the drug was diluted seemed to confirm this, since under these conditions the number of acid hydrogen ions was reduced by half. It was thus concluded that chlorpromazine should be diluted at least 1:1 with distilled water before injection into muscles of sheep.

Injection of acetylpromazine intramuscularly produced no untoward local effects.

Conclusion

It is concluded that one cannot estimate accurately the dose of pentobarbitone which will be required to anaesthetise a sheep for a given period. This is not of practical importance in operative surgery, and emphasises the old contention that clinical work is as much an art as a science. On the basis of the experience reported here, pentobarbitone can in fact be recommended as a safe and reliable anaesthetic for Merino sheep. Premedication with chlorpromazine and acetylpromazine tended to increase the effect and duration of pentobarbitone.

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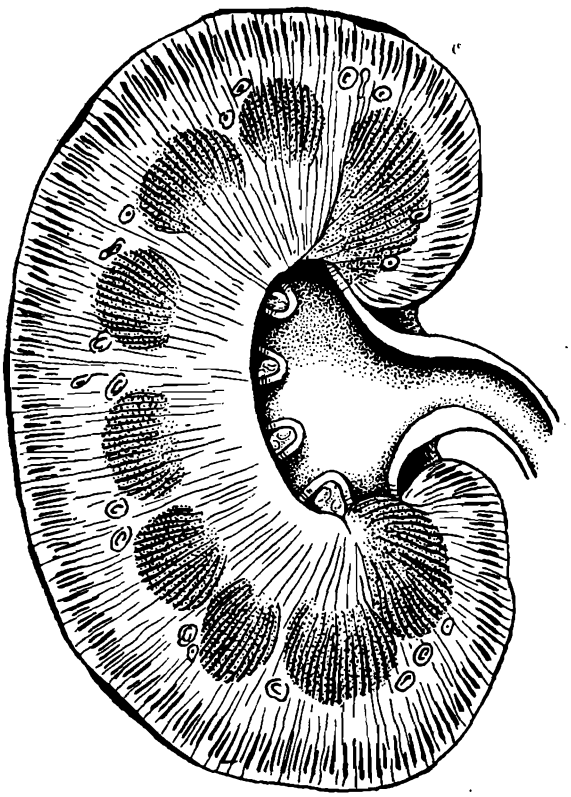

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1. *The Elastrator.*

Elastration or bloodless castration by means of a rubber ring was introduced into this country during the last decade and has since been used fairly extensively.

There are two aspects of the operation which make this method of castration and docking not only undesirable but a malpractice and these are, the increased susceptibility to tetanus and, the pain engendered by such a constriction above very sensitive organs. Domestic animals perhaps are not so "sensible of" but certainly are just as "sensitive to", pain as the higher orders and, to subject them to this form of torture is a practice which should be condemned in no uncertain terms.

The incidence of reported tetanus in animals generally, but particularly in lambs, has been increasing over the last few years. On enquiry one finds that (a) a number of unexplained deaths occur each year after docking and castrating (b) a certain number of cases are recognised as tetanus or "stiffsickness" of unknown aetiology and the loss accepted (c) there have been outbreaks of tetanus following the use of the rubber ring where previously conditions were as in (a) and (b).

Chodnik, Watson and Hepple[1] in 1959 mention castration by rubber rings as being the second most predisposing factor after tetanus neonatorum, van Rensburg[2], in the same year, reported 14 cases of tetanus out of 42 calves treated with the elastrator. Three outbreaks in lambs and one in calves, resulting from the use of the elastrator, were personally attended when in practice in Kenya during the period 1953-57. Stamp[3] (1963) considers that tetanus in the United Kingdom has recently become a minor problem due to the use of the rubber ring.

The pressure necrosis and tissue anoxia caused by the ring promote secondary gangrene and ideal conditions for the growth of the tetanus bacillus in an area very exposed to contamination. Initially the dependant testicles in their sac become swollen, tense and oedematous with later rupture, sloughing of the skin and exposure to infection. In other instances after the sac or tail have dropped off an area or lesion of necrotic tissue is exposed which becomes contaminated. The larger the animal with thicker and more resistant tissue, the longer the process will take and consequently more animals are exposed to infection, thus selecting the right size of animal will account for greater efficiency and less infection.

The Australian authority Belschner[4] considers that the elastrator offers no advantages over the knife. To my mind the two methods in general use, the knife and the burdizzo are quick and clean with least upset to the animal and far less likelihood of infection.

2. *Tetanus Vaccine.*

A tetanus vaccine has recently been registered and is available for use in the field. The number of cases and outbreaks of tetanus reported to Onderstepoort has shown a considerable increase over the last few years. All stock are susceptible to infection when castrated with a knife but this susceptibility appears to be enhanced by the use of the rubber ring particularly in lambs and calves, as indicated above.

Tetanus vaccines have been in use for man and animals for many years but at Onderstepoort one has not been produced commercially because of the small demand.

The vaccine now being produced to meet the increased demand conforms to standards of potency and safety etc. laid down by the B. Vet. C. 1965[5]. It can be used in all classes of livestock and at the recommended dosage will maintain an adequate immunity for field purposes for 9-12 months. An adequate immunity varies from .001-0.2 units antibody/ml serum, Tasman and Huygen[6], Chodnik, Watson and Hepple[1], Mason and Schaafsma[7].

The dose for *all* animals is 1 ml in volume containing 10 Lf (Lf = flocculating units). This value

and less, (down to 5 Lf, in practice) has been found, following 2 inoculations, to give serum antibody levels of up to 8-10 units/ml in various species of animals. In sheep this titre fell to 0.5-1.5 units/ml after a year but following a booster dose levels of 30-80 units/ml were obtained within 10 days.

Good results have been obtained with the vaccine in field trials:—

(i) Lambs of ± 6 weeks age when docked and castrated were protected from a field infection, by a colostral immunity from their dams which were inoculated at 6 weeks and 2 weeks before lambing — control lambs died of tetanus. This confirms the work of Chodnik, Jull and Addison[8].

(ii) Part of a flock of lambs had been castrated and docked and some cases of tetanus had occurred. The operation was suspended and the lambs (± 6 weeks old) inoculated, 3 weeks later given a 2nd inoculation and operated upon 10 days after the 2nd inoculation — no further cases occurred.

In a limited series of laboratory trials sheep with antibody titres of 0.5 units/ml were challenged with up to 1000 LDs which they survived.

Although tetanus is uncommon in dogs, (Mason[9]) they were included in the trials and tolerated the dosage well, showed no untoward reactions and responded to within the 8-10 u/ml antibody range.

The inoculation regime advised at present for *all* animals receiving their 1st inoculation at the age of 3 months or older is 2 inoculations with an interval of 4-6 weeks followed by an annual booster inoculation. Ewes should be inoculated at 6-8 weeks and again at 2 weeks before lambing, with the annual booster 2 weeks before lambing. The colostral immunity in the lambs will last for at least 3 months covering the period of docking and castration.

The inoculation is given subcutaneously in all animals except the horse in which it is given by the intramuscular route. Horses in some cases show a fairly severe local reaction with oedematous swelling due to the aluminium adjuvant and not to the greater susceptibility of the horse for tetanus. This reaction has been virtually eliminated by reducing the volume of the dose and giving it intramuscularly.

The vaccine has been given a shelf life of 6 months although vaccine, after storage for 10-12 months in the vaccine store, showed no loss of immunising value.

ACKNOWLEDGEMENT

Permission by the Chief of the Onderstepoort Research Institute for the publication of this article is acknowledged with thanks. The assistance of Dr. Krige, Lydenburg has been, and is, much appreciated in the field trials. Dr. Mason's and Dr. Schaafsma's "Plea" of 1962 for active immunisation was taken seriously, but not only for the horse.

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PLASMA ENZYMES IN BLUETONGUE

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The plasma levels of glutamic oxaloacetic transaminase, glutamic pyruvic transaminase, lactic dehydrogenase and aldolase have been found to rise after the subsidence of the febrile reaction to bluetongue virus. In all the enzymes named, peak plasma levels occurred some 8 days after the height of the febrile reaction and normal levels were not attained for some 8 days thereafter.

The cases so far studied were extremely mild, clinical symptoms, apart from the febrile reaction, being barely discernible, yet these plasma enzymes rose to frankly abnormal levels.

The cause of the increase of these enzymes in the blood is considered to be skeletal myopathy. Liver damage would appear to be ruled out by the fact that there was no hyperbilirubinaemia and that the bromsulphthalein excretion test was negative. Electrocardiograms taken over the relevant period showed no abnormalities indicating that the enzymes were, at least not mainly, derived from the myocard. The well known occurrence of myopathy associated with bluetongue also strengthens the assumption that the enzymes are of skeletal muscle origin. In future work, the determination of creatine phosphokinase will be included as this enzyme is considered to be the most specific indicator of skeletal muscle involvement.

Another finding was a marked and long sustained rise in red cell fragility also appearing in the post febrile period. The cause of this lesion is unknown. It was not associated with a decrease in methaemoglobin reductase activity.

Apart from their intrinsic interest, these findings may prove valuable in supplying presumptive confirmatory tests for the diagnosis of bluetongue in the post febrile and viraemic period.

Discussion. P. G. Howell —

DISCUSSION

This work reported by Professor Clark brings to mind particularly interesting potential fields of investigation. For some time past we have been studying the distribution of virus during the course of the disease and its persistence in the body after the termination of the febrile phase. If we can correlate the release of enzymes with muscular damage and associate this with virus multiplication, I believe that we now may have a very useful aid for this purpose. As we are all aware the clinical manifestations of the disease vary considerably, thus, if we can show a relationship between muscular damage and the virulence of a strain, I envisage that we now have a useful marker for the assessment of attenuation strains.

A COMPARISON BETWEEN PLASMA ENZYME LEVELS IN BLUETONGUE AND GEELDIKKOP

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In a previous communication dealing with certain aspects of the biochemistry of geeldikkop, (Brown, 1964) I showed that marked elevations of the levels of certain enzymes present in plasma occurred during the earliest stages of the disease. Increased levels of activity of glutamic-oxalacetic transaminase (G.O.T.), iso-citric dehydrogenase (ICD.), lactic dehydrogenase (LDH), phosphohexose isomerase (PHI) and aldolase (Ald.) were noted during the first two days of illness. Although after the second day of illness there is a decline in the activity of these enzymes in plasma, moderately elevated values with the exception of those for aldolase, persist even in apparently recovered animals, particularly so in the case of GOT.

In the same communication, (Brown, *op. cit.*) I reported a marked absolute increase in plasma γ — globulin levels which is evident from the onset of clinical symptoms in almost all the cases of geeldikkop which we have studied. It could be argued that the observed elevations in plasma of the activities of the enzymes mentioned, are due to alterations in the selective permeability of the hepatic cell membranes. Such changes are known to be a feature of geeldikkop but are not visible under the ordinary light microscope (Brown, *op. cit.;* Brown, le Roux and Tustin, 1960). The markedly elevated γ — globulin levels in plasma are however, quite inconsistent with the nature of the hepatic pathology (Brown, 1964).

In the previously cited paper, I once more drew attention to the possible role of mild viral infections as stressors precipitating the acute geeldikkop syndrome and incriminated bluetongue in particular. In a subsequent detailed analysis of the symptomatology of geeldikkop (Brown, 1966) this theme was enlarged upon and the close similarity of many of the symptoms seen in the early stages of geeldikkop, to those of an arthropod-borne virus disease like bluetongue, was indicated. It was postulated that the acute and typical symptoms of geeldikkop were preceded by a mild febrile condition, the symptoms of which pass largely unnoticed by the owner of affected flocks and his shepherds, and which have largely disappeared by the time of appearance of the dramatic symptomatology of geeldikkop. Biochemical and haematological evidence of the preceding syndrome is however still largely in evidence. (Brown, 1964; Brown, le Roux and Tustin, 1960).

Acting on the hypothesis that geeldikkop is precipitated by a mild virus infection, similar in nature, if not identical to a mild strain of bluetongue, we have studied the biochemistry of this condition. The main object of these studies has been to establish, which of the biochemical changes found in geeldikkop and described earlier, (Brown, 1964) are due to a possible stressor of the nature mentioned and which are germane to the geeldikkop syndrome proper.

Clark (1966) has shown that the main chemical pathological features of bluetongue include marked elevations in the activity of plasma GOT, GPT, LDH and Ald. Such elevations occur one to two days after subsidence of the febrile reaction and disappearance of the clinical symptoms of the disease. Maximum elevations are encountered five days after the end of the fever and persist for a further eight to ten days.

These changes have been interpreted as being due probably to the muscle lesions typical of bluetongue. They are the only features of the biochemistry of geeldikkop which can be evoked by the strain of bluetongue virus used. Their appearance and duration after bluetongue infection, are consistent with regard to our postulate that geeldikkop can be precipitated by a disease of this nature, and possibly indicate that symptoms such as torticollis, sometimes seen in geeldikkop, may in fact be due to a virus of this nature. We have tentatively concluded that the elevation of these enzymes in the plasma of early geeldikkop cases may be due to hitherto undetected muscular damage rather than to hepatic pathology.

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RIBOFLAVIN, NIACIN, PANTOTHENIC ACID AND LYSINE SUPPLEMENTATION EFFECTS IN GROWING-FINISHING PIGS ON HIGH-ENERGY RATIONS

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SUMMARY

The limit feeding of high energy pig rations containing 80-83% maize meal and 6-3% fish meal, did not show any measureable response to the supplementation of riboflavine, niacin or pantothenic acid, in quantities which ensured levels adequate for the requirements of growing-finishing pigs. Lysine supplementation gave a statistically significant response by improving the efficiency of feed conversion.

INTRODUCTION

Production type pig rations should supply the full requirements with respect to the B vitamins and essential amino-acids among which are at times only marginal levels of riboflavin, niacin, pantothenic acid and lysine.

The typical South African pig ration contains animal or marine protein which serves to balance the inadequacies of the plant ingredients. The chemical balancing may however be inadequate due to an insufficiency of the total addition, or due to partial biological unavailability of the nutrients.

Rations containing high maize concentrations promote rapid gains, but the plethora of this energy source increases the possibility of an induced deficiency elsewhere. Furthermore, in such rations, the chemical content of niacin is high, and far in excess of the theoretical requirement, although the biological availability of niacin from maize origin is considered to be negligible[1].

Riboflavin and pantothenic acid are closely linked with niacin in the systems related to carbohydrate and fat metabolism, and an inadequacy of one B vitamin will cause a breakdown of the chain of metabolic reactions in which they are associated. Such nutritional deficiencies may therefore develop without the characteristic symptoms of a specific vitamin deficiency, but rather as a generalized, non specific, reduction in efficiency, especially in borderline deficiencies.

Of the essential amino-acids, lysine is probably the most limiting amino-acid in pig rations[2] and it is the most sensitive to the processing methods used in the preparation of animal and marine-protein sources. The availability of this specific amino-acid can be used as a guide to the biological value of the protein as a whole.

This experiment was designed to measure the qualitative requirements of riboflavin, niacin, pantothenic acid and lysine in high energy rations, when limit-fed to growing pigs under optimum conditions.

METHOD

Animals.

Thirty-two Large-White pigs born to sister sows within a week, were used in this experiment. The baby pigs were weaned at six weeks and placed on a pre-experimental 18% protein ration in individual pens. For two weeks they were individually fed two pounds of meal daily. The sixteen barrows and sixteen gilts at eight weeks averaged 39.8 pounds and according to sex and weight were distributed evenly into eight treatment groups, with each animal in its individual pen. They were fed twice a day and weighed every two weeks.

TABLE 1.—EXPERIMENTAL DESIGN

	Control	Lysine	Riboflavin Pantothenic Acid	Riboflavin Pantothenic Acid Lysine
Control....	4	4	4	4
Niacin.....	4	4	4	4

Feed.

A growing ration containing 16% protein was limit-fed until the animals exceeded 100 pounds body weight and then a 14% protein ration was limit fed until slaughter at 200 pounds. At commencement 2½ lbs feed was fed daily, increasing to 3½ lbs at 100 pounds body weight and to 5 lbs by the time the animals reached slaughterweight.

TABLE 2.—RATIONS FED DURING EXPERIMENTAL PERIOD

Growing Ration:—16.01% protein equivalent	
Yellow mealie meal	80%
Lucerne meal	5%
Peanut oil cake meal	4%
Sunflower oil cake meal	3.5%
Fishmeal	6%
Bonemeal	0.5%
Calcium carbonate	0.5%
Salt	0.5%
Zinc	50 ppm zinc
Vitamin A	70,000 i.u./100 lb
Vitamin D_3	7,000 i.u./100 lb
Finishing Ration:—13.96% protein equivalent	
Yellow mealie meal	83.5%
Lucerne meal	5.0%
Peanut oil cake meal	4.0%
Sunflower oil cake meal	3.0%
Fish meal	3.0%
Bone meal	0.5%
Calcium carbonate	0.5%
Salt	0.5%
Zinc carbonate	50 ppm zinc
Vitamin A	70, 000 i.u./100 lb
Vitamin D_3	7,000 i.u./100 lb

The supplemented rations had additions, per 100 lb ration, of 181.5 gram feed-grade lysine hydrochloride, riboflavin 0.5 gram, niacin 0.6 gram, calcium pantothenate 0.2 gram. The B vitamin additions were doubled when the 14% ration was fed, however the addition of lysine remained constant throughout the experiment. Both the rations were analysed for available lysine according to the method of Carpenter[3].

TABLE 3.—STATISTICAL ANALYSIS

Source of Variance	Degrees of Freedom
Lysine	1
Riboflavin + Pantothenic acid	1
Niacin	1
Lysine/Riboflavine + Pantothenic acid	1
Lysine/Niacin	1
Niacin/Riboflavin + Pantothenic acid	1
Niacin/Lysine/Riboflavin + Pantothenic acid	1
Error	24
Total	31

The series of measurements and evaluations derived during the experiment and after slaughter were analysed statistically according to the method laid out in table 3.

RESULTS

The overall performance of the pigs in this experiment can be evaluated from the averages of results derived from all the pigs in the experiment. They were slaughtered at an average weight of 198.6 pounds with a carcase weight of 159.9 pounds yielding 80.7% dressed weight.

The fat measurements were: shoulder 3.4 cm, back fat 2.2 cm, average loin fat 3.05 cm, and fat over eye muscle 2.47 cm. The livers and kidneys weighed 2.8 and 0.45 lbs respectively. The carcase lengths from pubis to first rib were 78.9 cm. The eye muscle areas averaged 32.54 sq. cm. The iodine number for the fat samples taken from the group averaged 68.5 gram iodine per 100 gram fat. The measurements thus far mentioned showed no noteworthy differences which might be attributed to the effects of treatment.

The pigs consumed 468.5 lbs of feed in 126 days with an average feed conversion of 2.98 lbs feed per pound weight gain. Here however, there was a distinct difference caused by lysine supplementation, which reduced the conversion figure to 2.93 as compared to 3.03 for the pigs not receiving lysine. This difference was statistically significant (P .05).

TABLE 4.—AVAILABLE LYSINE IN THE FEEDS

	Control	*Lysine supplemented*
16% Protein	2.72* (0.4352)**	3.65 (0.5840)
14% Protein	2.86 (0.4576)	3.79 (0.6064)

* Gram available lysine per 16 gram nitrogen.
** Percentage available lysine in ration.

DISCUSSION

The riboflavin and pantothenic acid levels of the two unsupplemented rations were calculated[4] and found to be marginally below the requirements set by the National Research Council[1]. The

niacin content was calculated to be far in excess of the required amount; however, recent references[1] indicate that the niacin of maize is virtually unavailable. The additions of all three vitamins were made with the intention of exceeding the theoretical requirements of the pigs by 50 to 100%, so as to qualitatively determine the desirability of their supplementation.

The results indicated that with this type of ration no benefit was derived from these B vitamin additions. Lysine addition increased the available lysine, resulting in an improved feed conversion to body weight. It may therefore be deduced that lysine was in fact a limiting amino-acid and that increasing its supply with this high energy type ration is beneficial.

ACKNOWLEDGEMENTS

1. The Chief, Veterinary Research Institute, is thanked for the permission to present this paper.
2. Mr. C. M. HAVENGA, of the Department of Agricultural Technical Services assisted with the statistical analyses of the data.
3. Mr. V. de VILLIERS, of the Biochemistry Department, Faculty of Agriculture, University of Pretoria, applied the "available lysine" analytical method of Carpenter.
4. Mr. K. M. BUCHANAN of A. S. Ruffel was helpful in arranging the initial supplies of the vitamins and lysine.

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RECENT ADVANCES IN ANIMAL NUTRITION

Editor: J. T. A. Rûms.

J. & A. Chirchill Ltd., London. 1966. pp. 261. Price 36/-.

This book brings together selected recent literature which is classified into seven chapters concerned with: processing effects on the nutritive value of herbage, certain aspects of poultry nutrition, vitamin A in ruminant feeding, protein and energy in bacon-pig production, and aspects of laboratory-rat nutrition.

No effort is made to cover all fields of progress in nutrition, however the various authors succeed in condensing large volumes of literature and by the use of selected references are able to bring forward the essence of the current trends of thought in the specific topics that they deal with in the respective chapters.

This book is of considerable value to those persons having a basic knowledge of animal nutrition and desiring to expand their knowledge without having to refer to the ever increasing numbers of research articles which are published in a multitude of journals.

P. A. B.

J. S. Afr. vet. med. Ass. 37 (4) 1966

ELECTROPHORESIS OF OVINE PLASMA PROTEINS ON CELLULOSE ACETATE: THE TECHNIQUE AS ADAPTED TO STANDARD EQUIPMENT FOR USE WITH FILTER PAPER STRIPS

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SUMMARY

Cellulose acetate strip electrophoresis of plasma proteins has many advantages over filter paper strip electrophoresis. These are described, together with a method for using standard paper electrophoresis equipment adapted for use with cellulose acetate strips for work of this nature. Results obtained from electrophoretic analysis of ovine plasma protein fractions are presented to illustrate the value of the technique in clinical laboratory practice.

INTRODUCTION

Electrophoretic separation of plasma protein fractions and their subsequent estimation by various means, has become established as one of the most important techniques in clinical laboratory medicine. The usefulness of the technique has enjoyed such universal interest that rapid strides have been made in the refinements and improvements of methods, and the apparatus involved. These advances in electrophoretic technology have occurred particularly within the last five years and clinical laboratories are today faced with the choice of a bewildering array of equipment and procedures which often have to be adapted to suit their own particular requirements.

Until a few years ago filter paper strip electrophoresis of plasma proteins was a standard clinical laboratory practice and a considerable amount of capital was invested in electrophoresis baths, power units and scanners particularly in institutes where this work is done on a large scale. Although the information gained was of immense value in laboratory medicine and research in various biological disciplines, the techniques in current use suffered from some serious defects, not the least of which was the time of sixteen to twenty four hours required for adequate separation of the major protein fractions. This required, in most instances, overnight "runs" and the leaving of the apparatus (and often precious plasma samples) to the caprices of electric current supply from the local power grid. Only too often have valuable material and data been lost because of power fluctuations (particularly during the winter months) and sudden power failures. Other difficulties attendant on the long "running" period, are overheating of the bath with evaporation of the buffer, and condensation and pool formation on the strips, or polarization of the electrodes. Owing to the long period of time involved before the protein bands could be stained and examined, faulty separations were often not apparent until the day following application of the material to the strips and more valuable time would be lost in repeating the work.

A further serious drawback of the method is the failure to obtain adequate resolution of the various globulin fractions in the plasma of different species. Clark[1] and Brown[2] have commented, for instance on the poor resolution of ovine plasma globulins on paper electrophoretograms.

With the advent of cellulose acetate electrophoresis techniques and their subsequent refinements many of these objections were at once removed. Separation time was reduced to two hours, permitting not only a significant increase in the daily output of results, but also allowing for repetition of "runs" on samples where separation appeared inadequate or where some sort of error in technique was apparent. Resolution of the hitherto refractory ovine globulins has been excellent with these techniques as will be seen from the figures presented later in this paper. The advantages of cellulose acetate as the supporting medium for plasma protein electrophoresis are such that it's use in preference to filter paper is warranted in any clinical laboratory. The adoption of cellulose acetate techniques requires some modifications of existing apparatus used for filter paper work since the cellulose acetate strips are considerably smaller than their conventional paper counterparts.

Much of the apparatus which is available for paper electrophoresis can be readily adapted for cellulose acetate work at little extra cost and the additional accessories can generally be obtained from the manufacturers concerned.

Details of the technique that has been adapted to the Evans Electroselenium (EEL) paper electrophoresis outfit modified for cellulose acetate work are presented in this paper. Several difficulties were encountered in the evolution of the technique and methods of circumventing these are described. The satisfactory application of the method to the separation of ovine plasma proteins is recorded.

Equipment, Materials and Reagents

The electrophoresis bath used was the Evans Electroselenium (EEL) bath designed to take six filter paper strips each 34 x 5 cm. This bath was fitted with four EEL cellulose acetate trays thus carrying a full capacity of eight strips. (The capacity can be increased to twelve strips by the use instead of a lid approximately 33 cm x 9.5 cm such as the Beckman staining tray lid.) The bath was coupled up to an "Eelite" power unit providing a current of 2 milliamps per strip or 18 milliamps for the full load. With a full load it was found preferable to use the latter milliamperage instead of 16 milliamps for the eight strips.

The cellulose acetate strips used were Schleicher and Schüll "Membranfolien" 25 x 160 mm strips. Each were provided with two filter paper end pieces (Whatman adsorbent loaded paper, S.G.81) cut to 4.5 x 6.5 cm in size.

A Michaelis type barbital : acetate buffer was used. The composition of the buffer was sodium barbital 14.67 gm; sodium acetate trihydrate 9.71 gm; 0.1-N HCl 90 ml made to 1500 ml with distilled water. The stock buffer (three parts) was diluted with distilled water (two parts) before use. It was kept in the refrigerator between runs, being warmed to room temperature just before use and was made up fresh weekly.

The "fixative dye solution" contained Amidoschwarz 10 B (Merck) 1 gm, Trichloracetic acid 3 gm and sulphosalicylic acid 3 gm in 100 ml distilled water. This solution is kept in a brown bottle, is used repeatedly and is made up fresh every three weeks.

The "washing solution" was a 5% v/v aqueous solution of glacial acetic acid and the "clearing solution" contained 20% v/v glacial acetic acid in absolute methanol. The latter was made up fresh immediately before use.

Further apparatus required includes a photographers "squeegee" (obtainable from Beckman Instruments Ltd.), suitable polythene or stainless steel trays for washing and staining, and a number of glass plates 17.5 x 5 x 0.1 cm in size and thickness.

All chemicals used throughout were "analytical reagent" grade.

Most of our work has so far been done on ovine serum. Blood was collected in centrifuge tubes to marked levels and allowed to coagulate. After standing for 20-30 minutes the tubes were centrifuged at 2500 r.p.m. for 20 minutes and the clear serum removed by suction. Proteins in the serum were stained before application to the strips by addition of 1-2 drops of bromphenol blue solution, (1% bromphenol blue in 96% ethanol; 50 gm $HgCl_2$ made up to 1 L with this solution,) to the serum which must be shaken immediately after addition to avoid crystallization. Prior staining of this nature facilitates even application of material to the strips and allows one to note the rate of separation.

It was usual to perform the electrophoretic separations on the same day as the blood was collected. Serum may however be stored under refrigeration for no longer than three days for this purpose.

Method

(1) *Preparation of the Strips*:— Each strip must be inspected under good illumination for any flaws. A line is drawn across the strip 5½ cm from one end with a ball point pen, and the strip is identified by notching one end with scissors. The strips are then impregnated with buffer by first curving each strip, then placing it, lined side downwards, on the surface of the buffer solution. They are allowed to float in this position for 10 minutes and are then completely immersed for a further 10 minutes. The curving of the strip, shown in figure 1, facilitates placing the strip on the surface of the buffer without trapping bubbles of air underneath it. It is essential that these be avoided since they interfere with homogenous impregnation. Floating the strip as described above allows uniform penetration of the buffer solution by capillary action into the micropores of the cellulose acetate membrane. Immediate immersion of the strip on the other hand permits air

bubbles to be trapped in these pores and on the surface of the membrane([3],[4]). The strips should be handled at all times with tweezers since fingermarks leave permanent impressions on the membranes.

The filter paper end pieces are immersed in the buffer solution immediately before use.

The cellulose acetate electrophoresis trays are now placed on a beaker and the filter paper end pieces are placed at either end. The tray is now placed in position in the bath with the filter paper end pieces dipping well into the buffer solution in the bath (see figure 2).

The cellulose acetate strips are now removed from the buffer solution and blotted *lightly* between sheets of filter paper. Care must be taken to avoid excessive or uneven pressure during blotting since this will lead to uneven hydration of the strip. This phenomenon is marked by the appearance of whitish areas or spots on the cellulose acetate. The strip is now laid on its tray resting on the filter paper end-pieces, once it has been ascertained that the surface of the tray is free from air bubbles and pools of buffer. The marked starting line should be at the cathode end of the bath and all strips should be placed as tautly as possible without distortion.

(2) *Application of the sample to the strip*:— Before application of the sample the bath is connected to the power unit and the current is allowed to flow at the rate of 2 milliamps per strip or a total of 18 milliamps for a full load. Samples were generally applied about 15 seconds after the bath had been connected to the power unit. (The "Eelite" power unit is connected to the mains supply half an hour before the commencement of the run so that it may warm up, as per manufacturers' instructions.) A 0.1 ml graduated pipette was used for the application. The serum was applied in a fine uniform streak along the marked line, commencing and ending about 3 mm from either end of the strip. Following application of the material the strips were once more pulled taut using rubber gloves or wads of tissue paper.

Approximately 0.01 ml of serum was applied to each strip. In this type of work the smaller the volume of material applied the more successful is the separation of the protein bands. The pipette used (viz. 0.1 ml micro type) should be so selected as to deliver a very slow flow.

The lids of the trays are placed in position ensuring that no buckling of the strips or filter paper end pieces takes place and the bath is covered with its own lid. Under the conditions described a running time of 2 hours is sufficient to achieve satisfactory resolution of the most important ovine plasma protein fractions (figure 3).

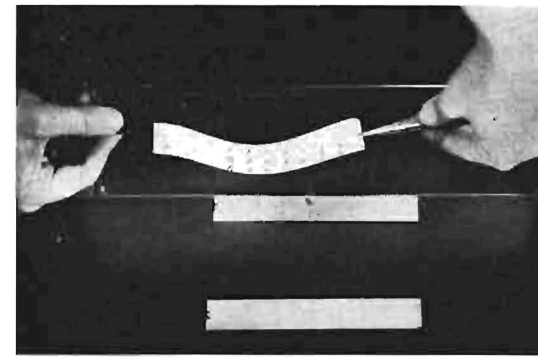

Fig. 1.
Placing the bowed strip onto the surface of the buffer.

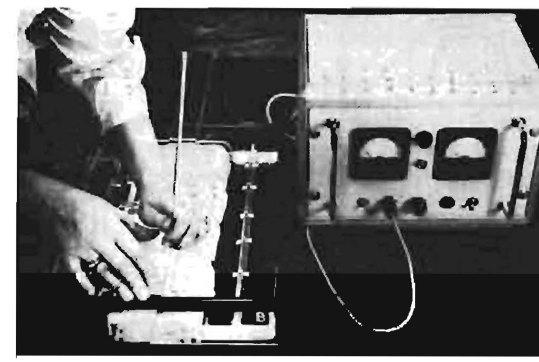

Fig. 2.
Application of the serum.

(3) *Fixing, Staining and Washing of the strips*:— After the run has been completed it is essential that the strips are not allowed to sag or touch the bottom of the tray while they are being removed. The previous remarks with regard to handling the strips with forceps only apply most pertinently from now until completion of the procedure. We have found that the spade tipped type of philatelists' forceps are most suitable for this work.

After removal from the tray each strip is once more curved slightly and placed carefully serum side downwards on the surface of the dye solution. It is allowed to float in this position for 10 minutes before being fully immersed for 5 minutes.

The stained strips are transferred to the "washing solution" and washed in three changes of this solution, or more if required, until the background is light in colour and the final washing fluid appears colourless. The strips are left in the final washing solution while each one is taken through the final steps of the procedure.

The strips are then taken through a wash of approximately one minute each in methanol and the clearing solution, the containers being agitated continuously during these steps. A glass plate, as described earlier, is placed into the clearing solution before the strip and the latter is positioned thereon and held in position as it is removed from the solution. Immediately after removal from the clearing solution, the strips are ironed out flat on to the plates by means of the squeegee and the whole sprayed with glacial acetic acid contained in an atomizer, while the plate is in an upright position. If an atomizer is not available, the plate may be dipped into glacial acetic acid and removed within 3-4 seconds. Alternatively this final step may be omitted altogether, the only difference being, that the background of the strip will not be glass-clear. Each strip on its plate is then placed in a hot air oven at 100°C for 10-15 minutes. After cooling, the plate is soaked in water for 4 minutes and the strip peeled off with the help of a razor blade, and then blotted dry.

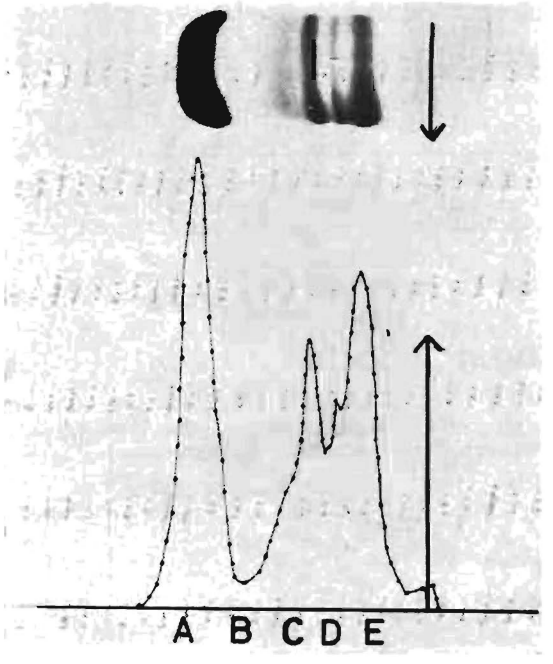

Fig. 3.
Cellulose acetate strip and corresponding electrophoretogram.

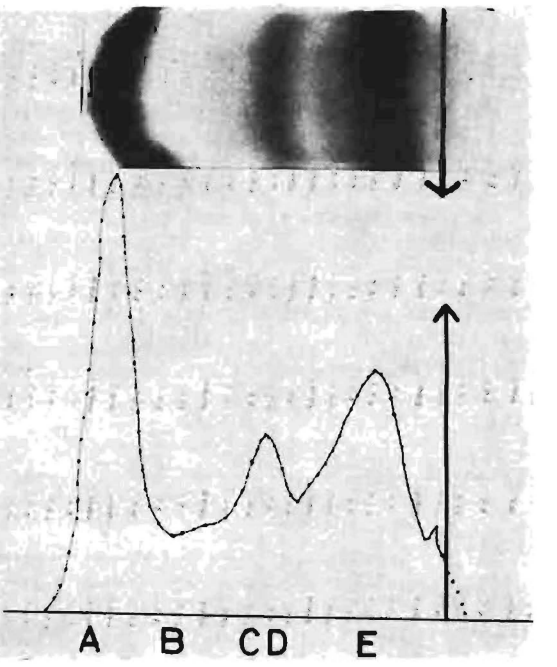

Fig. 4.
Filter paper strip and corresponding electrophoretogram.

(4) *Scanning and preservation of the strips*:— Adaptors for cellulose acetate strips are available for the EEL paper strip scanner, and the tracings so prepared are quite suitable for estimation of the albumin : globulin ratio by planimetry and proportional calculation from the total plasma protein figure of each sample([3]). We have found this adaptation of the instrument to be rather insensitive for accurate computation of the α_1, α, β and γ — globulin fractions and prefer to use an instrument of the Beckman "Analytrol" type for work of this nature. Such apparatus is however at the moment probably beyond the means of the average small clinical laboratory and the information gained is seldom required for diagnostic purposes. The strips are easily preserved for filing by mounting on large index cards with cellulose tape and should data regarding the various globulin fractions be required, these strips can be sent to any of the big medical laboratories for accurate analysis. For most purposes the average practitioner's main interest lies in the albumin : globulin ratio and in the γ — globulin fraction, both of which can be estimated satisfactorily, using the simple adaptation of the basic scanner.

RESULTS

A typical cellulose acetate electrophoretogram of ovine plasma proteins is presented in figure 3. The excellent resolution of the albumin, α_1, α, β, and γ — globulins is clearly seen. For comparison a filter paper electrophoretogram of ovine plasma proteins is presented in figure 4. The poor resolution of the minor globulin fractions is evident.

Scanning diagrams from these two electrophoretograms are presented in the same figures. Scanning was done on an EEL scanner adapted to take cellulose acetate strips. The insensitivity of the scanner as regards α and β — globulin bands is quite apparent. The use of the apparatus for an accurate estimation of the albumin: globulin ratio is however clearly demonstrated.

The results of a preliminary survey of the "normal" levels of these various protein fractions in ovine plasma as established by cellulose acetate electrophoresis, are presented in Table 1. The animals used were clinically healthy sheep drawn from the pool of available animals at this Institute.

TABLE 1—PLASMA PROTEIN FRACTIONS OF OVINE PLASMA AS DETERMINED BY CELLULOSE ACETATE ELECTROPHORESIS

Sheep No.	T.P.P. gm %	Albumin gm %	Globulin gm %	A:G Ratio
1	8.17	3.21	4.96	11:17 = 0.647:1
2	9.55	3.39	6.16	11:20 = 0.550:1
3	7.45	2.56	4.89	11:21 = 0.524:1
4	9.12	3.04	6.08	10:20 = 0.50 :1
5	8.12	3.25	4.87	12:18 = 0.667:1
6	7.82	2.71	5.11	9:17 = 0.529:1
7	7.92	2.55	5.37	9:19 = 0.474:1
8	8.25	3.14	5.11	8:13 = 0.615:1
9	7.86	2.81	5.05	10:18 = 0.556:1
10	7.92	3.96	3.96	11:11 = 1.00 :1
11	8.37	3.14	5.23	9:15 = 0.60 :1
12	7.42	2.83	4.59	8:13 = 0.615:1
13	8.80	3.77	5.03	9:12 = 0.750:1
14	9.03	3.33	5.70	14:24 = 0.583:1
15	8.10	3.37	4.73	15:21 = 0.714:1
16	7.10	2.58	4.52	8:14 = 0.571:1
17	8.75	3.01	5.74	11:21 = 0.524:1
18	7.95	2.89	5.06	8:14 = 0.571:1
19	8.15	2.91	5.24	10:18 = 0.556:1

FOOTNOTE.—Total plasma proteins (T.P.P.) were determined by the method of Weichselbaum, T. E. (1946) Am.J.Clin.Path. 16, 40. The A:G ratio (final figures given in extreme right hand column) is calculated from the relative areas of albumins and globulins as determined by planimetry on the "scan" diagram (figures in second column from the right).

ACKNOWLEDGEMENTS

The author wishes to thank the Chief, Veterinary Research Institute for his permission to publish this article and Professor R. Clark and Dr. J. M. M. Brown for their valuable assistance in preparation of the manuscript.

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CYTOGENETICS AND ITS APPLICATIONS IN VETERINARY MEDICINE

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Cytogenetics is the science dealing with the morphological study of chromosomes, the normal number associated with each species, as well as any aberrations and their phenotypic effects, i.e. a correlation of morphological and numerical abnormalities of chromosomes with clinical phenomena. It is a field widely studied in human medicine during the last decade; significant results in developmental disorders such as Klinefelter's (2n — 47, XXY) and Turner's (2n — 45, XO) syndrome, mongolism and various intersex conditions[48 52] as well as better understanding of carcinogenesis have been obtained. These advances have been made possible by relatively simple improvements in technique which involve hypotonic treatment of dividing cells, subsequent fixation in acetic alcohol, preparation of drop spreads and staining with alkalinised Giemsa solution[22]. Bone marrow and tissue cultures are suitable sources of dividing cells. In veterinary medicine and zoology, apart from determinations of normal morphology and number of chromosomes comparatively little has been done to study possible aberrations. The object of this introductory article is to stimulate interest in this new branch of science: present knowledge and basic concepts, therefore, are briefly reviewed.

CHROMOSOME MORPHOLOGY

Chromosomes can be identified morphologically only by their relative lengths, position of centromere and of satellites, if present. These features are best visualised at the metaphase stage of cell division, while the chromatid pairs are still held together by an undivided centromere. The position of this centromere can be strictly median, in the median region, submedian, subterminal, in the terminal region or strictly terminal (fig. 1 and 3) giving thereby chromosomes designated as metacentric (for first two positions), submetacentric, subtelocentric, acrocentric and telocentric. Levan, Fredga & Sandberg[32] have suggested this nomenclature and prefer the chromosomes to be designated as indicated in table 1.

TABLE 1

Centromeric position	*Recommended designation*	*Not recommended*
Median, *sensu stricto*	M	Metacentric
Median region.....	m	
Submedian.....	sm	Submetacentric
Subterminal.....	st	Subtelocentric
Terminal region.....	t	Acrocentric
Terminal, *sensu stricto*	T	Telocentric

Although they do not recommend the terminology in the last column it is so universally used that it would be almost impossible to eliminate. When used, these terms should always refer to the morphology of the chromosomes and not to the position of the centromere. As some confusion could arise with the term "metacentric", I would suggest it be used succeeded by the letters M or m in brackets. Telocentric chromosomes are considered non-viable.

According to modern concepts chromosomes undergo replication, i.e. doubling, during interphase whilst division into two separate entities (chromatids) occurs during prophase and separation of these during anaphase. Each mature anaphasic chromosome consists of a chromatin thread or chromatid (defined by Gall[19] as "half a replicated chromosome") which in turn consists of a yet undefined number of unit threads or chromonemata. Morphologically only 2-4 can be seen on occasion, although 16-128 (64) have been counted in electron micrographs[40]. Various structural hypotheses have been put forward to explain such polynemic structures but evidence for any specific arrangement has not yet been obtained.

As chromosomes in divisions and replications presumably act as units, a polynemic structure naturally offers some difficulties which have not yet been explained successfully. Coiling of the chromonemata is responsible for contraction of the chromosomes which takes place progressively from prophase to metaphase. Colchicine, which is used to stop cell-divisions at the metaphase stage, ap-

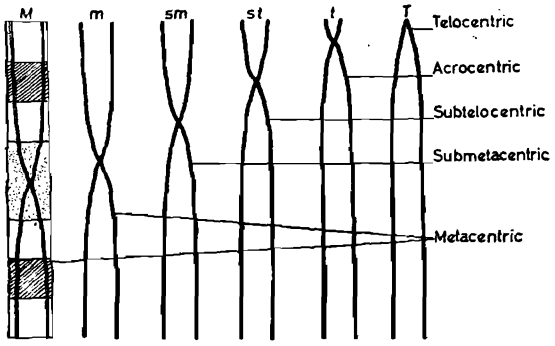

Fig. 1

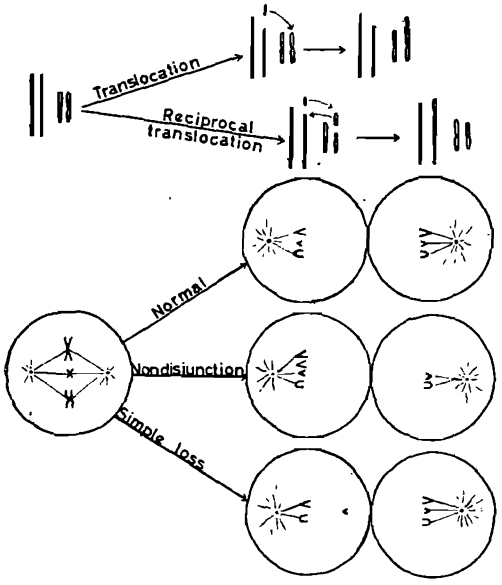

Fig. 2

pears to cause more advanced contraction of the chromosomes than normally seen. During interphase, portions of the chromosomes apparently remain coiled, stain more intensely and represent the chromatin granules of the resting nucleus.

Ohno and Hauschka[45] in 1960 provided cytological evidence that in cells of various tissues of female mice one whole chromosome remained in this state. They considered this to be one of the X chromosomes and the phenomena of differential condensation of one of a pair of X chromosomes is referred to as heteropyknosis. Eleven years previously Barr & Bertram[2] had observed a chromatin body in neuronal nuclei of female cats and had regarded it as evidence of sexual difference. This sex chromatin or Barr body, as it has become known, is mostly found against the nuclear membrane and is best identified in vesicular nuclei.

Fig. 1.

This diagram illustrates typical examples of the six categories of chromosome morphology. The areas marked in the chromosome on the left indicate (according to Levan, Fredga and Sandberg[32]) the various positions which the centromere may have in defining metacentric (m-stippled area) submetacentric (grey areas), subtelocentric (lined areas) and acrocentric (white areas) chromosomes[32].

Fig. 2.

The upper diagram illustrates

(a) above, translocation of part of one chromosome to another and
(b) below, reciprocal translocation which involves the exchange of parts of two non-homologous chromosomes. In both cases original homologous pairs are transformed into pairs of partially homologous chromosomes making classification very difficult and even erroneous.

The lower diagram illustrates some possibilities in separation of daughter chromosomes during mitosis:

(a) the normal way,
(b) by exhibiting the phenomena of nondisjunction whereby two daughter chromosomes are moved to one cell instead of separating, thereby giving rise to hyperploid and hypoploid states and
(c) by simple loss (or deletion) of one chromosome forming a monosomic.

An additional Barr body may be found for each X chromosome present above the normal diploid number. So, for instance, individuals possessing an XXXY chromosome complement would have two Barr bodies in their somatic cells. In neutrophils the body presumably is represented as a drumstick-like attachment to the nucleus.

The presence of these bodies in somatic cells have therefore given rise to the technique of cytological sexing of two kinds: (a) nuclear sexing performed on tissue sections or buccal smears and (b) polymorphic sexing performed on blood smears[22]. These methods are most useful in cases of doubtful sex. By this means it is also possible to determine the sex of embryonic blastocyts.

Mary F. Lyon formulated a hypothesis[34] which states that (a) the heteropyknotic X chromosome is genetically inactive except for a short pairing segment, (b) that it could be either paternal or maternal in origin in different cells of the same animal and (c) that inactivation occurs early in embryonic development.

Doubling of the amount of D.N.A. in preparation for cell division takes place during interphase. During this process thymidine is incorporated into the chromosomes. By using tritiated (i.e. radioactive) thymidine, autoradiographic studies can be undertaken on the manner, time and duration of replication. One X chromosome has been found to be late replicating. By this means the X chromosome can be identified amongst morphologically similar chromosomes.

Classification of Chromosomes

In the classification of chromosomes the Denver international system — agreed upon by representative cytogeneticists at the meeting held at the University of Colorado in Denver (*1960*), is followed[10]. Homologous pairs of autosomes, (obtained by photographing suitable spreads and subsequent pairing off of the homologous chromosomes), are arranged in descending order of length and numbered serially by Arabic numerals. The sex chromosomes are not numbered (Fig. 3). Chromosome pairs of more or less similar morphology are arranged in groups, which are denoted by the number of the first and last pair of the group with a hyphen inserted e.g. Group 1-3. For convenience they are also denoted by capital letters of the alphabet e.g. Group A containing chromosome pairs 1, 2 & 3.

Such an array of chromosomes, produced from a single metaphase spread either by photography or drawing and subsequent arrangement in homologous pairs, is called a karyotype, (Fig. 3) with the extension in meaning that such a karyotype can typify the chromosomes of an individual or even a species. The term idiogram is used for a diagramatic representation of a karyotype based on measurements of chromosomes from several cells.

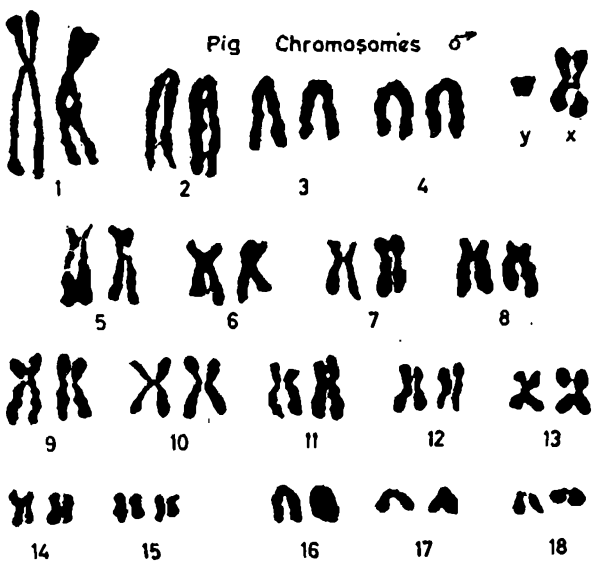

Fig. 3. Karyogram of pig chromosomes.

Table 2.—Diploid chromosome numbers in domestic and laboratory animals

Ox[36) 58]	60	Chinchilla[42]	64
Sheep[36) 39]	54	Rabbit[15]	44
Goat[35) 36]	60	Guinea pig[36]	64
Cat[17) 36]	38	Rat[36]	42
Dog[25) 35]	78	Mouse[36]	40
Pig[20) 27]	38	Blue monkey[13]	60
Horse[36) 57]	64	Ferret	40
Donkey[36) 57]	62		
Mule[57], Hinny[57]	63		

	→ 0	0_+
Fowl[31) 36) 46]	78	77
Duck[36]	80	79
Goose[36]	82	81
Pigeon[36]	80	79
Turkey[36]	80–82	79–81
Guinea fowl[36]	76	75

The chromosome number can be referred to as being orthoploid (normal haploid or diploid state) or heteroploid (general term for abnormal numbers, although often normal in some plants and insects). The heteroploids can be subdivided into aneuploids (general term for abnormal numbers which are not multiples of the haploid number) or euploids which refers to a balanced set of chromosomes including therefore orthoploid and polyploid states. The term polyploid refers to a balanced set higher than the diploid number. Greater specificity is conferred by the terms triploid (3n), tetraploid (4n), etc.

The aneuploids can be further subdivided into hypoploids or hyperploids or, if more specificity is desired, the terms hypodiploid (with diminished number of autosomes or sex chromosomes (e.g. $2n - 1$)) or hyperdiploid (e.g. $2n + 1$) can be used. As these terms do not indicate which autosome has been increased or decreased, the terms monosomic, trisomic, nullosomic or polysomic may be used with reference to the specific chromosome, e.g. trisomic for chromosome 21.

CHROMOSOMES OF MALFORMED ANIMALS (INCLUDING INTERSEXES)

Investigations carried out at this Institute[22] indicate, that a wide variety of malformed animals possess a complete morphologically normal karyotype as determined from bone marrow preparations

only. These abnormalities included ano-vestibular fistulas, hereditary laminitis, diprosopus cases, branchiogenic cysts, cases of "skew face" in cattle and of absent or deformed limbs. These observations do not exclude the possibility of gene mutations as aetiological factor nor of localised aberrations in affected areas not microscopically visible as the direct cause. Murphy & Reisman[41] have found a higher incidence of aneuploid cells in cultures of cleft palate tissues but normal configurations in relevant blood cultures. These observations suggest that abnormalities are caused by localised aberrations in the affected tissues. Confirmation of this is required in animals.

Some human abortuses may be due to chromosome anomalies in the foetus or in the endometrium. Clendenin & Benirschke[18] have found chromosome anomalies in 3 out of 10 cases of human abortuses. Carr[14] found 12 anomalies out of 60 abortuses. It has also been shown[29] in humans that a considerable degree of aneuploidy exists normally in human endometrial cells. However, in some cases of sterility, of bleeders and of abortions, the incidence of aneuploidy is increased. The aetiological significance of these findings have still to be determined. Similar investigations may be of significance in domestic animals.

Very promising results were obtained in intersexes[22]. All intersexual pigs studied, some even with complete internal male genital organs, were shown to be masculinised genetic females. No genetic male intersex has yet been located. Cultures of the kidney and testis revealed no Y-chromosome present. I have concluded tentatively that the Y chromosome is not required for the differentiation of testes but is necessary for fertility.

The female twin of a heterosexual pair of sheep twins, was shown to be chimaeric due to chorioallantoic anastomoses[21], thereby indicating that the freemartin condition also exists in sheep (see this journal Vol. 36 p. 101 & 102 for photographs). All bovine freemartins and their male twins, are also chimaeras possessing both male and female cells in their blood[7 47], bone marrow, thymus, spleen and lymph nodes[59]. The percentage of male and female cells may vary considerably in different pairs of heterosexual twins and may further alter with age. A single-born sheep intersex with testicles, was shown to be a genetic female[21], whereas an intersex dog with aplastic testicles was found to be a genetic male[23].

Intersexes in goats are believed to be associated with hornlessness[4 53 54]. According to breeding experiments they are all considered to be genetic females. Padeh, *et al.*[49] have described a single-born, horned XX/XY hermaphrodite which they believed to have obtained its mosaicism as a result of double fertilisation. Chimaerism was also considered as aetiological factor with possibility of early resorption of the male twin. Blood cultures revealed 60% XY and 40% XX cell types. The 40% XY-cells contained 59 chromosomes with one centric fusion resulting in a metacentric chromosome. A family of goats with only 59 chromosomes (one metacentric due to centric fusion) was located[49].

A hermaphroditic cat with XX and XY cells has been described[56] — perhaps a case of freemartinism? A sterile bull had an additional metacentric chromosome (2n −61) not found in the normal karyotype[3]. Three hemophilic dogs were found to possess normal karyotypes[11]. Animals with a history of non-pathological sterility appear to be most promising subjects for cytogenetic studies.

Identification of Hybrids

Interspecific hybridisation is often questionable. It very seldom occurs in nature but mostly in captivity. Often the most bizarre results are reported after crossbreeding the most unlikely animals. Gray[24] has compiled a list of over 300 hybrids. Chromosome analyses would have been helpful in establishing the authenticity of many of these hybrids. However, at that time such determinations were still a difficult procedure.

Benirschke *et al.*[9] in the course of their studies found that the chromosome number and the "gross" appearance of these elements are similar in those species whose hybrids are apparently fertile (e.g. among bears and in dogs crossed with coyotes) "and it appears that the sterility of the mule and the hinny can be accounted for by the gross morphologic dissimilarities between the karyotypes of their parental species, the horse and the donkey". This morphologic dissimilarity of chromosomes causes difficulty during meiosis in the hybrids, resulting in infertile gametes. However occasional mare mules do become pregnant and produce young. Benirschke *et al.*[8] have reported one such case which was phenotypically a mule but genetically a donkey. It appears therefore that where hybrids give birth to young these may revert to the grandparents genetically.

A recent report by Kaulischer and Frechkop[30] of a fertile hybrid with 65 chromosomes between *Equus caballus* (64 chromosomes) and *Equus*

prjewalskii (66 chromosomes) is noteworthy. The existence of *E. prjewalskii* as a separate species of the Equidae is thus substantiated.

At present investigations are being planned to establish the authenticity of sheep-goat hybrids.

It is interesting to note that evolutionary studies[16] suggest that the karyotypes of Primates with high diploid numbers and large percentages of acrocentric chromosomes are characteristic of more primitive species. It has also been suggested that through evolutionary development twelve of the sixty chromosomes of the goat may have fused to form the six metacentrics in the karyotype of the sheep. Similar studies on carnivores[23] are being conducted.

Mechanisms Causing Chromosome Aberrations

In the first instance certain, as yet unknown inherent mechanisms produce aberrations (Fig. 2). These are: (1) translocation (attachment of part of a chromosome to another); (2) reciprocal translocation (interchange of parts of two chromosomes); (3) deletion (loss of part of a chromosome or even a whole chromosome) and nondisjunction (i.e. lack of separation of two chromatids at metaphase so that one hyper- and one hypodiploid cell is produced).

Certain exogenous influences can produce chromosomal aberrations. Lilly[33] found that aflatoxin causes breaks in human chromosomes. It also inhibits synthesis of D.N.A. from tritiated thymidine and inhibits mitoses of human lung cell lines. As aflatoxin poisoning also occurs in some domestic animals and birds[12] such studies could help to unravel its mechanism of action.

Theurapeutic irradiation produces chromosomal aberrations which can be assessed by analysis of lymphoid cells from peripheral blood culture. Aneuploidy is said to affect 10% of the cells which, after conclusion of therapy, return to normal only after one year. It has been shown that irradiation also produces acentric chromosome fragments in lymphocytes. These acentric fragments are lost during mitoses but persist in cells that do not divide. By this means it has been shown[1] that some lymphocytes in humans have a life span of 530± 64 days while the majority only live for 3-4 days. Another important application has been the development of the chromosome marker technique. Irradiation-induced reciprocal translocation, known as T6 in mice has resulted in one autosome being of small size and tripartite in appearance, making its identification easy[59]. Genetic strains of mice immunologically tolerant to each other have been produced which have T6 in homozygous and heterozygous form. These have been found useful in tracing developmental potentialities of lymphoid and myeloid cells[59]: lymphocytes heterozygous for T6 and myeloid cells homozygous for T6 are injected into normal mice and the ultimate fate of these cells studied. Cytogenetics has given us a method of identifying cells: the chromosomes act as the fingerprints of these cells!

Cytogenetics applied to virology is another important aspect. Nichols[43] considered viruses to be capable of producing at least three types of changes involving the chromosomes: the first of these is the single break, the second is chromosome pulverization and the third is cell fusion and spindle abnormalities. Among the viruses studied giving these effects are the SR strain of Rous sarcoma virus and the measles virus. In animal virus diseases such studies may reveal significant results.

A most extraordinary development has been the fusion of cells from different species and even different vertebrate groups, by means of killed viruses. By using viruses of the para-influenza group, cells from man, mice and fowls have been fused[20]. Some such hybrid cells can grow more vigorously than their parent cells. The importance of this work has been in showing that there are no mechanisms within vertebrate cells for recognising incompatibility like those mechanisms which result in destruction of tissue and organ grafts. The authenticity of such fusions is established by chromosome analyses. Such composite cells carry out their functions in a perfectly integrated way.

Chromosome Complements in Neoplasms

A large proportion of neoplasms investigated has been found to possess morphologically or numerically abnormal karyotypes. The aberrations are by no means consistent even though such neoplasms had originated from the same tissue[50].

Tissue cultures serve as excellent models for the study of the effects of viruses, certain chemicals and irradiation in carcinogenesis. Although viruses cannot always be located in neoplastic cells, there is evidence that virus nuclear components may persist.

Basrur & Gilman[6] have reported 4 out of 5 cases of lymphosarcomas in dogs to be karyo-

typically altered, notwithstanding a normal chromosome complement revealed by chromosome analyses of blood cultures.

In virus-induced murine leukaemia, aneuploidy was only observed in later stages of the disease, suggesting that chromosome alteration results from, rather than initiates, neoplastic transformation[51].

Basrur, Gilman & McSherry[5] reported finding 61 chromosomes in a Holstein heifer that died from lymphosarcoma.

Canine transmissible venereal tumour has been studied karyologically by Japanese workers[37 38 55]. They found such karyotypes to differ markedly from the normal, in that there was a tendency to fusion of acrocentrics to form metacentrics, resulting in only 59 to 60 chromosomes instead of 78.

The finding of a minute chromosome, formed as a result of deletion, in chronic myeloid leukaemia in man[44] prompted similar research in animals but so far without success.

In conclusion I may state that cytogenetics is one of the basic sciences which may lead to a better understanding of karyological mechanisms in both normal and abnormal states.

ACKNOWLEDGEMENTS

I wish to express grateful appreciation to Prof. H. P. A. de Boom for his expert guidance in preparing the manuscript to Miss. J. W. Cilliers for her most willing assistance and to Mr. A. M. du Bruyn for preparing the photographs.

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AN ATLAS OF SURGICAL APPROACHES TO THE BONES OF THE DOG AND CAT

D. C. PIERMATTEI, R. G. GREELEY, W. B. Saunders Company, Philadelphia and London. 132 pp. Price $9.50.

Fortunately the time of the veterinary textbook (except encyclopaedias) which claims to tell "everything of everything" is forever past.

With the growth of knowledge and the advent of specialization the need for books covering a limited field has become more insistent. Of this category the book under review is a good example.

Besides a few pages on general considerations, the book is divided into sections dealing systematically with the different regions of the body. When the book is opened at any page, the text is on the left. The various steps of the surgical procedure are each succinctly and clearly described in separate paragraphs identified by different letters. The facing page is reserved for well executed drawings each identified by the letter of the corresponding paragraph. Clarity and system are therefore outstanding features of the book.

Individual surgeons have their differences about details of technique, but then there are very often personal peculiarities without any foundation in merit. It can be stated with confidence, that this volume will have a very wide appeal to practitioners, students, docents in surgery and experimental surgeons with an interest in orthopaedic surgery.

There is a suggestion, however; the authors might include in a succeeding edition the approaches to the standard sites of amputation of the limbs, including the toes.

The book is slim, in handy format with clear printing on fine quality gloss paper.

C. F. B. H.

CHORIOPTIC MANGE IN THE ALPACA, *LAMA PACOS*

E. YOUNG†

INTRODUCTION

Alpacas are domesticated camelines which the Incas of Peru developed for the production of wool[1]. A population of 2.5 million alpacas is raised in southern Peru, ranging to altitudes of over 4,500 meters.

MATERIAL AND METHODS

In February 1965, three adult alpacas were imported into the Republic of South Africa from a zoo in Western Germany. A few days after their arrival at the quarantine section of the Pretoria zoo, all these animals developed areas with dermatitis crustosa and alopecia on the legs and around the base of the tail (fig. 1). Scrapings revealed mites which were identified by Prof. R. du Toit of Onderstepoort as members of the genus *Chorioptes* (fig. 2).

Fig. 1.
Chorioptic lesions on the medial aspect of the hind leg of an Alpaca.

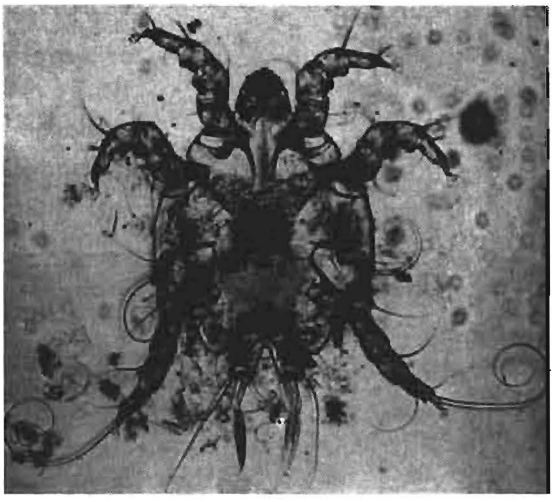

Fig. 2.
Chorioptes mite from a skin lesion of Alpaca.

The animals were washed twice, with an interval of seven days, with a mixture containing 0.03% of the gamma isomer of a BHC wettable powder. The animals' enclosures were also washed with this mixture and the floors were covered with clean bedding. The lesions disappeared gradually and subsequent scrapings of the previously infected regions yielded negative results.

DISCUSSION

In the highlands of Bolivia and Peru this wool producing animal constitutes a source of con-

†Veterinary Investigation Centre, Kruger National Park

siderable national income and mange may have a detrimental effect on the economics of wool farmers in this part of the world.

Sarcoptic mange has been described as the only form of scabies affecting the camel, dromederi and other animals belonging to the camelidae, and the causal agent has been named *Sarcoptes scabiei var. cameli*[2]. *Sarcoptes* parasites are known to cause the most serious forms of mange in alpacas but mange due to *Psoroptes* and *Demodex* has also been observed to occur in alpacas of Peru[3]. To the best of my knowledge, this is the first record of chorioptic mange in the alpaca.

ACKNOWLEDGEMENTS

1. Dr. Teoderico Terry, Chief of the Department of Animal Health of Peru for the information kindly supplied by him.
2. The photographic section of Onderstepoort for the excellent photograph of one of the mites.
3. The Chief, Veterinary Field Services, Pretoria and the Chief, Veterinary Research Institute, Onderstepoort for permitting publication of this report.

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CANINE SURGERY

The work of thirty-seven authors.

Edited by

J. ARCHIBALD

1024 pages, 1218 illustrations. American Veterinary Publications, California. Price R18.75.

"Canine Surgery" requires no introduction to veterinarians. This new book, compiled by thirty-seven authors, has been considerably expanded; not only by the inclusion of new knowledge and new and useful techniques but by the virtual re-writing of most of its chapters. The volume is larger than the previous edition, the print is smaller and consequently contains much more information. The subject matter is freely illustrated with most instructive and vivid photos and clear line drawings. Only people who are authorities in the various facets of canine surgery can produce a work of such high standard. This was made possible by the fact that thirty-seven authors who are specialists in their own field, contributed in the compilation of this book.

The first few chapters are devoted to surgical principles, local and general anaesthesia, sterile technique, fluid therapy and shock. This is followed by a detailed description of the surgical conditions of the various tissue structures and organs. New diagnostic procedures and new operative techniques have been included. A survey of the anatomy of the relevant structures is given at the beginning of each chapter. A new feature is the inclusion of the patho-physiology involved in most conditions to aid selection of the most rational treatment. This is not standard practise in all veterinary text books. It is, therefore, an essential contribution to a better understanding of the interplay between surgery, pathology and physiology. Chapters dealing with the heart and great vessels, liver and biliary tract, spleen and pancreas are valuable additions.

The only criticism is that the book covers too wide a field. Anaesthesia is a specialized subject, on which information is freely available. This could be left out to allow for more space for actual surgery.

This is certainly the most comprehensive work of its kind and should be a welcome addition to the library of students, practitioners and clinical research workers.

D. G. S.

SUID-AFRIKAANSE VETERINER-MEDIESE VERENIGING

NOTULE VAN DIE EEN-EN-SESTIGSTE ALGEMENE JAARVERGADERING VAN DIE VETERINER-MEDIESE VERENIGING GEHOU IN DIE OUDITORIUM VAN FAKULTEITSGEBOU, ONDERSTEPOORT, OP WOENSDAG 14 SEPTEMBER 1966 OM 8.15 VM.

AANWESIG: Dr. H. P. Steyn — Aftredende President
Dr. A. F. Tarr — Verkose President
Dr. L. W. v.d. Heever — Verkose Vise-President

Die Sekretaris Dr. W. J. Ryksen en die volgende lede:—

Abrams, L.; Adelaar, T. F.; Anderson, P. S. S.; Anema, S. G.; Barnard, B. J. H.; Barrie, N.; Belonje, P. C.; Beverley, G. H.; Bilbrough, R. B.; Bisschop, G. H. R.; Bisschop, J. H. R.; Bishop, G. P.; Bosman, P. P.; Boswell, J. C.; Botes, H. J. W.; Boyazoglu, P. A.; Brown, J. M. M.; Brümmer, W. A.; Buhr, W. H. B.; Cilliers, S. D.; Clark, R.; Clow, D. G.; Coetzee, C. J.; Coetzee, H. J. J.; Coetzee, J. D.; Coles, D. J. W. A.; Craig, C. L.; Coubrough, R. I.; Davies, P. V. A.; De Boom, H. P. A.; De Lange, D. H.; De Lange, M.; De la Rey, R.; Dent, G. C.; Du Preez, G.; Du Preez, J. H.; Du Preez, J. H.; Du Toit, R. M.; Edwards, L. T.; Erasmus, A. S.; Erasmus, J. M.; Every, R.; Faul, A.; Fourie, P. J.; Frean, J. R.; Goosen, P. J.; Greathead, M. M.; Grosskopf, J. F. W.; Harte, C. P.; Hellig, H.; Hofmeyr, C. F. B.; Horak, I. G.; Howell, R. J. H.; Hugo, P. P.; Hurter, L. R.; Irwin, D. H. G.; Jansen, B. C.; Jarvie, D. J.; Kempster, Z. P.; Kleeberg, H.; Kriek, N. P. J.; Krige, J.; Lambrechts, H. B.; Le Roux, D. J.; Le Roux, P. H.; Loveday, R. K.; Malherbe, W. D.; Maré, C. J.; Masters, P. M. S.; Meara, P. J.; Morgenthal, J. C.; Morley, A. J.; Muir, R. W.; O'Brien, S. V.; Philip, J. R.; Pols, J. W.; Reinecke, R. K.; Robson, T.; Roos, C. J.; Schneider, H. H. A.; Scholtz, H. E.; Schutte, A. P.; Shone, D. K.; Smit, J. P. J.; Snyders, A. J.; Steyn, D. G.; Steyn, D. J.; Steyn, H. P.; Sykes, R. D.; Tarr, A. F.; Terblanche, H. J. J.; Terblanche, M.; Thiel, A. R.; Thorburn, J. A.; Thorold, P. W.; Trengrove, R. B.; Turner, S. J.; Tustin, R. C.; Uys, P. L.; Van Blerk, N. S.; Van de Pypekamp, H. E.; Van der Heever, L. W.; Van der Merwe, G. F.; Van der Walt, K.; Van der Watt, J. J.; Van Heerden, S. J.; Van Niekerk, C. H.; Van Niekerk, J. W.; Van Rensburg, G. F. J.; Van Rensburg, S. J.; Van Rensburg, S. W. J.; Van Tonder, E. M.; Van Wyk, J. A.; Van Zyl, J. K. G.; Van Schalkwyk, I.; Viljoen, J. H.; Wacher, P. P. C.; Weaver, D. B.; Wessels, C. C.; Wilkens, C. A.; Worthington, R.; Zumpt, I. F.

VERSKONINGS VIR AFWESIGHEID:— Lewenslange President, P. M. K. le Roux, en die volgende lede — G. v.d. Wall de Kock, C. H. Flight, J. L. Doré, W. G. Barnard, W. P. van Aardt en S. J. T. Downes.

1. Kennisgewing van vergadering word aanvaar en die notule van die 60ste jaarvergadering bekragtig op voorstel van Dr. W. D. Malherbe gesekondeer deur Dr. A. F. Tarr.

2. Geen sake voortspruitende uit die notule van die sestigste vergadering.

3. Die President se verslag lui soos volg:—
"Ladies and Gentlemen,

This is my last annual report to you and I propose making it as brief as possible as I anticipate a fairly lengthy meeting today.

I wish to thank members generally for their good response to my appeal to pay their subscriptions. There are however still a few who are more than one year in arrear with their subscriptions and we must remind them once more that although there has been some leniency during the current year, the decision of Council to remove all members from the mailing list who are a year or more in arrear with their subscriptions will be rigidly enforced in future. This, of course, will always be subject to the condition that there is no good reason for a member being in arrears.

You will notice that as at the 31st March, 1966, i.e. the end of our financial year, there was R1,816.61 outstanding in arrear subscriptions. A good deal of this has been paid up since, but I submit that this is too large an amount to be outstanding.

Council met six times during the past year and for those few among us who may be

critically disposed I would like to indicate that one member of Council, since he became a member of Council a few years ago, has spent over R2,000 in cash alone in paying his transport between his place of residence and Pretoria. May I remind you that this does not take into account loss of earnings and other out of pocket expenses.

I am not saying this because it is intended to stifle criticism. Good constructive criticism is welcome and appreciated, but let it be tempered by the knowledge that your Councillors, more especially the self-employed people living a long way from Pretoria, render an unselfish service at their own expense which surely is philanthropic, if nothing else. I believe these men do this because they believe that they are rendering a service. There is no personal advantage to be gained from being a member of Council.

Furthermore, I believe, that this spirit is in keeping with that of most members of our Profession who have been described by a former Minister of Agriculture as dedicated men.

During the past year Council has considered ways and means of ensuring regional representation of branches on Council. A decision was reached to recommend to the A.G.M. that the membership of Council be increased from eight to twelve with 2 vice-presidents and a president, making a total of 15. At a later date it was felt that this would not ensure regional representation and it was suggested that each of the 7 regional branches be given the right to nominate their representative on Council. Each representative to be appointed for a 2 year period like any ordinary member of Council and to enjoy full voting rights.

Council decided in favour of the latter recommendation and later today members will be asked to express an opinion.

You will notice from your balance sheet that the Major Brown book fund prize now stands at R5,770.68 and that the annual interest amounted to R230.83 for 1965-66.

Up to a year ago R50 per annum was awarded as the Major Brown book fund prize. Last year this amount was increased to R100 and it was equally divided between two fourth year students. This year it was decided to increase this prize to R200 and to ask Faculty to recommend how the money should be allocated.

It has been decided to have the coat of arms of the Association reproduced as a large emblem measuring 20 x 24 inches. This would be made of metal and reproduced in colour with all features raised and all lettering in gilt. This was to have been ready to be hung in the congress hall behind and above the President. This emblem will cost R200, and will be truly artistic. Unfortunately the artisan or artist who does the enamelling has been absent on sick leave for some time and we therefore apologise on behalf of the manufacturer for the delay in the completion of the emblem.

The Committee dealing with the registration of drugs under Act. No. 36 of 1947 has met several times and has asked the Registrar administering the Act to issue a proclamation authorizing the establishment of two registers. All drugs which are not dangerous and over which no control need be exercised to appear on the A register and all remedies containing the dangerous ingredients, of which a list was supplied to the Registrar, to appear on the "B" register. The latter to be supplied to the public only on prescription from a veterinarian.

Mr. Bekker, who attended the last Committee meeting assured us that the necessary regulations to legalize the control asked for, would be published in the Government Gazette.

A further brief memorandum was drawn up in which the defects of Act 36/1947 were outlined and in which we indicated the improvements in the Act which we considered to be desirable. A great deal more work will be required before actual amendments to the Act can be proposed and drafted.

In this respect we must point out to members, that other organisations, such as the medical profession succeeded in obtaining committees or commissions appointed by the Government to investigate and make recommendations, whereas it appears that opposition from the Department of Agricultural Technical Services precludes us from enjoying the same privileges. Perhaps some of our members who hold senior positions in this Department could explain the reasons for this opposition.

The Committee investigating national veterinary affairs is in the same predicament. Some years ago when I wrote to the Minister of Agricultural Technical Services asking for a Commission of enquiry into all aspects of veterinary services I was informed that this was not considered necessary. I need not suggest to you who was responsible for drafting this reply. The question I ask is : Was the

Veterinary Division of the Department consulted before this reply was drafted? If not, are we to accept a decision of this nature from non-veterinarians?

Our deliberations regarding veterinary affairs are now reaching completion. The Committee has decided that I am to be responsible for collating all information received in reply to our questionnaires and to draw up a memorandum for possible presentation to the Minister.

And that, Ladies and Gentlemen concludes a summary of some of the main features of the activities of Council for the past year.

The results of our numerous other deliberations during the past year will become apparent from the discussions to follow during this meeting".

4. By die bespreking van werksaamhede van die veterinêre stigting het die President kortliks die stigting en voorlopige werksaamhede geskets. Die konstitusie is in Afrikaans vertaal en die Raad van Kuratore, bestaande uit Drs. H. P. Steyn, A. F. Tarr, J. W. Pols, D. J. W. A. Coles, D. K. Shone, H. S. Purchase en Mnr. S. Bam, beraam en organiseer planne om 'n kollekteerkampanje op tou te sit. Die President doen 'n beroep op lede van elke tak van die S.A.V.M.V. om invloedryke persone op die gebied van sport, landbou, wildbewaring, dierebeskerming, handel en perswese, te nader om aan te sluit by die stigting. Op die oomblik is slegs R1,030 ingesamel en R500 belowe, watter bedrag aangewend sal word om die kampanje te loods.

5. *Dringende sake*:

Voorgestelde veranderinge van die gedragskode wat betref toelaatbaarheid van name van hospitale op die geboue self, naamborde en wegwysers kom toe onder bespreking. Dr. Jansen beklemtoon dat advertensie van enige soort die aansien van die professie skend. Spreker pleit vir jong beginners wat wel op wetenskaplike vlak kan meeding maar nie met imponerende hospitale nie.

Dr. B. H. Pappin staan 'n konserwatiewe benadering voor. Goeie hospitale wat aan die minimale eise voldoen met onopsigtelike naamborde en wegwysers.

Dr. A. R. Thiel steun prof. Jansen en meen dat niemand mag toegelaat word nie om sy spreekkamers in 'n hospitaal te vestig want daarmee adverteer hy homself.

Dr. P. H. le Roux voer aan dat daar geen hospitale was nie toe die gedragskode opgestel was in 1948. Plaaslike owerhede wil 'n rigsnoer hê van die higiëniese vereistes wat opgestel moet word en waaraan hospitale sal moet voldoen. Die veeartsraad beheer net professionele sake, maar praktisyns is bereid om op 'n vrywillige basis hul hospitale te laat beheer.

Dr. C. L. Craig verduidelik dat plaaslike owerhede verordenings kan maak betreffende die konstruksie en ander vereistes van stalle, hoenderhuise, hondehokke ens. ens.

Drs Z. P. Kempster, D. G. Clow, Du Preez en die afgevaardigde van Suidwes-Afrika spreek hul afkeur uit teen die koppeling van hospitaalname met dié van veeartse.

Die vergadering besluit met 83 stemme teen 19 om nie die gedragskode te wysig nie.

Die President doen 'n ernstige beroep op die lede om te alle tye die gedragskode in letter en gees toe te pas.

Prof. Jansen verduidelik dat die Veeartsraad sy oordeel beslis volgens die gedragskode. As die gedragskode aangeneem is deur die meerderheid van die professie, dan word die bepalings van sodanige kode bindend beskou, selfs deur die Hooggeregshof.

Dr. le Roux voer egter aan dat die beheer van hospitale uitgeoefen kan word deur die Veeartsraad wat volle beheer het oor die doen en late van die persoon self. Die saak word daarna as afgehandel beskou.

Voorgestelde verandering van samestelling van die raad van die vereniging.

Die President verduidelik dat die Raad geografiese verteenwoordiging voorstaan. As alle takke verteenwoordigers het, sal dit samewerking en belangstelling gaande hou. Om die Raad te vergroot is wysiging van die konstitusie nodig, maar die Raad kan lede koöpteer.

Dr. P. M. S. Masters stel voor dat komiteelede van takbesture om die beurt raadsvergaderings bywoon om die reiskoste sodoende oor 'n aantal persone te verdeel.

Drs. H. G. J. Coetzee en C. C. Dent steun die voorstel maar Dr. D. K. Shone verkies dat een persoon deur elke tak aangewys word om alle raadsvergaderings by te woon want hy sal beter op hoogte bly van beleidsake.

Die vergadering besluit om die Raad te versoek om by wyse van proef, takverteenwoordigers te

koöpteer na goeddunke en op die volgende jaarvergadering verslag te doen oor die sukses of andersins van die stelsel.

6. *Lidmaatskap.*

(a) Die President vertolk in paslike woorde, die vergadering se medelye met die familielede van die volgende afgestorwe lede of eggenotes van lede. Die vergadering het staande die laaste eer betuig aan die nagedagtenis van:—

Dr. Campbell Dickson;
Dr. A. F. Harber;
Dr. Frank Veglia;
Col. James Irvine-Smith;
Mev. Curson, eggenote van lewenslange lid Dr. H. H. Curzon.

(b) Bedankings van lidmaatskap word aangeneem van Drs. Ray Datnow, S. M. Hirst, J. G. Townsend en D. W. Verwoerd.

(c) & (d) Aansoeke om lidmaatskap word oorweeg en die volgende persone aangeneem as nuwe lede:—

Carey, Peter William B.V. Sc. 1965.	067 Burger Street, Krugersdorp.
De Lange, Dempsey Henning B.V. Sc. 1965.	Staatsveearts, Otavi, S.W.A.
De Kock, Alexander Otto B.V. Sc. 1965.	Posbus 114, Kroonstad. O.V.S.
Descroizilles, Noël, Vivian B.V. Sc. 1966.	118, 8th Ave., Highlands North, Johannesburg.
Dobbie, Graham Rose B.V. Sc. 1966.	21 Logan Drive, Nahoon, East London.
Downey, Michael, Brian B.V. Sc. 1965.	Langeni, Upper Tree Rd., Camps Bay, Cape Town.
Du Plessis, Louis Stephanus B.V. Sc. 1965.	P.O. Box 1967, Pretoria.
Faul, Adèle, B. V. Sc. 1963.	P.O. Box 502, Bloemfontein.
Irvine-Smith, Bruce B.V. Sc. 1965.	12 Wallace St., Waverley, Johannesburg.
James, Michael, Edward B.V. Sc. 1966.	5A Church Street, Middelburg. Tvl.
Kiewiet, Pieter, B.V. Sc. 1965.	Posbus 25, Badplaas.
Kriek, Nicolaas Petrus Jacobus B.V. Sc. 1965.	Staatsveearts, Privaatsak, Mosselbaai.
Le Roux, Petrus Jacobus Hugo B.V. Sc. 1965.	Posbus 33, Villiersdorp.
Marcus, Edwin, Phillip B.V. Sc. 1965.	2, The Albany, Corlet Drive, Illovo, Johannesburg.
Russell, William David B.V. Sc. 1964.	30, St. Peters Rd., Bellevue, Johannesburg.
Schutte, Nicolaas Jacobus B.V. Sc. 1965.	1ste Laan, Melville, Johannesburg.
Schneider, Herbert, Heinrich Peter Adolf B.V. Sc. 1965.	Posbus 27, Omaruru, S.W.A.
Strydom, Daniël Honey B.V. Sc. 1965.	6, Innes Court, 6th Ave., Umtali, Rhodesia.
Theron, Louis Petrus B.V. Sc. 1965.	Privaatsak 2, Irene, Pretoria.
Van der Westhuizen, Barnard B.V. Sc. 1961.	Pk. Onderstepoort.
Van Graan, Benoni, B.V. Sc. 1966.	P.O. Box 3, Hekpoort. Tvl.
Van Rensburg, Izak. Bartholomeus Jansen. B.V. Sc. 1965.	P.O. Onderstepoort.

Van Niekerk, Ockert, Tobias B.V. Sc. 1965. Wessels, Brian, Cloete B.V. Sc. 1966.	P.O. Box 66, Carolina. 10, Queens Ave., P. O. Westville, Natal.

Giesecke, Werner, Heinz Dr. Med. Vet. 1965 — Berlin.	P.O. Onderstepoort.
Handcock, William Joseph M.V.B. M.R.C.V.S. 1956.	8 Bathurst Street, Grahamstown.
Kühne, Karl, John B.V. Sc. M.R.C.V.S. 1963 — Bristol.	P.O. Box 572, Bulawayo, Rhodesia.
May, Audrey, Violet M.R.C.V.S. 1935 — London.	Highdown Farm, Nothingham Road, Natal.

Daar is agt Kadet lede.

(e) Prof. R. Clark word voorgestel as lewenslange Ere Vise-President. Die aftredende President, Dr. H. P. Steyn vermeld die onbaatsugtige getroue toewyding van Prof. Clark aan die belange van die vereniging veral as voorsitter van die redaksie- en kongres komitees.
Met algemene stemme en applous word Prof. R. Clark gekies as lewenslange Ere Vise-President.

FINANSIËLE VERSLAG

7. Die inkomste- en uitgawe staat en balansstaat word kortliks behandel. Die gunstige balans is te danke aan (a) 'n profyt wat op die laaste jaarkongres gemaak is, (b) die feit dat gedurende ses maande die sake van die vereniging gaande gehou is deur vrywillige dienste gelewer deur Profesors S.W.J. van Rensburg en R. Clark met groot besparing van uitgaaf aan salaris en (c) die joernaal instede van 'n gebruiklike verlies, teen 'n geringe wins gepubliseer kon word.

Met die algemene prysstygings van drukkoste, hure en salarisse gedurende 1966 en die verlies wat altyd ondervind word as die kongres weg van Onderstepoort gehou word, kan geen surplus vir 1966 — 67 in die vooruitsig gestel word nie.

Dr. D. K. Shone beveel aan dat die beleggings van die spaargelde van die vereniging nie langer in Staats-, Munisipale- en Bougenootskap lenings belê moet word nie. Weens die aanhoudende waardevermindering van geld word die beleggings steeds minder werd en is onderhewig aan devaluasie indien dit sou plaasvind.

Spreker bepleit belegging in groei-eenhede of vaste eiendomme.

Die President verklaar dat die saak die aandag van die raad geniet. Dit lyk of die konstitusie gewysig moet word om afwyking van die bestaande beleid toe te laat.

Op voorstel van Dr. D. K. Shone, gesekondeer deur Dr. J. M. M. Brown word die finansiële verslae goedgekeur.

Op voorstel van Prof. C. F. B. Hofmeyr word 'n eenparige mosie van dank aan Profs. S. W. J. van Rensburg en R. Clark genotuleer vir hulle sekretariële en redaksionele dienste vir die periode Julie 1965 — Januarie 1966. Die naam van Prof. J. H. R. Bisschop wat ook sy deel bygedra het, word ook hierby ingesluit.

Verslae van staande komitees.

Sien Presidentsrede.

8. *Wêreld Veeartsenykundige Vereniging.*

Prof. B. C. Jansen, die S.A.V.M.V.-verteenwoordiger, doen verslag. Die volgende wêreld kongres gaan in Parys gehou word in Julie 1967. Die S.A.V.M.V. het sy finansiële verpligtings nagekom. Binnekort word 'n katalogus deur die filmbiblioteek uitgestuur en die S.A.V.M.V. sal films kan huur van dié liggame genoem in die katalogus.

Prof. C. F. B. Hofmeyr lewer 'n pleidooi vir finansiële hulp van lede om die Onderstepoort studenteliggaam in staat te stel om 'n verteenwoordiger te stuur na 'n kongres van die internasionale vereniging van studente in die veeartsenykunde. Enige bydrae kan aan Prof. C. F. B. Hofmeyr, Pk. Onderstepoort gestuur word.

9. (a) Die diere-slag en vleishigiëne konsepwet is nog in die eerste stadium van voorlopige bespreking en formulering.

(b) Na die laaste wêreld oorlog het die veeartskorps opgehou om te bestaan. Daar bestaan tans 'n moontlikheid dat een of meer veeartse weer in die Weermag kan aangestel word.

(c) Soos lede weet is die Marais-kommissie deur die Staatspresident aangestel om 'n verslag uit te bring oor Landbou in die Republiek. 'n Komitee van die Raad van die S.A.V.M.V. is benoem en besig om 'n memorandum op te stel vir voorlegging en toeligting aan die kommissie. Die Komitee sal die volgende punte behandel:—

(i) Veeartsenykundige behoeftes van die Republiek, insluitende personeeltekorte.

(ii) Moontlike tekorte aan veeartsenykundige opleidingsfasiliteite.

(iii) Voorsiening van voldoende veeartsenydienste aan die platteland.

(iv) Wenslikheid van 'n her-indeling van die Staatsveeartsenykundige onderneming.

(v) 'n Beskouing van die meer belangrike veeartsenykundige probleme van ons land, bv. die uitroeiing van tuberkulose en mastitis by beeste, brucellose by die verskeie diersoorte, verminose, lae aanteelvermoë en onvrugbaarheidsprobleme, voedingstekorte en wanbalanse en die siektes wat daaruit ontstaan en ander erosiesiektes, en

(vi) die gesondheidsbestuur van dierehoudings.

10. *Bestuursverkiesing*:—

Die Sekretaris rapporteer aan die vergadering dat die verkiesing van President en Raadslede vir die jaar 1966-67 en 1966-68 onderskeidelik, onder toesig was van die volgende komitee, wat deur die Raad aangestel was.

Ere Vise-President — S. W. J. v. Rensburg.
Gekose Vise-President — L. W. v.d. Heever.
Lid van die Veeartsraad — J. H. R. Bisschop.
Gekoöpteerde bestuurslid — G. D. Sutton en die Sekretaris.

525 stembriefies is uitgestuur en 359 terug ontvang — 69% stemme is uitgebring.

Die resultate is:

President — Dr. A. F. Tarr.
Raadslede — Drs. H. P. Steyn, M.C. Lambrechts, M. de Lange en Prof. J. D. W. A. Coles.

Dr. H. P. Steyn, voorsitter van die vergadering, verduidelik dat weens die terugtrekking van Dr. J. L. Doré en die verheffing van Prof. Clark tot Ere Vise-President, twee vakatures ontstaan het op die Raad. Die twee vakatures is gevul deur die koöptasie van Drs. P. H. le Roux en I. van Schalkwyk, twee van die onsuksesvolle kandidate met die meeste stemme, vir die jaar 1966-67.

Prof. J. H. R. Bisschop, S.A.V.M.V.-verteenwoordiger op die veeartsraad en Dr. G. D. Sutton vir finansies en kongres, is ook weer gekoöpteer vir die jaar 1966-67. Alle benoemings is met applous begroet.

11. *Algemeen.*

Dr. J. C. Boswell doen 'n beroep op die Dekaan om ondersoek in te stel na die oorsake van die hoë druip persentasie van die 1965 finale jaar studente.

Dr. Beverley expressed concern at the prevalence of rabies in the Transvaal and the real danger of introducing rabies from Natal by inhabitants of the Rand, returning from Coastal resorts with unvaccinated dogs which they had taken on holiday with them. The public would realise that the Division of Field Veterinary services meant business if roadblocks could be set up during the holiday season on the two main roads leading into Natal and cars searched for dogs transported without permits.

In reply to Dr. R. K. Loveday who enquired about a suitable tie adorned with our emblem, the chairman explained that reproduction of the many different colours of the emblem had proved an insurmountable manufacturing problem.

Drs. Van Wyk en Professors B. C. Jansen, K. van der Walt, D. Smit en J. D. W. A. Coles het die wenslikheid bespreek om die nuwere wetenskaplike gegewens oor te dra aan die professie as 'n geheel. Die vergadering besluit om die saak oor te laat aan die raad in oorleg met die fakulteit.

Mansjetknope:

Die Sekretaris wys ontwerpe van mansjetknope maar geen beslissing oor die aankoop daarvan is geneem nie.

'n Voorstel van Dr. Kleeberg om pryse te skenk vir die referaat wat nie alleen waardevolle materiaal bevat nie maar ook goed voorgedra word vind byval en word aan die Raad opgedra vir oorweging.

12. Prof. B. C. Jansen stel die Onderstepoort fasiliteite weer tot beskikking van die vereniging vir die 1967 kongres.

Dr. A. R. Thiel nooi die kongres uit om in 1967 in Durban te vergader. Sy uitnodiging word met dank aanvaar.

13. Besluite word oorgehou tot die laaste dag van die kongres.

14. Beskrywingspunte.

Dr. Bisschop enquired what had happened to resolutions on C.A. and T.B. control passed at the Annual General Meeting of the Natal Branch.

President replied that they were being considered by council in consultation with Chief of Field veterinary services. Any practitioner was at liberty to undertake C.A. and T.B. testing in accordance with regulations at present in force.

Hulde betuiging aan wyle Dr. H. F. Verwoerd.

Die Aftredende President verduidelik dat op die Raadsvergadering twee dae tevore hulde gebring is aan die afgestorwe Eerste Minister wyle Dr. H. F. Verwoerd wie die kongres drie jaar gelede geopen het. Sy optrede en benadering van ons probleme en die feit dat 'n seun van hom lid van ons professie is, het hom besonder bemind gemaak. Hy is die enigste persoon in 'n hoë ampsposisie wat spreker enigsins aangemoedig het met die stigting van 'n nuwe fakulteit.

As roubekenning het die vergadering staande hulde gebring aan die nagedagtenis van wyle dr. H. F. Verwoerd.

Bevestiging van nuwe President.

Die Aftredende President, Dr. Steyn het toe die verkose President Dr. A. F. Tarr in sy nuwe amp bevestig met die volgende woorde:
"Ladies and Gentlemen,

The subject I wish to present to you may be called "protocol within the Profession". It is something which I believe has never engaged the attention of veterinarians to any degree.

While I was your President, I felt that discussion of the topic might cause embarrassment but as I am now laying down this high office and as we are, in a manner of speaking, in the interim period between one President retiring and the next one being inducted it would appear to be an opportune time to discuss this matter.

Allow me to put a few blunt questions: How does the President of this Association rank within the Profession? Should he receive acknowledgment as President at all veterinary functions which are attended by more than just group representatives and if so, in what way should he be acknowledged?

This is a matter of grave concern to the welfare and status of the Profession. If we do not regard the President of this Association as the leader, who should be the leader?

Our President, after all, is the one man in the Profession who should have the interests of all sections of the Profession at heart. More than that, he must have the interests of the country at heart. He is the man, above all others, who must consider how best the Profession can serve the public through all its various branches. He should be the one man who can best grasp the fact that the only justification for the existence of the Profession is the service which it can render, not the homage it may expect.

Any man who accepts the Presidency does so, especially if he is a private individual, at tremendous personal sacrifice of himself and of his finances. It seems very much as though we can look forward to having some one from the private sector in the chair for at least some time to come.

Furthermore the President is the mouthpiece of the Profession provided he is not a government official, in which case his freedom to speak is limited.

I would suggest to you that if you cannot honour your own President, you certainly cannot expect others to do so. To grant interviews to newspapers or to address farmers meetings and belittle the President of the Association certainly does not redound to the credit of the Profession. To be derogatory of the President to parliamentarians or senior members of the government certainly cannot enhance professional status. Let us then not make a mockery of this post.

To me it appears obvious that the President cannot be expected to address every gathering to which he is invited but surely he should at least be accorded some place of honour and the acknowledgement.

Only last night I conveyed my appreciation to all colleagues for the way in which I had been treated and received by them wherever I had gone. This was said in all sincerity, but there have been several exceptions which I do not intend enumerating. Let me repeat a quotation from Churchill

which I have made before: "Let us beware of creating a society in which no one counts for anything except the politician and the official". And remember, this was said by one who is generally regarded as the greatest politician the English speaking world has known for probably at least this century.

It may be said that this or that individual is not a fit or a good leader. This, gentlemen, is beside the point. The man we elect as President is unquestionably the leader and he should, at all times and at all places, where there may be a Professional gathering, be acknowledged as such.

This, ladies and gentlemen, is an opinion I can now express without fearing any suspicion that I am seeking self aggrandisement. I am within a few minutes of transferring this badge of office to another pair of shoulders. He, I have no doubt, will prove to be a more capable leader than I have been, but whatever his or his successor's ability, I promise them my loyal support and due respect and honour and I believe I am fully justified, in enjoining each and every one of you to do the same.

The honour which we accord our President, in no way detracts from the respect and honour which we should accord to other leaders in the various spheres of activity of the broad professional spectrum. Each and every one of you is a member of a learned and an honourable profession, you are all respected members of any community in which you may be active, but there are certain members upon whom greater responsibility devolves than others and there are some who possess greater skill or more wisdom than others. These qualities are invariably enhanced by experience and the passage of years. Who are we to be proud of any gifts which might have been bestowed upon us. Let us not bury the talent with which we may have been endowed, but let us acknowledge with good grace and in all sincerity the ability, the experience and the responsibility of others. Thereby we can only enhance our own status and theirs.

Our Profession is only a very small group of men, but we are and have been fortunate to speak with a fairly influential voice. This voice could be the more influential if it were always unanimous, or, at least, if any dissentients had the courage or the good grace to express their opinions in the councils of this Association and back their arguments with good reasons. We suspect that this does not always happen and the result is that the Association, and through it the whole profession, is adversely affected.

Our Profession is only beginning to come of age as an independent and responsible body which appreciates its obligations to the country. It owes no allegiance to a government department and it regrets the fact that veterinarians within the Public Service have become subservient to another group. There are no doubt a number of reasons for this unfortunate development which we need not examine here, but if this is ever to be rectified, it would seem that our Association could play a very important part in the process. This, however, could only happen, provided all members of the Association gave their full support to the Association at all times, and not only when they hope to achieve their own ends. Unfortunately we appear to have to put up with divided loyalties occasionally.

I would suggest to you that no man reaches full and free professional status, until he places loyalty to his profession as second only to loyalty and devotion to his country. As long as we place loyalty to our employer above either of these two loyalties, we descend to the level of any ordinary employee.

And now, ladies and gentlemen, I have much pleasure in presenting to you your new President.

Prolonged applause whilst Dr. Steyn transfers the chain of office to the shoulders of the newly elected President, Dr. A. F. Tarr and congratulates him.

Dr. Tarr thanked the Past President for his kind remarks and the meeting for their kind reception. He said that he had always felt how extremely difficult it would be for anybody to follow in Dr. Steyn's footsteps. He asked for the support of the members and assured them of his best efforts.

He asked Prof. S. W. J. van Rensburg, Life Vice-President, to propose a motion of thanks to the outgoing President. Prof. van Rensburg, addressing the hushed meeting and speaking with deep feeling and the authority of his fifty years of service to the Association, said that he had known each and every past President. All had intended to do their best for the Association. He called upon members to serve their profession as by doing so they served their country. The country looked to the veterinary profession for help to obtain bigger supplies of foods of animal origin.

Turning to Dr. H. P. Steyn, he said that all past Presidents had the spirit to be of service, but none equalled Dr. Steyn for devotion to duty, impartiality and sincerity. He considered himself

fortunate to have preceded and not succeeded him. He pledged his support to Dr. Tarr in the big responsibility of his high office, and expressed the hope that Dr. Steyn would serve the profession for many years to come.

Prof. Van Rensburg het verder gesê dat die hele professie ook lof toeswaai aan mev. Birdie Steyn. Elke uur wat haar man vir die vereniging gewerk het, moes sy dinge reghou op die plaas. Altyd het sy hom aangemoedig en gesterk. Op die laaste raadsvergadering is besluit dat ons iets meer wil doen. Nog nooit is aan 'n aftredende President 'n geskenk aangebied nie, maar nog nooit het iemand soveel vir die vereniging gedoen as Dr. en mev. Steyn nie. Die Raad voel dat alle lede persoonlik 'n ietsie sal wil bydra.

Hy spreek die hoop uit dat dr. Steyn nog vir baie jare die vereniging met raad en daad mag bystaan.

The President postponed consideration of further discussions and motions until 4.00 p.m. on 16th September 1966, when the following motions were considered:—

Dr. Thorold moved that the 61st Annual General meeting of the S.A.V.M.A. condemn the use of the elastic ligature (elastrator) for the castrating, docking and dehorning of livestock and suggest that it be removed from the market.

Seconded by Prof. van Rensburg who detailed his experiences and condemned the method.

Gedurende die lewendige bespreking het sprekers soveel uiteenlopende opinies gelug aangaande sterftes en gewigsverlies met die gebruik van die elastrator, dat die voorstel nie tot stemming gebring is nie.

Dr. Steyn, gesekondeer deur dr. M. D. Malherbe, stel toe die volgende resolusie voor:—

> "This 61st Congress of the S.A.V.M.A. resolves that Council should consider the desirability of providing the agricultural lay press with information arising from the Congress which may be of value to stock farmers".

Dit is eenparig aangeneem. Voortvloeiende uit die voordrag oor "scrapie" van die vorige dag en na oorweging van die moontlikheid van die invoer van ander uitheemse siektes, het die vergadering eenparig die volgende besluit geneem:—

> "That the members of the S.A.V.M.A. are becoming increasingly aware of the animal diseases which exist in the world of which we in South Africa are, at present, free, and especially those diseases with long incubation periods or diseases which are difficult to diagnose in the early stages.
>
> This 61st Congress of the S.A.V.M.A., therefore, respectfully requests the Chief, Veterinary Field Services to investigate the implications of placing a total ban not only on the importation into South Africa of all livestock, poultry and birds, but also on animal products such as semen and eggs, where such embargoes are not already in existence, with the exception of stock from neighbouring countries destined for slaughter; and that such a ban be brought into practice as soon as possible if it be deemed necessary in the interests of the country".

Sprekers het beklemtoon dat dit geen kritiek van die afdeling Veeartsenykundige Velddienste is nie, maar inteendeel bedoel is om die verantwoordelike amptenare se hande te sterk.

Die President het namens die vereniging die volgende persone bedank vir hulle samewerking wat die 61ste kongres so 'n sukses gemaak het. Prof. B. C. Jansen vir die gebruik van Fakulteitsgeboue en beide Prof. Jansen en dr. M. C. Lambrechts, vir verlof aan hulle personeel om die verrigtinge by te woon. Prof. Rautenbach vir die gebruik van die Musaion en verskaffing van verversings. Dr. Steyn vir sy hulp en ook dr. L. W. v.d. Heever wat ook as voorsitter opgetree het. Veg-Generaal Raymond vir sy openingsrede, dr. Verbeek vir sy kongreslesing, mevv. M. C. Lamrechts, H. P. Steyn, B. C. Jansen en W. J. Ryksen vir die onthaal van gaste en kantoorwerk en dr. Sutton vir sy hulp. Mnre. Schnetler en Warren van die Winthrop firma vir hulle skakelwerk en telefoondiens, handelsfirmas en mnr. R. Deal vir hul uitstalling, mnr. Marais en personeel vir die pragtige plantversierings, mnr. Meyer, opsigter van die geboue, die Sekretaris, die kongreskomitee, mnr. de Bruyn, die Weermag vir die leen van meubels, en die besoekers. Prof. Hofmeyr vir die demonstrasie van toediening van fluothaan aan die perd, prof. De Boom en mnr. Coetzer vir die ontruiming en beskikbaarstelling van die anatomiesaal, die Onderstepoort Administrasie vir reëlings van telefoon ens. ens. Dr. en mev. R. Worthington, die gasheer en gasvrou van die vorige aand, en dr. Tustin en Profs. van Heerden en van Rensburg vir sport organisasie. Mev. Roos vir die etes, mevv. Botha en Brits vir tikwerk, mej. Cilliers vir haar hulp met tekening en al die afgevaardigdes wat die kongres so 'n sukses gemaak het.

Applous.

Die President het toe die vergadering verdaag.

FOR THE TREATMENT OF FUNGAL INFECTIONS GRISOVIN-FP

Before the discovery of Griseofulvin the treatment of fungus infections of the skin was often difficult and the results unsatisfactory. Oral Griseofulvin has simplified the treatment, and for most of these infections this antifungal antibiotic has made the prognosis excellent.

The activity in vivo of Griseofulvin against a large group of fungi is highly specific.

Griseofulvin is not active in vitro against candida albicans. Experience in animals indicates that it is unlikely to be effective in the treatment of blastomycosis, histoplasmosis, cryptococcosis or coccidioidomycosis. Griseofulvin has no antibacterial activity, which is a practical advantage in that oral administration is unlikely to change gastro-intestinal flora.

Because candida does not respond to Griseofulvin, it is important to make a differential diagnosis and a suitable preparation employed topically, e.g. Dequalinium chloride in the form of Dequadin paint.

Given orally, Griseofulvin is effective against the dermatophytes causing ringworm in cattle, horses, dogs and cats of all ages including:

Trichophyton mentagrophytes, rubrum, verrucosum microsporum audouini, canis, equinum, gypseum.

Dosage: Calves—15-20 mgm./Kg. bodyweight daily. Small animals and chinchillas—10-20 mgm./Kg. bodyweight daily.

These dosages should be continued for 3—4 weeks in confirmed cases of ringworm.

In animals with long coat there is a danger of re-infection after cessation of treatment from fungus remaining in the hair shaft. It is therefore recommended that hair around the affected area be clipped away at commencement of treatment, and again after 14 days. In this way the possible reservoir of infection can be eliminated.

Presentation: Grisovin F.P. 125 mgm.
Bottles of 25's and 100's.

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P.O. Box 485 — Germiston — Transvaal

4143

NUUS VAN ONS TAKVERENIGINGS

Jaarvergadering van die Wes Transvaalse tak van die S.A.V.M.V. gehou te Potchefstroom op 18/6/66.

Teenwoordig: Dr. H. P. Steyn President S.A.V.M.A.
Dr. P. Hugo Voorsitter, Wes Tvl. tak.
Prof. S. van Heerden, Onderstepoort.
Dr. B. Erasmus, Onderstepoort.
Drs. Wolmarans, Zumpt, de Kock, Erasmus, Dahms, Fair, van Wyk, T. D. Gurnell, J. van Zyl, Lange, Jooste, Jarvie, Stevens, Malan, Botha, Schnettler, Lutz, Engelbrecht en de Villiers.

Dr. Hugo verwelkom alle teenwoordiges. Die teenwoordigheid van so baie kollegas word veral waardeer, aangesien sommige kollegas baie ver moet kom om die vergadering by te woon. Hy rig 'n spesiale woord van verwelkoming aan die president van die S.A.V.M.V., Dr. Steyn.

Dr. Steyn in sy toespraak wys daarop dat ons in hierdie land slegs sowat 'n derde tot 'n helfte het van die veeartse, wat daar behoort te wees. Die ligging van Onderstepoort maak dit ongeskik vir die opleiding van 'n groter aantal studente. Daar is sprake dat 80 studente per jaar ingeneem mag word. Spreker meen dat dit 'n tragedie sou wees. 'n Tweede fakulteit geleë in 'n ontwikkelde veeteeltstreek, met genoeg materiaal vir studente, het dringend nodig geword.

Die privaat praktisyn in die veld, speel 'n belangrike rol in die welsyn van die vee nywerheid, wat naas goud ons belangrikste nywerheid in die land is. Hierdie rol kan nog belangriker wees as dit toegelaat word. 'n Deeltydse organisasie, kan baie bydra om hierdie rol te bevorder.

Besigheidsvergadering.

A. *Verkiesing van Nuwe bestuur.*
Voorsitter: Dr. P. Hugo.
Sekretaris: Dr. W. de Villiers.
Komiteelede: Drs. L. van Wyk, D. Jarvie, W. Brummer, en T. D. Guvnell.

B. *Nuwe lede voorgestel*: Drs. Oberholzer, Fair, de Kock en Gurnell.

C. *Bedankinge*: Drs. T. Hellberg, T. A. T. Louw, R. van den Veen en van Rensburg. Almal verplaas uit die area.

D. Algemeen

1. Kort bespreking oor Professionele Indemniteits-Versekering vir privaat praktisyne.

2. *Gedragskode*: Kortliks bespreek. Die algemene gevoel is dat daar nie veel aan die bestaande kode behoort verander te word nie. Die sekretaris noem dat by 'n algemene vergadering gehou gedurende Desember 1965, die opinie uitgespreek is, dat onder sekere omstandighede advertensies in die pers toegelaat word. Bev. waar uitbreke van epidemies plaasgevind het en terwille van die publiek sowel as die betrokke diersoort, daarteen gewaarsku behoort te word. Sulke reklame sal alleenlik deur die S.A.V.M.V. of takke gedoen word.

3. *Questionaire*: Dr. Steyn doen verslag : Uitstaande kenmerk van antwoorde ontvang dui op groot belang deur meeste veeartse geheg aan daarstelling van 'n deeltydse staats organisasie. Ooglopend uit antwoorde het geblyk, dat die privaat praktisyn op die platteland min of geen hulp van staatswee, georganiseerde landbou of veemiddel-fabrikante ontvang. Dr. Steyn het by die Dept. van Volksgesondheid navraag gedoen en vasgestel, dat die behartiging van deeltydse werk as baie suksesvol beskou word. Die Dept. van Volksgesondheid meen dat uitstekende beheer uitgeoefen kan word oor deeltydse beamptes.

Wetenskaplike Voordragte: Prof. S. van Heerden lewer 'n referaat oor genitale besmetting van merries, asook 'n verdere referaat oor die sinkronisasie van bronstigheids periodes by beeste.

Dr. Erasmus praat oor die sindroom van die asemhalingssiektes by perde.

Hierdie referate het groot belangstelling geniet en 'n lewendige bespreking het op elkeen gevolg.

'n Simposium oor dieresiektes in Wes Tvl. is ongelukkig nie voltooi nie weens gebrek aan tyd. Slegs Leptospirose in varke ingelei deur Dr. T. D. Gurnell en Gousiekte ingelei deur dr. J. van Zyl, is behandel. Beide is uitvoerig bespreek.

Die verrigtinge is aangenaam afgesluit met 'n skemerkelk-onthaal by die Queens Hotel.

W. de Villiers
Sek. Wes Tvl. tak.

339 Prince Alfred Street,
Pietermaritzburg.
27th June, 1966

The Secretary S.A.V.M.A.,
P.O. Box 2460,
PRETORIA.

Dear Sir,

At our Natal Branch Annual General Meeting held in Pietermaritzburg, on 16th June, 1966, the following matters were discussed:—

(a) *Annual S.A.V.M.A. Congress*:—

I have been instructed by our members and committee to extend to you a cordial and sincere invitation to hold the next S.A.V.M.A. Congress (1967) in Durban. We would appreciate it if this matter could be discussed by the Congress Committee as soon as possible, and we look forward to your earliest acceptance.

(b) *Veterinary Foundation*:—

It was unanimously decided that every member contribute the sum of R10 to the S.A. Veterinary Foundation. This will result in a total of approximately R700. We know that the Witwatersrand Branch has already made a substantial (R1,000) donation to the Foundation. It was felt that these decisions should be brought to the notice of the other branches in order to enlist their aid in a similar manner.

(c) *Veterinary Films*:—

It has been brought to our notice that scientific films of a veterinary nature are available through the Department of Education Arts and Science (Audio — Visual Education). Would you enquire whether associate membership of this Department is available to either the S.A.V.M.A. and/or its Branches?

(d) *Other Resolutions*:

These may be found in the accompanying minutes under the headings:—

(i) Code of Ethics, and

(ii) Resolutions.

Kind regards,
Yours sincerely,
J. M. O'Grady
HON. SECRETARY

P.S.

1. The Natal Branch recommendations re:- Code of Ethics are being compiled by Dr. J. L. Doré, and will be forwarded as soon as possible.

2. An explanatory note in connection with the Resolutions passed at the above A.G.M. will also be forwarded as soon as possible.

MINUTES OF THE ANNUAL GENERAL MEETING, NATAL BRANCH S.A.V.M.A. HELD IN PIETERMARITZBURG ON 16TH JUNE 1966 AT ROYAL HOTEL

This meting was opened by the Chairman, Dr. F. B. W. du Casse at 9.15 a.m. He also welcomed the President of the S.A.V.M.A., Dr. H. P. Steyn, and guest speakers, Dr. C. J. Maré and Dr. P. H. le Roux.

APOLOGIES: Drs. S. Turner, R. Bangay, M. C. Lambrechts, L. Blomefield, K. Dalzell, J. Quinlan, S. M. Shires.

MINUTES OF PREVIOUS ANNUAL GENERAL MEETING: As these had been circularised to all members with the Agenda, they were taken as read.

MATTERS ARISING: These had been discussed by the Committee during the year and all decisions plus discussions had also been circularised to all members. (See Schedule).

CHAIRMAN'S ADDRESS: Forms the editorial article of this issue of the Journal.

NEW MEMBERS: The following were proposed: Dr. W. de Klerk, Dr. H. Lamprechts, Dr. C. A. Wilkens, Dr. D. B. V. Barrow, Dr. A. J. Morley, Dr. H. R. Cable.

RESIGNATIONS AND DEATHS: Dr. du Casse expressed regret at the passing of Dr. A. M. Diesel, an Hon. Life Member, Maj. Daly, a previous member, and Dr. R. Alexander, also a previous member. All members were asked to stand in silence as a token of respect.

OFFICE BEARERS: The following were unanimously elected:—

(a) Chairman — Dr. F. B. W. du Casse
(b) Vice-Chairman — Dr. A. R. Thiel
(c) Secretary/Treasurer — Dr. J. M. O'Grady
(d) Committee:- Drs. J. Zwarenstein, L. Rossiter, R. Solomon, J. Doré, W. Hobbs, D. le Roux and A. J. Louw.

FINANCE: The Secretary reported a credit balance of R118.65. The financial statement was accepted. Proposed Dr. F. du Casse
Seconded Dr. A. Thiel

CORRESPONDENCE: As all relevant correspondence had already been circularised to members and committee members this matter was proposed as dealt with.
The Secretary was asked to enquire of the Secretary of the S.A.V.M.A. whether affiliation to the Department of Education, Arts and Sciences was possible for the purpose of obtaining scientific films.

VETERINARY FOUNDATION: Dr. H. P. Steyn informed the meeting that a Board of eight (8) trustees had been established which at present was investigating suitable brochures and publicity campaigns. Total assets stood at approximately R1,030 to date, of which R1,000 had been donated by the Witwatersrand Branch. The Secretary of the S.A.V.M.A. was in the process of translating the Constitution before circularising *all* members.

Dr. W. G. Barnard proposed that the R10.00 per member as previously suggested to all members of the Natal Branch, become payable to the Foundation immediately. This was seconded by Dr. A. Tarr and accepted.
After some discussion it was proposed that the local committee compile a letter to the Journal for possible use as an Editorial, wherein all S.A.V.M.A. members were urged to support the Foundation. The Witwatersrand and Natal donations were to be mentioned as further incentive to contribute.
Dr. Steyn pointed out that support from the profession was essential to attract support from the general public. Commercial firms had already indicated a willingness to do so generously.

MILEAGE FEES: After much discussion it was proposed that a *minimum* fee of 20 cents per mile be laid down. *Proposed* Dr. W. G. Barnard. *Seconded* Dr. A. R. Thiel. This proposal was carried by an overwhelming majority.
Drs. Steyn and Barnard warned against an unethical and unprofessionally *low* fee. Certain cases were to be treated on their various merits and left to the discretion of the practitioner concerned.

GENERAL: Dr. A. Tarr proposed a sincere vote of thanks to Dr. H. P. Steyn for his efforts on behalf of the profession. Seconded by Dr. W. Barnard. Dr. Steyn replied that the sacrifices he had made were unimportant. He emphasized that unity amongst members of the profession was the all-important factor. At the moment disagreement amongst ourselves was the biggest stumbling block. More support from outside was forthcoming than from some of our own colleagues.

Dr. W. G. Barnard enquired as to the withdrawal of Promone — E from the market. From the discussion following, Pyometra was the obvious cause.

Dr. L. Rossiter enquired about the Natal Branch Constitution. The Secretary promised to investigate the matter. He also proposed that the Secretary write to the Secretary of the S.A.V.M.A. inviting them to hold the next Annual Congress in Natal. He further proposed that Local Branch meetings alternatively be held in Pietermaritzburg and Durban. The Committee was instructed to investigate these possibilities.

Dr. J. Coles proposed a vote of thanks to the Secretary/Treasurer as well as an Honorarium of R20.00. Seconded by Dr. A. F. Tarr.

Dr. G. Bisschop suggested a liaison between Private Practitioners and the State with regard to circulars from State Departments. At the moment this was non-existent and in the majority of cases the press and public appeared to be in possession of certain facts before the rural practitioner. This complaint was supported by the fact that scrapie had occurred in the Underberg area and due to Departmental policy other Natal practitioners were ignorant of this very important fact. Dr. H. P. Steyn strongly decried the "Hush-Hush" policies of the Department and emphasized *that the private practitioner was to be kept well informed if efficient control of Scheduled Diseases was to be made possible.*

ADDRESS BY THE PRESIDENT OF THE S.A.V.M.A.:

(a) Dr. H. P. Steyn gave the members a resume on the progress made on the revision of the code of Ethics up to date. He personally did not feel that a complete revision was necessary but that certain explanatory notes be added to the already adequate code. Recommendations from the Cape and Witwatersrand Branches had been received so far. Dr. Steyn pointed out that the Veterinary Board was only legally empowered to control Veterinarians and *not* organisations, such as hospitals etc. — but

if the latter was used as a form of self-advertisement, then the Board could step in.

(b) Progress of the Veterinary Association:—
  (i) Veterinary Foundation
  (ii) Second Faculty
  (iii) Part-Time employment of Veterinarians.

The only support for these projects within the profession came from the practitioners themselves. Scientific advisors to the Government, our own Colleagues, were inexplicably opposed to these projects. A move was afoot to extend present facilities at Onderstepoort to accommodate 80 students.

This was wrong, Pretoria being predominantly a small animal area. The need for a second Faculty in a large animal area was essential.

On enquiring, the Secretary for Health had refuted the arguments offered against part-time employment i.e. that permanent staff would resign and that control of part-time staff was impossible. The request at the moment, therefore, was to implement the scheme on an experimental basis, in certain areas, before condemning the idea altogether.

Dr. Steyn appealed to *all* members of the Association to be prompt with their subscriptions. The S.A.V.M.A. subs were over R2,000 in arrears to date. In future, defaulters of over 2 years would be removed from the mailing list *after* due notice.

The President extended his congratulations to the Natal Branch and was impressed by the wonderful spirit and excellent attendance. It was with regret that he informed the Branch that the current year was his last as President of the S.A.V.M.A. In future he would apply all his energies to the Foundation.

Dr. F. du Casse thanked the President and expressed regret on behalf of all the members present at his intended retirement.

CODE OF ETHICS:—

1. It was proposed by Drs. V. Morford and W. Barnard that any disciplinary action against defaulters only be published in a newsletter to the profession and *NOT* in the Journal. This was accepted by the meeting.
2. The following *resolution* was proposed by Dr. I. Canham and seconded by Dr. V. Morford and passed by the meeting:—
   This meeting of the Natal Branch proposes that the final recommended amendments to the Code of Ethics, as a whole, be circularised to all registered Veterinarians in the Republic of South Africa, to give them the opportunity of voting in favour of, or against the *entire* amended code. Council will abide by the majority decision.
3. The Natal Branch recommendations re: The Veterinary Code of Ethics as discussed at this meeting is being compiled by Dr. J. Doré. (See Schedule).

RESOLUTIONS:— The following resolutions were passed by the Natal Branch — all unanimously:—

1. This meeting requests the Council of the S.A.V.M.A. to take such steps to urge the Department of Agricultural Technical Services to adopt and implement a scheme whereby Private Rural (Vet.) Practitioners will become state — subsidised on part-time employment.

   Proposer: Dr. G. H. R. Bisschop. *Seconder*: Dr. J. M. O'Grady.
2. This meeting requests that the Director of Veterinary Field Services or his duly authorised representative, Outlines and explains his Department's policy and the progress that has been made concerning Tuberculosis testing with special reference to the rôle of the Private Rural (Vet.) practitioner at the *forthcoming* Annual General Meeting of the S.A.V.M.A.

   Proposer: Dr. G. H. R. Bisschop. *Seconder*: Dr. J. M. O'Grady.
3. This meeting invites the present sitting "National Veterinary Services" Sub-Committee of the Council of the S.A.V.M.A. to present a detailed report as to the feasibility of implementing a scheme for state subsidy on mileage of Private Rural (Vet.) Practitioners — as proposed by Dr. Mönnig (Opening speech to the 60th S.A.V.M.A. Congress) as soon as possible.

   Proposer: Dr. G. H. R. Bisschop. *Seconder*: Dr. J. M. O'Grady.
4. This meeting requests the S.A.V.M.A. Council to immediately investigate the present (Bovine) Brucellosis policy, *and if necessary,* consider urging the Authorities responsible to withdraw the present vaccines available from the *PUBLIC* Market.

   Proposer: Dr. G. H. R. Bisschop. *Seconder*: Dr. J. M. O'Grady.

Dr. J.Coles proposed a vote of thanks to the Chairman, Dr. F. du Casse. Meeting closed at 6 p.m.

MEMBERS PRESENT: Drs. J. Doré, P. Snyman, G. Bisschop, C. Maré, P. Bisschop, I. Banks, B. Paine, G. Shaw, A. Cross, V. Morford, P. Wacher, D. Coles, R. Every, I. van Schalkwyk, L. Rossiter, J. Zwarenstein, W. Barnard, A. Thiel, D. Clow, R. Solomon, B. Baker, D. Osbourn, D. McMillan, H. Lambrechts, A. J. Louw, H. Hellberg, H. Holtz, H. Strydom, C. Nilsen, R. Bezuidenhout, A. Downes, N. Owen, R. Sykes, M. Brightman, A. Morley, B. Weaner, I. Canham, A. Tarr, A. McGregor, D. le Roux, M. Dommisse, A. Canham, P. Collier, F. du Casse, W. Hobbs, R. Nixon, G. Retief, M. Taylor, C. Wilkens and J. O'Grady.

Before lunch the Natal Branch members had the privilege of hearing two very informative and well delivered papers. The first "The Róle of Viruses in Bovine Infertility and Abortion" was delivered by Dr. C. J. Maré of Onderstepoort and was illustrated with colour slides. During this paper Dr. Maré emphasized the increasing importance of this problem and assured everyone that Onderstepoort was doing its best to obtain more facts from the field. For diagnostic purposes blood-serum and vaginal secretions were necessary.

The second paper "The Surgical Patient" by Dr. P. H. le Roux of Johannesburg covered everything from Pre-operative to Post-operative procedures as well as prevention of and treatment of shock etc. This was also illustrated by means of an excellent 8 m.m. colour film on closed end-to-end intestinal anastomosis.
The day's proceedings were nicely rounded off by a well attended cocktail party at the Royal Hotel.

Dauphinestraat 14,
Bayswater,
Bloemfontein.
19 Augustus 1966.

NATULE VAN DIE ELFDE JAARVERGADERING VAN DIE O.V.S. TAK VAN DIE S.A.V.M.V. GEHOU OP 30 JULIE TE BLOEMFONTEIN.

Teenwoordig: Dertien lede onder wie Dr. W. J. Ryksen, Sekretaris S.A.V.M.V. en as gaspreker Dr. H. J. W. Botes van Onderstepoort.
Verskonings: Drs. A. du Plessis, R. J. Howell, G. du Preez en R. Muir.

Verwelkoming: Die voorsitter verwelkom almal en spreek die vergadering se meegevoel uit met die afsterwe van Dr. Diesel en die verlies van Dr. de Beer en sy gade.

Die notule van die vorige jaarvergadering is aangeneem en die volgende spruit daaruit voort:

(1) Vorige jaar se resolusie: Die sekretaris (S.A.V.M.V.) rapporteer dat die resolusie voorgelê is en dat dit die gunstige oorweging van die raad geniet het maar dat daar op die oomblik geen fondse beskikbaar is vir die doel om 'n publisiteits amptenaar aan te stel nie. Dr. Frean vervul die taak op die oomblik vir Onderstepoort. Dr. Ryksen noem ook dat Dr. Steyn die belange van die vereniging en professie baie bevorder en dat hy die enigste persoon is wat met algehele gesag rakende die professie praat.

(2) Die voorsitter noem dat die fooi lys wat in 1965 se begin voorgestel is alreeds weer verouderd is. Die tariefskaal is baie in ooreenstemming met die van die ander takke. Dit is absoluut noodsaaklik vir professionele etiquette dat die minimum tarief deur al die lede nagekom moet word, sowel Privaat Praktisyns as Staatsveeartse.

Die toestand dat Staatsveeartse nie dieselfde mylfooie as die privaat Praktisyns vorder nie, wek kommer, omdat die Staatsveearts eerder verkies word omdat dit goedkoper is. Dit word ook onder die vergadering se aandag gebring dat daar sekere praktisyns op toere deur die gebied gaan en hul ook skuldig maak aan lae tarief vorderings.

Voorsittersrede:

In sy voorsittersrede noem Dr. Louw dat die tak se getal lede die afgelope tyd al hoe minder word veral as gevolg van die nuwe landbou streeksindeling. Die voorsitter noem dat alle veeartse voordeel trek uit die vereniging en maak dus aanspraak op almal se ondersteuning. Melding word gemaak van die swak reaksie op sirkulêres van die tak sowel as die Moederliggaam deur lede en 'n beroep word gedoen om aan die saak aandag te skenk.

Geldelike Verslag:

'n Kredietbalans van R48.16 word rapporteer. Die afgelope jaar het die uitgawes die inkomste sodanig oorskry dat die balans R17 minder is as in 1965 en daarom moes die fooie noodwendig verhoog word.

Korrespondensie:

(1) 'n Brief van goeie wense van die wes Transvaalse Tak word kennis van geneem;

(2) Kennisgewings van Raadsvergaderings sowel as notules word van kennis geneem.

Algemeen:

Die voorsitter stel dr. Ryksen aan die woord wat die vergadering die volgende meedeel.

(i) Die stigting van die veterinêre stigting word gemeld en steun daarvoor word gevra;

(ii) As gevolg van die aanbevelings van die slagpale kommissie is daar nou 'n konsep wetsontwerp waarin die veearts tot sy reg kom betreffende vleis en voedsel keuring;

(iii) 'n Nuwe wet is deur die medici daargestel betreffende die beheer van medisyne. Die beheer van middels vir gebruik op diere word tans ondersoek deur die vereniging.

(iv) Die joernaal se laat verskyning word verklaar as gevolg van die Republiekfees se publikasies.

'n Beroep word op lede gedoen om artikels vir die joernaal te skryf.

Verder vind besprekings onder algemeen plaas betreffende die volgende saak:

Is dit geoorloof om operasie op teeldiere te doen om hul aanneemlik te maak vir skoudoeleindes? Die vergadering se opvatting is dat die onus op die eienaar rus.

Nuwe Ampsdraers verkies:

Voorsitter: Dr. D. J. Louw.

Onder Voorsitter: Dr. T. A. Theron.

Sekr./Penningmeester: Dr. H. G. J. Coetzee.

Addisionele lede: Drs. T. A. T. Louw, N. Barrie en G. J. H. Stevens.

Hiermee is die besigheidsvergadering afgesluit.

Die volgende wetenskaplike voordragte is gedurende die middag afgehandel en vrylik bespreek:

1. (a) Leptospirose in huisdiere.
   (b) Coliseptisemie.
   — Dr. H. J. W. Botes. (Onderstepoort).
2. Die subletale faktor by grys karakoelskape.
   — Prof. J. Nel. (Landboufakulteit UOVS.)
3. Voorkoms van Pasteurella en Corynebacterium in die Suid-Vrystaat.
   — Dr. A. Faul.
4. Diafragmatiese breuk in die pasgebore kalf — Gevalsverslag.
   — Dr. T. A. Theron.

'n Mosie van dank in die stoel word aangeneem.

Die dag se verrigtinge is afgesluit met 'n gesellige skemerkelk party.

Ere Sekretaris Penningmeester.

THE ANNUAL GENERAL MEETING OF THE EASTERN TRANSVAAL BRANCH OF THE S.A.V.M.A. was held at Pietersburg on Saturday 4 June 1966. With the exception of the Swaziland members who were unable to attend a fully representative meeting was attended by Drs. Meeser, Coetzee, Hurter, Schoeman, Thomas, Wellington, de Vos, van Niekerk, Erasmus, Veenstra, Pullinger, Young, Krige, Davies and Eschenburg.

Apologies for non attendence were received from Drs. Lambrechts, Jansen, Ryksen, de Lange and Schuss.

Guest speakers were Drs. Loveday and Hofmeyr from Onderstepoort and Professor D. M. Joubert of Agricultural Technical Services.

Visitors were local medical colleagues, Drs. Naude, Alberts, Steyn and Mr. P. Dique of Hall and Sons, Nelspruit.

During the business session of the Branch the following were elected to the committee:

Chairman: Dr. J. Meeser
Secretary: Dr. C. J. Coetzee
Member: Dr. J. Krige.

It was decided that the venue of the next meeting would be Pietersburg.

A most interesting discussion on the position of Veterinarian in rural practice followed. Members suggested that rural stock owners did not appreciate the value of veterinary services. It was suggested that the State tended to cold shoulder the efforts of Practitioners to establish themselves.

It was also suggested that the lack of interest on the part of rural owners was partly due to ignorance of services available because of the failure of successful extension and educational work amongst farmers. In support of the above statements it was pointed out that in 1956 the 18 students who graduated occupied themselves as follows:—

"8 in large animal practice (of these 5 were prize students),

8 in small animal practice, 1 joined a commercial firm and

1 the State Service.

Today of the 8 large animal (i.e. rural) practitioners 3 are left in practice. The remaining 5 have either joined the commercial world or changed to small animal practice."

The outcome of the discussion was the following proposal by Dr. P. V. A. Davies seconded by Dr. W. Eschenberg:—

"That this Association desires that the Directorate of Veterinary Services takes immediate positive action to stimulate the establishment of rural private practice in South Africa."

The meeting also decided that the annual subscription would be R2.00. Prior to the start of the scientific session the President of the Association, Dr. H. P. Steyn, after congratulating the branch on progress made informed members that he would not be available for re-election as President of the Association.

In all four scientific papers were read.

In introducing Professor D. M. Joubert, Assistant Director Annual Husbandry to the meeting the Chairman congratulated Professor Joubert on the award awarded him by the S.A. Akademie vir Kuns en Wetenskap.

Professor Joubert addressed the Branch on the "Role of Sheep and Goats in Tropical Areas." Amongst the interesting points raised by Professor Joubert are:

(1) that 57% of the worlds goat population is situated in the tropics,

(2) high environmental temperatures predispose low birthweights of lambs and kids,

(3) high temperatures predispose pre-natal mortality,

(4) that provided the humidity is average sheep evince a remarkable adaption to high temperatures.

Dr. V. de Vos gave an interesting lecture on "Ecology and Disease in Wildlife Management." In stating that disease can act as a density regulating mechanism in free living wild animals Dr. de Vos dealt with the effects of such diseases as foot and mouth disease, coccidiosis, verminosis, panleucopenia and cytozoonosis.

Dr. Loveday delivered a stimulating review of Leptospirosis in pigs. He stated that

(1) leptospirosis is the chief cause of abortion in pigs.

(2) that the pig is the main reservoir of leptospirosis, especially L. pomona, and that the pig shows a long carrier state.

(3) that leptospira do not withstand sunlight and dessication.

(4) that as leptospirosis is self limiting in well run piggeries an outbreak should be treated by

(a) separating farrowing and dry sow,

(b) allowing no baths or wallows,

(c) putting the sows on to concrete,

(d) destroy foetuses,

(e) remove all dogs,

(f) camp off water.

Should treatment be attempted the antibiotic of choice is Streptomycin 10 mgm/Kg.

Professor Hofmeyr using slides and a film demonstrated a series of the simpler surgical procedures of correction of injuries to the penis of the bull.

A most instructive day was suitably concluded with an excellent dinner at the Ranch Motal. On this occassion the Chairman replied to the many courtesies extended to him by the Soutpansberg Branch of the S.A. Medical Association inviting the present President and the Past Presidents to be the guests of the Branch.

CHAIRMAN.

SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION

CAPE WESTERN BRANCH.

MINUTES OF ANNUAL GENERAL MEETING HELD AT THE ARTHUR'S SEAT HOTEL ON 5.11.65

PRESENT:

Drs. Brownlie, Horwitz, le Riche, Gurnell, de Villiers, Fourie, Stephan, von Ludwiger, Muller, Longland, Wilson, Vogelzang, Dorrington, Thomson, Nelson, Tabic, Naude, du Toit, Visser, du Buy, Kriel, Vincent, Venter, Faull, Albertyn, Basson, Smuts, Masters.

GUESTS:

Drs. H. P. Steyn & K. van der Walt.

VISITORS:

Drs. McFarlane, Snyders and Dames.

APOLOGIES:

Drs. Maree, de Kock, Walters, Dickson, Schneider.

NEW MEMBER:

Dr. Hyam. Proposed by Dr. Brownlie, Seconded by Dr. Horwitz.

RESIGNATIONS:

Nil.

FORMAL OPENING OF MEETING BY THE PRESIDENT OF S.A.V.M.A.

Dr. Steyn thanked the Cape Western branch for inviting him to open the meeting as he was most anxious to address members of this area. The following points were discussed by Dr. Steyn.

ETHICAL CODE: For some years the names of certain veterinary hospitals have been used as the addresses of the practitioners attached to the hospitals, while this was contrary to the ethical code, Council took no action as no complaints were received, however in December 1964 a complaint was received and Council ruled that the veterinarian concerned would have to remove his name from the hospital premises. Should the majority of veterinarians decide that the ethical code be altered, this could be done.

USE OF TITLES: No other degree except the degree or diploma enabling a veterinarian to practice his profession is permissable on a name-board, stationery etc.

ACTIVITIES OF COUNCIL: The questionnaire regarding veterinary education and private practice had been answered as a group by certain practitioners of the Cape West, this had been disregarded by Council as the questionnaire had been addressed to members as individuals. A veterinary foundation had been formed and a Board of Trustees would soon be appointed.

CHAIRMAN'S REPORT:

Dr. Albertyn thanked Dr. Steyn and presented his report. The Committee had met three times, there had been very favourable response to membership fees. Regarding the de-horning of cattle by non-veterinarians, the Branch had taken legal opinion. Dr. Albertyn felt that the time was approaching when private veterinary pathologists, working in conjunction with practioners could well play an important role in veterinary practice. In conclusion, the Chairman thanked the two secretaries who had been in office with him and stated that he felt that it was now time for another Chairman to be elected as he had held office for four successive years.

FINANCIAL REPORT:

The acceptance of this report was proposed by Dr. Horwitz and seconded by Dr. de Villiers.

OFFICE BEARERS:

The following committee was elected:

Chairman: Dr. G. L. Muller.

Vice Chairman: Dr. A. A. Albertyn.

Sec./Treasurer: Dr. P. M. S. Masters.

Add. Members: Drs. Basson, Brownlie, Horwitz, Faull & Dorrington.

RESOLUTION:

This Branch favours an investigation into the ethical Code regarding veterinary hospitals.

It was further resolved that the Branch Committee investigate and report to the Branch at a Special meeting regarding this proposal.

SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION—CAPE WEST BRANCH
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st OCTOBER, 1966

Cost of Annual General Meeting Nov., 1965...	78.04	Balance of income over expenditure Oct., 1965	159.42
Hire of 35 m.m. slide projector—A.G.M.....	1.50	Expenses collected from 3 visitors to A.G.M. 1965	7.50
Cost of Ordinary General Meeting, June, 1966	31.23	Interest accrued on savings account 70328.....	12.70
Cost of Owen function September, 1966.....	11.23	Subscriptions accrued during the year.	
Gratuity to typist.....	6.30	47 members..... 235.16	
Cost of National tape recorder.....	107.49	Donation received via Dr. I. du Toit..... 2.00	
Postages.....	6.00	237.16	
Stationery.....	1.14		237.16
Excess of income over expenditure for the year (Deposited in U.B.S. Savings a/c No. 70328)	173.85		
	R416.78		R416.78

P. M. S. MASTERS,
Hon. Secretary/Treasurer.

GENERAL:

Dr. Horwitz proposed a vote of thanks to the retiring Chairman for his excellent work as chairman of the Branch for the past four years. This was unanimously passed by the meeting. Dr. de Villiers proposed a vote of thanks to the President — Dr. Steyn.

A member stated that Artificial Insemination is a State subsidised service and therefore the veterinarian employed by the A.I. Co-op should not undertake treatments unless the consulting veterinarian of the herd was present. He inquired of Dr. Steyn what the position was regarding fertility work performed by A.I. veterinarians.

Dr. Steyn replied that fertility work performed by an A.I. Co-op employed veterinarian without the knowledge and consent of the consulting veterinarian was unethical and should be reported to the Veterinary Board.

Prof. van der Walt then delivered a most interesting paper on the Sheep & Wool industry in Australasia illustrated by slides. Dr. le Riche introduced the discussion on the paper by mentioning some aspects of sheep diseases in the Western Province.

Dr. de Villiers thanked the speakers and the meeting adjourned at 7 p.m.

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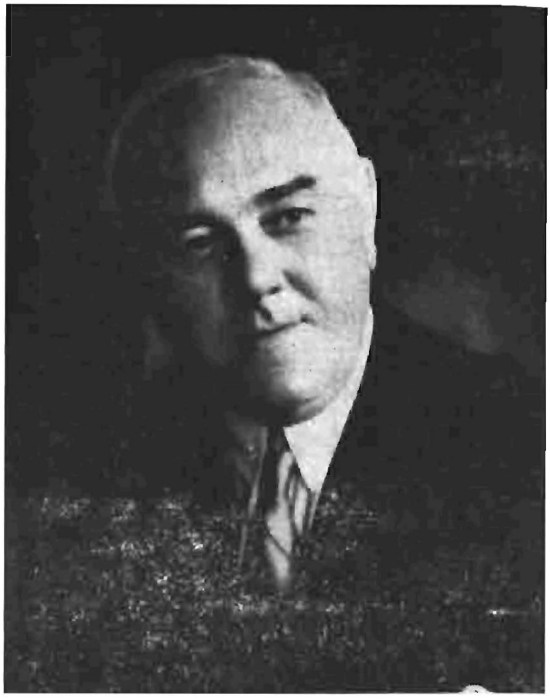
OBITUARY

COL. JAMES IRVINE-SMITH, C.B.E., V.D., M.R.C.V.S., F.R.S.I., J.P.

James Irvine-Smith arrived in South Africa early in 1900 as a civil veterinary surgeon in the Imperial Army, and after serving in the S.A. Constabulary, he was appointed Municipal Veterinary Surgeon of Johannesburg in May 1907.

At a time when the sales and slaughtering of stock were primitive, his unusual ability soon became apparent, and progress was made with the erection of the Abattoir and Livestock Markets which opened in 1910. Although originally subordinate to the M.O.H., the City Council recognised his excellent services by making him responsible for the Abattoir and Livestock Markets Department. After the outbreak of war in 1914 he was recalled by the military authorities, and entrusted with the creation of the S.A. Veterinary Corps., of which he was Director. However, in 1916 he was compelled to return to his civil duties in Johannesburg, where veterinary public health activities continued to expand, and in 1930 a milk laboratory was opened and systematic dairy inspection undertaken, in addition to many other services.



COL. J. IRVINE-SMITH.

Col. Irvine-Smith served on numerous public bodies, such as the Government Railways and Harbours Commissions in 1909, 1916 and 1923, Chairman of the Egg Export Commission of 1925-26, and member of the Agricultural Advisory Board in 1920. He also served on the Executive Committee of the Witwatersrand Agricultural Society, and executive of the S.A. Agricultural Union, and was a member of the S.A. Board of Examiners of the Royal Sanitary Institute.

His enthusiasm for the profession was evident throughout his career. In 1903 he was elected the first President of a veterinary professional society and interested himself in the question of legal protection for the profession. The S.A.V.M.A. was formed in 1920, with Irvine-Smith serving as President from 1921 to 1924. In recognition of his labours for the profession, he was elected Hon. Life Vice-President in 1924. By his tenacity he gained special powers for veterinarians employed in abattoirs, specifically defined in the Transvaal Local Government Ordinance of 1912, and later incorporated in the Public Health Act. He was a pioneer of veterinary science in this country, and advanced the status of the profession, by his determination and administrative ability. After a distinguished career as Director of the Johannesburg Abattoir and Livestock Markets Department he retired on 4th August 1939.

Colonel Irvine-Smith retained interest in professional affairs in spite of suffering impaired health in later years. He passed away peacefully on August 23rd 1966, and is survived by his only son Mr. C. C. Irvine-Smith. His grandson Bruce practices as a Veterinarian in Johannesburg, and our deepest sympathy goes out to him and to the other members of the family in their grievous loss.

P. J. M.

LT. COL. A. F. HARBER, D.S.O. M.R.C.V.S.

With the death early last June of Lt. Col. A. F. Harber, the veterinary profession has lost yet another stalwart of the early century.

Augustus Frederick Harber, from Gloucestershire, England qualified in 1897, London, winning the Fitzwygram Prize of that year. With three of his classmates, two of whom were S.B. Woollatt and S. T. Amoss, he came out to join the Natal Government.

He served in the British Forces in the South African war, being a veteran of the siege of Ladysmith. During the First Great War he served in the Union Forces with the Border Mounted Rifles in the South West Africa campaign. For his services he was mentioned in Dispatches by General Botha and awarded the D.S.O. He was retired with the rank of Lt. Col.

In civilian life, he served the Natal and Union Governments until about 1920, having been stationed at various times at Darnall, Pietermaritzburg, Point (Durban) and Mooi River.

COL. A. F. HARBER.

He lectured at Cedara during the 1920's for a period and also acted as a judge of horses at various shows.

From 1933-1947 he served the Durban corporation as municipal veterinary officer, and lecturer and demonstrator in Meat Inspection. He finally retired in 1955.

He was a foundation member of the South African Veterinary Medical Association.

We extend our deep sympathy to his son and two daughters with the loss of their Grand Old Man.

W. J. R.

FRANCESCO VEGLIA

One of the early pioneers of Onderstepoort, Francesco Veglia known as Frank Veglia to the older members of the profession, passed away early this year.

Born 5.9.1881 at Fossano (Cuneo) Italy, he graduated from the Veterinary High School in Turin in 1904. In 1911 he came to Onderstepoort as helminthologist and did pioneer work in the subject of nematode worms, especially in elucidating the life histories of the wire worm, Haemonchus contortus and the nodular worm Oesophagostomum columbianum, of sheep.

In 1917 he obtained departmental permission to leave South Africa in order to join the Italian Army, where he was sent to the front and was appointed Liaison Officer with the Director of Veterinary Services, British Contingent with General Headquarters at Lugo di Vicenza and remained till the end of the war. Returned to Onderstepoort where he worked until his retirement in 1927. His publications can be found in the Onderstepoort Journals.

Upon the formation in 1920 of the Veterinary faculty in the University College of Pretoria (a constituent College of the University of South Africa) later the University of Pretoria, he was appointed lecturer in helminthology and served until his retirement in 1927.

He returned to Italy and became interested in farming and in commerce. He directed four farms under the "Gruppo Aziendale Agricolo a coltiwazione Diretta" specializing in Piedmontese cattle and the production of prime-beef. Commercially he interested himself in the firm Burdizzo Instruments, a family concern.

To his widow, two daughters and three sons, we extend our sincere sympathy.

G. T.

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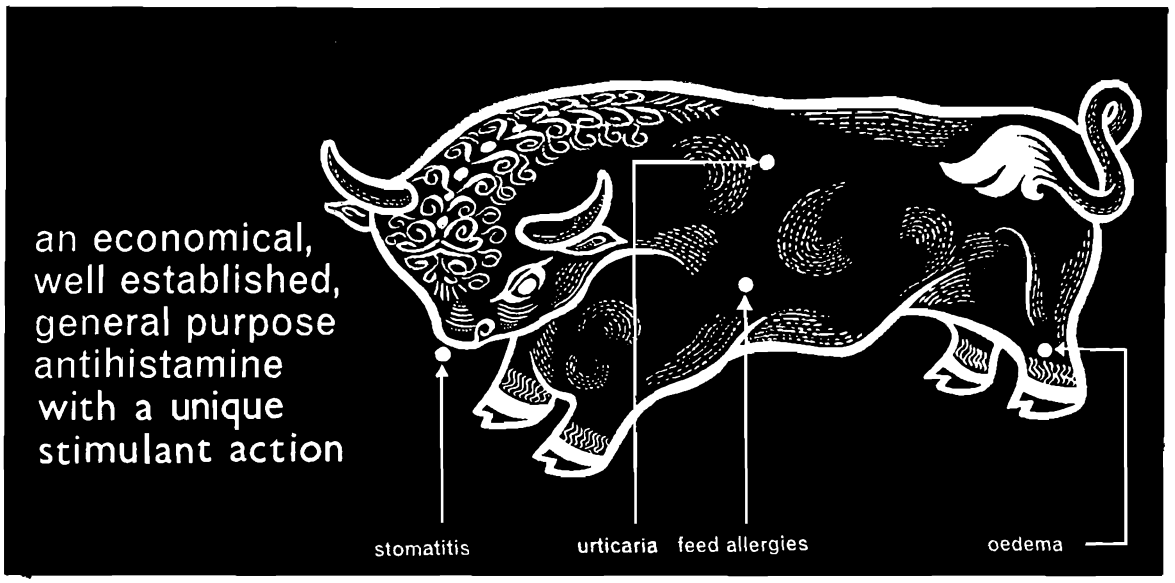

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BOOK REVIEW

MEAT HYGIENE

Third Edition.

PAUL J. BRANDLY, GEORGE MIKAGI and KENNETH E. TAYLOR, Lea & Feabiger, Philadelphia, U.S.A. 1966. (Distributors: Bailliére, Tindal & Cassel Ltd., London). pp 790, Figs 216, numerous tables, price –£6 (R12.00).

This third edition of A. R. Miller's wellknown work has been completely revised and extensively augmented by "three of his most appreciative students" who now hold senior positions in the Meat Inspection Division of the U.S. Dept. of Agriculture. They have made available what must be considered one of the most valuable and comprehensive manuals on the subject of meat hygiene in the very broadest sense of the term.

This new edition of what has become a standard reference book contains numerous new figures, tables and chapters, and undoubted now constitutes the most up to date work dealing with every conceivable aspect of meat hygiene. It embodies tried and established knowledge and at the same time deals with the many advances in science and technology which are applicable. Poultry slaughter and inspection is included in detail. Humane slaughter is fully covered. The chapters on ante and post mortem inspection is comprehensive but pays special attention to those conditions which are commonly encountered — and these are well illustrated by excellent photographs. Trichinosis is approached in the light of the most recent concepts of this problem. Extensive attention is given to food-borne illness due to meat and meat products, as well as to wholesomeness, adulteration, misrepresentation, chemical and preservative residues, ionising radiation, etc. This is in line with the increasing importance of these matters, and the authors give an authoritative evaluation and practical approach of these problems facing the meat hygienist.

With the emphasis now being placed on mechanised on-the-line dressing and other abattoir or meat packing house operations, it is noted with satisfaction that this book has been brought up to date with an excellent chapter on the facilities and procedures relating to sanitation in the operation of such plant.

Other chapters deal with history and elements of meat hygiene, physical, chemical and deteriorative changes in meat and organs, controls, techniques and facilities for inspection, preparation of meats and meat food products, materials added to meats, organised meat hygiene control, meat grading, etc. There is also an excellent glossary of terms used in the meat industry.

The book is beautiful prepared and printed, and can be considered as a "must" for those who are directly or indirectly concerned with the various stages of preparation of meat as food. Both publishers and authors deserve every credit for this work.

L. W. v.d. H.

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