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VOLUME 45 Nos 1 & 2
JAARGANG 45 Nrs 1 & 2

MARCH-JUNE/MAART-JUNIE 1974

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Miliary eczema

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THE NEW LOOK

In their efforts to counteract increasing costs and at, the same time, the delays in appearance of the Journal of the SAVA, the Editorial Committee with guidance from Council, more recently with the assistance of members of the Finance Committee, have taken certain steps. This entailed, perforce, changing of the size of the Journal to the standard A 4-format. To those who might have preferred the ease of handling of the previous format, and, particularly, librarians who might have to provide for additional height of shelf space, we tender our apologies. The time is past – if ever it existed – that we can permit ourselves luxuries.

To make better use of available printing space, the index will henceforth appear on the front page and the remainder thereof on the first page. The busy reader need not open the Journal, but will be able to judge the main contents at a glance. Those readers who did not like the old cover design will heave a sigh of relief, to those who did, or in the course of time became used to it, we offer the same apology as above.

An important step to obviate the anachronistic appearance of the Journal and to ensure timeous issue in future was to combine the first two issues of this year (March & June 1974,)(Vol. 45, Nos 1 & 2). We trust that our readers will accept this in the same way that they have shown their understanding of the problems of the Editorial Committee by acceptance of the inevitable.

As in the past, criticism will be welcome. If there appears to be no reaction, rest assured that there are sound and valid reasons for non-acceptance.

REDAKSIONELE AANTEKENING

NUWE VOORKOMS

In sy pogings om die stygende koste te bekamp en tegelykertyd die lang vertraging van verskyning van die Tydskrif van die SAVV te verhelp, het die Redaksie-komitee, onder leiding van die Raad, en meer onlangs met hulp van lede van die Finansieskomitee, bepaalde stappe gedoen. Dit het meegebring dat daar noodgedwonge tot die standaard A4-formaat oorgegaan moes word. Aan diegene wat miskien minder van die hanteerbaarheid van hierdie formaat hou, en veral aan bibliotekarisse wat nou vir wysiging van rakhoogte voorsiening moet maak, teken ons apologie aan. Die tyd is egter verby – as dit ooit bestaan het – dat ons onsself weeldes kan veroorloof.

Om beter gebruik van beskikbare drukwerkruimte te maak, sal die inhoudsopgawe voortaan op die voorblad verskyn en die oorloop daarvan op die eerste bladsy. Die besige leser hoef dus nie die Tydskrif oop te blaai nie, maar sal die belangrikste inhoud met 'n oogopslag kan bepaal. Dié lesers wat nie van die ou omslag-ontwerp gehou het nie, sal 'n sug van verligting slaak, aan die wat wel daarvan gehou het, of mettertyd daaraan gewoond geraak het, bied ons dieselfde apologie as hierbo aan.

'n Belangrike stap om die anachronistiese verskyning van die blad te bekamp en tydige verskyning in die toekoms te verseker, was om die eerste twee uitgawes van hierdie jaar (Maart en Junie, 1974; Band 45, Nrs. 1 & 2) te kombineer. Daar word vertrou dat ons lesers hiermee genoeë sal neem, net soos hulle in die verlede hul begrip vir die probleme van die Redaksiekomitee met lydsame skikking in die onvermydelike getoon het.

Nes in die verlede sal kritiek verwelkom word. As daar nie op gereageer word nie, wees verseker dat daar in elk geval deeglik op ingegaan is, maar dat daar grondige of onvermydelike redes bestaan waarom dit nie aanvaar is nie.

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THE VETERINARIAN'S RÔLE IN ANIMAL PRODUCTION

The actuality of this subject in a world faced with exponentially increasing needs of the essentialities for life may be accepted as being axiomatic. Realization of this fact was the motive for devoting one general session of the recent scientific Congress of this Association to discussions on "Animal Production". The papers delivered at that session, including two relevant ones, appear in this issue of the Journal.

The whole matter could be disposed of by simply regarding any form of professional service rendered directly or indirectly to livestock owners as the veterinarian's contribution to animal production. The urgent undertones of concern and the attempts to seek clarity, which characterized the discussions at the abovementioned session, belie such an over-simplified, self-satisfying explanation.

Western economy is based on the principle of 'demand and supply'. Enormous advances in technology and business methods and reciprocally changing social patterns have added another, totally different dimension to this principle and have modified it completely. This consists of the creation of new, more or less artificial demands, not by the consumer in the first place, but by the potential supplier, who then holds himself in readiness to satisfy the expected demand. As the pattern evolves, the element of artificality decreases and the luxury article becomes a necessity. One needs but refer to the motor vehicle as an example. On ethical levels, which vary from acceptable to surreptitious, man's love of ease, his cupidity, ambition, and, more recently, his sensuality, are exploited to stimulate demand.

How does the livestock-farmer, with his traditionally rural, individualistic and conservative outlook – especially in South Africa – fit into this scurry of high gear business, which, more often than not, he finds confusing? And, with him, how does the veterinarian fit in, with his strictly ethically directed principles of service?

Food and the raw materials for clothing are essential for life, but do not lend themselves readily to formation of artificially stimulated demands. Man's eating habits are also more conservative and pattern-conforming. Initially, agriculture as a whole, and animal production in particular, could meet the natural demands for the following reasons:-

1. Lower population density.
2. Pristine increase of production by application of principles obtained by relatively simple research techniques.
3. The lower economic level of most people and the simpler social patterns.
4. Lesser degree of awareness or total unawareness of global "human welfare".

Since World War II, especially, a phenomenal change in all these aspects has occurred. The first animal industry that found the answer was that of poultry: the back-yard chicken run was transformed, almost over-night, into a biological protein factory. Fortuitious and well-co-ordinated integration of the activities of geneticists, physiologists, nutritionists and veterinarians with those of far-sighted business enterprise was responsible. It was more a revolution 'from without'; the majority of poultry farmers had little say in the matter. They had to climb on to the band-wagon or be pushed out. The large organizations had control and could act in a strongly directive manner. The pig industry also began following this pattern. Because of consumer preferences, its rise was less spectacular. Here, too, the same degree of integration of scientific business acumen was lacking. Now we stand in the midst of the revolution of intensification of the red meat industry.

There are, however, important differences concerning the latter: one is dealing with physically larger animal units, namely cattle and sheep; they are viviparous and not oviparous; they are either monotocous or oligotocous, not polytocous as is the pig; they are not so easily reduced to cogs in the protein factory (this was well indicated in one congress paper). In addition, there are more and larger vested interests, much more invested capital is concerned, the activities are more diversified, in other words, there are cattle, sheep, stud and dairy farmers, each in turn specialized to greater or lesser extent. These interests are better organized (agricultural unions, stud book societies, etc.). The 'revolution' by the nature of things will be more an 'evolution', developing mainly from the existing pattern, albeit accelerated by climbing in of 'big money', but by no means wholly dominated thereby.

How does this 'evolution' effect the veterinarian? On the one hand we have the traditional cattle farmer, on the other the big business man, both under pressure of consumer demand. It cannot reasonably be expected of either to determine exactly the nature of veterinary services really required by them. As a matter of fact, at this stage it is almost too much to expect of them that they will realize the need for veterinary aid in any form, until . . . disease strikes and the veterinarian is forced back into his traditional rôle of 'healer of sick animals', the filler of wells after the calf has drowned. At this stage we dare not even mention diseases of erosion.

It is thus patent that the Profession must 'sell' its services, 'sell' in the modern concept of the word, by creating the demand therefor, but obviously on a totally different level, with a totally different motivation and in a totally different manner. The ignition point for its motivation must be service to country and community, fully admitted that the worker has a right to his daily bread, but service must be measured by the actual contribution to production rates and, in rands and cents, to the gross national product, not to own nett income. The incentive thereto is the appallingly low production figures in South

Africa, as revealed in the relevant papers in this issue of the Journal. The method must be one of convincing the animal productionist and of rendering palpable evidence: he must be made to realize clearly where his real needs lie.

This is easier said than done. That the veterinarian must play a bigger rôle in animal production is a threadbare cliche. The question is : how? The whole matter needs careful consideration and analysis; as a matter of fact, the subject will have been the subject of speculation by any member of the Profession who has any sense of responsibility. To give direction to such speculations, a brief exposition is given here of some aspects. Clearly, the importance and urgency of the matter must be borne in mind at all times. The clichés must be rejuvenated by repeated appreciation.

There must be absolute clarity of concept concerning the whole matter. At the recent congress the opinion was aired broadly that the veterinarian should concern himself with disease, the animal scientist with genetics, with an area of overlap between them. Unfortunately, man is a being of territoriality, whether his territory be geographic, material, factional or psychological. We must try to evade the trap of playing off one profession against the other. Too much bogging-down damage has been done in the past because of this. One is afraid of what will happen in the area of overlap; are we going to chase each other around like enraged sticklebacks?

We stand before the total assignment of causing the chromosome-determined animal constitution to function optimally in its environment. The sting in this apparently simple statement is in fact a trident: 'chromosome-determined' means that we must attain the best possible genetic constitution for a given long-term purpose; 'optimal' means that we have to aim at maximum production over a maximum or within a minimum period of time, in the economically most productive fashion, without harm to biological function; 'environment' means that environment which best promotes biological function and at the same time is most economically attainable. Any deviation must be located accurately and corrected, not only to save the individual or situation, but to avoid its perpetuation.

Anyone having even the faintest notion of applied biology will realize that such an assignment cannot be placed on one pair of shoulders. Theoretically one can postulate a whole series of experts taking part in the assignment, from geneticists, physiologists, toxicologists, microbiologists, parasitologists, genesiologists, therapeutists, hygienists, etc., to economists, financial experts, business administrators and marketing experts. Each of these will have its own infra-structure of assistants and facilities. At national level we have such experts, at least qualitatively. If this is the case quantitatively as well, is an open question, with a negative reply being the most probable one. What we definitely do not have are such teams in full co-operative activity within a frame-work of efficiently co-ordinated and directed organization and with a clearly directed, purposeful assignment

As one moves from the highest organizational levels to individual concerns, so the team decreases accordingly, in other words more fields of expertise will have to be covered by one and the same person, but then more in executive capacity, to relate the personnel to the activities of the concern. The ultimate size and composition of the team will depend upon the nature of the particular concern and the capabilities of persons available. The smaller concerns could make use of consultation services on an *ad hoc* basis. The degree of specialization lost in the process must be compensated for by support from properly co-ordinated and adequate supporting services in the form of diagnostic, analytic, and research laboratories and consulting centres. For example, the executive must be able to obtain a complete metabolic or infection profile of a particular concern at reasonable cost and within a reasonable space of time.

It is clear that of the broad spectrum of expertise mentioned above, the veterinarian, theoretically at least – if one considers his training – should be able to cope with a considerable segment of the spectrum, moreover, that he should be able to co-operate effectively with other executives as a result of insights instilled into him. In this respect, a number of pertinent, self-searching questions must be posed.

Is our present knowledge adequate? Although in terms of the absolute, knowledge will never be adequate, our present knowledge is such that it can effect a highly significant increase in production if properly applied. It can be predicted safely that the global approach in terms of economic return will reveal a number of hitches and hiatuses as soon as co-operative action needs be taken. Operative research, so successfully applied in World War II to outwit the enemy and kill people, can surely be employed to advantage to supply more food.

Is our undergraduate teaching adequate? Regarding the material offered theoretically, the answer is surely : Yes. Justified doubts may be raised against the lack of necessary emphasis on preventative medicine as a whole. This is not an omission of the individual teacher. The hiatus arises because students are not given an over-all picture at the end of the various courses of study, still less are they given the opporunity of practical exercise in general preventative medicine, where nosology and livestock and business management are properly integrated. A syllabus, already submitted by Faculty Council in 1972 and pertinently aimed at rectifying this defect, had to be postponed on account of lack of available funds. An interim effort, whereby two periods of teaching per week are made available to the Department of Zootechnology, can be accepted as a token of goodwill, but remains patch-work. The offering of short courses can contribute considerably to rectify the defects on a post-graduate level. One needs but to recall the tremendous success of the short course in mastitis offered by the Faculty some years ago.

Do members of the Profession realize the problem sufficiently? One wonders whether members, apart from paying lip-service to clichés, realize this to the extent that they are sufficiently motivated to undertake all the extra trouble and effort. In all fairness, this answer must be related to the one at the end of this editorial. Yet is it true that our mental focus is on therapy of the single case, partly because of our own traditional concepts, partly because the veterinary course ends with clinical subjects and that unconsciously influences the student, mainly because of traditional concepts of potential clients, so much so that at a congress a number of years ago

the following statement was dropped: "The practitioner and metritis had for many years lived happily together on this particular farm". Series of short courses ought to contribute considerably in this respect, as well towards development of the desired realization and insight.

Are there sufficient veterinarians in the country? The answer is an emphatic: NO.

Once more the sorry refrain is heard: 'No financial provision has as yet been made for the doubling of the Faculty'. Year after year promising young people have to be turned down. This year the number was eighty-two.

Has adequate provision been made in the employment pattern for veterinarians wishing to devote themselves to animal production? With a definite NO the essence of the problem is exposed. The most important reason for this has already been advanced. Neither the livestock farmer nor the entrepreneur really realize that they need the services of the veterinarian to prevent disease and enhance production. Still less are they prepared to pay for such services at this stage. Where there is no demand, there is no supply, it is as simple as all that. Dare we point an accusing finger at the young graduate if he prefers urban practice, with its established pattern, with the added attraction that there he can develop his healing proficiency and surgical expertise fully?

In order that the call 'sell the Profession' does not degenerate into a cheap, empty cliché, initiative will be required, to be followed by carefully considered and responsible action and meaningful dialogue with other parties concerned. The animal producer, in particular, must be incited to action. Thorough study must be made of movements such as the CETA's of France, the CREA's of Argentine (see Agricultural Report – South America, No. 12), the animal health services of the Netherlands, Belgium & England, and the scheme of the Royal Agricultural Society as set out elsewhere in this issue, to mention but a few. In this respect it is fitting to look at our own poultry industry as well : within a decade the number of veterinarians concerned therewith has grown from 4, all of them in the Civil Service, to over 20, the majority of them in the private sector. The lame attitude that 'the Government must do something' is fatal. Governments are there to legislate and execute, not to 'do'. It is the animal producer who must be activated and helped to help himself, especially through his own organizations. In this respect the rural practitioners form the advance guard: by their actions they must deliver visible proof that the veterinarian is there to swell the farmers banking account, not to shrink it.

Linked to these discussions hinging on productivity, there is a final consideration of the prospect of a greatly increased effective productivity of the veterinarian as such within the framework of the scheme broadly outlined above.

BOOK REVIEW — BOEKRESENSIE

TEXTBOOK OF LARGE ANIMAL SURGERY

F.W. OEHME AND J.E. PRIER (EDS)

Baltimore: The Williams & Wilkins Co. 1974. Pp. x + 608. Figs. 538.

Thirty authors have contributed to this book, which is a most welcome addition to the rather limited number of publications available on the subject of large animal surgery. The goal has been to produce a practical and updated text for veterinary students and a reference guide for large animal practitioners.

The book contains 16 chapters, of which the first five (145 pages) cover general surgical considerations, wound healing and tissue repair, suturing techniques, surgical restraint, and anaesthesia respectively. Much that is dealt with in these chapters is available in textbooks on anaesthesia, animal management and veterinary surgery but one can understand the editors' desire to bring together in one volume all the information that the large animal surgeon may need. Some of the suturing techniques are not generally known in this country and will definitely help to overcome the problem of wound disruptions in large animals. The chapter on anaesthesia gives a detailed description of inhalation anaesthesia and the various nerve blocks.

The largest part of the book consists of chapters dealing with the integumentary (skin, hoof, claw, mammary glands), musculoskeletal, digestive, urinary and genital systems, and the special sense organs (eye, eyelid, ear). The respiratory (mainly the upper part), cardiovascular and nervous systems are discussed in three short chapters. The emphasis is clearly on those systems and treatments that are within the scope of the private practitioner.

There is also a chapter on the abdominal wall (anatomy, choice of surgical sites, hernias) and a concluding chapter on post-operative recovery and care (mainly shock and dehydration).

A list of references is supplied at the end of every chapter. One notable omission in the list pertaining to the genital system is the work done by C.F.B. Hofmeyr on phallocampsis and other causes of bovine *impotentia coeundi*, which work was published in the Journal of the South African Veterinary Association.

The book is indexed, profusely illustrated and neatly produced. It is recommended.

C.J.R.

REDAKSIONEEL

DIE VEEARTS SE ROL IN VEEPRODUKSIE*

Die aktualiteit van hierdie onderwerp in 'n wêreld wat eksponensieel stygende lewensbehoeftes in die gesig staar, kan as aksiomaties aanvaar word. Die besef hiervan het aanleiding gegee tot afsondering van een algemene sitting van die afgelope wetenskapkongres van hierdie Vereniging vir bespreking van „Diereproduksie". Die betrokke referate, asook twee verbandhoudendes, verskyn in hierdie uitgawe van die Tydskrif.

Die hele aangeleentheid kan maklik afgemaak word deur eenvoudig enige vorm van professionele diens t.o.v. dieregesondheid, direk of indirek aan eienaars van vee gelewer, te aanvaar as die veearts se rol in veeproduksie en daarmee basta. Die deurdringende ondertoon van kommer en soeke na helderheid wat die besprekings op bovermelde sitting gekenmerk het, loënstraf hierdie oorvereenvoudigde, selftevredenheidbiedende stelling.

Die westerse ekonomie berus op die „vraag-en-aanbod"-beginsel. Reusevorderings op tegnologiese en sakegebied en resiprokaal veranderende maatskaplike patrone het heeltemal 'n ander dimensie tot hierdie beginsel bygevoeg – dit in-der-waarheid totaal vervorm. Dit is die skepping van nuwe, in mindere of meerdere mate kunsmatige aanvrae, nie in die eerste instansie deur die verbruiker nie, maar deur die potensiële aanbieder. wat dan by voorbaat gereed staan om aan die nuwe vraag te voldoen. Namate die patroon hom voltrek, neem die element in kunsmatigheid af en die weelde-artikel word 'n lewensnoodsaaklikheid. Dink maar aan die motervoertuig as voorbeeld. Op etiese vlakke wat wissel van gangbaar tot bedenklik, van eerlik tot slinks, word van die mens se gemaksug, hebsug, eersug, en, meer resent, van sy sensualiteit gebruik gemaak om aanvraag te stimuleer.

Hoe staan die veeboer, met sy tradisioneel landelike individualistiese en konserwatiewe lewensbenadering – veral in Suid-Afrika – te midde van hierdie vir hom dikwels verwarrende sakepressiegedoente? En saam met hom, die veearts, met sy streng etiesgerigte diensbeginsels?

Voedsel en die grondstowwe vir bekleding is weliswaar lewensnoodsaaklikhede, maar leen hulle nie maklik tot kunsmatige aanvraagstimulering nie. Die mense se eetgewoontes is ook meer konserwatief en patroongebonde. Aanvanklik kon die landbou in sy geheel en veeproduksie in die besonder in die natuurlike aanvraag voorsien, en wel om die volgende redes:-

1. Die laer bevolkingsdigtheid.
2. Die aanvanklik aansienlik verhoogde rendement wat verkry kon word deur toepassing van beginsels wat deur betreklik eenvoudige navorsingstegnieke vasgestel kon word.
3. Die laer ekonomiese peil van bevolkings en die eenvoudiger maatskaplike patrone.
4. Minder bewustheid of totale onbewustheid van globale „menslike welsyn."

Dis veral na die Tweede Wêreldoorlog dat in al hierdie opsigte 'n fenomenale ommekeer ingetree het. Die eerste veebedryf wat die antwoord hierop gevind het is dié van pluimvee: die pluimveeagterplasie het byna oornag verander in 'n biologiese eiwitfabriek. 'n Gelukkige en goedgekoördineerde samesnoering van genetici, fisioloë, voedingsdeskundiges, veeartse en versiende entrepreneurskap was hiervoor verantwoordelik. Dit was merendeels 'n van buite opgelegde rewolusie waarin die meerderheid pluimveeboere helaas bitter min seggenskap gehad het. Hulle moes inklim en saamry, of uitgedruk word Die groot organisasies het die hef in hande gehad en kon sterk rigtinggewend optree. Die varkbedryf het insgelyks die voorbeeld begin volg. Weens verbruikersvoorkeure was sy opgang nie so skouspelagtig nie. Ook het hier dieselfde mate van samesnoering van wetenskaps- en besigheidsvernuf ontbreek. Ons staan nou in die revolusie van rooivleisbedryfsintensifisering.

Daar is egter belangrike verskilpunte wat laasgenoemde betref: ons het met fisies groter diereenhede te doen, namelik beeste en skape; hulle is vivipaar en nie ovipaar nie; hulle is meesal enkelbarend of laagveelbarend, nie hoogveelbarend soos die vark nie; hulle laat hul nie so eenvoudig in die kader van eiwitfabriek inpers nie (soos een referent op die sitting dit tereg aangetoon het). Daarby is daar baie meer gevestigde belange en groter belange met groter kapitaal betrokke, met wyer gediversifiseerde aktiwiteite, m.a.w. daar is bees-, skaap-, stoet-, en melkboere, elke groep weer op sy beurt tot mindere of meerdere mate gespesialiseer. Bowendien is hulle tot 'n mate meer georganiseer (landbou-unies, stamboekverenigings, e.d.m.). Die „rewolusie" sal uit die aard van die saak eerder 'n „evolusie" wees, wat grotendeels uit die bestaande patroon sal moet groei, weliswaar aangehelp deur die inklim van grootgeld-belange, maar geensins totaal daardeur oorheers nie.

Hoe tref hierdie evolusie die veearts? Enersyds staan die tradisionele veeboer, andersyds die groot sakeman, albei onder geweldige druk van die verbruikersvraag. Dit kan nie redelikerwys van enigeen van die twee verwag word om presies die aard van veeartsenykundige diens wat hulle werklik nodig het, te bepaal nie, trouens dis op hierdie stadium amper te veel verwag dat hulle eers sal besef dat hulle veeartsenykundige diens *überhaupt* nodig het, totdat . . . siekte toeslaan en die veearts in sy tradisionele rol van „dokter van siek diere" teruggedruk word, die demper van putte nadat die kalf versuip het. In hierdie verband durf ons nie eers van erosiesiektes praat nie.

Dis dus duidelik dat die Professie sy diens moet „verkoop" – „verkoop" in die moderne sin van die woord deur self die vraag daarvoor te skep, maar vanselfsprekend op 'n totaal ander vlak, met 'n totaal

* Streng semanties gesproke het die term „diereproduksie", wat ons klakkeloos uit Engels oorgeneem het, 'n wyere begripskonnotasie. Deur „dier" in te eng na „vee" word die aandag bepaal op diere wat die mens ter voldoening van sy primêre behoeftes, nl. voeding en kleding, aanhou.

ander motivering en op 'n totaal ander manier. Die ontbrandingspunt van motivering moet diens aan land en gemeenskap wees, ruim toegegee dat die arbeider sy loon werd is, maar diens moet gemeet word aan werklike bydrae tot die totale produksiesyfers en in rand en sent tot die bruto nasionale produk, nie netto eie inkomste nie. 'n Aansporing daartoe is die ontstellende produksiesyfers in die betrokke referate in hierdie uitgawe van die Tydskrif onthul. Die metode moet een wees van oortuiging en tasbare bewyslewering: ons moet by die veeprodusent 'n duidelike besef laat ontstaan waarin sy behoeftes geleë is.

Dit is makliker gesê as gedoen. Dat die veearts 'n groter rol in veeproduksie moet vervul is 'n holruggeryde cliché. Die vraag is: hoe? Die hele saak verdien noukeurige besinning en analise, trouens, was seker die onderwerp van gedagte van elke lid van die Professie wat enigsins 'n sin vir verantwoordelikheid het. Om rigting aan sulke gedagtegange te gee, volg hier 'n beknopte uiteensetting van enkele aspekte. Vanselfsprekend moet die erns en die dringendheid van die saak ten alle tye deur die Professie onder oë gesien en in gedagte gehou word. Die clichés moet telkens deur intellektuele deurlewing vernuwe word.

Daar moet absolute helderheid van begrip oor die aangeleentheid wees. Tydens die jongste kongres is die mening in die breë gelug dat die veearts hom hoofsaaklik op die siekteleer moet toelê, die veekundige weer op die oorerwingsleer, met 'n oorvleuelingsgebied tussenin. Ongelukkig is die mens 'n territoriale wese, of sy territorium nou geografies, materieel, faksioneel of sielkundig is. Dus moet ons weg beweeg van die slagyster van beroepe teen mekaar af te speel. Te veel vasvalskade is in die verlede al hierdeur berokken. 'n Mens vrees eintlik wat gaan op die oorvleuelingsgebied gebeur: gaan ons mekaar soos twee verwoede stekelbaarse rondjaag?

Ons staan voor die totale opdrag om chromosoombepaalde diereliggaamsfunksie optimaal in sy omgewing te laat funksioneer. Die angel in hierdie skynbaar eenvoudige stelling is 'n drieledige een: „chromosoombepaal" beteken dat ons die beste genetiese samestelling vir 'n bepaalde lang-termyn doel wil probeer bereik; „optimaal" beteken dat ons mik na maksimumproduksie oor 'n maksimum of binne 'n minimum tydperk, op die ekonomies mees renderende wyse, sonder benadeling van biologiese funksie; „omgewing" beteken die omgewing wat die gunstigste is — enersyds mees bevorderlik vir liggaamsfunksie, andersyds op mees ekonomiese wyse verskafbaar. Enige afwyking moet so gou moontlik akkuraat opgespoor en reggestel word, nie net om die individuele geval of situasie te red nie, maar om sodanige afwykings in die toekoms te vermy.

Enigeen wat maar iets van die toegepaste biologie af weet, sal besef dat so 'n opdrag nie op 'n enkele paar skouers geplaas kan word nie. Teoreties kan 'n mens 'n hele reeks deskundiges as deelnemers aan die opdrag postuleer, vanaf genetikus, fisioloog, voedingsdeskundige, dierebeoordelaar, ekoloog, weidingsdeskundige, patoloog, toksikoloog, mikrobioloog, parasitoloog, genesioloog, terapeut, higienis, ens., tot ekonoom, finansier, bedryfsleier en bemarkingsdeskundige. Elkeen hiervan sal weer sy eie infra-struktuur van hulppersoneel en fasiliteite hê. Op nasionale vlak beskik ons oor sulke deskundiges, ten minste kwalitatief. Of dit kwantitatief ook die geval is, is 'n ope vraag, met 'n negatiewe antwoord as die mees waarskynlike een. Waaroor ons beslis nie beskik nie, is sulke spanne met 'n duidelike, doelgerigte opdrag, koöperatief werksaam in doeltreffend gekoördineerde en gerigte organisatoriese verband.

Namate 'n mens van die hoogste organisatoriese vlakke na die enkele instansies beweeg, sal die span na verhouding kleiner word, m.a.w. meer velde van deskundigheid sal deur een persoon bestryk moet word, en dan meer in uitvoerende hoedanigheid, om die personeelstruktuur met die werksaamhede te laat verband hou. Die uiteindelike grootte en samestelling sal afhang van die spesifieke aard van die besondere bedryf en die hoedanighede van die persone beskikbaar. Die klein bedrywe kan van konsultdienste op 'n *ad hoc* basis gebruik maak. Die mate van spesialisasie wat noodwendig ingeboet moet word, moet vergoed word deur rugsteuning van elke uitvoerende deskundige deur behoorlik gekoördineerde en voldoende ondersteuningsdienste, t.w. diagnostiese, ontledings- en navorsingslaboratoria en raadplegingsentra. Hy moet bv. binne redelike tydsbestek en teen redelike koste 'n hele metaboliese of infeksieprofiel van die betrokke bedryf se vee kan kry.

Dis duidelik dat in die breë spektrum van deskundigheid hierbo genoem, die veearts, as 'n mens sy opleiding in ag neem, teoreties in elk geval, bekwaam behoort te wees om 'n aansienlike segment van die spektrum te kan behartig, meer nog, dat hy geredelik deur reeds gekweekte insig sinvol met ander uitvoerende beamptes behoort te kan skakel. Na aanleiding van hierdie oorweging moet 'n paar pertinente, selfondersoekende vrae gestel word.

Is ons huidige kennis voldoende? Alhoewel in terme van die absolute, kennis nooit voldoende sal wees nie, is die huidige stand van ons kennis sodanig dat dit 'n hoogs betekenisvolle verbetering van ons veebedryf kan bewerkstellig, mits dit korrek aangewend word. Dit kan egter met vrymoedigheid voorspel word dat die globale benadering met oog op ekonomiese rendabiliteit 'n hele reeks haakplekke en leemtes gaan laat opduik sodra die verskillende deskundiges koöperatief begin optree. Operatiewe navorsing, so uiters suksesvol in die jongste wêreldoorlog toegepas om die vyand te uitoorlê en mense dood te maak, kan sekerlik ingespan word om mense meer voedsel te verskaf.

Is ons voorgraadse opleiding toereikend? Wat die teoretiese stof-aanbieding betref kan hierop seer seker „ja" geantwoord word. Waar daar wel met reg bedenkings ge-opper kan word, is teen die gebrek aan nodige klem wat op voorkomende geneeskunde in sy geheel gelê word. Dit is allermins die fout van die individuele dosent. Die leemte ontstaan daardeur dat die studente nie aan die einde van hul onderskeie vakkursusse 'n oorkoepelende geheelbeeld gegee word nie, nog minder dat hulle geleentheid gegee word tot praktiese oefening in algehele voorkomende geneeskunde waarby siekteleer en bedryfskennis behoorlik geïntegreer word. 'n Leerplan, reeds in 1972 deur die Fakulteitsraad voorgelê en pertinent gemik op regstelling van hierdie leemte, moes weens gebrek aan beskikbare fondse op die lange baan geskuif word. 'n Tussentydse poging, waardeur twee

periodes per week in die tweede semester aan die Departement Sootegnologie afgestaan word, toon ten minste die goeie wil, maar dit bly slegs lapwerk. Aanbieding van kortkursusse kan baie bydra om die leemtes nagraads aan te vul. Dink maar aan die geslaagdheid van die kort kursus oor mastitis wat 'n paar jaar gelede deur die Fakulteit aangebied was.

Besef lede van die Professie die probleem terdeë? Afgesien van lippediens aan clichés, wonder 'n mens of dit wel in so 'n mate besef word dat dit kollegas sal aanspoor om al die ekstra moeite en inspanning te onderneem. In alle regverdigheid moet hierdie antwoord met die een aan die einde van hierdie stuk in verband gebring word. Tog is dit waar dat ons op terapie van die individuele geval ingestel is, deels weens ons eie tradisionele konsepte, deels weens die feit dat opleiding eindig met kliniese vakke en die student daardeur onwillekeurig ten sterkste beïnvloed word, maar grotendeels weens die tradisionele opvattings van potensiële kliënte, en wel tot so 'n mate dat 'n kollege tydens 'n kongres etlike jare gelede hom die volgende opmerking laat ontval het: „Die praktisyn en metritis het vir jare lekker op die betrokke plaas saamgeboer." Reekse kort kursusse behoort ook in hierdie opsig baie by te dra tot ontwikkeling van die korrekte besef en insig.

Is daar voldoende veeartse in die land? Die antwoord hierop is: beslis nie. En weer klink die droewige refrein: „Geen fondse is voorasnog beskikbaar gestel vir verdubbeling van die Fakulteit nie." Jaar na jaar word belowende jongmense weggewys. Vanjaar was die getal twee-en-tagtig.

Is daar behoorlik voorsiening in die maatskaplike werkspatroon gemaak vir die veearts wat hom op veeproduksie wil toelê? Met 'n onomwonde NEE word hier die eintlike knoop blootgelê. Die belangrikste rede is vantevore aangevoer. Nog die veeboer, nog die entrepreneur besef werklik dat hulle die veearts se diens as voorkomende geneeskundige en produksiebevorderaar nodig het. Nog minder is hulle op hierdie stadium bereid om daarvoor te betaal. Waar geen vraag is nie, sal geen aanbod wees nie. So eenvoudig is dit. Kan dit dus die jong graduandus verkwalik word dat hy hom tot die stedelike praktyk wend, met sy duidelik geykte patroon, met die aantrekking dat hy sy diagnostiese en helende vernuf en chirurgiese vaardigheid daar ten volle sal kan ontplooi?

Opdat die wekroep van „verkoop die Professie" nie tot 'n goedkoop en hol cliché verval nie, sal daar met verantwoordelikheid en oorleg opgetree moet word, inisiatief sal geneem moet word, sinvolle beraad met ander instansies sal gehou moet word, en veral die veeprodusent sal tot optrede aangespoor moet word. Deeglike kennis sal geneem moet word van die funksionering van organisasies soos die CETA's van Frankryk, die CREA's van Argentinië (sien Landbourapport – Suid-Amerika, nr. 12), die dieregesondheidsdienste van Nederland, België en Engeland, die skema van die Royal Agricultural Society soos elders in hierdie blad uiteengesit, en dies meer. In hierdie opsig is 'n blik op ons eie pluimveebedryf ook gepas: binne 'n dekade het die getal veeartse daarby betrokke gegroei van vier, almal staatsbeamptes, tot oor die twintig, verreweg die meeste daarvan in die private sektor. Die lamsakhouding van: „die Regering moet iets doen" is fataal. Regerings is daar om te legisleer en te eksekuteer, nie om te „doen" nie. Dis die veeprodusent wat aangespoor en gehelp moet word om homself te help, veral deur middel van sy eie organisasies. In hierdie opsig vorm die landelike praktisyns die voorhoede, om deur hul werksaamhede tasbare bewys te lewer dat die veearts daar is om die boer se bankrekening te laat swel en *nie* om dit te laat krimp nie.

Aansluitende by hierdie besprekings wat om produktiwiteit skarnier, is daar die slotoorweging van die vooruitsig van grootliks verhoogde effektiewe produktiwiteit van die veearts as sodanig binne die raamwerk van die hierbo breedgeskilderde skema.

EDITORIAL NOTE

LIBRARY FACILITIES

Thanks to the efforts of the late Professor Herman Graf, the very advantageous arrangement was made that all journals received by the SAVA in exchange for this Journal were to be donated to the Merensky Library of the University of Pretoria. This library, in turn, created the Onderstepoort Branch. Till the end of last year it was housed in the Students' Hostel at Onderstepoort, in the modified lounge of the 'old hostel'. The Merensky Library accepted full responsibility for cataloguing, binding and maintenance of all the journals. To this were added journals received gratis by the Association or the Faculty, as well as scientific journals and books ordered by teachers or students for the Library – the cost being met by an allowance from the Department of Agricultural Technical Services – or donated to the Library by colleagues and other kindly disposed instances.

In time a modest but valuable nucleus of a veterinary library came into being. Although the library was at the disposal of all members of the SAVA, as well as teachers and students of the Faculty, it was used almost exclusively by the latter because of its topographical location and hours of service (late afternoons and evenings). Students were appointed as library assistants and they were mainly responsible for the proper conduct of affairs. The expressions of appreciation at discussions of quarterly and annual reports by the University Library Committee indicate how well they discharged their duties and what good use was made of the library.

Severing of the Faculty from the Department of Agricultural Technical Services and rigid economy imposed upon the Department resulted in considerable reduction of book purchases and journal subscriptions in the Library of the Veterinary Research Institute, understandably to supply the needs of the Institute only. Although Faculty members etained the privilege of free access to the Institute Library, its value to the clinical and certain basic science departments of the Faculty,

particular, fell considerably. Unfortunately, at the time of change over no financial provision was made for a Faculty Library. (See this Journal, Vol.44, No.2, p.107.)

The Librarian of the Merensky Library, Mr. A.J. van den Bergh, devoted himself with zeal to the ideal of a fully functional Faculty Library. As a result of his efforts, the hard work of his staff, and an interim allowance favoured by the University authorities, the old library could be established in a new form on the Onderstepoort Campus, as from the beginning of 1974, with a qualified librarian in charge and complete with facilities for reprography, in Room 8/9 of the Faculty Building. After initial trial-and-error the library hours were set from 8h00 to 12h30 and from 13h00 to 16h30. Hopefully the hours may be extended later on.

It is to be understood that for the present, at any rate, funds are meagre and that utmost care has to be exercised in placing orders for books and journals. A carefully selected but reasonable comprehensive list of journals to be subscribed to has been drawn up by Faculty and its Library Committe. In certain essential instances the existing journal-holding of the Institute Library and of the Merensky Library and its various subdivisions will be duplicated, in a considerable number of cases it will be complemented. At the same time the Editorial Committe of the SAVA, with the aid of the Secretary of the Association, is critically reviewing its exchange list in order to obtain maximum coverage at minimum cost. The fact that the Editor is at the same time Convenor of the Faculty Library Committee and Faculty Rpresentative on the Central Library committee of the University will ensure proper coordination.

As in the past, members of the Association will have access to the Faculty Library. The reprography facilities (at 5c per page) will facilitate matters greatly. The Librarian cannot make photocopies, each one will have to do it himself or make arrangements with colleagues on the spot. As soon as matters are stabilised, the publication in this Journal of a list of journals held will be considered.

This announcement naturally implies that donation of journals and/or books or the sponsoring of journal subscriptions and/or book purchases will always be most welcome.

The SAVA expresses its sincere thanks to all persons and bodies that have contributed to the Faculty Library in whatever way.

REDAKSIONELE AANTEKENING

BIBLIOTEEKFASILITEITE

Danksy die bemoeiinge veral van wyle prof. Herman Graf, is die wedersyds uiters voordelige reëling getref dat alle tydskrifte, wat die SAVV in ruil vir hierdie Tydskrif ontvang, aan die Merensky-biblioteek van die Universiteit Pretoria geskenk word. Dié biblioteek het op sy beurt 'n Onderstepoort-tak tot stand gebring. Tot einde verlede jaar is dié tak van die biblioteek in Huis Onderstepoort gevestig, en wel in die gemodifiseerde ruskamer van die ou koshuis. Die Merensky-biblioteek het verantwoordelikheid geneem vir inbind, katalogisering en instandhouding van al die tydskrifte. Hiertoe bygevoeg is tydskrifte wat die SAVV of die Fakulteit as gratis toesending ontvang het, asook wetenskaplike tydskrifte en boeke deur dosente of studente vir die biblioteek bestel – dié koste is bestry uit 'n toelaag van die Departement Landboutegniese Dienste – of deur kollega's en ander goedgesindes aan die biblioteek geskenk.

Mettertyd is 'n beskeie maar waardevolle kern van 'n veeartsenykundige biblioteek opgebou. Alhoewel hierdie biblioteek tot beskikking van alle lede van die SAVV en dosente en studente van die Fakulteit was, was dit weens sy topografiese ligging en diensure (laat namiddae en saans) meesal net deur studente gebruik. Studente is as biblioteekassistente aangestel en hulle was hoofsaaklik vir die goeie gang van sake verantwoordelik. Dat hulle hul goed van hul taak gekwyt het en dat studente goeie gebruik van die biblioteek gemaak het, blyk uit waarderende woorde wat by die Universiteitsbiblioteek-komitee tydens diskussie van kwartaal- en jaarverslae uitgespreek is.

Met uitlywing van die Fakulteit uit die Departement Landboutegniese Dienste en streng besnoeiings binne hierdie departement, is die boek-aankope en tydskrif-intekenings van die Departementele Biblioteek by die Instituut vir Veeartsenykundige Navorsing aansienlik ingekrimp en begryplikerwyse ingestel om net aan die Instituut se behoeftes te voorsien. Alhoewel dosente van die Fakulteit nog oor die voorreg van vrye toegang tot hierdie Instituutsbiblioteek beskik, is sy waarde, veral vir die kliniese en sekere basies-wetenskaplike departemente van die Fakulteit, baie verlaag. Ongelukkig is daar vir hierdie saak tydens omskakeling van die Fakulteit geen geldelike voorsiening gemaak nie. (Sien hierdie Tydskrif, Band 44, Nr.2, Blds. 107.)

Die Bibliotekaris van die Merensky-biblioteek, mnr. A.J. van den Bergh, het met besieling hom vir 'n volwaardige Fakulteitsbiblioteek beywer. Danksy sy pogings, die harde werk van sy personeel en 'n goedgunstige tussentydse toekenning deur die Universiteitsowerhede, kon die ou biblioteek in nuwe gedaante, met 'n gekwalifiseerde bibliotekaresse in bevel en kompleet met reprografiefasiliteite, in die Fakulteitsgebou, Kamer 8/9, vanaf aanvang 1974 op die Onderstepoortkampus verskyn. Na aanvanklike eksperimentering is die biblioteek-ure vanaf 8h00 tot 12h30 en vanaf 13h00 tot 16h30 vasgestel. Hopelik sal dit later verleng kan word.

Dit is te begrype dat, vir die huidige altans, fondsvoorsiening uiters skraps is en dat daar met uiterste omsigtigheid te werk gegaan moet word. 'n Uitgewande maar tog redelik omvattende lys tydskrifintekenings is deur die Fakulteitspersoneel en sy Biblioteekkomitee opgestel. In bepaalde, essensiële gevalle sal dit die bestaande tydskrif-aanhouding van die Instituutsbiblioteek en die van die Merensky-biblioteek en sy onderskeie takke dupliseer, in 'n aansienlike reeks gevalle sal dit daardie biblioteke komplementeer. Terselfdertyd is die SAVV se

Redaksiekomitee met behulp van die Vereniging se Sekretaris besig om sy lys tydskrifuitruilings krities te hersien met oog op die mees voordelige verkryging van so 'n volledig moontlike veterinêre literatuurdekking teen minimum onkoste. Die feit dat die Redakteur tewens Saamroeper van die Fakulteit se Biblioteekkomitee is, asook die Fakulteitsverteenwoordiger op die Sentrale Biblioteekkomitee van die Universiteit, verseker dat gepaste skakeling sal geskied.

Soos in die verlede, sal lede van die Vereniging toegang tot die Fakulteitsbiblioteek hê. Reprografiefasiliteite (teen 5c per bladsy) sal sake ook vir almal baie vergemaklik. Die Bibliotekaresse kan nie self afdrukke vir lede maak nie; elkeen sal dit self moet behartig of reëlings met plaaslike kollegas moet tref. Sodra sake gestabiliseer is, sal publikasie van 'n lys titels van tydskrifte in die Fakulteitsbiblioteek in hierdie Tydskrif oorweeg word.

Hierdie bekendstelling hou die implikasie in dat skenkings van tydskrifreekse of boeke, of die bors van tydskrif-intekenings/boek-aankope altyd baie welkom sal wees.

Die SAVV spreek hiermee sy besondere dank uit jeens alle persone en instansies wat tot die Fakulteitsbiblioteek bygedra het, op watter wyse ookal.

EDITORIAL NOTE

SECURITY

In some respects the optimism of youth may be a liability rather than an asset: one is so apt to accept a healthy, accident-free life as the norm and not heed the statistically proven incidence of ill-health or accident-rate. Even among the not so young there is often the attitude: 'it cannot happen to me.' The professional person, in terms of his potential income, is faced with the problem of ensuring adequate benefits in case of incapacitation, whether temporary or permanent. The veterinarian is undoubtedly more at risk than most other professional men. In this respect membership of the Professional Provident Society, on whose Board the SAVA is also represented, supplies a vital security.

The Special General Meeting of members held on the 20th November 1973 approved the various amendments to the Rules necessary to give effect to a number of important improvements in the benefits afforded by membership. These improved benefits which have come into effect on the 1st January 1974, include the following:

1. The rate of Permanent Incapacity benefit is doubled and is now the same as the sick pay benefit rate. The maximum shares will now provide a permanent incapacity benefit of R7 665 per annum compared with the benefit of R3 833 paid previously.

2. The maximum sick pay benefit is increased from R630 to R945 per month by the issue of supplementary shares at substantially reduced subscription rates.

3. Sick pay protection is now available to age 70 by providing for the new supplementary shares to be retained after age 65, the retirement age for ordinary shares.

These increased benefits are particularly intended to compensate for today's spiralling inflation and rising costs experienced by the private practitioner.

Attention of members is drawn to the accompanying announcement by the Professional Provident Society.

REDAKSIONELE AANTEKENING

SEKURITEIT

In sekere opsigte is die optimisme van die jeug 'n nadeel eerder as 'n voordeel: 'n mens is te geneig om 'n gesonde, ongeluksvrye bestaan as die norm te aanvaar en nie op die statisties bewese voorkoms van siekte of ongeluksyfers ag te slaan nie. Selfs onder die ,,nie meer so jonges" bespeur 'n mens dikwels die houding: ,,dit kan nie met my gebeur nie". Die professionele persoon, in terme van sy potensiële inkome, word voor groter probleme gestel om gepaste voordele te bekom in geval van ongeskiktheid, hetsy tydelik of blywend. Die veearts is ongetwyfeld aan groter risiko's blootgestel as meeste ander professionele mense. In hierdie opsig bied lidmaatskap van die Professionele Voorsieningsvereniging, op die Raad waarvan die SAVV ook verteenwoordig is, noodsaaklike sekuriteit.

Die Spesiale Algemene Vergadering van lede, gehou op 20 November, 1973, het verskeie amendemente van die Reëls goedgekeur ten einde 'n aantal belangrike verbeterings in voordele, aan lede gebied, te bewerkstellig. Hierdie verhoogde voordele, wat vanaf 1 Januarie 1974 in werking getree het, sluit die volgende in:-

1. Die mate van Blywende Ongeskiktheidsvoordeel is verdubbel en is nou dieselfde as Siektevoordeeldekking. Die maksimum aandele sal nou 'n blywende ongeskiktheidsvoordeel van R7 665 per jaar verskaf in vergelyking met die voordeel van R3 833 tevore uitbetaal.

2. Die maksimum siekte-uitbetalings is van R630 tot R945 per maand verhoog deur uitreiking van bykomstige aandele teen aansienlik verlaagde subskripsietariewe.

3. Beskerming teen inkomsteverlies as gevolg van siekte is nou beskikbaar tot die ouderdom van 70 deurdat voorsiening gemaak is dat nuwe aanvullende aandele behou kan word tot na die ouderdom van 65, die beëindigingsouderdom vir gewone aandele.

Hierdie verhoogde voordele is veral bedoel om vergoed vir die hedendaagse inflasie-spiraal en stygende koste wat die private praktisyn ondervind.

Die aandag van lede word op die bygaande aankondiging van die Professionele Voorsieningsvereniging gevestig.

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Jl S. Afr. vet. Ass. 45 (1 & 2): 15-20 1974

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en
68ste ALGEMENE JAARVERGADERING
UNISA, PRETORIA, 15-19 OKTOBER 1973

PRESIDENTSREDE: A.B. LA GRANGE

By 'n geleentheid soos hierdie is dit die voorreg en genoeë van die President om uiting te gee oor sake rakende die Professie en die sektore wat dit dien, asook aan sekere persoonlike gedagtes en menings aangaande aspekte wat hy as ter sake mag beskou. Dis geen geringe taak nie, want huidig kan die Professie in nie minder as tien aparte dissiplines verdeel word nie, die aktiwiteite waarvan oor 'n breë spektrum strek. Dit sal helaas onmoontlik wees om te glo en te verwag dat ons opmerkings vanaand al hierdie groepe kan dek en nog minder dat dit in almal se smaak sal val.

Ten einde omlyning in my gedagtegang te bring, wil ek die Professie basies net in drie segmente verdeel, en na enkele van elkeen se aktiwiteite verwys.

1. Die groep van stedelike praktisyns.
2. Die onderskeie groepe wat direk of indirek gemoeid is met 'n verskeidenheid van fasette wat eintlik op landbou betrekking het, bv. navorsing, veeartsenyvelddienste, landelike praktisyns, dié in die handel, dié in reproduksie en produksie en dié in openbare gesondheidsdienste.
3. Dié in opleiding.

Met die eerste groep, nl. ons stedelike praktisyns, gaan dit in geheel goed en hulle lewer 'n uitmuntende en 'n onmisbare diens. Die grootste meerderheid van stedelinge kom vandag nog vanuit ons boere-agtergrond. Ons stedelinge is inherent lief vir ons huisdiere en dikwels word hulle as deel van die gesin behandel. Hulle word goed versorg en die stedelike praktisyn speel 'n belangrike rol in die gemiddelde huis.

Om ons groot stede word ryskole meer en meer algemeen en hulle bestaan kan slegs in belangrikheid toeneem. Dit verwelkom ons almal, want dit prikkel die kind en jonger mense se liefde en belangstelling in diere en so ook 'n respek vir ons bodem, plante en natuur. Diere dra by tot geluk en balans in ons huise.

Ons stedelike praktisyns is goed georganiseerd: hulle het gereelde kontak met mekaar, en hulle is vooruitstrewend en is 'n dinamiese groep. Moderne hospitale wat goed toegerus is, is aan die orde van die dag en dit stel hulle in staat om 'n beter diens te lewer.

Daar is ongelukkig 'n groot deel van ons stedelike bevolking wat derduisende diere nie behoorlik versorg nie. Dit is basies omdat sulke mense nie 'n verantwoordelikheidsin teenoor troeteldiere het nie en hulle nie behoort aan te hou nie. Gelukkig is ons ryklik geseën met goed georganiseerde welsynsorganisasies. Hierdie organisasies is invloedryk en verrig 'n reuse-taak. Dit is ons vurige hoop en strewe dat daar nouer samewerking tussen ons Professie en hierdie organisasies geskep sal word en dat individuele veeartse hulle verpligting in dié verband sal insien en nakom. Ons moet mekaar aanvul en ons wedersydse probleme beter leer ken.

Dit moet aanvaar word dat veeartsenykundige diens aan troeteldiere 'n onmisbare gemeenskapsdiens is. Persele en geboue moet spesifiek ontwerp uitgelê en toegerus wees om sodanige diens te lewer ten einde nie 'n openbare steurnis en gesondheidsrisiko daar te stel nie. Ons stedelike praktisyns vind dit al moeiliker om hierdie persele en fasiliteite te verskaf, want geen dorpbeplanningskema het ooit vir veeartsenydienste voorsiening gemaak nie. Dis een saak wat dringend aandag verdien.

Persoonlik kan ek nie anders as om die veearts nog basies te sien as 'n dienaar, 'n steunpilaar en 'n leier van ons landboubedryf en in besonder ons veebedryf nie. Ek meen ons kan slegs ons probleme en moeilikhede ten volle besef as ons ten volle op hoogte is met die basiese feite van ons landbou-milieu in die algemeen. Die verslag van die Du Plessiskommissie is 'n dokument wat elke veearts en elke boer behoort te bestudeer.

Die Republiek beslaan ongeveer 1,2 miljoen km². Hiervan is 103 miljoen hektaar beskikbaar vir landbou, waarvan 15 persent bewerkbaar is. Van die totaal is 13 persent of 13 miljoen hektaar in die Bantoetuislande. Dit sluit van ons bes bewerkbare gebiede met hoë reënval in. Produksiegewys is hul bydrae 'n absolute minimum. In Desember 1972 het ons totale kapitale belegging in landbou R7 479 miljoen bedra. Ons beesbevolking beloop nagenoeg 11,8 miljoen, waarvan 38 persent in die hande van ons Bantoebevolking is. Ons skape tel vrywel 30 miljoen. Die bruto waarde van ons landbou-opbrengs het van R131 miljoen in 1938/39 tot R1 375 miljoen in 1970/71 gestyg, en ten spyte van alle teenslae bedra dit 9 persent van ons bruto binnelandse opbrengs. Oor dieselfde 31 jaar het die bruto waarde van dierproduksie van 63 miljoen tot 547 miljoen rand gegroei. Landbou-uitvoere staan net terug vir goud. Landbou verskaf werk aan 90 000 blankes en 1,5 miljoen nieblankes. Ten spyte van etlike onvleiende aanmerkings en kritiek wat dikwels op landbou en op ons boere in besonder gemik is, bly boerdery een van ons primêre bedrywe wat sorgsamer aandag verdien. Dit is 'n deel van die veearts se pligte om toe te sien dat elke aspek van die boerderybedryf nie net volgehou word nie, maar verbeter word.

Om ons professie sinvol aan ons veebedryf te koppel, is dit goed om te onthou dat die eerste veeartse hier in 1924 gekwalifiseer het. Hierdie mense was almal deur die Staat vir die Staat opgelei. In daardie jare was dit nodig om die aksent op infeksie-siektes en staats-veterinêre geneeskunde te laat val. Die opleidingskursusse was aangepas soos behoeftes verander het en veral kliniese onderrig het na vore gekom, asook soötegnologie, voedingsleer, ens. Die Staat is vir 30 jaar nie meer die enigste werkgewer nie en huidiglik staan meer as 50 persent van ons lede slegs in die private praktyk.

Een van die grootste uitdagings van vandag is die voeding van die menigtes. Om dit te kan doen, selfs in ons eie land, sal enorme eise aan bodem, plant, boer en wetenskaplike gestel word. Dit kan aangeneem word dat ons as 'n professie met graagte hierdie uitdagings aanvaar en dat ons op die voorpunt sal en wil wees van die veranderde omstandighede wat besig is om momentum te kry. As alle faktore in ag geneem word, steek die landboubedryf m.i. glad nie so danig af teen ander bedrywe soos kritici beweer nie. Dit is wel waar dat die veefaktor binne die landboubedryf nog nie na wense presteer nie. Dit is juis hier waar ons met groter ywer en toewyding moet optree, ons huis in orde moet kry en ons prioriteite moet bepaal.

Eerstens, kan ons onsself afvra of daar genoeg veeartse beskikbaar is. Volgens alle beskikbare informasie en verslae is daar nie. Daar was reeds in 1960 'n geïdentifiseerde tekort van 300. Reeds in 1969 is in die Mönnig-verslag bepaal dat verdubbeling in opleidingsgetalle onderneem moet word. Vanaf 1962 is hierdie Vereniging besig met voorleggings, onderhandelings en onderhoude t.o.v. die owerheid oor hierdie ernstige posisie en sy uitendelike implikasies. Ons het geglo – en hierdie mening bestaan nog feitlik by almal – dat 'n tweede blanke fakulteit 'n saak van dringendheid is en in 'n belangrike behoefte in ons veebedryf sal voorsien. Amptelik was egter besluit dat verdubbeling by die bestaande fakulteit te verkies is.

Dit is nou teleurstellend om te weet en te berig dat ons in

1973 nog nie eens oor die nodige fasiliteite van 45 studente beskik nie, wat nog te sê vir 90. Omdat verdubbeling jare gelede reeds op kabinetsvlak aangeneem was, kan 'n tweede fakulteit nie weer heroorweeg word nie. Die owerheid moet egter besef dat elke jaar se vertraging niks anders as 'n swaarder remskoen aan ons veebedryf is nie. In hierdie vertraging skuil daar pertinente nadele meer as net in blote getalle. Die twee wat kommer wek is die volgende:

1. Die tekort aan veeartse word steeds meer akuut en die gaping tussen vraag en aabod steeds groter. Die gevolg is dat baie werk wat tradisioneel en verkieslik deur 'n veearts verrig behoort te word, noodwendig deur minder goed opgeleide persone of groepe persone sogenaamd „tydelik" verrig moet word.

   Hierdie „Tydelikheid" is in die verlede op baie gebiede as permanent van aard bewys. Dit is nie bedoel as 'n refleksie op hierdie groep nie, want hulle lewer hul beste, maar dit kweek onwillekeurig 'n aanvaarding van dienste of omstandighede wat beter moes gewees het.

2. Die beperkte inname van studente skep die geleentheid tot 'n streng prestasiekeuring vir toelating. Vir 'n universiteit en fakulteit is dit vanselfsprekend 'n baie gunstige posisie, maar ek glo hierin skuil ook besliste nadele. Die ruggraat van 'n professie of beroep bestaan altyd uit 'n normale, hardwerkende, gebalanseerde en gemiddelde klomp mense. Van hierdie jong seuns bly die grootste gros in die slag met die streng keuring en hulle is grootliks vir ons as 'n professie verlore. Is ons werklik oortuig en tevrede dat die prestasie om gekeur te word nie 'n elite-etiket aan persone hang wat hulself dan onwillekeurig 'n valse waarde in lewensbeskouing en verhoudings gee nie? Daar is persoonlikheidseienskappe wat straks van groter waarde in 'n gebalanseerde landsburger is as uitsonderlike akademiese prestasies! Het dit nie tyd geword dat ons, soos ander fakulteite, belangstellings- en aanlegtoetse deur kliniese sielkundiges ernstig moet oorweeg nie? Juis omdat keuring na die eerste jaar gedoen word is dit prakties moontlik om dit tydens die eerste studiejaar te laat doen.

Dit mag oorbodig wees om te beweer dat hierdie Professie die belangrikheid van voortgesette opleiding terdeë besef. Die geweldige vordering op gebied van wetenskap en tegnologie maak dit vrywel onmoontlik vir die gemiddelde veearts om op hoogte te bly van moderne kennis en ontwikkelings. Ons word in gespesialiseerde rigtings gedwing. Die vermoëns van die suksesvolle veearts van die toekoms sal oneindig groter wees as dié van die huidige suksesvolle een.

Dis geensins ongewoon om oorsese spesialiste in ons midde te hê nie. Hulle was al etlike jare vir die Fakultiet, Groepe, Takke en dissiplines beskikbaar. Ek meen dat meer betekenisvolle nut geput kan word uit die besoeke van gesaghebbendes en dat baie van ons eie talentvolle beroepsgenote meer erkening kan geniet.

Geldvoorsiening vir voortgesette opleiding is altyd 'n probleem in 'n klein beroep. Ons is besonder dankbaar jeens besoekende spesialiste, asook jeens bepaalde industrieë, lede en ander vriende wat hierdie programme finansieel ondersteun het. Desnieteenstaande sal ons as professie in die toekoms geroepe word om die hand nog dieper in die sak te steek. Ons hoop ook dat private ondernemings die veeartsenykundige professie in toenemende mate sal ondersteun ten einde ons in staat te stel om ons program van voortgesette opleiding uit te brei.

In die tweede plek moet ons onsself afvra of die bestaande veeartse doeltreffend en maksimaal tot voordeel van ons veebedryf benut word. Die groep wat dan onmiddelik op die voorgrond tree is die landelike praktisyns. Die geografiese distribusie van ons veestapels is aan ons almal bekend. Die relatiewe lae digtheid van veegetalle bring mee dat veeartsenykundige dienste nog nie geredelik binne die bereik van elke veeboer is nie. Op ons owerheid rus 'n swaar verantwoordelikheid om hierdie posisie reg te stel of minstens te verbeter. Dit is ons innige hoop dat die Staat in die toekoms sy weg sal oopsien om staatsveeartsenykundige werk op 'n deeltydse basis onder bepaalde toestande aan landelike praktisyns toe te vertrou. Indien dit gedoen kan word, kan daar eweredige veeartsenykundige dienste tot die beskikking van so-te-sê elke veeboer gestel word. Ons is dankbaar dat die landelike praktisyns tans by sekere amptelike skemas betrek word, maar dit sal nog nie die primêre probleem oplos nie. Dit is ook hierdie groep van veeartse wat hulle vermoëns sal moet inskerp op die veranderinge en eise wat intensifikasie in ons veebedryf aan ons gaan stel. Die toekoms vereis van die veeboer om meer produkte met minder grond te produseer; die antwoord lê beslis nie in veel groter veegetalle nie. Dit lê veral in bewaringsboerderypraktyke, intensifisering, doeltreffende reproduksie en produksie, asook in 'n intieme kennis van die grond, plant en dier en aanverwante aspekte van die boerdery. In hierdie bedeling tree die veearts as voorbehoedende geneeskundige onmiddelik op die voorgrond en verskuif die behoefte aan 'n klinikus wat enkele siek diere genees na dié van 'n konsultant vir dierege-sondheid en -produksie.

Ons moet dit aanvaar dat die veeboer vandag voor groot uitdagings en probleme staan. Die dae van die ondoeltreffende boer is getel en 'n kleiner getal gróót boere sal steeds meer en meer op 'n geïntegreerde basis produseer. Hierdie boere of groot instansies is ingestel op die doeltreffendheid van hulle kuddes of groepe diere in geheel. Hulle het weinig belang in die enkele dier, behalwe dat hy verwyder moet word as hy nie presteer nie. Die doeltreffendheid wat hier nagestreef word is slegs moontlik as gesonder advies van die konsultant-veearts ontvang word en dit is die veearts se plig om ten volle met al die komponente van optimale produksie op hoogte te wees.

Dis betekenisvol dat 97 persent van alle plaasprodukte deur 60 persent van die plaaseenhede in ons land gelewer word; die orige 40 persent se bydrae is maar 'n skamele drie persent. Die persentasie produserende eenhede sal steeds verminder, wat sal beteken dat selfs groter eise aan ons kennis en tegniese advies en dié van verwante groepe gestel gaan word.

Boerdery is nie meer 'n leefwyse nie, maar word streng 'n besigheidsonderneming. Dus is groter doeltreffendheid in elke opsig 'n voorvereiste vir die sukses van elke boer. Die veearts het 'n bykomsige rol in die landbousektor te vervul, naamlik dié van opvoeder. Volgens die Du Plessis-kommissie se verslag het 60 persent van alle blanke boere 'n opvoedingspeil later as standerd 8; 2,9 persent het standerd 1 of 'n diploma en minder as twee persent 'n graad. Ek sien dit as een van ons eerste pligte om aktief deel te neem aan verspreiding van kennis onder die boerderygemeenskap. Ons moet 'n aktiewe rol speel op landboukongresse, boeredae, dierklinieke, kortkursusse, tentoonstellings, ens. Gelukkig word boere vandag beter opgelei en is hulle meer wetenskaplik gerig. Dis veral hierdie groep wat 'n meer doeltreffende beheer oof landbou kry en indirek 'n aanspraak op die veterinêre professie.

Aangaande vleishigiëne het die Regering gedurende 1965 besluit dat die afdeling Veeartsenydiens die sentrale beheerliggaam van 'n doeltreffende, landswye vleisinspeksiediens sou word. Dis nou duidelik dat die Afdeling ook groter plaaslike vleisinspeksiediens by abattoirs onder beheer van die Abattoir-kommissie, asook by etlike private slagplase huidig onder konstruksie, moet verskaf. Wetgewing van 1967 en 1969 het verantwoordelikheid vir vleishigiëne op die veeartsenykundige professie geplaas. Tog is in 1973 die toepassing van die Wet op Higiëne by Dierslag, Vleis en Dierlike Produkte Nr. 87 van 1967 slegs beperk tot 17 groot, sentrale abattoirs. Die neiging tot ontwikkeling van 'n veterinêre rubberstempelvleisinspektoraat, met pligte gedelegeer aan vleisinspekteurs en abattoirsuperintendente, moet ten alle koste vermy word. Wet 87 van 1967 moet dringend oor die hele Republiek uit-

gebrei word ten einde die hoogs moontlike standaarde van vleisinspeksie en higiëne te verseker.

Maatreels word vereis om die talle voltydse veterinêre higiëniste, wat nodig is om Wet 87 toe te pas, te trek. Deeltydse veeartsenykundige aanstellings moet oor die hele land gemaak word om alle slagplase doeltreffend te dek. Etlike jare reeds het 'n chroniese tekort aan vleisinspekteurs by meeste abattoirs ernstige belemmering van 'n doeltreffende vleisinspeksiediens veroorsaak. Die konsepleerplan en voorgestelde nuwe kursus vir vleisinspekteurs lê reeds jare ter oorweging by die sentrale outoriteite sonder tasbare tekens van vordering. Behoorlike fasiliteite vir opvoeding en opleiding van 'n doeltreffende vleisinspektoraat vir die Republiek is dringend nodig. Hierdie en baie ander gedugte moeilikhede, wat uit die oorname aan vleishigiëne spruit, staar die veeartsenykundige professie in die gesig. Flinke en doeltreffende optrede is nodig, sodat die Professie nie onder ongunstige menings en aan verlies van openbare agting ly nie.

Ons lewe in 'n era van 'n veranderde wêreld. Die reuseveranderings en vorderings in wetenskap en tegnologie vereis veranderings en aanpassings van elkeen wat 'n nuttige bydrae tot dieregesondheid en produksie wens te maak. Dis 'n aanvaarde feit dat landbou oor die algemeen langsaam en selfs teësinnigis om aan te pas en veranderings toe te pas. Dit is belangrik om daarop te let daar tweëerlei reaksies op verandering is. Enersyds is daar die positiewe, tersaaklike reaksie, andersyds die negatiewe, die vernietigende tipe. Laasgenoemde word veral gekenmerk deur negatiewe kritiek wat teen mense, leiers en hul inrigtings gemik is. Dit word oor die algemeen gekenmerk deur halwe waarhede en skewe bewerings wat agterdog en wantroue saai, en lojaliteit en krag ondermyn. Dit is 'n wêreldverskynsel en 'n simptoom van die wêreld waarin ons vandag lewe. Ek vertrou dat ons as Professie en diegene wat ons dien altyd in staat sal wees om tussen positiewe voorstelle en negatiewe neigings te onderskei.

Ons is numeries eintlik maar 'n klein professie en boonop is ons binne die professie wyd gediversifiseer. Diversifikasie kan 'n bron van krag wees, maar dit kan ook lei tot onderlinge versnippering en verswakking. Ons toekoms kan slegs beveilig en verseker wees as ons as 'n groep saam staan en saam werk in diens van ons veebedryf. Diversifikasie en spesialisasie bring groepbelange sterk op die voorgrond, maar ons kan in ons eenheid van doel, strewe en diens slegs slaag as ons ook werklik in mekaar se aktiwiteite belangstel.

Ek wil afsluit deur hierdie Vereniging en hierdie Kongres se hartlike gelukwense oor te bring aan die Entstofnavorsing en produksiespan van die Navorsingsinstituut vir Veearsenykunde op Onderstepoort. Die Instituut het vanjaar die Goue Medalje van die Geassosieerde Wetenskaplike en Tegniese Verenigings van Suid-Afrika vir hoogstaande wetenskaplike en tegnologiese prestasies verwerf. Aan die Hoofdirekteur, die Instituut-direkteur en die hele personeel wil ons sê: hartlik geluk met hierdie besondere onderskeiding; ons is almal trots op u.

BIENNIAL SCIENTIFIC CONGRESS and 68th ANNUAL GENERAL MEETING UNISA, PRETORIA, 15-19 OCTOBER, 1973

PRESIDENTIAL ADDRESS: A.B. LA GRANGE

At an occasion as this it is the pleasure and privilege of the President to give expression to matters affecting the profession and the sectors it serves, as well as some personal thoughts and opinions on aspects he may regard as relevant. This is not an easy matter, for at present our profession can be divided in no less than ten separate disciplines, the activities of which cover a wide spectrum. It is impossible, alas, to believe and to expect that our remarks tonight will cover all these groups, even less so that they will find all-round favour.

To bring order to my train of thoughts, I wish to distinguish but three components and to refer briefly to each.

1. The group of urban practitioners.
2. The various groups directly or indirectly concerned with a number of facets bearing on agriculture, for example, research, veterinary field services, rural practioners, those in industry, those concerned with reproduction and production and those in public health services.
3. Those concerned with education.

The first group in general fares well; our urban practitioners render an excellent and indispensable service. The majority of our city-dwellers today still hail from the soil. They have an inherent love for domestic animals and often treat them as part of the family. Such animals are well treated and the urban practitioner plays an important rôle in the average household. In the vicinity of our larger cities riding schools are becoming more and more common and their importance can only increase. This is to be welcomed, because it fosters in our children and young people a love for, and an interest in, animals and consequently in our soil, plants and nature. Animals contribute to the happiness and balance in our homes.

Our urban practitioners are well organized: they make regular contact with one another and constitute a dynamic group. Modern, well-equipped hospitals are in the order of the day and enable them to render better services.

Unfortunately, of our city dwellers a large proportion does not care properly for thousands of animals, because basically they do not have the sense of responsibility towards their pets and should not keep them. Fortunately we are richly blessed with well-organized welfare organizations. These organizations

are influential and perform a major task. It is our earnest desire that a closer co-operation shall be created between our profession and these organizations and that individual veterinarians will realize their commitments in this respect and fulfil them. We must complement each other and become better acquainted with each other's problems.

It must be accepted that veterinary services to small animals is an indispensable community service. Premises and buildings must be specifically designed and equipped to provide this service in order not to constitute a public nuisance and health hazard. Our urban practitioners are finding it increasingly difficult to create these premises and facilities, for no town planning scheme has ever allowed for veterinary services. This is one aspect which needs urgent attention.

Personally I cannot but see the veterinarian as a servant, a pillar of support and a leader of our agricultural industry in general and our livestock industry in particular. I feel that we can only fully appreciate our problems and difficulties if we are conversant with the basic facts of our agricultural milieu in general. The report of the Du Plessis Commission is a document every veterinarian and every farmer should study.

The Republic is roughly 1,2 million km² in size. Of this, 103 million hectares are available for agriculture. Of this 15 percent is arable. Out of the total area, 13 per cent or 13 million hectares are in Bantu homelands. This includes some of our best arable areas with the highest rainfall. Production-wise their contribution is an absolute minimum. In December, 1972, our total capital invested in agriculture was R7,479 million. Our total cattle population has grown from R131 million in 1938/9 to R1,375 million in 1970/71 and in spite of all adversities accounts for 9 per cent of our gross domestic product. Over the same 31 years, the gross value of animal production has grown from 63 million to 547 million Rand. Agricultural exports are second only to gold. Agriculture employs 90 000 whites and 1,5 million non-whites.

In spite of many unsavory remarks and criticisms frequently directed at agriculture and at our farmers in particular, farming is still one of our prime industries which should be looked after better. It is part of the veterinarian's duties to see to it that the quality of every aspect of the farming industry is not only maintained, but improved upon.

To relate our profession to the animal industry, it should be borne in mind that the first veterinarians qualified here in 1924. They were all educated by the State for the State. In those years it was essential to emphasize infectious deseases and state veterinary medicine. The training courses were adapted as the needs changed and clinical teaching came well to the fore, as did Zootechnology, Nutrition, etc. Over the past 30 years the State is no longer the sole employer and presently more than 50 per cent of our members are solely concerned with private practice.

One of the greatest challenges today is the feeding of the masses. To do this, even in our own country, will make enormous demands on soil, plant, farmer and scientist, It can be accepted that we as a profession will accept the challenge readily and that we wish to be in the vanguard when the changed circumstances start gaining momentum.

When all aspects are considered, the agricultural industry in my opinion does not compare so unfavourably as some critics aver. It is true that the performance of the animal factor within the agricultural industry has not attained the desired level. It is here where we have to act with greater diligence and dedication, put our house in order and determine our priorities.

First of all we should determine whether there are sufficient veterinarians. According all available information and reports this is not the case. Already in 1969 the Mönnig Report indicated that a doubling of veterinary student intake should be undertaken. Since 1962 this Association has been busy with representations to and discussions and interviews with the authorities with regard to this serious situation and its eventual implications. We believed – and this opinion is still held by the majority – that a second faculty for whites constituted at matter of urgency and would supply an urgent need in our livestock industry. Officially it has been decided, however, that doubling of the present faculty is the procedure of choice.

It is disappointing to realize and to state that in 1973 we do not even have the necessary facilities for 45 students, let alone 90. Because doubling of the present Faculty had already been accepted years ago at Cabinet level, a second faculty cannot be considered. The authorities must realize, however, that every year of procrastination puts a heavier brake on our livestock industry. This delay holds more disadvantages than merely one of numbers. The two that cause concern are the following:

1. The shortage of veterinarians is becoming more acute and the gap between demand and supply an ever-widening one. Consequently, work traditionally and preferably entrusted to veterinarians perforce has to be done by less well-trained persons or groups on a so-called 'temporary basis', a type of arrangement the past has shown in many spheres to attain a permanent character. This is not meant as a reflection on such groups, because they do their best, but it willy-nilly creates an acceptance of services or circumstances which should have been more favourable.

2. The limited intake of students creates the opportunity for strict selection for entry on the basis of academic achievement. For a university and faculty this obviously creates very favourable circumstances, but I believe that it hides definite disadvantages. The backbone of a profession always consists of normal, hard-working, balanced, average people. Of these young men, the majority fails to make the grade in the face of strict selection and such men are lost to the profession. Are we truly convinced and satisfied that the achievement to be selected does not attach an elite label to persons who then subconsciously generate false values in their outlook on life and relationships? There are personality traits which yet may be of greater value in a balanced citizen than exceptional academic achievements! Has the time not come that, as in other faculties, interest and adaptability tests by clinical psychologists should be considred seriously? Because selection is undertaken after the first year

of study, it is practicable to have such tests undertaken during that year.

It may be superfluous to state that this profession is acutely aware of the importance of the rôle of continued education. The tremendous advances in science and technology in general make it virtually impossible for the average veterinarian to keep abreast of, or even up to date with, modern knowledge and developments. We are being forced into avenues of specialization. The capabilities of the successful veterinarian of the future will be infinitely greater than those of the present successful one.

It is by no means rare to have overseas' specialists in our midst and they have been available to the Faculty, Groups, Branches and disciplines for some years. I feel that more meaningful use could still be made of visiting authorities as well as giving recognition to many of our own talented members.

Financing continued education is always a problem in a small profession. We are indeed deeply indebted to the visiting specialists, as well as to certain industries and our members and friends who have supported these programmes financially. Nevertheless, we as a profession will be called upon to delve deeper into our pockets in the future. We also hope that private enterprises will assist the veterinary profession increasingly to enable us to expand our programme of continued education.

In the second place we must ask of ourselves whether existing veterinarians are being used to maximum benefit of our livestock industry. The group immediately concerned is that of rural practitioners. The geographic distribution of our stock is known to all of us. The relatively low density of livestock numbers has the effect that veterinary services are not within reach of every stock farmer. On the authorities rests the onerous responsibility to correct this position or at least to ameliorate it. It is our sincere hope that the State will see its way clear to entrust state veterinary services to rural practitioners under specific circumstances on a part-time basis. If this could be done, an even distribution of veterinary services could ensure their availability to virtually every stock farmer. We are grateful that rural practitioners are already involved in certain official schemes, but this will not solve the basic problem.

It is also this group which will have to enhance their abilities and adapt them to the demands created by intensification in the livestock industry. The future requires the stock farmer to produce more on a smaller area: the answer does not lie in greater numbers of stock. It is to be sought rather in conservation farming practice, intensification, efficient reproduction and production, as well as an intimate knowledge of soil, plant and animal and related aspects of farming. In this set-up the veterinarian will function as exponent of preventative medicine and the need for a clinician treating the individual sick animal will recede in favour of that for a consultant in animal health and production.

We must accept that the stock farmer is faced today with major challenges and problems. The days of the inefficient farmer are past and a smaller number of farmers will produce more and more on an integrated basis. These farmers or large concerns are keyed to productivity of their herds or groups of animals as a whole. They will have little interest in the individual animal, except when it has to be culled when it fails to make the grade. The efficiency striven for can only be achieved if sound advice is obtained from the consulting veterinarian; it will be the latter's duty to become fully conversant with all the components of optimal production.

It is quite significant that 97 per cent of all farm produce is being produced by 60 per cent of the farming units in our country; the remaining 40 per cent only contributed a mere three per cent. This percentage will still decrease, this means that even greater demands will be made on our knowledge and technical advice and that of related groups.

Farming is no longer merely a way of life but it is becoming strictly a business undertaking: therefore greater efficiency in every sense of the word is a prerequisite to success for every farmer. The veterinarians have an educational duty. The Du Plessis Commission has reported that 80 per cent of all white farmers have less than a standard 8 level of education; 2,9 per cent have standard 10 or a diploma, and less than two per cent a degree. I see it as one of our prime duties to actively participate in the dissemination of knowledge to the farming community. We must play an active rôle at agricultural congresses, farmers davs, animal clinics, short courses, shows, etc. Fortunately, farmers are being trained better and are more scientifically orientated lately. It is this group in particular that is getting a more efficient control of agriculture and also indirectly a claim on the veterinary profession.

Concerning meat hygiene the Government decided during 1965 that the Division of Veterinary Services should become the central controlling authority of an efficient, country-wide meat inspection service. It is now evident that the Division must also provide greater local meat inspection services at abattoirs controlled by the Abattoir Commission, as well as at the many private abattoirs now in course of building. Legislation of 1967 and 1969 conferred upon the veterinary profession responsibility for meat hygiene. Despite this, in 1973, the application of the Animal Slauther, Meat and Animal Products Hygiene Act No. 87 of 1967 is still limited to 17 large central abattoirs. The tendency for a rubber stamp veterinary meat inspectorate to develop, with duties being delegated to meat inspectors and abattoir-superintendents, must be prevented at all cost. Act 87 of 1967 should be urgently extended over the whole Republic to ensure the best possible standards of meat inspection and meat hygiene.

Measures are required for attracting and training the many full-time veterinary meat inspectors needed to administer Act 87. Part-time veterinary appointments must be made throughout the country to cover all abattoirs effectively. For many years a chronic scarcity of meat inspectors at most abattoirs has presented grave problems in maintaining an efficient meat inspection service. The draft syllabus and projected new course for meat inspectors have been under consideration by the central authorities for years without tangible evidence of progress. Proper facilities for educating and training an effective establishment of meat inspectors for the Republic are urgently needed. These, and many other formidable difficulties arising from taking over meat hygiene, confront the veterinary profession. Prompt and effective action is needed so that the Profession

does not suffer adverse reflections and loss of public esteem.

We live in the era of a changing world and this is also true for the veterinary profession and those we serve. The enormous changes and advances being made in science and technology necessitate changes and adaptions imperative for everybody who wishes to make a useful contribution to animal health and production. It is an accepted fact that agriculture in general is slow and even reluctant to adapt to and implement changes. It is important to note that in this changing era there are types of reaction to change. One is relevant to the position and is positive but the other is negative and destructive. The latter is frequently characterized by negative criticism directed at people, leaders and their institutions. It generally consists of half truths and slanted statements that sow suspicion and mistrust, and undermine loyalty and strength. This is a world phenomenon, a sympton of the world in which we live. I sincerely trust that we as a profession and those we serve will always be in a position to differentiate between positive suggestions and changes and those that are negative.

Numerically we are a small profession, which, moreover, is widely diversified. Diversification can be a source of strength; it can also lead to internal dissolution and weakening. Our future can only be assured and safe if we stand together and co-operate in service to our livestock industry. Diversification or specialization accentuate group interests, but we can only succeed in our unity of purpose, endeavour and service if we truly are concerned in each other's activities. I wish to conclude by conveying the sincerest congratulation of this Association and this Congress to the Vaccine Research and Production Team of the Veterinary Research Institute at Onderstepoort which has been awarded the Gold Medal of the Associated Scientific and Technical Societies of South Africa for its excellent scientific and technological achievements. To the Chief Director, the Director of the Institute and the whole personnel we say: heartiest congratulations with this unique distinction; we are all proud of you.

SERIAL PUBLICATIONS — PUBLIKASIEREEKSE

APPLIED ANIMAL ETHOLOGY

An International Scientific Journal reporting on the Application of Ethology to Animals used by Man is announced as a new journal from Elsevier.

The journal will deal with all animals domesticated in any way. Subjects will range from mammals (cattle, pigs, horses, sheep, goats, camels, dogs, cats, deer, fur-animals, etc.) through birds (poultry, cage birds, racing-pigeons) to insects (honey-bees). It will aslo be concerned with feral relations of domesticated animals, animals living in zoos and safari parks and animals on the perimeter of domestication (red deer, wildebeest, eland, etc.). Experiments with laboratory animals will only be included if the results obtained are of direct relevance to the understanding of domesticated animal behaviour.

Besides carefully designed ethological studies in depth, this new journal will accept carefully documented behavioural data – often gathered as a side result to agricultural or veterinary studies.

Applied Animal Ethology will be of interest to those working with domesticated animals (agricultural scientists, veterinarians and zoologists), with animals in zoos and safari parks and with wild animals (ecologists, conservationists, curators).

It is planned to include original scientific papers on such topics as:

– The functions of behaviour
– Inter-relations between the behaviour of the animal and management systems
– The relationships between artificial selection for production traits and the behaviour of the selected stock
– Behaviour of zoo animals
– The relationship between behaviour of domestic and zoo animals.
– Experiments on laboratory animals with a direct bearing on the problems of domesticated animal behaviour
– Domestication and the maintenance of viable ecological balance in man-controlled environments
– The application of ethology to problems of animal conservation and population control
– Relationships between man and companion animals
– Studies on the development of behaviour
– Evolution of behaviour and the history of domestication
– The training of animals, both domesticated and wild
– Abnormal behaviour
– The behaviour of animals with clinical conditions

Mr. A.F. Fraser (Royal School of Veterinary Studies, Department of Veterinary Reproduction, University of Edinburgh, Edinburgh, Great Britain) bas been appointed Editor-in-Chief of the new journal. Dr. D.G.M. Wood-Gush (Poultry Research Centre, West Mains Road, Edinburgh, Great Britain) will be Associate Editor. They will be assisted by an international Editorial Advisory Board, made up of experts in the field.

Manuscripts should be submitted in triplicate to:

The Editorial Office
Applied Animal Ethology
P.O. Box 330
Amsterdam
The Netherlands.

Papers should be in English.

Fifty reprints will be provided free of charge. There are no page charges.

The subscription price is Dfl. 82.00 (ca. US $29.80) per volume, plus Dfl. 8.50 (ca. US $3.10) for postage.

Applied Animal Ethology will be published quarterly, four issues constituting one volume. The first issue is expected in the third quarter of 1974.

Further information and free sample copies are available from:

Elsevier Scientific Publishing Company
P.O. Box 211
Amsterdam
The Netherlands

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ARNOLD THEILER

MEMORIAL LECTURE

GEDENKLESING

CURRENT CONCEPTS IN VETERINARY EDUCATION*

Professor Sir ALEXANDER ROBERTSON**

Preamble:

When Professor Hofmeyr suggested that I take veterinary education as the topic for this Arnold Theiler Memorial Lecture, I was somewhat surprised; for Sir Arnold's outstanding record in elucidating and helping to bring under control many obscure and seemingly intractable animal diseases, and his obvious expertise amounting almost to genius in many, if not most branches of veterinary science, have tended to obscure the fact that he was also eminent in the educational field. When entrusted around 1918 with the establishment of veterinary education in South Africa he drew up a syllabus for a five year course based on Onderstepoort and its staff, since he believed that students should share in the activities of active research workers – a belief which was novel in that day and age but one which is now widely accepted throughout the educational world.

Certainly when in the early twenties Theiler became the first Dean of the first veterinary faculty in this country, he put his precepts into operation in a way which has not only survived the test of time but has served this country well for more than half a century. It is time, of course, that his dictum about the student's main requirements being a Bible, a Pleximeter and a Corkscrew may have undergone some modifications. The Pleximeter has doubtlessly been replaced by more complicated and more expensive gadgetry; and the Bible, also, has probably been supplanted by Blood and Henderson – or in this context perhaps I should say Henning! But the corkscrew, I was glad to note, is still regarded, here as elsewhere, as a valuable asset by members of our profession!

Coming to such an experienced, and indeed eminent, veterinary faculty, it was clearly unlikely that I could tell you much that was new or much that would be of value. Nevertheless, being involved at the moment in discussions on veterinary educational problems, I thought it might be at least of some interest to learn the gist of what your counterparts in Britain are thinking and saying on these matters; but I should make it clear, right from the start, that as yet we have no panacea for our own ills and it is unlikely, therefore, that anything I have to say will be of much help with yours.

A phenomenon which I have noted with considerable interest in nearly forty years concerned more or less actively with veterinary education has been a periodic urge in faculties to re-organize their curricula. This bears some semblance to an epidemic disease in that it occurs at fairly regular intervals; it is as least in part like an inflammatory reaction characterized by heat and occasional pain, though perhaps the redness and swelling may not be so obvious; it certainly takes up a great deal of time of a great many people, often to little avail, as the more startling proposals usually tend to cancel each other out and at the end the faculty is usually left with a curriculum remarkably like that with which it started; and it leaves behind a considerable amount of immunity but with presumably some residual infection so that when a sufficiently large susceptible population is again built up, usually with the acquisition of new staff, the phenomenon reappears.

Like all classical epidemics, this can occur occasionally in pandemic form, when the urge to change appears in many veterinary faculties in many different countries at about the same time; and there are indications that we are in one of these phases just now. In Britain, as you know, we have a Government Committee of Inquiry into the Veterinary Profession charged with looking into its future rôle and educational requirements; and more or less analogous investigations are being conducted in many countries – in Europe and North America and even as far afield as Australia. Is this mere imitativeness or is it the result of some mutation of the normal virus resulting in a sort of mass hysteria amongst veterinary academics, or is there some fundamental common factor stimulating thinking people in so many different countries to look critically at accepted concepts and accepted methods.

One of the ideas on which I was nurtured was to the effect that if a simple explanation would suffice there was no need to look for a more complicated one. In this case there is, of course, a simple explanation, namely, the changing rôle of our profession both in range of services and in the degree of specialized knowledge required. To take Britain as the region with which I am most familiar, the complete, or almost complete, elimination of a number of the major clinical diseases has left behind less spectacular but still important problems, often multifactorial in aetiology which frequently cannot be dealt with adequately by the classical clinical approach or by the conventional test and slaughter blunderbuss of traditional prophylaxis.

To control bovine mastitis, for instance, which is still responsible for serious financial loss to our dairy industry, demands an understanding of bacteriology, a detailed knowledge of milking machines and milking techniques and a realization of the possible effects of breeding, housing and management on its incidence. Similarly, respiratory diseases in our farm livestock present an enormous problem in which infective agents, building design, ventilation arrangements and temperature control all have a part to play. Moreover, the development of large and more intensively managed livestock units is leading to an increasing appreciation of the advantages of preventive medicine procedures applied on a flock or herd basis as contrasted with the traditional treatment of the individual sick animal. At the same time the increasing affluence of our modern society, despite the protestations of politicians and trade union leaders to the contrary, has led to a steady increase in the demand for greater veterinary care of domestic pets and of animals for recreation, both often calling for sophisticated diagnostic and therapeutic techniques; and there has been an increasing need for veterinary surgeons to play a part in a wide variety of tasks such as artificial insemination, ova transplantation, food hygiene, toxicology, laboratory animal management, and even fish farming. Thus the range of careers open to veterinary graduates now varies from the highly technical clinical specialist on

*Presented at the University of Pretoria on Tuesday, 16 October, 1973.

**Faculty of Veterinary Science, University of Edinburgh

the one hand to the pure administrator on the other; and between these two extremes are many others including general diagnosticians, research scientists, animal health advisers and meat inspectors. It is this changing and widening rôle of our profession, both in the range of services required of it and in the degree of specialized knowledge these entail, that is making the profession in so many countries conscious that some modification of educational facilities and arrangements may well be required.

This is an understandable trend and a healthy one. But at the risk of being regarded as something of a reactionary, I would like to interpolate here a word of caution. Amid the discussion and the criticism of both past and present veterinary training, it should be borne in mind that it has produced people who have coped successfully with the challenge of continuing change in many aspects of veterinary work. The increasing sophistication of small animal practice, the growth of laboratory diagnostic services, the development of preventive veterinary medicine as well as increasing activity in numerous fields of research have all been achieved by people trained under the present system. It cannot, therefore, be as out-moded as some would have us believe; and I sometimes wonder whether the ideal curriculum at which the more enthusiastic reformers aim is not rather like the pot of gold buried under the end of the rainbow. Certainly, if it were possible to devise an ideal curriculum I suspect it would very soon cease to be ideal; and as a Dean I found it often more fruitful to be modifying teaching arrangements to make the best use of the talents of the staff I could get than to design the perfect arrangement and then search, probably in vain, for staff with the necessary outlook and abilities to carry it through. I sometimes wonder, therefore, whether the best solution would be to allow our veterinary schools more freedom to experiment with different arrangements than is readily possible under most professional registration systems. However that may be, we would all agree, I am sure, about the desirability of adapting courses to meet fundamental and lasting changes in requirements.

Some critics take the view that our graduates are not as good as they used to be. Though there may be some truth in this, I suspect the real answer is that they never were! The blame for this supposed deterioration is usually laid at the door of faculty selection of entrants, too much emphasis, it is often said, being placed on school performance and not enough on personality and on practical ability for the type of work a graduate will eventually be called upon to do.

Certainly at the time I entered the "Dick Vet.", as it was affectionately known, all applicants – usually totalling 25 to 30 a year – were accepted if they had even a modicum of education and ability – often one must admit on very flimsy certification but equally often supported or sponsored by some practising member of the profession. But the saving grace undoubtedly lay in the fact that only those who really wanted to be veterinary surgeons applied: motivation can help overcome many disabilities. Nowadays, British Veterinary Schools get many hundreds of applicants all of whom want for various reasons to get into University and most of whom feel or have been advised that this avenue offers the best chance of acceptance; and just how many of those really want to practise veterinary surgery is anybody's guess. But what to do about it and how to pick out the really motivated is quite another matter. I am sure we would all welcome some fool-proof method of selection on likely suitability for a veterinary career but this is a problem to which I certainly do not have the answer – if indeed there is one. The undergraduate veterinary course is both long and demanding, covering a wide range of subjects, all of which are important to an adequate understanding of animals in health and disease; and whatever may or may not be the practicability of selecting students in terms of their future suitability as qualified veterinary surgeons, we have at least a clear obligation to select those who are likely to have a good chance of graduating; it is therefore desirable that applicants should have both wide general knowledge and reasonably good academic ability. In the absence, therefore, at least so far, of any really effective method of selection for vocational aptitude, there seems little reason to depart drastically from our current methods of selection based on academic performance and teacher assessment, supplemented possibly, where practicable, by personal interview. Such methods, for all their theoretical weaknesses, have appeared to work reasonably well so far in selecting students with sufficient ability to complete the course satisfactorily – and some of those appear to have become useful members of our profession either in spite of or possibly because of inadequate selection procedures!

It is generally accepted that while veterinary undergraduate courses should be related to vocational aims, they must have a sound scientific basis; and accepting this concept, most courses are planned to cover initially the scientific study of the healthy animal followed by a study of animal diseases, their clinical manifestations and the methods which can be used to ameliorate, cure, or eradicate them. Because of this dual content, about which there seems fairly general tacit agreement, some have felt that the veterinary undergraduate course could usefully be made a two-tier one with a three year study of the bio-veterinary and preclinical sciences plus possibly some of the more basic parts of the paraclinical subjects leading to a first degree; and then a two to three year study of applied aspects of the paraclinical subjects which, along with the usual clinical subjects, would lead to a professional degree. There is some logic in this, since British Universities at any rate accept an intercalated year leading to an honours science degree in one of the preclinical sciences which implies that students already attain a general B.Sc. standard in the main subjects of the preclinical sector. It is argued, therefore, that this should be recognized by an ordinary B.Sc. degree at the end of three years of such study – which incidentally would have the merit of allowing those unwilling or unsuitable to proceed to a professional career to break off at this stage with at least something to show for their efforts.

Various elaborations of this have been mooted, including a common science course in veterinary medicine, agriculture and the biological sciences, or even a common initial training for all students of biology and applied biology, including agriculture and veterinary and human medicine, but such

changes would obviously involve quite drastic modifications in the outlook of many university faculties and many university administrators; in so far as Britain is concerned, therefore, they are, and seem likely, to remain for some considerable time, little more than a pipe dream – or, so some might say, nightmare!

Whatever organizational changes there may be, undergraduate education, while providing a sufficient degree of training to enable the new graduate to embark on his career, should be general enough to provide a reasonable understanding of the enlarging horizons of professional work and should also prepare the graduate to proceed, should he so desire, to some degree of post-graduation specialization; hopefully it would at the same time foster the desire to learn and to that end engender a continuing spirit of enquiry. In other words, it should encourage him to think as well as giving him something to think about. There will always be a need for instruction in the basic sciences in a biological context, whether this is undertaken before or after entry to a veterinary course. In either event, this leads on to the veterinary course proper, with a study of structure and function, whether undertaken, as used to be largely the case, in separate departments or taught as a co-ordinated course in a unified department of preclinical studies which may also encompass at least the more fundamental aspects of pharmacology. And as an increasing proportion of students tend to come from largely urban backgrounds with little or no inbuilt knowledge of agriculture, it is important that they should be brought into contact with animals and their environment at as early a stage as possible in their undergraduate training.

This section leads on usually to what have been traditionally known as paraclinical studies, a somewhat vague if impressive term used to include all those subjects – pathology, microbiology and parasitology, plus occasionally animal husbandry and pharmacology – which are interpolated between the pre-clinical sciences and the clinical subjects. Pathology, microbiology, parasitology and pharmacology are obviously of fundamental importance to an understanding of the causation, manifestation and treatment of disease so that a thorough grasp of these subjects is essential to the understanding of clinical medicine and surgery. The animal husbandry component, though also important, comes into a somewhat different category. The veterinary graduate must have a basic understanding of the structure and function of the industry he has to serve. He must also be familiar with the general patterns of flock and herd management prevalent in the area in which he has to work, as these will not only have an influence on the problems with which he has to deal, but will also frequently impose considerable limitations on what he can do. Thus a sound general knowledge of the aims and activities of animal owners – be they farmers, dogbreeders, racehorse owners or mink raisers – how they breed, feed, house, handle and market their livestock, is an essential component of the veterinary curriculum. Moreover, the various aspects normally included under the term Animal Husbandry have an important bearing on the occurrence, control and prevention of both clinical and subclinical disease and on the maintenance of health. As such, they are of fundamental importance to the understanding and the application of preventive medicine measures so that they also require to be co-ordinated with clinical studies.

The clinical section of the course, traditionally devoted to medicine and surgery with reproduction or as some now call it, genesiology, included either as part of surgery or as a separate subject, is mainly concerned with the study of all aspects of disease in animals –aetiology, diagnosis, treatment and prophylaxis; and it has always been a formidable task to deal with this adequately in the time available even when, as so seldom happens, adequate supplies of clinical material are readily available. Moreover, nearly forty years ago a committee on veterinary education in Britain criticized veterinary schools as failing to develop concurrently with the training in curative medicine a sufficient appreciation of preventive medicine, but developments in this field have been slow and sporadic. If, as seems likely, there is to be increasing intensification of livestock production, farmers will increasingly require veterinary advice couched in terms of preventive medicine in its widest sense, including not only the prevention of disease but also the promotion of health and productivity. If at the same time the student has to master the intricacies of the more sophisticated techniques applicable in companion animal practice, and if all the additional subjects suggested as now necessary, – economics, population genetics, farm management, ecology, ethology, fish farming, laboratory animal medicine and exotic animal management, to mention but a few – are to be incorporated, either the undergraduate course must be extended or something has to be discarded or some degree of selection and specialization introduced.

In view of the increasing content of knowledge which a veterinary curriculum is expected to include in order to achieve the broad general training which has been considered desirable, it certainly seems unlikely that the customary five years of study can be reduced; but on the other hand economic and social pressures are likely to put an upper limit of about six years to the period that can be devoted to undergraduate training. Moreoever, the growing diversity of veterinary work is such that some degree of specialization seems certain to become increasingly necessary. There are those who believe that this could be usefully introduced at the undergraduate stage, if only to avoid the time and effort devoted by students to the study of subjects of which little or no use may be made in their subsequent careers; and certainly the availability of options in the later years of the course could have advantages in allowing of the production of specialist graduates within the conventional 5 - 6 years veterinary course. It is generally felt, however, that many, if not most, undergraduates are too uncertain of their ultimate professional inclinations to ask them to take a more or less irrevocable decision at such an early stage; and it is suggested that a curriculum common to all undergraduates makes for professional cohesion as well as allowing for a wider choice of subsequent careers.

This is no doubt true; though some are inclined to wonder whether a limited degree of specialization

through the use of "electives" in the later stages of the course might not be introduced without creating undue difficulty for the undergraduate or the teachers, but such suggestions have made little headway so far in British Veterinary Schools. Unless, therefore, the undergraduate course is to be protracted further than most of my colleagues think is wise, in the absence of undergraduate specialization the course has to aim at providing a graduate who can start on his career immediately after graduation with a general understanding of clinical, therapeutic and prophylactic methods, plus at least an introduction to state medicine and public health.

The necessary specialization must then be a function of postgraduate training and experience. Even this, many feel to be difficult with the increasing growth of knowledge to encompass in the time available and that those destined for general practice should also undergo some specialized training of an in-service type in the form of post-graduation, pre-registration clinical experience, the idea being that new graduates would be given provisional registration which would allow them to be employed; but that full registration allowing them to branch out on their own would be witheld until they had spent a period, say six months, in general practice to the satisfaction of their employer. The protagonists of this view-point claim that it would only be legalizing what already happens, since it is widely believed that, for the first six months of his professional life at any rate, the new graduate is largely an apprentice learning many practical aspects which it has not been possible to inculcate thoroughly in his undergraduate course.

Many other professions in Britain – medical, legal and pharmaceutical, for example – actually have such an arrangement; it has been suggested that it could be used both to ease the pressure on curriculum time and on clinical staffs and in essence make available to the trainee a wider range of clinical material than his School could normally provide. Understandably, this idea has been received with some scepticism, if not actual hostility, by many clinical teachers who feel, rightly or wrongly, that it might undermine their position and authority. The official attitude in Britain at the moment seems to be that, while such an arrangement could be useful, it would be difficult to organize in such a way that all of the three hundred or so young graduates qualifying annually got an adequate and reasonably uniform exposure to clinical experience. Failing that, it is suggested that the problem could be solved at least partly, by making more adequate use of the time devoted during the course to "extra-mural studies", or, as it is more generally known, "seeing practice". This is certainly a useful way of bringing the general practitioner into teaching and at the same time extending the range of clinical material seen, as well as providing valuable experience in dealing with clients. Unfortunately, under present arrangements in Britain, much of the tuition is diffuse and haphazard, and some of it occurs before students have had sufficient basic instruction to benefit fully from it. Considerable thought is now being given to ways and means of making this period – which can amount to something like a quarter of a student's undergraduate career – more useful and more effective.

Qualitatively, it would seem reasonable to conclude – as many enthusiastic curriculum revisionists have done before now – that the conventional veterinary curriculum has much to commend it. But quantitatively it is probably a rather different story. The veterinarian in agricultural practice will almost certainly require to have an increasing knowledge of animal production methods and of the disciplines involved. Small animal work on the other hand needs increasing attention to the treatment and prevention of disease in the individual animal at an increasingly sophisticated level; while for competence in mixed practice both aspects will require attention.

Thus assuming the desirability of retaining a five to six year veterinary course with no undergraduate specialization, such developments must increasingly place a strain both on curricular arrangements and on the students' intellect, unless and until more facilities for postgraduate specialization can be developed and utilized.

Some specialization, of course, already exists in many branches of the profession, in varying degrees of depth and efficiency, much of it, in the clinical field at least, unofficial and self-taught, as it were, as the results of experience. There is, however, fairly general agreement that this requires to be extended and given official recognition; indeed nearly ten years ago a Government Committee recommended that there should be a considerable increase in post-graduate training in British Veterinary Schools, though, in the event, apart from the provision of some additional accommodation, until recently not much appears to have been done about it. When it comes down to working out the details of how this should be done and who should pay for it, we find that there are almost as many opinions as there are people expressing them. In general, however, there would appear to be a need for a number of different types of post-graduate course.

Further training of teachers and research workers is already catered for to a considerable extent, usually in specific disciplines, through the M.Sc. and Ph.D. or higher degrees. The great gap occurs in relation to the clinical area; as self-employed general practitioners still predominate numerically in our profession in Britain, this is obviously a very serious gap indeed, the problem being aggravated by the fact that this is the group which has usually the least time as well as the least opportunity for continuing study. Moreover, veterinary surgeons in practice, though convinced about the needs and benefits, seem doubtful they could readily recoup themselves for the time, effort and cost involved by increased charges to their clients.

Apart from a few specialized diploma courses, in Veterinary State Medicine for example, and in certain isolated subjects such as Radiology and Anaesthesia, there are few, if any, courses of formal instruction leading to a specific recognizable qualification available to the British Veterinary Surgeon – though he can, of course, acquire a Fellowship of our Royal College of Veterinary Surgeons by a period of largely unsupervised study and investigation in some particular field. It seems likely, therefore, that there will be an increasing need and increasing demand for a greater number of courses at post-graduate level than are at present available. In addition, if the

changes envisaged in agriculture and in veterinary practice materialize, there is almost certain to be a greater demand from veterinary surgeons in private practice for both refresher and extension courses dealing with particular animal species, particular disciplines and particular aspects of husbandry.

At present, practitioners trying to keep abreast of new knowledge mainly have to rely, apart from their own reading and attendance of conferences and meetings, on a miscellany of ad hoc refresher courses. Some already feel the need of actual qualifications to enable them to consult or compete with non-veterinary specialists and to integrate their contribution into the economy of the farm. A demand for postgraduate courses of the length and depth required to justify a formal qualification could face universities with staffing and financial difficulties; it could also face the participants with the necessity of spending more time away from their practices than could normally be spared, let alone afforded. It has been suggested, therefore, that, as a preliminary measure, a series of well-planned short refresher-type courses with guided study and with co-operation between veterinary schools and research institutes to make the best use of existing staffs and facilities could be organized to lead up, possibly over a period of several years, to an examination with a F.R.C.V.S. as the qualification awarded to successful candidates. Such courses, it is suggested, should be based mainly on species specialization, though there could well be certain intra- or inter-species subjects such as bovine infertility or orthopaedic surgery of small animals. Some feel it would be advantageous if the names of those who have obtained such official specialist qualification were to appear in the Register of our Royal College in classified form which would show in what subject they had obtained their specialist experience. I understand that the Royal College is considering the possibility of maintaining a consultant register of this type for the information of members of the profession and that tentative plans for one or two courses of the type outlined are under consideration. There is certainly some urgency in this matter, so far as Britain is concerned, as a result of its entry into the European Community, since specialization is already recognized in some of the countries concerned. It is becoming necessary to formulate our ideas on this and associated educational requirements.

I would add one word of caution, however. Specialization we must have and undoubtedly shall have. But I would hope that, at least in so far as the practising arm of the profession is concerned, this specialization does not go too far. The general practitioner is our first line of defence as he is usually the first to encounter the problem, whether it be of frank disease or of low productivity in any of its multifarious forms. He must, therefore, have a sufficiently broad general knowledge to be aware of the likely possibilities and to take appropriate action at least on a prelimnary basis, for on his success or failure much may depend. In such a situation good generalists can be more important than narrow specialists, though as a second line of defence the latter are invaluable and often essential. I would hope, therefore, that with possibly limited exceptions any specialization the farm animal practitioner undertakes would be mainly on an animal species basis, leaving discipline specialization largely to the academics and to the research workers.

BOOK REVIEW

BOEKRESENSIE

WHO EXPERT COMMITTEE ON BIOLOGICAL STANDARDIZATION:

TWENTY-FIFTH REPORT

GENEVA: World Health Organization. 1973. pp.66
Publ. Price $1,75

The establishment of biological standards is an activity inherited by WHO from the League of Nations Health Organization and this report records the proceedings and recommendations of the 25th meeting of the Expert Committee.

The report is divided into three sections with supporting annexures. The first deals with decisions taken on certain pharmacological substances including the antibiotics doxycycline, minocycline, neomycin and gramicidin S, as well as certain hormones, vitamins and enzymes.

Immunological substances are dealt with in the second section, in which consideration is given to the antigens of diphtheria toxoid (unabsorbed), yellow fever and cholera. Standard antibody preparations receive attention through the establishment of an international reference preparation for the assay of human immunoglobulin Ig E preparation and the renaming of the international standards for the gas-gangrene antitoxins, so as to conform with present principles of bacterial nomenclature.

The third section is of particular interest and value to the manufacturer of vaccines. Details are given of amendments to the requirements in the production of inactivated influenza vaccine and cholera vaccine. In addition, an extensive annexure is included which deals with the requirements for rabies vaccine intended for administration to humans. The section is concluded with a particularly useful account of the general requirements for the sterility testing of biological substances and incorporates those revisions brought about by improvements in techniques, as well as the opinions of consultants and the requirements formulated by a number of countries.

P.G.H.

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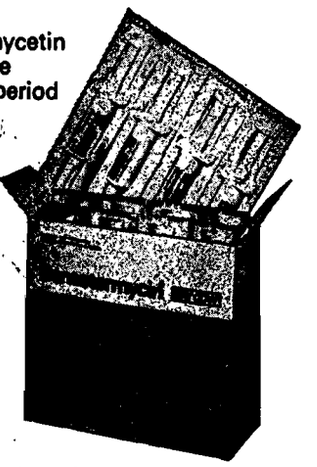

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REVIEW

OORSIG

PINEAL STRUCTURE AND FUNCTION IN DOMESTIC LIVESTOCK

R.B. SYMINGTON, B.K. KNIGHT AND M.M.M. HAYES*

SUMMARY

An outline is given of the phylo- and ontogenetic development of the pineal, its functional macro- and micro-anatomy and its histochemistry are reviewed with special emphasis on the bovine species. Its metabolic activity is described in relation to environmental factors and possible topographical pathways and function of pineal hormones are indicated, as well as the importance of the rôle of this organ/gland in animal production and reproduction.

INTRODUCTION

In man and higher animals, the pineal (organ or gland?) is a small structure which lies between the rostral colliculi and is attached by a short stalk to the dorsal diencephalon in the region of the habenular and caudal commissures. Between these commissures, a small inlet of the third ventricle forms the pineal recess. Although philosophers, anatomists and physiologists have speculated upon the function of the pineal for almost two thousand years, its function, in higher animals at least, still remains conjectural. In part, this lack of detailed knowledge regarding pineal function is attributable to both the deep siting of the pineal within the central nervous system and to the complex innervation of the organ. Additionally, neither pinealectomy [61 78], administration of pineal extracts [30 59], nor implantation of pineal metabolites [10 39] had any consistently conclusive endocrine effect. Again, until recently, little was known about the metabolic products of the pineal and their potential functional significance. Finally, since pineal structure and function have changed during phylogenic evolution [51], results of experimental studies using laboratory animals cannot be extrapolated validly to either study or solution of the problems of pineal function in domestic livestock.

The purpose of this paper is:

(i) to review the state of knowledge regarding the functional anatomy of the pineal in large animals;

(ii) to describe the metabolic activities of the pineal and the relationship of these activities with environmental features and;

(iii) to indicate how the pineal may perhaps be of considerable functional importance in normal growth, development and reproductive ability.

PHYLOGENETIC DEVELOPMENT OF THE PINEAL[28]

As noted earlier, pineal structure and function have changed markedly during phylogenetic evolution [51]. Patently, knowledge of these changes must aid comprehension of pineal function in higher animals.

Briefly, in lower vertebrates the pineal is a photoreceptor sensory organ with its functional cells closely resembling the rods and cones of the retina. In these species pineal function is mediated by a nervous pathway, "the pineal tract". In reptiles and birds the photoreceptive nature of the pineal is reduced and the cells are partially secretory. In most of these species the secretory activity is controlled by direct reception of photic stimuli by the pineal cells themselves. In mammals photoreceptive function has been lost completely and the functional cells are entirely secretory in nature. Nevertheless, activity of these cells is still regulated, albeit indirectly, by reception of photic and possibly other environmental stimuli. In lower mammalian species these stimuli reach the pineal from the retina by way of the inferior accessory optic tract.

EMBRYONIC DEVELOPMENT

Embryogenesis of the bovine pineal begins as an evagination of the dorsocaudal diencephalon. During foetal life two lobes (rostral and caudal) can be distinguished in the pineal. These lobes are derived from different sources. The rostral lobe is derived from ordinary ependymal spongioblasts during the 5th to 6th weeks of gestation while the caudal lobe develops from ependymal cells of the subcommissural organ during the 17th week of gestation [52]. It is of note that the latter lobe develops from specialized secretory ependyma. Eventually the rostral and caudal lobes fuse and remain demarcated only by a septum of connective tissue.

At first, the lumen of the developing pineal can be regarded as a compound tubule [1]. The main lumen of the tubule forms the anlage of the pineal recess and the finger-like branches of the lumen protrude into the developing cell mass. The branches of the lumen are seen as rosettes in the parenchyma of the organ. Since the rosettes are of ventricular origin, they are lined with primitive ependymal cells. The cytoplasm of these cells stains positively with chrome-alum haematoxylin and aldehyde fuchsin, as does the material in the lumen of the rosettes. In animals, but not in man, the secretions of the rosettes and those of the subcommissural organ form Reissner's fibre [52], possibly a cerebro-spinal fluid (CSF) detoxifying structure. Rosettes apparently disappear during post-natal life.

GROSS ANATOMY

The gross anatomical relationship of the pineal to adjacent structures is shown in figure 1. Briefly, the pineal is a small, ovoid or conical structure which lies between the caudal ends of the thalamus in the groove between the two rostral colliculi. It is

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attached to the walls of the third ventricle by a hollow stalk which is anchored to the habenular and caudal commissures. The pineal recess is the extension of the third ventricle between these commissures. The pineal is separated from the splenium of the corpus callosum by the tela choroidea, and its root, of the third ventricle. In horses the pineal is 10-12 mm long and 7 mm wide and is fusiform in shape [71]. In cattle the pineal varies considerably in size (up to 15 x 6 mm) and shape, and although primarily greyish in colour, frequently contains patches of black pigmentation. In sheep the pineal is smaller and more conical in shape than it is in cattle.

Venous drainage occurs via the adjacent great cerebral vein and thence into the straight sinus. In bovines, pineal capillaries are not fenestrated although both pinealocytes and glial cells end in close relationship with the basement membrane of the vessels.

Since functional activity of the pineal and integrity of neural connections are closely related in lower animals [28] and in primates [75], knowledge of pineal innervation is essential to comprehension of pineal function in domestic livestock. Unfortunately, comparatively little is known about this subject in these species. By analogy with laboratory animals[28 64]

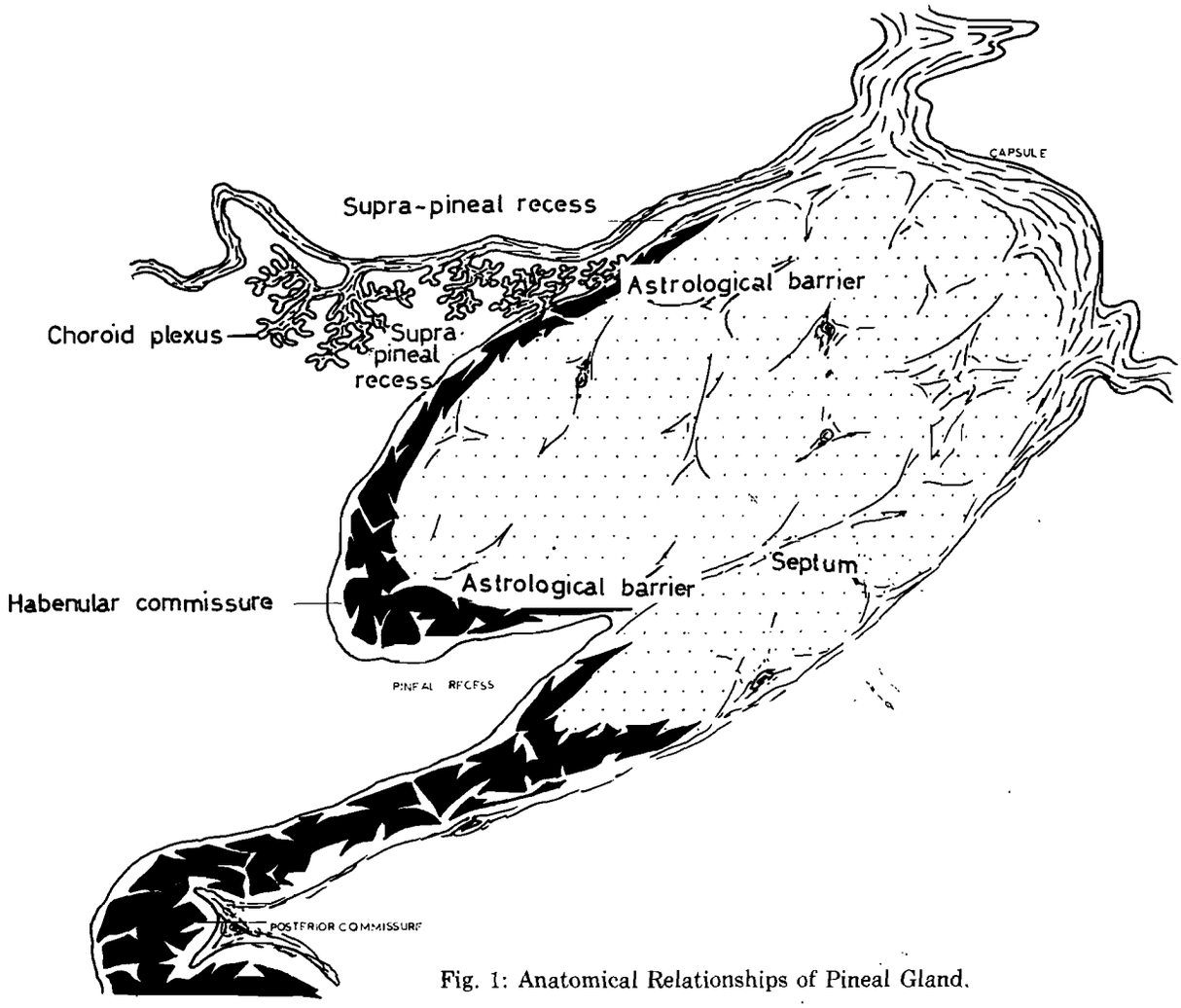

Fig. 1: Anatomical Relationships of Pineal Gland.

Of particular note in relation to the modern concept of pineal secretory function is the exposure of a considerable proportion of the surface area of the organ to ventricular CSF (Fig. 1). Not only does CSF invade the body of the organ via the pineal recess, but because of reflection of the pia of the pineal to form the roof of the third ventricle, a large part of the rostrodorsal surface of the pineal abutts on ventricular CSF. Caudally and externally to its pial covering, the pineal bulges into the dorsal cistern.

Although the precise blood supply of the pineal is unknown, blood most probably reaches the pineal in vessels which arise from the caudal choroideal artery [84]. This vessel takes origin from the caudal cerebral artery. Within the pineal distribution vessels run in the connective tissue septae of the parenchyma.

and primates [75], innervation of the pineal in domestic livestock is likely to consist of:-

(i) Post-ganglionic sympathetic fibres originating in the cranial cervical ganglion. These fibres are distributed in the organ via its vasculature and end in close contact with the main functional cell type of the organ (pinealocyte). The cranial cervical ganglion is probably linked to the external environment via the retina of the eye and a complex, multisynaptic pathway. This pathway could be the means by which pineal function is influenced by photic stimuli.

(ii) Fibres from the habenular and caudal commissures [1]. Neither the extent, nor the functional significance, of these fibres has been fully elucidated in most animal species.

(iii) Although present in several species [23 46], a pineal ganglion does not appear to exist in the pineal of all mammals.

Although noradrenaline is reported to be the main functional neuro-transmitter in the pineal of laboratory animals [25 80], both adrenergic and cholinergic nerve fibres occur in the pineal of many species of animal [55]. Nevertheless, not only is the specific functional significance of these different types of nerve fibres obscure, but differences may occur in this respect, even between closely related species.

In recent studies of primate and bovine pineals using fluorescence microscopy and enzymatic techniques [20 21], bovine pineals were found to contain noradrenaline diffused throughout the parenchyma and 5-hydroxytryptamine or 5-hydroxytryptophol in localized concentrations in the parenchyma of the organ. In contrast to the findings of Arvy [3], both monoaminergic and cholinergic fibres were seen in bovine pineal. The latter fibres entered the pineal from the capsule and were widely distributed throughout the parenchyma. Monoamine oxidase had a generalized distribution with localized concentrations in the caudal areas of the pineal. Unfortunately it was impossible to discern whether or not monoaminergic fibres entered the pineal from the habenular or caudal commissures. Nevertheless, as distinct from the views of other workers [26 27 28], Hayes *et al* [21], suggested that a large, if not the major part, of the nerve supply to the pineal of the primate at least could originate from the CNS.

MICROSTRUCTURE

The pineal of all domestic species of livestock is a richly-vascularized structure consisting basically of parenchymatous tissue covered by either ependymal cells or by thick pia mater (Fig.1) [1]. The general histological appearance of the parenchyma and the electron microscopic appearance of pinealocytes is in accord with the classical concept of an endocrine organ. Thus, pinealocytes occur in irregular clumps supported on a background mesh of reticular fibres and contain typical secretory organelles. Trabeculae from the capsule invade the organ and divide the parenchyma into irregular, indistinct lobules.

The capsule, which consists of collagenic and reticular fibres, covers the cisternal surfaces of the organ. The capsule is thickest around the caudal pole of the pineal and thin over both the rostrodorsal and caudoventral surfaces of the gland. The capsule is reflected from the rostrodorsal surface of the pineal to form the roof of the third ventricle (Fig.1). The ventricular surfaces of the pineal are covered by ependymal cells contained the necessary cellular mal cells in human, baboon and monkey pineals has revealed the presence of four distinct sub-types of ependymal cell [33 35 74]. Fontana-positive granules (indicative of polyhydric phenols) and/or chrome-alum haematoxylin-positive material, (indicative of peptidergic material) were found in the ependymal cells of various regions of the gland. These ependymal cells contained the necessary cellular organelles to allow secretion of such substances into the CSF.

The parenchyma comprises two main cell types: pinealocytes and glial cells. The former cells are large and have numerous cytoplasmic processes which ramify throughout the parenchyma and end in bulbous swellings. Numerous microtubules lie within the cell body and cell processes. The Golgi-complex is associated with electron-dense cored vesicles similar in appearance to those of the adrenal medulla and carotid body. Glial cells are large, multi-processed cells with a characteristic, rich microtubular component. Within the parenchyma the astrocytes lie singly and at random. The glial processes contain glycogen and end as bulbous expansions, either freely, on other glia, pinealocytic processes, or blood vessels.

In primates, glial cells form a thick glial "membrane" which lies between the parenchyma and pineal recess, and between the parenchyma and the rostrodorsal surface of the pineal[32]. The rôle of these "membranes" remains conjectural.

The effect of ageing on microstructure of the pineal appears to have been studied mainly in primates [32 76 83]. In general the glial component of the pineal increases in extent with advancing years. Degeneration of the parenchymatous tissue with formation of scar tissue and cysts may occur, and the degree of calcification or formation of *corpora acervuli* (brain sand) may also increase. Despite the apparent occurrence of such changes in pineal microstructure with age, little or no evidence exists to show that functional activity of the pineal, however that is assessed, declines concomitantly.

METABOLIC ACTIVITY

Since the function of an organ must depend ultimately on its metabolic activity, it is not surprising that comprehension of pineal function did not really begin until the metabolic activity of the pineal was elucidated.

The isolation of melatonin from bovine pineals [37] stimulated both conduct of numerous trials to examine the biological effects of melatonin *in vivo* [15 49 60 86] and study of the biosynthetic pathway of melatonin [4 82]. Thus, research established the steps involved in this pathway [72], and its enzyme-limiting stages [38 67]. Additionally, study was made of the biological activity, in particular, of the anti-gonadotrophic potency of the various indoleamine metabolites [17 41]. Again, the effects of environmental factors on the rate of production of the biologically active principles were investigated [5 86].

The various steps in the biosynthesis of melatonin and the other indoleamines by the pineal is shown schematically in figure 2. Research by Martini and colleagues indicates that several of these indoleamines are involved in suppression of pituitary gonadotrophic function [17 18]. Thus, melatonin and 5-hydroxytryptophol inhibit secretion of luteinizing hormones (LH) while serotonin and 5-methoxytryptophol reduce secretion of follicle stimulating hormone (FSH).

The most important environmental feature influencing production of indoleamines by the pineal of laboratory animals is the photoperiod [5 86] Although darkness enhances production of melatonin in these species, the reverse appears to be true in species such as the monkey [47].

Regulation by light of the rate of synthesis of melatonin is effected by a cyclic AMP mechanism [73]. In addition to light, other environmental factors also

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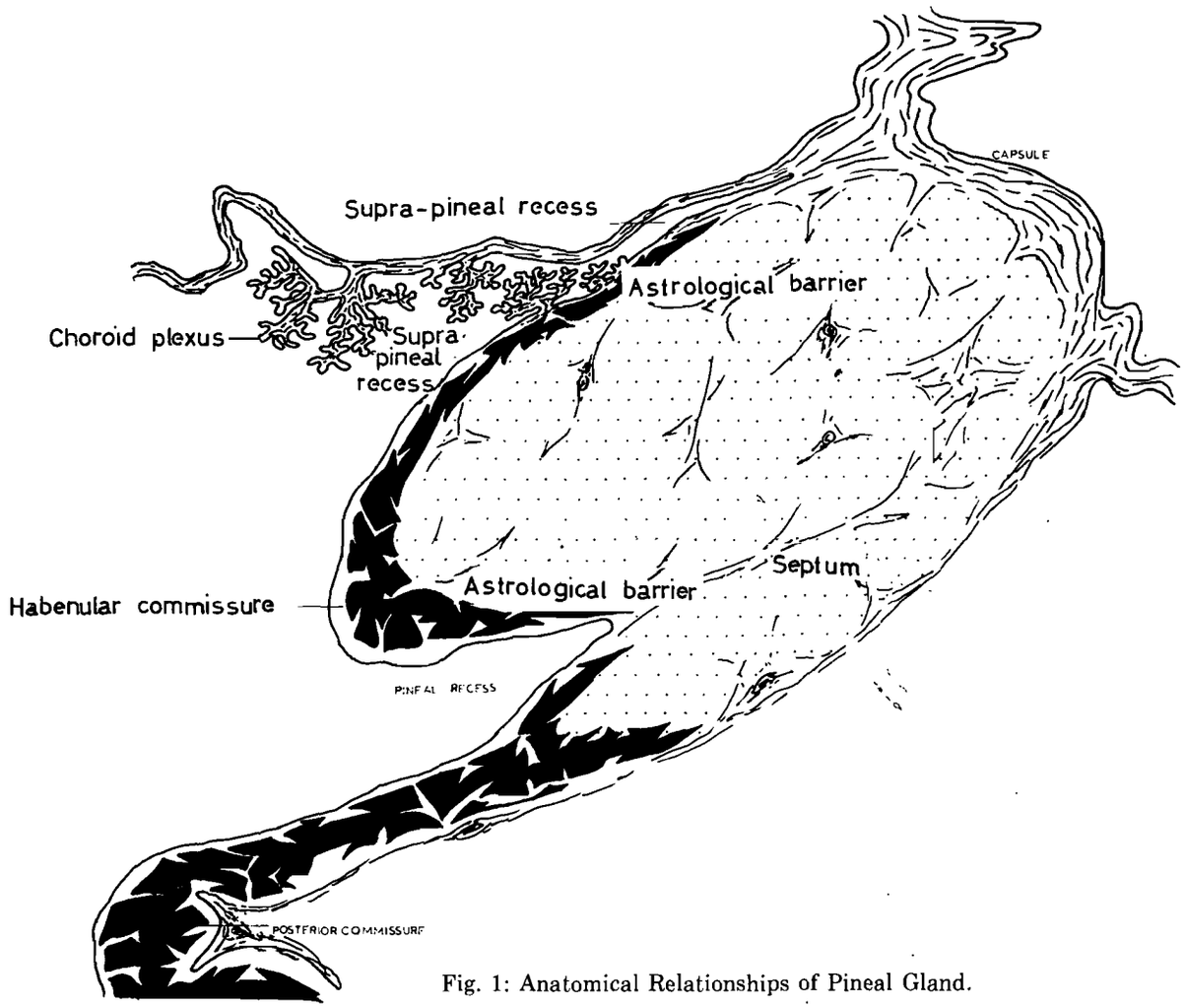

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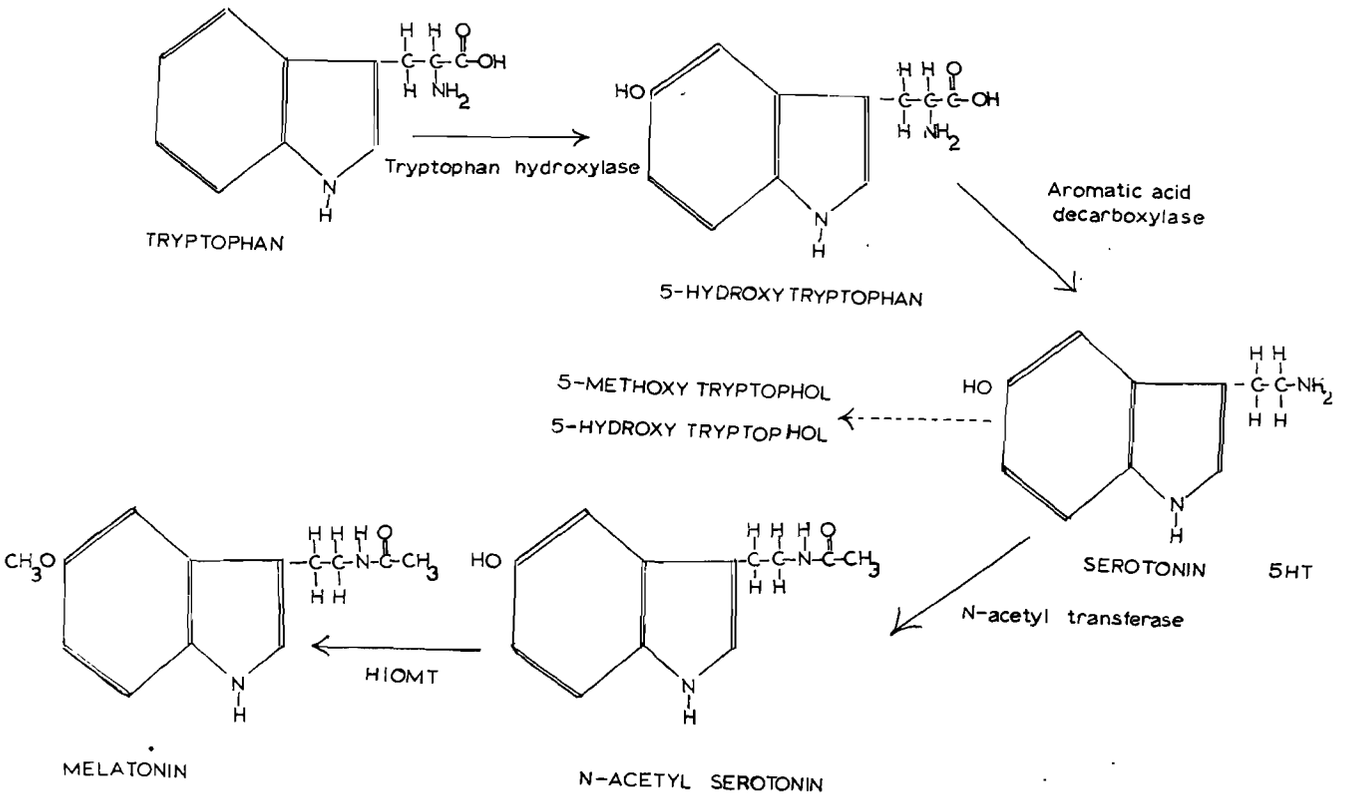

Fig. 2: Biosynthetic Pathway of Melatonin.

influence the rate of synthesis of indoleamines by the pineal. Thus stress [44], heat [50], olfactory stimuli [63], plane of nutrition [62] and endocrine status of the body [12 14 81] have all been reported to influence pineal metabolic activity. Again, in rats, the activity of hydroxyindole-o-methyl transferase, the enzyme which transforms N-acetyl serotonin to melatonin, varies during the oestrous cycle[87], with age of animal[31] and with the availability of N-acetyl serotonin[56].

Finally, although most investigators have incriminated the pineal indoleamines as the active anti-gonadotrophic principles of the pineal, recent evidence indicates that pineal products other than indoleamines are the active anti-gonadotrophin agents. These substances appear to be peptides [6 9 40]. Further, the efficacy of these peptides in inhibition of pituitary gonadotrophic function is much greater than that of melatonin. Which of these substances will eventually prove to be the predominant pineal principle awaits further research. It may be that chronological, species and environmental features will play a rôle in this context.

PINEAL FUNCTION

From early times many suggestions have been made regarding function of the pineal. Thus, Galen in 130 AD thought that in man the pineal was a vestigial organ, while Descartes (circa 1600) contended that the pineal was the seat of the soul. Pineal function remained an enigma until Pelluzi [57] demonstrated that sexual precocity in infants was associated with pineal tumours. Subsequent workers [8 14 16] demonstrated a somewhat tenuous association between the pineal and reproductive ability in both man and animals, while later workers [7 58 77] claimed to have successfully employed pineal extracts in treatment of hypermenorrhoea and hypererotism.

In recent years it has been shown that the pineal has endocrine effects other than those it exerts on the reproductive system. These effects include anti-growth, anti-thyroid and anti-adrenal influences [13 45 65 69 70]. Additionally, the pineal has been shown to influence the metabolism of carbohydrates, proteins, phosphorus and calcium, also possibly through endocrine routes [42 43 68]. Nevertheless of all the numerous actual or potential functions of the pineal, its antigonadotrophic role is still regarded as being paramount.

The pineal of laboratory animals is now regarded as a neuroendocrine transducer [2 85], that is, in response to neural stimuli the pineal synthesizes and secretes one or more hormones. These substances exert widespread effects on the animal but principally inhibit gonadotrophic function of the anterior pituitary. As yet, no specific function has been attributed conclusively to the pineal of domestic livestock. Nevertheless, using both *in vivo* and *in vitro* techniques, Symington and colleagues have shown that the bovine pineal produces one or more substances which inhibit production of LH by the pituitary [21 22]. Further, although there may be a direct effect of the pineal hormones on the anterior pituitary, the principle effect is mediated via the relevant hypothalamic hormone (luteinizing release factor). Continuing studies indicate that this latter effect is most probably mediated via the production of a hypothalamic inhibitory factor [20].

As noted previously, the chemical identities of the

antigonadotrophic principles of the pineal are still conjectural. Thus, both experimental [6 17 48], and histological [32 35 74] evidence have been used to support a rôle for either or both of these groups of substances in pineal function. Considerable controversy also exists as to the route taken by the secretory products of the pineal, that is, whether the hormones reach their target organ(s) via the bloodstream, via the CSF of the third venticle or via both routes. Using human, baboon and monkey tissues, histological study of these possibilities demonstrated the presence of indoleamines and/or peptides in the ependymal cells of the pineal recess and of the rostrodorsal surface of the pineal in the simians [34 36]. It is of additional note that the presence of both substances was also demonstrated in the tanycytes or specialized ependyma of the infundibular and optic recesses of the third ventricle. Further, the ependymal surfaces in the latter area were thrown into folds, presumably to increase in the latter area of tissue abutting on CSF [34 36]. Although such evidence would appear to favour the CSF route for transport of pineal secretory products to their destination in the hypothalamus, evidence was also available to show that the pineal products could pass from the gland via the bloodstream [32 74].

One other function of the pineal which merits further attention is that which links the pineal with the production and/or secretion of, and flow of CSF in the third ventricle. Classically, CSF is produced by the choroid plexus of the ventricles and absorbed largely by the arachnoid granulations [79]. Studies of the dynamics of CSF flow using cine-endoscopic techniques indicate that the walls of the third ventricle have a bellows-like action [19]. Again, within 15 minutes of intraventricular administration of catecholamines to rats, ependymal cells along the floor of the third ventricle grew extensive microvilli and cilia and developed secretory blebs. This activity was assumed to indicate a secretion of substances into, rather than an absorption of substances from, the CSF [66]. From an anatomical study of hydrocephalus, Cooper [11] suggested that the major part of the CSF was re-absorbed into the thin-walled capillaries in the walls of the ventricles, rather than into the arachnoid granulations. Cooper also suggested that amines such as 5-hydroxytryptamine influenced the permeability of the endothelium of these capillaries. Such amines could well be of pineal origin.

Finally, various workers have proposed the concept of a pineal-hypothalamic axis as an extension of the hypothalamic-pituitary axis, with the CSF acting as a transporting medium for the pineal hormones [53 54]. This mechanism is likely to be associated in part with regulation or modulation of hypothalamic release-factor activity.

CONCLUSION

Although no specific rôle has been ascribed conclusively to the pineal in domestic livestock, it is apparent that several aspects of pineal function could influence animal productivity. The bulk of experimental evidence shows that, in laboratory animals, the predominant rôle of the pineal is its partial control over hypothalamic production and/or secretion of gonadotrophin release factors. Accordingly, the pineal could influence many aspects of reproductive ability. Further, since the pineal may be affected by photic stimuli, the pineal could play a part in seasonal mechanisms. The pineal also appears to exert an action via the thyroid, adrenals and pancreas on growth and fattening propensities.

These numerous activities of the pineal have resulted in much confusion and difficulty for the researcher. Further, pineal research has been hampered by invalid extrapolation of results between different species. Patently, much research is still required before a definitive role may be ascribed to the pineal in domestic livestock.

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BOOK REVIEW BOEKPESENSIE

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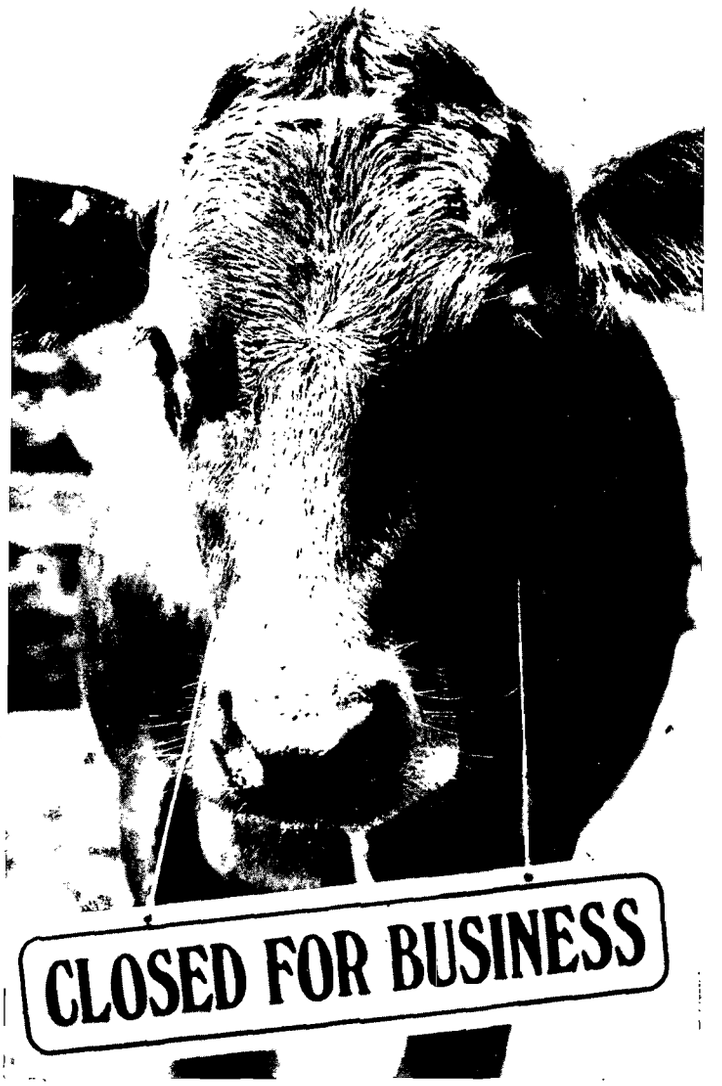
It deals exclusively with the important domestic animals. Domestic birds and laboratory animals have been omitted. Although nervous tissue is dealt with, the central nervous system has been left out for valid reasons. The text is amply provided with black and white photographs taken both with the light and electron microscope. Unfortunately, the illustrations are not annotated and this is a drawback, especially for the uninitiated student and for selfstudy purpose. For the veterinary student, for whom textbooks on the histology of domestic animals are very scarce, its publication is a glad event. It has been printed on a good quality paper.

This book is an excellent addition to and in some aspects even a replacement of, the standard textbook and I can gladly recommend it.

W.H.G.



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SOUTH AFRICA'S DAIRY PRODUCTION – AT THE CROSSROADS*

D.R. OSTERHOFF**

SUMMARY

The critical situation in the dairy production of South Africa is outlined. While acknowledging the overriding importance of nutrition and management in animal improvement, a progeny testing scheme of dairy bulls is suggested. This scheme is based on a large scale importation of the best available semen in the world, but then once only. This importation is to be followed up by a performance testing of young bulls originating from this semen and by a progeny test to find the best bulls for the next generation.

Such an importation could be of great value: it would stimulate artificial insemination and milk recording and could be the turning point towards higher and better production.

THE PRESENT SITUATION

In an attempt to analyze the present situation in South Africa's dairy production, all possible sources of information have been consulted. The greatest shortage is encountered in cheese production; in the present season (1972/73) 7 800 tons of cheese had to be imported[1]. Table 1 gives the annual production and consumption of factory cheese over the last ten years. The gradual increase in consumption is obvious, and the production cannot keep pace with the consumption.

Table 1: ANNUAL PRODUCTION AND CONSUMPTION OF FACTORY CHEESE (in 1 000 kg)

Year	Production	Consumption	Balance
1962/63	14 768	14 820	Import
1963/64	14 220	15 289	Import
1964/65	14 165	15 532	Import
1965/66	14 166	16 532	Import
1966/67	18 532	16 948	—
1967/68	20 673	18 107	Export
1968/69	22 100	19 397	Export
1969/70	17 625	21 100	Import
1970/71	17 680	21 963	Import
1971/72	19 250	23 584	Import

A similar situation is encountered in the production and consumption of condensed milk, whole milk powder and skim-milk powder. In the running season not less than 7 400 tons of skim-milk powder will have to be imported. In this case, too, production has been lower during the last four years than consumption.

Table 2: ANNUAL PRODUCTION AND CONSUMPTION OF CONDENSED MILK, WHOLE MILK POWDER AND SKIM-MILK POWDER (in 1 000 kg)*

Year	Production	Consumption	Balance
1962/63	38 732	39 518	–
1963/64	46 165	46 243	–
1964/65	43 399	47 858	Import
1965/66	39 621	51 355	Import
1966/67	57 948	55 841	–
1967/68	57 161	53 242	Export
1968/69	61 479	59 074	–
1969/70	52 977	64 436	Import
1970/71	51 304	68 304	Import
1971/72	63 874	70 124	Import**

* The relation between the three commodities is 70 : 11 : 19
** Imports 1971/72: 1 407 tons of condensed milk
40 tons of whole milk powder
5 093 tons of skim-milk powder

The situation regarding creamery butter has changed drastically since 1st October, 1971, when the Minister of Agriculture announced that the production of yellow margarine was allowed. Had this not happened, there would have been a shortage of about 14 000 tons of creamery butter in the season 1972/73. Table 3 reflects the situation over the last ten years.

Table 3: ANNUAL PRODUCTION AND CONSUMPTION OF CREAMERY BUTTER (in 1 000 kg)

Year	Production	Consumption	Balance
1962/63	43 500	45 803	Import
1963/64	40 407	48 175	Import
1964/65	38 241	48 270	Import
1965/66	37 941	48 541	Import
1966/67	44 423	48 367	Import
1967/68	52 633	49 434	Export
1968/69	55 434	52 348	Export
1969/70	47 267	54 019	Import
1970/71	43 964	53 353	Import
1971/72	45 419	38 997*	Export

* Consumption of yellow margarine started 1st October 1971; 26 000 tons of yellow margarine were purchased.

The surplus of creamery butter is not great and the Dairy Board tries to encourage producers to deliver industrial milk instead of cream.

Table 4: AVERAGE DAILY PRODUCTION AND CONSUMPTION OF FRESH MILK (in 1 000 litres)

Year	Production	Consumption	Remarks
1962/63	910,8	780,5	These figures
1963/64	958,4	803,8	reflect only
1964/65	1 044,5	964,5	the areas:
1965/66	1 084,8	908,8	Cape Peninsula, Pretoria,
1966/67	1 177,2	957,4	
1967/68	1 237,93	975,6	Witwatersrand,
1968/69	1 337,2	1 032,4	Bloemfontein,
1969/70	1 380,4	1 096,9	West-Transvaal.
1970/71	1 340.1	1 171,1	Figures from
1971/72	1 390,7	1 171,5	other areas are not available

* Lecture delivered at the Biennial Scientific Congress, South African Veterinary Association, Pretoria, Oct. 15 - 19, 1973.

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With regard to the fresh milk situation, only certain areas are controlled by the Milk Board and a clear picture cannot be obtained.[5]. Table 4 reflects the production and consumption in five areas only.

The actual production in the five areas remained constant for the present season, while the consumption increased to $1,2 \times 10^6$ litres. It has been calculated that in these five areas the consumption will be up to $1,5 \times 10^6$ litres by 1980 and 2.5×10^6 litres by the year 2 000.

Table 5: TOTAL MILK PRODUCTION (in million litres)

	1968/69	1969/70	1970/71
Butterfat (milk equivalent)	1 044	865	800
Cheese milk	253	186	189
Condensing milk	283	274	265
Total: Industrial milk	1 579	1 325	1 254
Fresh milk production	488	504	489
Fresh milk consumption	377	400	427

The only way to compare the dairy commodities is by comparison on the basis of milk equivalents as shown in table 5, from which it is clear that the production dropped during the period shown.

It has been calculated that in the year 1980 about 48 million people have to be fed in the Republic. Futhermore, with an increasing standard of living, the consumption of animal proteins will increase faster than the consumption of other commodities. For example, in the U.S.A. each person used 3 kg grain per day in the year 1972, but only 250 g of it was eaten directly and the rest (2,75 kg) was converted into more valuable food by animal .

There are two aspects to the problem:

(a) a low over-all production of all dairy commodities;

(b) the apparently impossible task for the two Boards concerned to sort matters out between themselves, to allow, for example, that all surplus fresh milk is poured into cheese factories.

The difference in price between fresh milk (8,3c/litre) and industrial milk (578c/100 kg), and the restrictions on fresh milk production by a quota system complicate the situation. The whole Dairy Industry must be looked into; the first step in the right direction is the marketing of the one commodity by one Control Board only.

Table 6: ARTIFICIAL INSEMINATION IN TRANSVAAL AND BOLAND

Year	First insemina-tions	Price per insemina-tion	Cost per insemina-tion	Loss per insemina-tion
1969	30 798	R4,01	R4,36	35c
1970	27 341	R4,00	R4,74	74c
1971	23 984	R4,00	R5,65	165c
1972	17 503	R4,00	R7,00	300c

GROSS INCOME (RAND)

Year	Sale of semen	Income from insemination	Other	Total
1970	135 624	109 364	142 466	387 454
1971	141 726	95 936	124 280	361 942
1972	188 302	77 110	164 694	430 106

ARTIFICIAL INSEMINATION

The Dairy Industry can be analysed further by a study of the progress made by artificial insemination. Unfortunately, only figures from Transvaal and Boland were available, but it is clear that progress is really very slow[3]. First inseminations performed by the AI Co-operatives have dropped to 17 500 and the costs per insemination have increased to R7,00 per insemination. Table 6 illustrates the situation.

It appears to be doubtful that artificial insemination as it is now will make a great contribution to the essential over-all increase in production.

MILK RECORDING

The next step in our analysis is the actual production of South African dairy cows. Only Friesland and Jersey cows included in the Milk Recording Scheme will be taken as examples. The results of all Friesland cows of which milk production is recorded officially are given in table 7, while the production of Jerseys is given in table 8[6,7].

Table 7: MILK RECORDING IN SOUTH AFRICA – FRIESLANDS

Year	No.	Milk (kg)	Butter fat %	Lactation length	Calving interval
Registered Frieslands					
1969/70	4 348	4 769	3,70	296	423
1970/71	4 712	4 523	3,72	296	429
1971/72	4 923	4 548	3,73	296	436
Grade Frieslands					
1969/70	15 183	3 935	3,57	291	405
1970/71	16 496	3 858	3,58	292	405
1971/72	17 547	3 920	3,64	293	409

Table 8: MILK RECORDING IN SOUTH AFRICA – JERSEYS

Year	No.	Milk (kg)	Butter fat %	Lactation length	Calving interval
Registered Jerseys					
1969/70	5 614	3 416	4,92	295	404
1970/71	4 884	3 402	4,93	295	407
1971/72	5 034	3 402	4,95	295	420
Grade Jerseys					
1969/70	4 924	2 976	4,78	290	396
1970/71	4 819	2 942	4,73	292	395
1971/72	4 799	2 991	4,81	291	416

There is no indication that the recorded average production of cows has improved over the period of three years. Herds of which milk production is recorded are usually the best in the country, since many stud farmers take part in the scheme for the sake of its advertisement value.

MASTITIS

Another aspect of the low dairy production is very often overlooked, the problem of mastitis in our dairy herds. Giesecke et al [6] investigated the incidence of mastitis in South Africa and concluded that losses caused by bovine mastitis cost in average dairy farmer R24 per cow or a total of R1844 per year. Dairy farmers in South Africa are estimated to lose, due to mastitis some R29 million of milk alone or a total of R38 million, equivalent to approximately 25% of their revenue from the sale of milk per annum. In addition, there are appreciable public health and manufacturing problems due to the presence of antibiotic residues in milk. These particular aspects will not be discussed here, but the introduction of coordinated properly supervised mastitis control measures is indicated.

MEASURES TO INCREASE PRODUCTION

In the previous section it has been indicated that the production of all dairy commodities is already low and that shortages will be greater in the near future. Nutrition and management will not be discussed here, although it is obvious that the production could be increased by better feeding and management of the National Dairy Herd. Only genetical possibilities of improvement will be considered here.

The Breeder's Societies, the Artificial Insemination Co-operatives and the Department of Agriculture are aware of the situation and various suggestions have been brought forward. Especially in the latter years, the lack of a progeny testing scheme for dairy bulls has been blamed for the situation. The fact that no bull progeny testing scheme exists, is only part of the truth. Because improvements through management and nutrition are slow and do not yield immediate effects, the focus is set on bull progeny testing. The President of the Friesland Breeder's Society remarked in his 1973 Report [10]: 'It was the fervent hope of all those who were interested in the Livestock Industry as a whole, that a start would already have been made with the Official State Aided Progeny Testing Scheme. A series of meetings was held during the year, and it is hoped that an official announcement will be made in the near future. The importance of this Scheme for the general advancement of the Livestock Industry and to the economy of the country cannot be over emphasized'. A similar view was given in the last report of the Jersey Breeder's Society [11].

In the Director's Report of 1972 of Insemina [3] (the newly amalgamated Transvaal and Boland A.I. Co-operative Societies), the following strong words are used: 'Year after year we report that no progress has been made in the initiation of a bull testing program. If nothing happens in this respect until the end of 1973, the Artificial Insemination Co-operatives are going to start their own testing programs. It must be mentioned here that the Natal A.I. Co-operative Society has already started its own bull testing scheme about four years ago, and is going ahead on its own without official aid. It is only to be hoped that the tested bulls will be given official recognition when an official scheme becomes a reality.

BULL PROGENY TESTING

The principle is simple: the best bulls have to be found within the borders of South Africa and these bulls should be used fully in artificial insemination organisations to the benefit of the whole dairy industry.

The implementation of such a 'simple' program is not easy, because it means a general switch-over from the old system, whereby the single animal is evaluated, the single breeder carries the load and decisions are based on subjective estimations, to a modern system, whereby the whole population is evaluated, the breeding is planned by specialists and decisions are based on objective estimations.

Any program can only lead to success if the following three prerequisites are fulfilled:

(a) Knowledge of and results of studies on, population genetics should be put into practice.

(b) Artificial insemination has to be used for breeding purposes.

(c) The co-operation of herdbook organizations and studbreeders is necessary and has to be taken into consideration.

The most burning question concerns the size of the active breeding population. To start a bull testing program it has been proved that at least 20 per cent of the population must be included in milk recording to provide the data for the basis of selection. In table 9 a comparison of the actual active breeding population in Sweden and South Africa is made to point out clearly the difficulties which have to be overcome in South Africa [9].

Table 9: COMPARISON OF ACTIVE BREEDING POPULATIONS

Percentage of population	Sweden	South Africa
No A.I.; no milk recording	20	89
A.I.; no milk recording	35	6
Milk recording; no A.I.	5	3
A.I. and milk recording = active breeding population	40	2

The total number of cows in milk recording in South Africa is 36 000 grade cows and 15 000 registered cows. The contribution of the State to milk recording amounts to R250 000 per year, the farmers contribute R92 340, the total cost being R342 340[12]. If this figure is divided by the number of cows in the recording scheme, the cost per cow per year amounts to R6,70 or 79 kg milk per cow per year.

bull calves. The preparation of special bull testing stations should not be too difficult; a great deal of experience has been gained by the National Beef Cattle Improvement Scheme, the only difference being that the bulls from the planned matings must start the performance test as early as possible, say after the first week, and complete the test at the age of 330 days. Co-operation with the producers of these bull calves must be assured, the contracts signed and about 300 bull calves should be collected at three testing stations : one at Cedara, one at Elsenburg-Stellenbosch and one at Irene, each taking about 100 bull calves. The testing procedures, including the feeding schemes†, should be as identical as possible [4].

These performance test have only recently started in Europe; within two to three years we could produce comparable results, bringing South Africa in line with the highly developed countries.

During the performance test two thirds of the bull calves are culled at two stages of selection – at 100 days and at 200 days of age – on the basis of their own performance and on the basis of the analysed results of the second lactation of their dams. At the end of the performance test about 80 - 90 bulls should be left over. A final selection is made at the end of the performance test period, when the results of the third lactation of the dams must be considered also; the remaining number is reduced to 35.

The third and final step:

These 35 bulls should be collected from the three stations and brought to an A.I. station or to a Government Experimental Farm for the so-called lay-off period. Semen is collected from these bulls for the bull progeny tests. From each bull semen is used for 250 first inseminations (35 x 250 = 8 750 inseminations), i.e., about 85 per cent of all cows in the active breeding population would be used for the purpose of testing these young bulls. As interest in the scheme is engendered, farmers should be encouraged to use A.I. together with milk recording to obtain the figure of 20 000 cows needed for the active breeding population. A very interesting task awaits the extension officer: he must convince the commercial dairy producer to take part in milk recording after explaining the whole scheme. Milk recording in general should only be undertaken on larger farms, those with 50 and more cows, and only for those farmers who are willing to make a contribution to the bull progeny test. The registered breeder can only show his superiority over the commercial man by taking part actively, finding the elite cows, helping with the scheme and finally producing the sires of the next generation.

The best suggestion to be made is possibly a drastic change in the present method of milk recording. One should start a new scheme of collecting the records of daughters of A.I. bulls. Each farmer taking part in the scheme obtains free semen from the bulls to be tested. At least 30 animals must take part and 50% of the female offspring must be kept until the end of the first lactation. For each complete lactation record the farmer receives a bonus of R20. In this way a valuable estimate of the relative breeding value of the 35 bulls selected is guaranteed.

In the final step seven bulls have to be selected from the 35 entering the bull progeny test. They are to be used extensively for A.I. Three of these should be mated with the elite cows and the whole circle started again. Another 10 bulls could possibly be sold by auction to some farmers in remote areas, but the remaining bulls should be slaughtered. The success of any scheme is closely correlated with the rigorous selection and elimination which has to follow.

† A feeding and management program is obtainable from the Author.

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INTENSIEWE BEESVLEISPRODUKSIE*

J. VAN MARLE**

SUMMARY

The author critically analyses the present unsatisfactory position with regard to beef production in South Africa and indicates the much higher realistic production levels that can be attained with great economic gain. He outlines the measures to be taken with regard to pasture management, feeding, breed selection and breeding policy and gives his personal choice of breeds to be used for cross-breeding with *Bos indicus* types as basis (Drakensberger for the Sourveld and Bonsmara for the Sweetveld regions). Of the dual purpose breeds he selects Brown Swiss and South Devon for the Sourveld, and Pinzgauer and Simmentaler for the Sweetveld regions. Of the British breeds his selection is Aberdeen Angus and Hereford, and Sussex and Hereford respectively.

Verskillende persone gee verskillende definisies aan intensiewe beesvleisproduksie. Preston & Willis sien dit as „the growing and/or feeding of cattle under conditions of confinement in which all feed is carried to the animals". Hulle verklaar ook dat „meat production must become a factory operation" en gaan verder daarmee met „on this basis, like any other manufacturing process, it need man's skill to convert raw materials into a marketable product".

Aangesien die produksie van vleis basies in twee fases gedeel kan word, naamlik die aanteelfase en die groeifase, is hierdie definisie en interpretasie heeltemal te eng en onaanvaarbaar. Met so 'n siening word een van die belangrikste beginsels van landbou vergeet, naamlik die optimale benutting van natuurlike hulpbronne met aangepaste boerderystelsels. In uiters min gevalle deur die wêreld leen die natuurlike bronne hulle dat voer na beeste aangedra kan word – varke, hoenders, konyne en visse wel.

Tweedens kan ek my nie voorstel hoedat die aanteelfase, dit wil sê koeie en kalwers, ekonomies in 'n fabrieksproses behartig kan word nie. Intensiewe beesvleisproduksie kan nie so eenvoudig voorgestel word nie: 'n veelvuldige aantal fasette moet met mekaar in verband gebring word.

Dit beteken:
- 'n hoër produksie per eenheid grond;
- 'n hoër produksie per eenheid dier;
- 'n hoër produksie per eenheid tyd;
- 'n vinniger omset per eenheid kapitaalbelegging en kontantvloei;
- groter insette van bestuur en organisasie;
- beter benutting van natuurlike hulpbronne.

Die voorvereistes vir intensiewe beesvleisproduksie is:
- aansporingspryse as vergoeding;
- voeding van koeie en osse volgens fisiologiese produksievereistes;
- voerproduksie in kwantiteit en kwaliteit in gebiede wat oor die potensiaal daarvoor beskik;
- beesrasse en tipes wat suiwer of in kombinasies oor die potensiaal beskik om die roustowwe doeltreffend in vleis om te sit wat vir die verbruiker aanvaarbaar is;
- 'n bestuursprogram gebaseer op gespesialiseerde tegniese kennis en besigheidsbeginsels.
- 'n gereelde aanvraag vir hoë kwaliteit vleis.

Volgens my eie beskouing van intensiewe beesvleisproduksie is dit nie alleen moontlik nie, maar absoluut noodsaaklik, dat die tradisionele wyse moet plek maak vir 'n meer aggresiewe benadering tot produksie.

HUIDIGE SITUASIE

1.
Getal Beeste

Op blanke plase	8 199 000
Bantoetuislande	4 428 000
	12 627 000

Die getal bly min of meer staties vir die afgelope 30 jaar.

2. Beskikbaarheid van Beesvleis

Tabel 1: SLAGTINGS VAN BEESTE IN DIE REPUBLIEK (Vleisraad Jaarverslag)

Oorsprong	1971/72 Aantal	%	1972/73 Aantal	%
Beheerde gebied	1 250 986	65	1 350 443	64
Buitegebied	664 384	35	746 920	36
Totaal	1 915 370	100	2 097 363	100
Uit R.S.A.	1 640 391			
Uit aangrensende gebiede	* 274 979			

Suid-Afrika, met sy hoë bevolkingstempo van 3,5% per jaar, sal in 1980 'n totale bevolking van 28 miljoen hê. Teen die huidige *per capita* verbruik van 25 kg/jaar, sal die benodigdhede aan vleis dan 706 miljoen kg vleis wees. Alhoewel die R.S.A. reeds 23% van sy beesvleis invoer, is die verwagte tekort nog 25 000 ton vleis of *ca* 125 000 beeskarkasse per jaar. Indien die vleisbeesindustrie nie doeltreffender funksioneer nie, sal *ca* 2 miljoen meer beeste nodig wees om die hoeveelheid vleis teen die huidige *tempo te lewer en te verhoed dat die tekorte toeneem.*

3. *Omset*

Die beraamde omset van die beesbevolking in Suid-Afrika is 18% in blanke gebiede, 3,8% met 'n variasie van 0,9% tot 7% in Bantoetuislande en 23% in S.W.A.

4. Gemiddelde Karkasmassa
1971/72 : 205,9 kg.
1972/73 : 200,1 kg.

* Referaat gelewer tydens die Tweejaarlikse Wetenskapkongres van die Suid-Afrikaanse Veterinêre Vereniging, Pretoria 15-19 Okt., 1973.

** Bantoe-beleggingskorporasie van Suid-Afrika Bpk., Posbus 213, Pretoria, 0001.

5. *Gemiddelde Waarde (c/kg)*

		1971/72	1972/73
Super	X	53,7	64,6
Prima	AX	50.7	63,2
Prima	BX	48,8	61,7
Graad	1 AX	48,8	61,6
	1 BX	46,7	60,7
	1 CX	45,4	59,2
	2 X	43,0	57,8
	3 X	40,6	54,7
	4 X	35,1	47,2
Alle grade		44,8	58,7

6. *Gradering*

Super en Pima het toegeneem vanaf	19,7% na 21,3%
Graad 1 het afgeneem vanaf	27,9% na 25,6%
Graad 2 het afgeneem vanaf	26,3% na 25,3%
Graad 3 het toegeneem vanaf	22,0% na 23,0%
Graad 4 het toegeneem vanaf	4,1% na 4,8%

7. *Vrektes a.g.v. Droogtes, Klimaatsfaktore en Siektes*

Daar word beraam dat totale vrektes 5 – 11% per jaar beloop.

8. *Indirekte Verliese*

Onregstreekse verliese as gevolg van siektes, interne parasiete en ondervoeding wat tot vertraagde tempo van groei lei en lae karkasmassas by 'n hoë verkoopsouderdom tot gevolg het, word geskat op 20 – 35% van die huidige produksie.

9. *Kalweroes-persentasie*

Die persentasie kalweroes van beeste van blanke boere word beraam op 50 – 55%. In Bantoegebiede is dit sekerlik veel laer.

Vanuit 'n ontleding van die huidige situasie is dit duidelik dat die doeltreffendheidspeil van beesvleisproduksie laag is as dit vergelyk word met ander Westerse lande. In ander Afrikastate is die posisie beslis swakker indien in aanmerking geneem word dat Suid-Afrika oor net 10% van die totale getal beeste beskik maar nogtans vir 20% van die beesvleisproduksie verantwoordelik is.

Die waarde van lewendehaweprodukte het ook vermeerder vanaf R381 miljoen gedurende 1961/62 tot R600 miljoen in 1971/72.

DOELSTELLINGS BEOOG MET INTENSIFIKASIE

Voordat enigiemand 'n nuwe program aanpak moet daar duidelike mikpunte gestel word. Die volgende produksienorme moet nagestreef word.

1. *Getalle*

Die feit dat die beespopulasie staties gebly het gedurende die afgelope 30 jaar kan nie sondermeer aanvaar word nie. Dit is wel waar dat geen nuwe gebiede opgestel kan word nie en dat die tradisionele beesweigebiede onder die huidige boerderystelsels in 'n groot mate te veel beeste dra, maar in talle gebiede kan die getalle vermeerder word met verbeterde boerderymetodes.

Ons lees dat Australië sy beespopulasie in die laaste 16 jaar met 96% verhoog het, dat die V.S.A. sy getalle in 20 jaar verdubbel het en dat in Brasilië beesgetalle so vermeerder het dat dit nou die derde grootste beesbevolking, na Indië en die V.S.A., het. In Australië alleen het getalle in die afgelope 5 jaar met 6 miljoen toegeneem as gevolg van ontbossing en die vervanging van die natuurlike weidings met verbeterde grasse, sommige wat van Suid-Afrika ingevoer is. In die V.S.A. was dit as gevolg van grootskaalse aanplanting van verbeterde grassoorte, kunsweidings, bemesting van veld en die oprigting van voerkrale. In Brasilië is deur ontbossing nuwe gebiede vir beesboerdery oopgestel.

Tabel 2 toon 'n raming van beesgetalle in verskillende produksiestreke met aanduidings waar die potensiaal bestaan om beesgetalle te verhoog.

Tabel 2: BEESGETALLE GEDURENDE MEI 1973
(X 1 000)

Provinsie en Streek		Mei 1973	Opmerkings
Kaapprovinsie			
Winterreënstreek	I	347	
Karoo	II	93	
Oos-Kaap	III	685	Groot potensiaal d.m.v. bemesting, ontbossing en radikale veldverbetering
Noord-Kaap		915	Potensiaal verhoog deur ontbossing en R.V.V.
O.V.S.			
Wes-O.V.S.		118	
Sentraal & Suid-O.V.S.		253	
Noordwes-O.V.S.		484	Voergewasproduksie
Noordoos- & Oos-O.V.S.		892	Bemesting, R.V.V. en voergewasse
Natal		1 292	Ontbossing, bemesting, R.V.V. en voergewasse
Transvaal			
Wes–Transvaal		635	Voergewasse en R.V.V.
Transvaalse Hoëveld		446	Bemesting, R.V.V. en voergewasse
Rand en Pretoria		170	Bemesting, R.V.V. en voergewasse
Noord-wes		365	Ontbossing en R.V.V.
Noord-Transvaal		640	Ontbossing
Middel-Transvaal		239	R.V.V. en voergewasse
Oos-Transvaal		625	Bemesting, R.V.V. en voergewasse

Die Transvaalse hoëveld en Suid-Transvaal kan as voorbeeld geneem word. Die 2 streke beskik tans oor gesamentlik 1 071 000 beeste en daar is reeds 50 000 ha oulandsgras aangeplant. Die drakrag van die natuurlike weiding is 2,7 ha/G.V.E. Volgens beraming kan die drakrag van die gebied na 1,5 ha/G.V.E. verhoog word indien 15% meer aangeplante weidings gevestig word.

As die samestelling van die beeskuddes verander om speenkalwers te produseer, en nie osse aan te hou nie, kan die getalle na 1 711 000 vermeerder word. Die speenkalfproduksie kan van die huidige 163 000 na 690 000 per jaar verhoog word.

Die implikasies van ontbossing, radikale veldverbetering, bemesting en voergewasse word in 'n latere hoofstuk meer volledig verskaf. Die genoemde streke beskik egter oor die potensiaal dat hierdie metodes daar toegepas kan word om voer en kosproduksie te verhoog, sodat getalle daar vermeerder kan word.

2. *Omset*

Vanaf 1969/70 tot 1972/73 het die omset van beeste en kalwers toegeneem vanaf 13,60 tot 18,1%. Dit is nog laag in vergelyking met Australië se 23% en die V.S.A. se 35% Die mikpunt vir die blanke gebiede moet op 25% gestel word. Die Bantoegebiede kan 'n groot bydrae maak. Indien die mikpunt hier op 10% gestel word, kan dit met die huidige getalle 350 000 meer beeste per jaar lewer.

3. *Groeitempo en Karkasmassa*

Om die beste benutting van goeie gras, voer en genetiese materiaal te maak om 'n beeskarkas van hoë gehalte te produseer, moet die groeitempo verhoog word. Die mikpunt moet wees 'n karkasmassa van 250 kg en ouderdom van 1½ tot 2 jaar. In die produksieproses kan die volgende mikpunte gestel word.

Voorbeeld 1

Fase	Massa (kg)	Dae	M.D.O.*
Speen	200	210	0,95
Groei	168	240	0,7
Afronding	120	100	1,2
Totaal	488	550	0,887

Voorbeeld 2

Volgens die tweede stelsel is die produksie heel intensief en vereis dit groter insette.

Fase	Massa (kg)	Dae	M.D.O.
Speen	250	210	1,19
Groei en afronding	200	150	1,33
Totaal	450	360	1,25

*Massa/dag ouderdom

4. *Verliese*

Direkte verliese behoort laer as 3% te wees. Indirekte verliese behoort feitlik heeltemal uitgeskakel te word indien die diere deurgaans op 'n hoë voedingspeil gehou, siektes bekamp en dosering teen parasiete oordeelkundig uitgevoer word.

5. *Voortplantingstempo*

Daar is voldoende voorbeelde om aan te toon dat 'n mikpunt van 85 – 90% wel realisties is

6. *Kuddesamestelling*

Klas	Ouderdom	Getal	%	Verkoop	%	Vrektes	%
Bulle	3-7 jaar	3	1	1	–	–	–
Koeie	2-10 jaar	100	37	20	–	2	–
Kalwers	0-12 mnde	84	31	31	–	2	–
Tollies	1-2 jaar	41	15,5	40	–	1	–
Verse	1-2 jaar	41	15,5	18	–	1	–
Totaal		270	100,0	79	29	6	2

PRODUKSIEMETODES OM DIE GESTELDE MIKPUNTE TE BEREIK

Na die voorafgaande bespreking van wat die huidige situasie is van wat die produksienorme in 'n program van intensiewe beesvleisproduksie behoort te wees, is dit duidelik dat die probleme begin en eindig op *optimum voeding* en dat die oplossings ook daar sal moet begin. Daar moet dus gesorg word dat vleisbeeste vir die aanteel- sowel as die groeifase voer in kwantiteit en kwaliteit kry om aan die fisiologiese produksievereistes te voldoen. Die voedingsbehoeftes van diere word gewoonlik geskei tussen onderhoudsbehoeftes en produksiebehoeftes. In die verlede, en selfs tans nog, word baie navorsing gedoen hoe om aan die onderhoudsbehoeftes te voldoen, bv. talle supplemente, blokke en lekke word aanbeveel om die natuurlike veld aan te vul om te verhoed dat die beeste nie te veel massa in die winter verloor nie. Met hierdie benadering kan geen sukses tot intensiewe beesvleisproduksie behaal word nie. Dit moet besef word dat alle diere altyd in produksie is en dat hulle altyd kos moet kry bo en behalwe wat vir onderhoud nodig is. Hoe beter die rantsoen in kwantiteit en kwaliteit gebalanseer is, hoe meer voedingsbestanddele is vir produksie beskikbaar en dus hoe beter sal die produksie wees.

AANTEELFASE

Die tragiese lae reproduksietempo in Suid-Afrika, in blanke sowel as Bantoetuislande, is in die eerste plek geen siekteprobleem nie, maar wel 'n voedingsprobleem. Dit is in meeste gevalle 'n gebrek aan kwantiteit, naamlik energie, maar ook aan kwaliteit, soos onder andere proteien, maar veral fosfor. Die klassieke werk van Sir Arnold Theiler en sy medewerkers het dit dekades gelede al onderstreep. Meer onlangse werk in die V.S.A. van Wiltbank en andere het die aandag gevestig op die belangrikheid van 'n hoë voedingspeil op verskillende reproduksiekriteria, soos die invloed op puberteit, ouderdom by eerste kalwing en voortplantingstempo, dit wil sê kalfpersentasie. Suid-Afrikaanse werkers te Döhne en onlangs te Potchefstroom het aangetoon dat die herkalwing van verse en algemene kalfpersentasie met soveel as 30% verhoog is deur supplementering van verse en koeie op goeie somersveld.

Robert Bellows berig dat beesboere in die V.S.A. die kalwer-oes met nog 12-15% kan verhoog deur verbeterde bestuur, maar dat produsente, genetici, reproduksiefisioloë en voedingsdeskundiges verklaar dat hulle 'n biologiese produksieplafon bereik het

tensy voerproduksie en voeding drasties verhoog kan word. O.O. Thomas som die mening van 'n tal navorsers op wie se bevindings op die waardevolle oordragingseffek van goeie voeding op melkproduksie en herkalwing dui.

Die voedingsvereistes vir optimale groei, geslagsaktiwiteit, dragtigheid en melkproduksie varieer, en dit is belangrik dat voeding vir vroulike sowel as manlike diere volgens die produksiestatus ingerig moet word. Alhoewel die voedingsvereistes reeds redelik noukeurig bepaal is, geniet dit nog nie die nodige mate van aandag van veekundiges of boere wat dit verdien nie. Voorligting in hierdie verband is 'n voorvereiste om intensifisering van beesvleisproduksie te laat slaag.

Alhoewel navorsers hulle tans besig hou met hoogs gesofistikeerde tegnieke, soos bv. sinkronisasie van estrus, hormoontoedienings vir veelvoudige geboortes, eiseloorplantings, vroeër kalwing van verse en vroegspeen van kalwers, is die voorvereiste vir hierdie metodes 'n voeding volgens produksievereistes. Voeding kan onmiddellik die grootste bydrae maak om meer kalwers te kry.

GROEI EN AFRONDING

Die produksienorme wat gestel is, is geensins onrealisties hoog nie, maar die basiese uitgangspunt moet wees dat slagdiere ten alle tye in produksie is en dat hulle moet groei.

Die berugte afname in groei en selfs massaverliese van beeste word algemeen in Suid-Afrika as normaal aanvaar. Menige navorsers het ook al die voedingsgebreke geïdentifiseer en menige aanbevelings is gemaak hoe om die verliese te oorkom. Dit is en word nog nie geïmplementeer nie. As redes is aangegee dat die vergoeding wat die produsent gekry het, nie voldoende was nie. Ek kan dit alleenlik gedeeltelik aanvaar en wel waag om 'n opinie uit te spreek, naamlik dat juis as gevolg van die gebrek aan voeding (insette) was die groeitempo laag en het verliese in massa voorgekom (produksie) en daarom was die finansiële vergoeding nie na verwagting nie. Myns insiens is dit eerder 'n gebrek aan kennis, of liewers 'n onwilligheid om beskikbare kennis te implementeer, wat vir hierdie toestand verantwoordelik is.

Etlike persone assosieer verhoogde groei alleenlik met die voeding van grane. Dit is beslis nie die geval nie. Die klassieke werk van Meredith het reeds in 1931 al aangetoon dat gras, in hierdie geval suur en swak gras, die potensiaal het om 'n hoë groei in osse te handhaaf. As gevolg van die verbeterde ekonomiese situasie vir beesvleis kan die resultate en aanbevelings van Hall, Meredith & Altona van 1954 met groot vrug bestudeer en toegepas word. Deur bemesting van swak veld te Frankenwald is die vleisproduksie per eenheid weiding tot selfs 300% verhoog. Hulle rapporteer dat met osse die daaglikse toename oor 'n periode van 4 jaar 0,789 kg/dag was en dat 198 kg massa toename/morg gelewer is; melkproduksie is van 115 tot 231% bo dié van die kontroles verhoog en dat wolproduksie vanaf 18,2 kg/morg in die kontroles tot 41,4 kg met bemesting van veld verhoog is. Die verhoogde produksie as gevolg van bemesting word toegeskryf aan verhoogde grasproduksie en dus hoër drakrag. Die sneller groeitempo word toegeskryf aan hoër smaaklikheid en voedingswaarde en dus hoër vrywillige inname van die gras.

Ruvoer in verskillende vorme kan dus optimale groei veroorsaak en selfs beeste markklaar ook maak, soos in Australië gevind is. Vir werklike intensifisering van vleisbeeste egter is die afronding of vetmaakfase 'n integrale proses. Dit is die hoogste vorm van intensifikasie en voldoen aan die definisie van Preston & Willis waar voer na die diere aangedra word. Dit is ook die enigste fase wat met 'n fabrieksproses vergelyk kan word. Die vetmesting van slagbeeste is dan ook geen nuwigheid in Suid-Afrika nie. Voor 1920 is alreeds navorsing te Potchefstroom gedoen. Boere maak ook al dekades lank osse vet. Die Vleisraad het 25 jaar gelede al 'n program geloods om boere in staat te stel om slagbeeste vet te maak. Soos reeds genoem, was die aanvraag en die pryse egter nie voldoende aansporing om die produksiemetodes werklik te laat posvat nie. Derhalwe was die tipe slagbeeste, sowel as die rantsoene wat gevoer is, nie vergelykbaar met wat tans die geval is nie en het dit geensins bygedra tot intensifikasie nie. Afronding of vetmesting is tans 'n gesofistikeerde bedryf, waarin tegniese kennis en besigheidsvernuf ewe belangrike vereistes is. Die baanbrekers op hierdie gebied is waarskynlik Kahnhym Estates naby Middelburg, wat binnekort 25 000 beeste op 'n slag sal voer. Hulle beraam om in 1975 50 000 beeste op 'n slag te voer, met 'n verwagte omset van 2½ keer per jaar, d.w.s., 125 000 slagbeeste per jaar. Verskeie ander voerkraaleenhede het ook in die laaste drie jaar om die Pretoria-Witwatersrand-Vereeniging kompleks tot stand gekom. Die O.T.K. te Bethal mik reeds na 'n nog meer gespesialiseerde vorm wat vergelyk kan word met wat in die V.S.A. bekend staan as „customer feeding". Hierdie vorm van intensifikasie het behalwe die vinnige omset en hoë produksie/eenheid grond, voer, dier, kapitaal en tyd, ook ander voordele, naamlik die benutting van industriële tipe voere en byprodukte. In geval van proteïene word substitute gebruik soos urea, ammoniak en afvalprodukte van die petroleumindustrie, asook van die pluimveeindustrie, soos mis en vere.

Energie word soms van die suikerindustrie verkry, in die vorm van melasse; die bierindustrie, nl. bierkaf en selfs ook vlugtige vetsure van die petroleumindustrie.

Daar is ook nadele en probleme aan verbonde, soos siektes as gevolg van die konsentrasie van beeste. Dit vereis 'n hoë kapitaalbelegging in fasiliteite. Nog 'n probleem wat tans dikwels bespreek word is besoedeling. In die V.S.A. het besoedeling veroorsaak dat menige groot voerkraaleenhede in die Ooste en Midde-weste moes toemaak en na die Weste verskuif word.

Alhoewel afronding van slagbeeste reeds as 'n produksiemetode inslag gevind het, staan die bedryf egter voor een groot probleem, en dit is die tekort aan geskikte voerbeeste. Vir die teler van voerbeeste is daar 'n uitstekende mark geskep. Die proses van intensifikasie moet dus nou na die teler gebring word. Die meeste telers kan dit waarskynlik binne 1 tot 2 jaar moontlik maak deur hulle kuddesamestelling daarby te laat aanpas. Deur sy koeipersentasie te verhoog, vermeerder sy risiko en hy moet dus sy voerproduksieprogram daarby laat aanpas.

VOERPRODUKSIE VIR INTENSIEWE VLEISPRODUKSIE

Dr. S.J. du Plessis verwys na die belangrikheid om boerderystelsels by omgewingstoestande aan te pas en na die onbestendigheid en riskantheid van ekstensiewe gewasverbouing in groot dele van Suidelike Afrika. Hy waarsku dat sporadiese rekordoeste kan lei tot ongeregverdigde optimisme, wat die gevaar inhou om 'n ewewigtige landbouproduksie af te stuur na 'n moeras van biologiese en ekonomiese onstabiliteit. Die gevolgtrekkings wat van hierdie siening gemaak kan word is dat vanweë die stygende rooivleisbehoeftes en veral weens die prysaansporing wat nou begin ontstaan, beesvleisproduksie in die meer begunstigde reënvalstreke asook in die marginale westelike graanproduserende dele van die land kan inskuif.

BEMESTING VAN NATUURLIKE VELD

Dickinson het onlangs 'n reeks interessante gegewens verstrek. Waar die gemiddelde reënval meer as 650 mm per jaar is, sal kunsmistoedienings grasproduksie verhoog en so ook diereproduksie. Selfs 'n beskeie toediening van 60 kg N en 15 kg P per ha lei tot 'n verdubbelde produksie. Die ekonomiese implikasies hang af van die heersende pryse van kunsmis en beesvleis. Die resultate van twee proewe wat 'n weerkklank is van dié op vleisbeeste op bemeste veld te Frankenwald en Döhne word verskaf in finansiële terme teenoor die pryse van kunsmis en beesvleis in 1950, 1972 en 1973.

Netto ekonomiese implikasies van vleisproduksie op bemeste veld (Rand/ha)

Jaar	Frankenwald	Döhne
1950	- R 2	+R 8
1972	+R17	+R39
1973	+R33	+R75

Dit is duidelik dat die huidige prysverhouding tussen kunsmis en beesvleis veldbemesting voordelig tref. 'n Verdere voorbeeld *word verskaf deur Frean.* Te Kokstad-Navorsingstasie is die drakrag van bemeste natuurlike veld 4 keer verhoog bo dié van onbemeste veld. Hierdie verhoogde drakrag het gelei tot 'n verhoging in beesvleisproduksie van R50 tot R55/ha bo die koste van die kunsmis.

Indien Meredith reeds in 1947 verklaar het dat die bemesting van 10 miljoen morge in die Drakensberg weigebied geregverdig was, is dit vandag sekerlik meer waar as toe. Dan is dit ook sekerlik geen wensdenkery om te verklaar dat daar geen rede is waarom die beesbevolking in dié gebiede meer as verdubbel kan word nie. Die gebied is reeds bekend vir die produksie van hoë gehalte beeste en as 'n gesonde beesweigebied: dit kan die westelike en noordelike ekstensiewe beesboerderygebiede vervang as dié gebied waar speenkalwers vir die voerkrale geproduseer kan word.

RADIKALE VELDVERBETERING

Behalwe bemesting van veld, is uiters waardevolle werk in verskillende streke van die land gelewer om natuurlike veld radikaal te verbeter deur insaaiing van ander weigewasse, ontbossing van weiding en selfs vestiging van hoër-produserende grasse van hoër voedingswaarde. Hierdie tegnieke kan myns insiens die grootste bydrae lewer tot instensiewe beesvleisproduksie.

Te Cedara in Natal het Kikuyuweiding 17 ton droë materiaal/ha gelewer, wat voldoende is vir vier koeie en kalwers. Hereford en Hereford-Afrikanerkruise het die volgende toenames in massa getoon gedurende groeiperiode van 180 dae: koeie 0,41 kg/dag en suipkalwers 0,77 kg/dag. Vier koeie en vier kalwers kan dus saam 850 kg lewende massa produseer. Teen huidige pryse van 35c/kg lewende massa beteken dit 'n inkomste van R306/ha.Cedara bereken dat dit R150/ha sal kos om die weidings op die produksiepeil te hou.

Die voedingswaarde van die weiding is hoog. Met 'n inname van 50 kg weiding (7,5 – 10 kg droë massa) deur 'n vleisraskoei kry sy 6,5 kg totale verteerbare voer en 1,6 kg verteerbare ru-proteïen. Te Nooitgedacht-Navorsingstasie naby Ermelo lewer *E. curvula* met goeie bemesting en in die 10% blomstadium gesny 12,4 ton hooi met 'n ru-proteïen inhoud van 11,4%.

Volgens Rethman & Malherbe kan oulandsgras wat goed bemes is met 'n gemiddelde reënval van 760 mm/jaar tot 6 grootvee-eenhede/ha deur die groeiseisoen dra. Die produksiekoste van hooi is bereken teen R60/ha vir die eerste jaar en R85/ha vir die daaropvolgende seisoene. Die Star rapporteer ook dat die Johannesburgse Munisipaliteit op sy rioolplase 8 000 beeste op 8 300 ha kunsweidings aanhou.

Daar is ook voorbeelde van radikale veldverbetering in die droër, tradisioneel ekstensiewe beesweistreke. Te Setlogoli in die Mafeking-distrik, waar die gemiddelde reënval 450 mm/jaar is, verkry 'n boer, Mnr. Errol Hobson, volgens die Landbouweekblad 5 ton *Cenchrus cilliaris* hooi/ha. In die gebied kan dus een koei en haar kalf/ha aangehou word in vergelyking met die drakrag van die natuurlike veld van 6 – 8 ha/koei en kalf. Die produksiekoste vir die vestiging van die gras was R33/ha, wat ontbossing, saad, bewerking en kunsmis insluit. In die Springbokvlakte verkry nog 'n boer, Mnr. van Zyl, van 2 000 ha *Cenchrus cilliaris* gemiddeld 4 – 8 ton hooi, afhangende van die reënval. In die eerste jaar was die beweidingsdruk 1 G.V.E./1,4 ha, maar met kleiner kampe word nou 1 G.V.E./1 ha gehandhaaf, terwyl in goeie reënjare nog 'n hooi-oes daarby afgehaal word.

Die paar voorbeelde toon dat bemesting van natuurlike veld en radikale veldverbetering in wyduiteenlopende ekologiese gebiede suksesvol deurgevoer is en geweldige moontlikhede vir die intensifisering van beesvleisproduksie bied.

TEELPROGRAMME VIR INTENSIEWE BEESVLEISPRODUKSIE

Alhoewel die eerste voorvereiste vir intensiewe beesvleisproduksie op verhoogde voerproduksie berus, is dit ook duidelik dat genetiese materiaal gebruik of geskep moet word om die mees doeltreffende omsetting van die voer in vleis te verseker. Voordat 'n teelprogram ontwerp word, moet aandag aan die basiese beginsels gegee word.

Aanpasbaarheid

By intensiewe beesvleisproduksieprogramme is aanpassing by klimaat minder belangrik, maar aanpassing by die betrokke voersituasie, produksiestelsel en einddoel uiters belangrik.

OPSOMMING

Produksie-eienskappe	Geskatte ekonomiese waarde	Gemiddelde oorerflikheid	Verwagte basterkrag
Reproduksie:			
Kalf	Mees belangrike	0,10	10 - 25%
Moerdereienskappe			
Kalfmoeilikheid			
Groei:			
Daaglikse toename	Tweede in waarde	0,40	5 - 10%
Finale massa vir ouderdom			
Voeromsetting			
Gehalte:			
Gradering	Derde in waarde	0,50	0
Vetdistribusie			
Sagtheid			
Spier : beenverhouding			
Ander:			
Aanpasbaarheid	Moet ook oorweeg word	0,60	?
Temperament			

Relatiewe Ekonomiese Belangrikheid van Verskillende Erflike Produksie-eienskappe

Die relatiewe ekonomiese waarde van produksie-eienskappe verander in geval van intensiewe beesvleisproduksie.

Reproduksie: weens die hoë koste van voerproduksie is reproduksie ekonomies relatief belangriker by intensiewe as by ekstensiewe beesboerdery. Alhoewel die uitwerking van seleksie laag is en dus nie juis geregverdig is nie, is daar nogtans 'n genetiese invloed, soos geopenbaar deur die verskille tussen rasse en die effek wat verkry word deur kruisteling. Dit is van die begin af belangrik om rasse te kies met 'n inherente hoë vrugbaarheid en 'n kruisteeltbeleid te volg tussen rasse met 'n goeie kombinasievermoë vir vrugbaarheid asook ander produksie-eienskappe.

Melk- en moedereienskappe: weens die hoë voedingspeil vanaf kunsweiding is seleksie en die keuse van rasse vir hoë melkproduksie by vleisraskoeie relatief minder belangrik.

Speenmassa: dié eienskap verminder ook relatief in ekonomiese belangrikheid vanweë 'n hoë voedingspeil voor en na speen, asook tegnieke van vroeër speen.

Groei na speen: dit vermeerder in ekonomiese waarde aangesien die finale slagmassa so gou moontlik bereik moet word.

Finale massa: die massa wanneer 'n dier slagryp is, is van die grootste belang. Die keuse van rasse is belangrik. Laatryp en die grootraamvleis- of dubbeldoelrasse sal minder goed inpas by 'n intensiewe sisteem. Die eindproduk, dit wil sê die karkasmassa, moet tussen 200 en 250 kg wees.

Voerinname en voeromsetting: Veral voeromsetting vermeerder relatief baie, omdat voerproduksie en intensiewe voerdery verantwoordelik is vir die toename in massa, in teenstelling met ekstensiewe weidings wat relatief goedkoop is. Alhoewel dié eienskap redelik hoog met daaglikste toename gekorreleer is, is dit hoogs oorerflik. Dit toon ook redelike verskille tussen rasse, wat dit regverdig om korrekte raskeuses te maak en seleksie toe te pas.

Karkaseienskappe

Vanweë die subjektiewe metodes van karkasgradering en die feit dat onderhuidse vet die bepaalde faktor is, bemoeilik dit die berekening van die erfbaarheidswaarde (h^2). Nogtans beskik ons oor genoegsame kennis van rasse om vooraf keuses te kan maak.

Die veranderde en veranderende verbruikersvoorkeur vir minder vet moet egter mee rekening gehou word. Deur 'n kruisteelprogram te volg kan rasse gebruik word om gou aan veranderende markvereistes en verskillende verbruikersvoorkeure te voldoen.

Temperament: dit is nog 'n erflike eienskap binne en tussen rasse wat met intensiewe vleisbeesvoerdery relatief meer belangrik word, aangesien beeste meer dikwels gehanteer word.

Teelstelsels

Dit is duidelik dat 'n enkele suiwer ras nie aan al die vereistes kan voldoen nie en dat 'n kruisteelstelsel die aangewese een is. Die F1-koei is veral 'n waardevolle dier vanweë die uitwerking van heterose op die laag-oorerflike reproduksie eienskappe.

Die keuse van rasse is 'n belangrike uitgangspunt Die rasse moet 'n goeie kombinasie-effek teweeg bring om die F1-koeie te lewer wat self middelmatig groot en vrugbaar moet wees, redelik melk produseer, 'n mak temperament hê en maklik kalf.

Keuse van Rasse

Voordat 'n keuse gemaak word moet mikpunte en produksienorme opgestel word. Dit word hoofsaaklik deur die omgewing, voersituasie, produksie- en bemarkingstelsel wat gevolg gaan word bepaal.

KLASSIFIKASIE VAN RASTIPES VOLGENS HULLE AANPASBAARHEID BY OMGEWING EN PRODUKSIESTELSEL (VOLGENS VENTER 1973)

	Produksie-eienskap	Britse Vleisrasse	Dubbeldoelrasse	*Bos indicus*	Gespesialiseerde vleisrasse
1	Groeitempo	Medium	Goed	Laag	Goed
2	Volwasse massa en grootte	Vroegryp	Laat	Medium	Laat
3	Melkproduksie	Variërend	Goed	Variërend	Medium
4	Vrugbaarheid	Goed	Goed	Medium	Medium
5	Voorkoms van distokia	Medium	Hoog	Laag	Hoog
6	Geslagsrypheid	Vroeg	Medium	Laat	Medium a.g.v. distokia
7	Bespiering	Medium	Goed	Swak	Uitstekend
8	Gradering	Goed	Swak by vroegslag	Goed	Medium maar by hoë massa
9	Voervereistes	Medium Semi-intensief	Hoog Intensief	Ekstensief	Hoog Intensief
10	Aanpasbaarheid :-Trope & subtrope	Swak	Redelik in Soet-velddele	Goed	Swak
	:-Gematigde klimaat	Goed	Goed	Medium; verhoogde onderhoudsbehoeftes	Medium. Hang af van grondvrugbaarheid en kwaliteit van voer

Die tabel laat 'n redelike wye keuse van rasse. My persoonlike keuses vir gebruik vir intensiewe beesvleisproduksie is die volgende:

***Bos indicus*-tipes** as basis in kruisteelsisteem
Suurvelddele - Drakensberger
Soetvelddele - Bonsmara

Dubbeldoeltipes
Suurvelddele - Bruin Switser en Suid Devon
Soetvelddele - Pinzgauer en Simmentaler

Britse Rasse
Suurvelddele - Aberdeen Angus en Hereford
Soetvelddele - Sussex en Hereford

Gespesialiseerde Vleisrasse

Persoonlik dink ek nie dat dié rasse 'n groot bydrae kan lewer nie.

BESTUUR

Die beplanning, implimentering en uitvoering van 'n geintensifiseerde beesvleisproduksieprogram verg die hoogste mate van bestuursvernuf. Tegniese kennis gekoppel met besigheidsbeginsels is nodig om die noodsaaklike voedingsbestanddele te verskaf en daarop die aanteel, uitgroei en afrondingsfases te beplan en uit te voer. Noukeurige rekords van alle fasette moet gehou word om die noodsaaklike bestuursinligting te voorsien, wat dan oordeelkundig oorweeg moet word om besluite te kan maak.

CONGRESS NEWS

KONGRESNUUS

VIIITH INTERNATIONAL CONGRESS ON ANIMAL REPRODUCTION AND A.I.

ORGANIZING COMMITTEE OF THE

POLISH ACADEMY OF SCIENCES

FIRST ANNOUNCEMENT

We take much pleasure in informing you that the VIIIth International Congress on Animal Reproduction and Artificial Insemination will be held in Krakow, Poland, on 12 - 16 July, 1976.

According to the programme coordinated with the Executive Body of the Standing Committee of the International Congresses for Animal Reproduction and Artificial Insemination, three sections have been planned:

I. Physiology of reproduction.
II. Pathology of reproduction.
III. Artificial insemination.

In all sections priority is given to the following main problems

A. Effects of environmental factors on animal reproduction with particular reference to tropical and sub-tropical conditions.
B. Genetic factors in animal reproduction.
C. Comparative aspects of research in reproduction.

Communications on other than the afore-mentioned topics are welcome.

The Secretary of the Congress is Professor Stefan Wierzbowski. Adress of the Congress Office is: 32-083 Balice/Krakow, Poland, Institute of Zootechnics, Department of Animal Reproduction and A.I.

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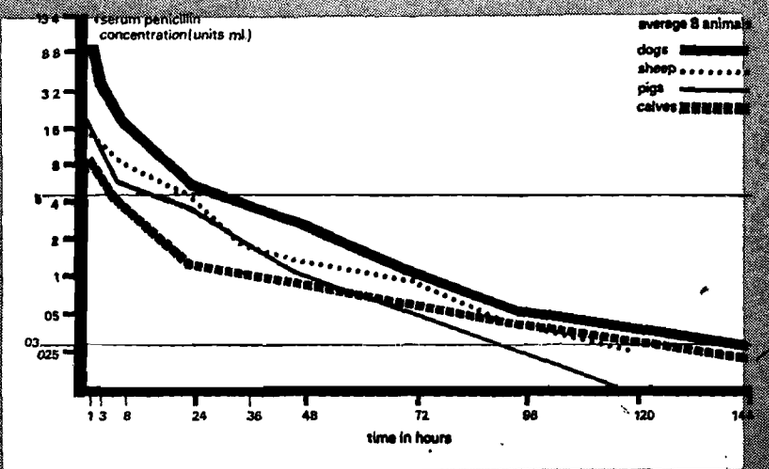

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LAMB AND MUTTON PRODUCTION IN SOUTH AFRICA: AN EVALUATION *

L. P. VOSLOO **

SUMMARY

As result of analysis of the present position (and disregarding the question of quality) it is calculated that 7,90 million sheep are available annually for slaughter in South Africa, which confirms that there is a difinite shortage of lamb and mutton production.

By increasing the percentage breeding ewes in the national flock to approximately 60 percent, meat production could be increased by 37 percent. Other measures are: the breeding of ewes to lamb as yearlings, and continue breeding from them up to the age of 6 years; increasing prolificacy genetically, using increase of testes diameter in ram lambs as indicator; increasing lamb survival by better management; and accelerating lambing, an aspect that demands much more research. These measures will obviate the need for increasing sheep numbers and its attendant danger of overstocking.

INTRODUCTION

Basically the lamb and mutton industry consists of two equally important aspects, viz., the number and the quality of the carcases produced. In the present paper the quality of the lamb and mutton carcases produced in South Africa will not be considered. This discussion will be limited to an evaluation of the industry with regard to the number of animals which are presently slaughtered.

In June, 1972, an analysis of the supply and demand of lamb and mutton in South Africa was published which revealed a shortage of 1,5 million animals per year [38]. According to the weekly reports of the Livestock and Meat Industries Control Board, the average slaughterings of sheep in the controlled areas from March to October 1973 was 71 000 per week. In the same reports the weekly requirements in the controlled areas are given as 122 000 lamb and sheep carcases per week. From this it can be estimated that the annual shortage is at present 2,5 million animals.

PRESENT SITUATION

To analyse the present lamb and mutton production situation in South Africa, it is necessary to consider the factors involved in the maintainance of a flock size. The approach is thus that the total number of sheep remain constant at 30 million and that only surplus animals are available for slaughter.

According to the most recent survey in 1956 [17], only 40 per cent of the total number of sheep in the country were breeding ewes. It is reasonable to accept, however that because of the stock reduction scheme the percentage of breeding ewes will have increased to 45 per cent. Thus at present there would be 13,5 million breeding ewes in the country and 16,5 million would be non-breeding stock such as lambs, yearlings and wethers. The number of surplus animals that can be produced by this breeding flock will depend on the following four factors:

(a) Number of lambs weaned per ewe mated (0,66)
(b) Annual survival rate of the breeding ewes (0,95)
(c) Age at first lambing (2 years)
(d) Age at final lambing (7 years)

The values taken for these factors were obtained from the same survey made in 1965 and there is no reason to believe that these values have changed since.

The number of ewes in the various age groups can now be estimated [27] as shown in table 1.

Table 1: DISTRIBUTION OF BREEDING EWES IN DIFFERENT AGE GROUPS

Total		2 yrs		3 yrs		4 yrs		5 yrs		6 yrs		7 yrs	Equation no.
T	=	T/y	+	q T/y	+	q^2T/y	+	q^3T/y	+	q^4T/y	+	q^5T/y	1
100	=	18,9	+	18,0	+	17,1	+	16,1	+	15,3	+	14,6	
13,5 m	=	2,55	+	2,43	+	2,30	+	2,17	+	2,07	+	1,97	

$$y = 1 + q + q^2 + q^3 + q^4 + q^5 \quad \text{..... 2}$$

From table 1 it is appears that 2,55 million maiden ewes are required annually as replacements to maintain the size of the breeding flock and that 1,97 million surplus old ewes will be available for slaughter.

If the number of lambs weaned per ewe mated is 0,66 and 50 per cent of the lambs are ewe lambs, then 4,46 million ewe lambs will be in the flock annually. With a survival rate of 0,95 from weaning to first mating, the number of maiden ewes in the flock will be 4,24 million. The total number of females in the sheep population is thus 22,2 million which means that the total number of wethers is 7,8 million.

The number of wethers in the various age groups can be estimated [27] as shown in table 2.

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** Dept. Sheep and Wool Science, University of Stellenbosch, Stellenbosch.

Table 2: DISTRIBUTION OF WETHERS IN DIFFERENT AGE GROUPS

Total		Weaners		1 yrs		2 yrs		3 yrs		4 yrs		5 yrs	Equation no.
T	=	T/y	+	q T/y	+	q^2T/y	+	q^3T/y	+	q^4T/y	+	q^5T/y	3
100	=	18,0	+	17,4	+	16,9	+	16,4	+	15,9	+	15,4	
7,8 m	=	1,40	+	1,36	+	1,32	+	1,28	+	1,24	+	1,20	

In equation 3 (Table 2) the annual survival rate of the wethers was taken as 0.97; it is general practice to dispose of wethers at the age of five years.

The total sheep population in the country thus compromises

13,50 million breeding ewes
4,46 million ewe lambs
4,24 million maiden ewes
7,80 million wethers
30,00 million

After provision has been made for the necessary replacements in the above flock structure, the number of surplus animals available for slaughter will be:

1,97 million old breeding ewes
1,69 million surplus maiden ewes
3,06 million wether lambs
1,20 million old wethers
Total 7,90 million

This analysis not only confirms that there is a shortage of lamb and mutton production in South Africa, but is a useful guide to indicate possible means of increasing production.

MEANS OF INCREASING PRODUCTION

COMPOSITION OF FLOCK

Theoretically it is possible to change the composition of a flock of 30 million sheep so that it consists only of breeding ewes and the minimum number of maiden ewes and ewe lambs required for replacements. If the annual replacement requirements remain 18,9 per cent and the survival rate from the weaning to first mating is also taken as 0,95, then the number of breeding ewes in the flock can be estimated by using the equation:

$$30 = X(1 + 0{,}189 + \frac{0{,}189}{0{,}95}) \quad \text{.....(4)}$$

where x represents the number of *breeding ewes*. The composition of such a flock is shown in table 3.

Table 3: COMPOSITION OF AN IDEAL FLOCK CONTAINING THE MAXIMUM NUMBER OF *BREEDING EWES*

Type	Number	%
Breeding ewes	21,6	72,0
Maiden ewes	4,1	13,7
Ewe lambs	4,3	14,3
Total	30,3	100,0

The meat production potential of a flock with such a structure will be 13,1 million slaughter animals per year if the percentage of lambs weaned remains at 66. It seems an attractive possibility to increase meat production by more than 65 per cent merely by changing the flock structure. It is unlikely, however, that such a flock structure will ever be attained. Nonetheless, it should be the aim to increase the percentage of breeding ewes in our national flock to approximately 60, which, by itself, will increase meat production by 37 per cent.

AGE STRUCTURE

(a) *Breeding of Ewe Lambs*

The breeding of ewes to lamb as yearlings is an obvious means of raising the level of productivity of a flock.

The scientific literature provides little information on the influence of the synthesis and the release of gonadotrophic and gonadal hormones on the puberal development of ewe lambs. It seems that the sexual activity of ewe lambs is not limited by the ability of the pituitary to produce hormones, since ewe lambs can be induced to ovulate and exhibit oestrus prior to attaining natural puberty [12] [26] [28]. Nevertheless, information on the ability of ewe lambs to carry a foetus to full term subsequent to hormonal treatment is lacking. The early breeding of ewe lambs with hormone treatment is thus not of practical importance yet.

Much more information is already available with regard to the environmental and to a lesser extent to the genetic factors involved in the puberal development of the ewe lamb [9]. In general it appears that it is influenced by breed, mass or size and date of birth [13] [14] [21]. In a recent experiment in Nebraska which involved 19 different breed groups consisting of 7 breeds and 12 cross-bred groups, ewe lambs were exposed to rams at the age of 216 days and a breeding mass of 40 kg [25]. The least square means for percentage ewes lambing per ewe exposed ranged from 32 to 100 with a mean of 71 for all breed groups.

At Aberystwyth it was shown [8] that Clun Forest ewe lambs underwent their first oestrus at a mean age of 228 days (202 – 245 days). The ewe lambs which did *not attain* puberty in their first year tended to be the ones which were born later in the season and those which did not reach a minimum body mass of 32 kg within the first year. Thus it appears that in most breeds ewe lambs maintaining a high growth rate will attain puberty between 7 to 8 months of age. The minimum body mass required for the onset of cyclic activity can be expected to vary considerably according to the size of the breed. Based on local findings [36] with a large breed such as the S.A. Mutton Merino, it appears that a conception rate of more than 60 per cent at first mating can only be expected if the breeding mass exceeds 65 per cent of the mature body mass of the ewes in the breed.

With regard to the influence of early breeding on subsequent reproduction it has been shown [18] [31] that ewes bred to lamb as yearlings have a greater life time reproduction than ewes bred to lamb as two-year olds. In fact, ewe lambs that do exhibit ovarian activity, whether bred as lambs or not, have a greater life time reproductive rate than ewe lambs that do not attain puberty during the first year [5].

(b) *Longevity*

Longevity of ewes is a major factor when computing the reproductive rate and thus the number and type of surplus animals available for slaughter. The longer ewes are kept for breeding, the smaller the number of replacements become and consequently more lambs will be available for marketing. If the influence of selection of young ewes on the reproductive rate is not considered, then the problem of finding the maximum breeding age becomes one of finding the highest value for the expression:

Total meat production / yr = surplus lambs + surplus ewes cast for age

Two interactions must be considered. Firstly, the number of lambs weaned per ewe mated increases with age up to five years and decreases with a further increase in age [33] [34] [36]. Secondly, the survival rate of ewes remains constant up to the age of seven years and then decreases [36]. An estimate of the reproductive rate per ewe per year taking into account these interactions is shown in table 4.

Table 4: ESTIMATED ANNUAL REPRODUCTIVE RATE PER EWE

Age at lambing	No. of ewes	Lambs weaned/ ewe mated*	Total lamb production	Lambs produced / ewe/year
2	1,00	0,70	0,70	0,35
3	0,95	1,06	1,70	0,57
4	0,86	1,22	2,75	0,69
5	0,82	1,36	3,87	0,77
6	0,78	1,25	4,85	0,81
7	0,74	1,20	5,74	0,82
8	0,66	1,16	6,51	0,81
9	0,59	1,12	7,17	0,79

* Reproduction data for S.A. Mutton Merino [36]

** Survival rate = 0,95 for ewes up to 7 years and 0,90 for older ewes.

With a known annual reproductive rate per ewe, the maximum breeding age which will render the highest number of surplus animals per ewe per year can be estimated as shown in table 5.

Table 5: THE INFLUENCE OF FINAL BREEDING AGE ON THE TOTAL NUMBER OF SURPLUS ANIMALS PRODUCED

Final breeding age	Annual ewe lamb replacements	Lambs produced /ewe/year	Surplus lambs	No. of ewes for age	Total surplus animals/ewe/year
5	0,27	1,07	0,80	0,23	1,03
6	0,22	1,10	0,88	0,18	1,06
7	0,19	1,12	0,93	0,13	1,06
8	0,17	1,11	0,94	0,10	1,04
9	0,15	1,09	0,94	0,09	1,03

From table 5 it appears that the maximum number of surplus animals will be available if the ewes are bred up to an age of six years. Naturally, the final decision will depend on the relative value of lambs and ewes cast for age and the importance of a short generation interval for a particular flock.

PROLIFICACY

As stated previously, the mean reproductive rate of ewes in South Africa is given as 0,66 lambs weaned per ewe joined. If this is compared with the prolificacy of the Finnish Landrace and the Russian Romanov, it is clear that the scope for increasing ewe prolificacy is enormous. These highly prolific breeds have shown that some ewes can produce five lambs per litter and some ewes can produce two litters a year indicating that the production of ten lambs per ewe per year is a genetic possibility [22] [32]. For various practical reasons it would be advisable to set the aim at a much lower rate but one at least considerably higher than at present.

One way of increasing litter size is to synchronize oestrus and stimulate ovulation by means of exogenous hormonal therapy [10] [30]. The problem of cost, reduced conception rate and unpredictable litter size still limits the practical application of this method.

A more permanent method, and usually the least expensive way of increasing prolificacy, is to improve it genetically. The most rapid way of making genetic progress is to cross existing breeds with the extremely prolific breeds. In animal breeding it is generally known that heterosis exists for a trait such as *fecundity which has a low heritability:* that the performance of crossbred individuals is better than the mean of the parents that produced them. The problem, however, is that those highly prolific breeds do not have the same carcass and wool qualities as the existing breeds [11].

At present it seems that the only solution to increase prolificacy is to select the most fecund animals within a breed and to breed from them. Up till now this was done by practically confining the selection to the most prolific females and the results in general were rather disappointing. Selection trials in New Zealand and Australia [32] revealed a progress of approximately one 50th of a lamb a year. The reason for this slow progress is ascribed to a number of factors *inter alia* the low heritability of twinning rate, the small selection differential that can be attained with female selection, and that prolificacy of a ewe can only be accurately assessed when she is 3 to 4 years old. A very important factor that has been neglected is the ability of the ram to confer fecundity. The most probable reason that this aspect has not received much attention is that it is rather difficult to assess the possible genetic contribution made by a ram to the prolificacy of his daughters. The present method is to take into account the performance of a particular ram's mother and his half sibs. Such indirect methods are usually not very accurate, consequently the result cannot often justify the amount of work entailed, nor the time required to accumulate sufficient information.

A very promising development in this field is the work presently done by the Animal Breeding Research Organisation at Edinburg [24]. This work sug-

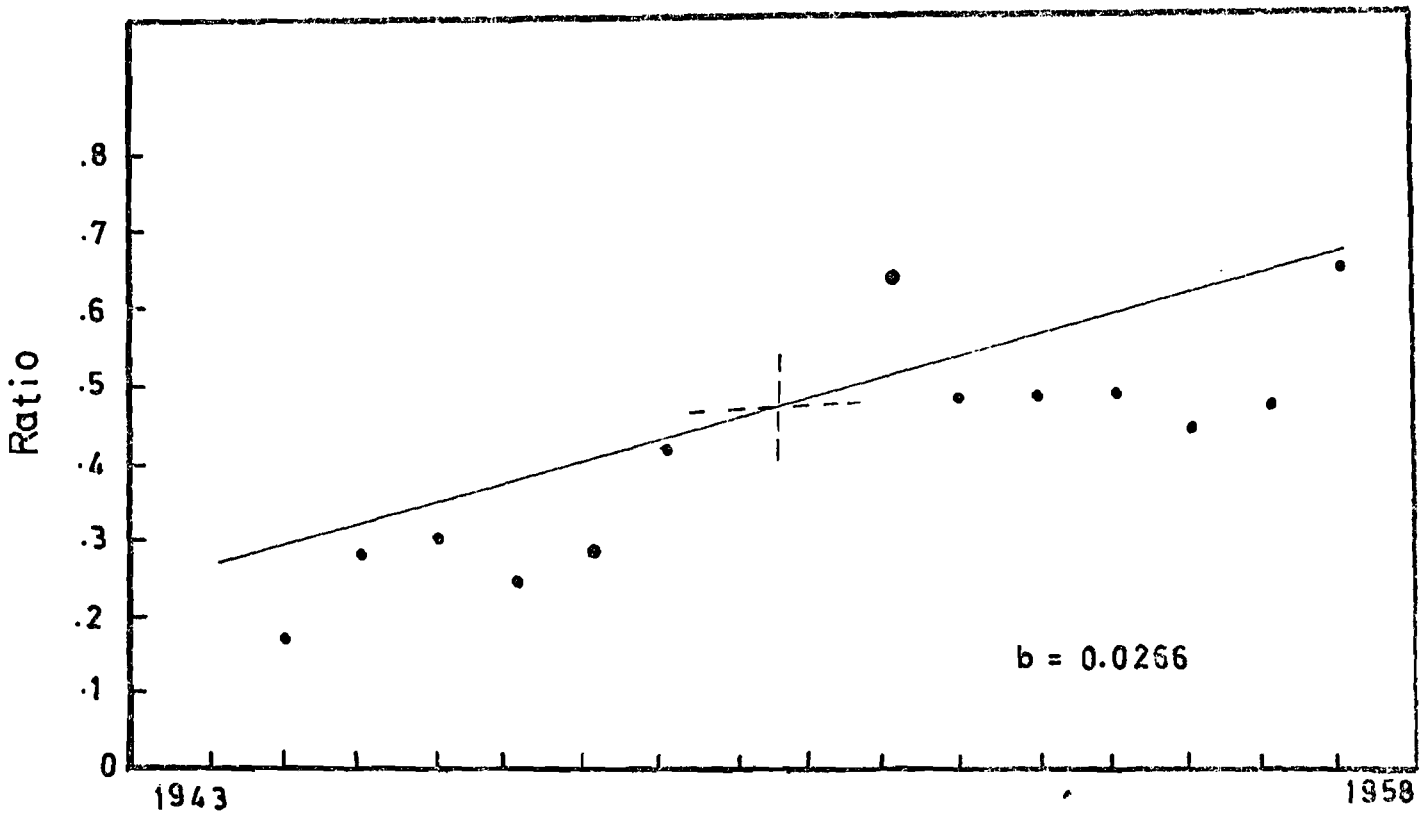

Fig 1 The ratio of multiple births to total from 1943 - 1958

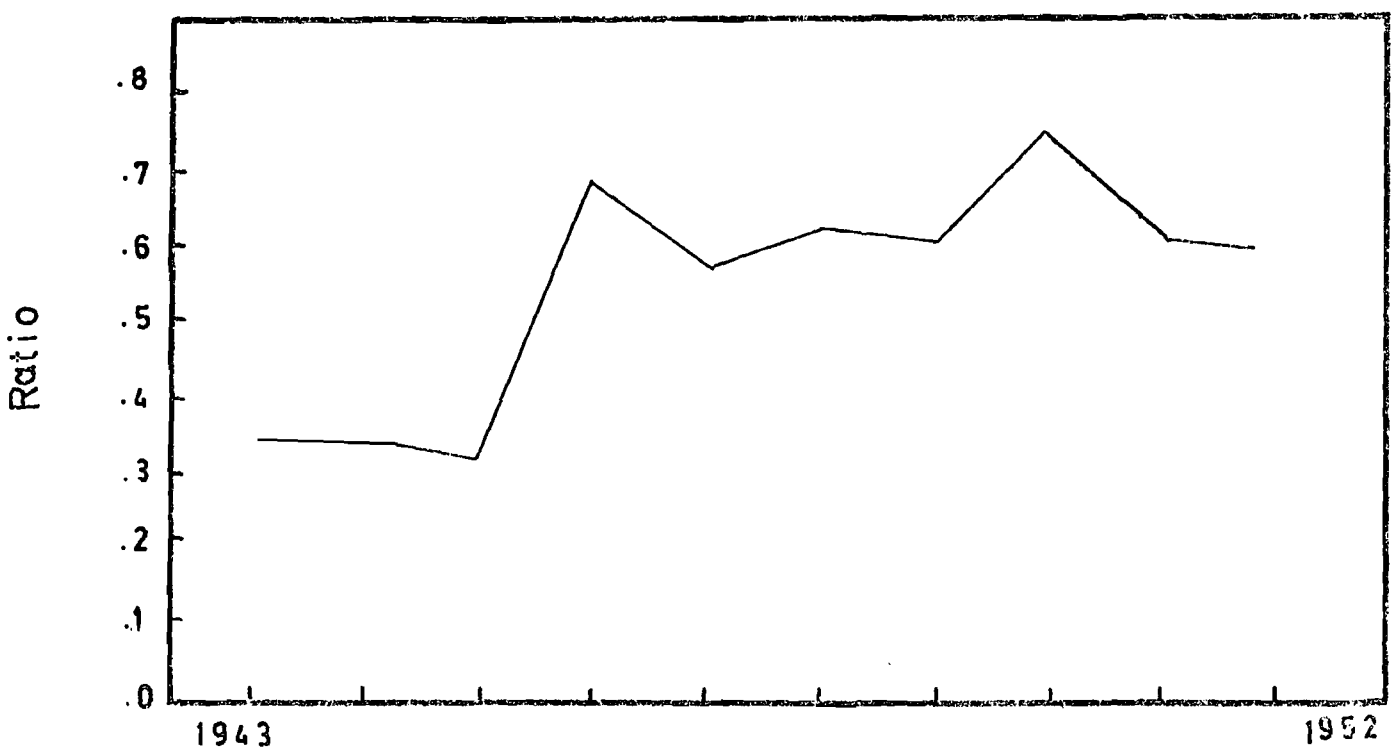

Fig 2 The ratio of multiple births produced by ewes born in 1943 to 1952 throughout their productive life

gests that sheep prolificacy might be assessed , not only by counting the number of lambs produced by mature ewes, but by measuring the rate of increase in testes diameter of ram lambs. On mice it has been shown that the mean testes mass of males was highly correlated (r = 0,97) with the ovulation rate of the females. Similar work on sheep [24] indicates that, when ewes are selected for increased ovarian activity, the male sibs express this in an increase in testicular diameter as a genetically correlated response. The physiological explanation is that the gonadotrophic hormones (FSH & LH) produced by the anterior lobe of the pituitary which control the activity of the ovaries also control testes activity in the male.

Observations on the gonadotrophic dynamics of Finnish Land Race and Romanov ewes [32] revealed that the release of LH as indicated by the peripheral plasma and urine levels is closely correlated with the ovulation rate. Differences in LH release can be detected between four and eleven weeks. Thus one of the major barriers of selection progress, viz., the time required to identify the most superior animals, can be overcome. In the case of ram selection the practical application is as simple as measuring the increase in testes diameter from birth to weaning. Even if a more acurate measurement such as testicular mass is required, it is possible to remove one testis without influencing the fertility or the libido of the ram.

The selection of the ewes on the peripheral LH level on the other hand will depend on rapid and inexpensive techniques for assaying LH.

In contrast to the slow progress that was made in selection trials for prolificacy in other countries, a mean increase of 2,6 per cent per year in the ratio of multiple to single births was obtained in the S.A. Mutton Merino Stud at Elsenburg Agricultural College over a period of 15 years [6]. These results are shown in figure 1. This progress could not be explained as a selection response, because the heritability of twinning rate in this particular stud was found to be as low as 10 per cent[6].

Further analysis of the data revealed that there was a definite time trend. As shown in figure 2 there was a sudden and sustained increase in the ratio of multiple to single births produced by ewes born in 1946. A possible explanation for this is the contribution of a particular sire; it is interesting to speculate that it was probably one which had a very rapid testes growth rate.

LAMB SURVIVAL

In most sheep-rearing countries, 15 – 20 per cent of all lambs born die between birth and weaning [1 3 23 35]. Most of these lambs are born dead or die within three to five days after birth. Congenital infections may be responsible for outbreaks of abortion or for sporadic losses at full term, but in general most investigations have shown a low incidence of congenital infection in lamb losses. A recent study in New Zealand [16] confirmed most previous findings, viz., that 80 to 90 per cent of all lamb losses can be ascribed to non-infectious causes.

Although no information has been published on the heritability of survival rate, there is indirect evidence of genetic influences. For example, an increase in inbreeding is accompanied by a decline in survival rate and cross-breeding as well as breeding from F_1 ewes results in a significant increase in survival rate [15]. In practice, inbreeding and particularly the rate of inbreeding is usually only a problem of closed studs with relatively small numbers of breeding ewes. Under such conditions breeders should either do pedigree mating or cyclic mating to prevent inbreeding.

The more numerous perinatal deaths are thus cuased by non-infectious and non-genetic factors. An important finding in New Zealand [16] is that of single-born lambs autopsied, 45 per cent died of dystokia and 15 per cent from starvation, whereas in multiple-born lambs 16 per cent of deaths were from dystokia and 42 per cent from starvation. In total, dystokia and starvation accounted for 60 per cent of deaths. The interaction between litter size and age of dam revealed that twin lambs from five-year-old ewes had a better chance of suvival than single lambs from two-year-old ewes [16 36]. These results indicate that efforts to reduce lamb mortality should be directed to intensive management during lambing and the period up to three days after birth. It has been shown in Australia [2] that perinatal mortality rate can be reduced to less than five per cent where assistance during parturition, shelter and, where necessary, additional milk were provided. A recent study at Glasgow [7] revealed that the intensity of husbandry at lambing had a large effect on the quantity of immune globulin absorbed by lambs and that the zinc sulphate turbidity values of the blood serum of three-day-old lambs were related to the susceptibility of lambs to disease. In certain states in the U.S.A. it is recommended [29] that small new-born lambs which show signs of hypothermia be fed on hundred m*l* cow colostrum at 40°C with a catheter tube directly into the abomasum. Preliminary observations in field trials in the Western Cape [39] showed that full milk enriched with cream and egg to more or less the same protein and fat content as that of ewe colostrum also had a beneficial effect on lamb survival when given directly into the abomasum to newly born lambs, that show signs of shivering and inactivity. Much more information is required before detailed recommendations can be formulated.

ACCELERATED LAMBING

In contrast to most countries, particularly countries in the Northern Hemisphere, there is no well-defined lambing season in South Africa. It is only in the areas with a relatively high summer rainfall – which, incidently are not the most important sheep production areas – where ewes lamb regularly in the spring. In the Mediterranean part of the country, lambing starts in the early autumn (February) and extends to mid-winter (June). In the Karoo, two lambing seasons on the same farm, one in spring and one in autumn, is fairly common, and strange enough the most frequent lambing is practised in the arid areas of the N.W. Cape, where rams are run continuously with the ewes, or the rams are put to the ewes for one month and removed for one month throughout the year.

Accelerated lambing, which implies lambing the same ewes more frequently than once a year, is not practised on a large scale. Even with such an open breeding season, experimental evidence reveals that most breeds in South Africa also show some seasonal variation in reproductive efficiency [19]. If the aim in

an intensive, accelerated lambing programme is to lamb at six-month intervals, it will probably be necessary to resort to the promotion of early rebreeding of ewes. The availability of breeds with a less restricted breeding season (Merino, S.A. Mutton Merino and Dorper) makes it possible to lamb three times in two years without the use of hormone treatment [19]. To attain this, it is better not to arrange matings at rigid eight-months intervals, but to adjust the interval between pregnancies according to the season [19]. For the Western Cape it is recommended to mate ewes in an accelerated lambing system during February, July and August.

From the literature cited, it seems that the factors involved in the conception of ewes at the shortest possible *post-partum* interval have received much attention [10 19 20 37], but there is a paucity of information on the influence of the added stress associated with accelerated lambing on the longevity of ewes. In two separate experiments in the United States [2 4] the survival of ewes after five years of frequent breeding was 15 and 82 per cent respectively.

Another aspect of accelerated lambing which still requires further research is the feeding of the early weaned lamb. Nothing is known yet about the factors responsible for the accumulation of toxic quantities of copper in the liver of lot-fed lambs. Information is also required on the predespatching treatment of feed lot lambs to prevent losses in transit. Finally, information is needed on the cost of the additional feed required by the ewe and the lamb to estimate the profitability of an accelerated lambing programme.

In conclusion it can be stated that there is an enormous scope for increasing slaughter lamb and mutton production in South Afica without resorting to an increase in sheep numbers and thus without endangering the natural pastures by overstocking.

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PIG HUSBANDRY SYSTEMS AND PROTEIN FEED COSTS *

S. D. PARSONS **

SUMMARY

Vital factor analysis, whereby the percentage change in any production factor required to effect a particular change in profit, is outlined as applied to the pig industry. In this way the priority of production factors can be determined, but only one factor at a time can be considered. In addition, the basic assumption has to be made that change in one factor will bring about a *pro rata* change in the others; this may not necessarily be valid. Consequently, a linear programming form of systems analysis was applied to a two-stage experiment, consisting of a profit maximizing and a least cost feed formulation model. The results, although of a preliminary nature, indicate that pig production will continue on an intensive basis, despite rapidly rising feed prices. The methods used offer an instructive example of how this form of systems analysis can be utilized.

INTRODUCTION

In terms of meat consumption, pig production is a relatively unimportant industry in Southern Africa, accounting for only eight percent of total meat consumed per capita in South Africa during 1972 [1]. In the main, pig production in this southern hemisphere primarily serves domestic markets. Some interterritorial transfer does occur but this is minor relative to total production; overseas exports have been minimal, largely because of the distances involved. For these reasons there has been little incentive to greatly expand pig production in Rhodesia or South Africa. Generally speaking, increased production by one farmer requires that other producers decrease production because of the limited market. Consequently, the pig industry tends to be competitive with relatively rapid adoption of technological innovations. It is usually the bigger producers specializing in pigs, or those with specialist managers, which are most efficient. In Rhodesia, 22 per cent of producers produce some 80 per cent of the country's high grade pigs. Very often the small herds of less than 25 sows are inefficient and possibly uneconomic. It may be speculated that these units remain in production because the owners are blissfully unaware that these small enterprises are being 'subsidized' by other enterprises on the farm.

CURRENT STATE OF TECHNOLOGY

Very briefly the advocated husbandry practices in use by the more efficient commercial producers entail sow confinement in sow stalls during pregnancy, with a feed level of approximately 2 kg of 14 – 17% crude protein/day, farrowing crates till piglets are between two and three weeks of age, multi-suckling from two weeks to weaning at five weeks and later grouping on the basis of sex and weight for fattening to bacon weight in semi-environment-controlled buildings incorporating limited 14% C.P. feed fed on the floor.

Because innovations in the pig industry are occurring continuously, it is unusual to find all these practices on any but the most modern piggery. Where innovation does not entail large capital outlays (e.g., five week weaning) it is common to find rapid adoption of latest practices. On the other hand, where innovation requires major building alteration and large capital expenditure, producers tend to behave in an economically rational manner by adopting the innovation more slowly.

The recent major upheavals in the world commodity markets will almost centainly have an impact on the pig industry. On the one hand, increasing beef prices will cause consumers to substitute pork for beef and hence the price of pork is likely to rise. On the other hand, the pork industry, wholly dependent upon concentrate feeds, will be hard hit by increasing feed grain and, in particular, protein costs. The net effect on the industry will depend upon whether the increase in the price of pork is sufficient to offset the increased feed cost, and also upon the adjustments that producers make in their production systems.

It is possible to determine the effect of a change in a factor of production on pig profits through a management control technique known as vital factor analysis (V.F.A) [7]. Essentially, vital factor analysis enables the determination of the percentage change in any factor required to produce a $1 or R1 change in profit, other factors remaining constant. An example of this analysis is shown in table 1.

Thus, for example, a 0,41 per cent increase in the number of pigs marketed per sow per annum would increase profit by $1.00 per sow per annum. On the other hand, a 0,56 per cent increase in bacon feed cost per tonne, or an 8,18 per cent increase in labour wages would decrease profit by $1.00 per sow per annum.

Perhaps the greatest value of vital factor analysis is that it enables the various factors affecting profits to be ranked in order of their economic importance. Such ranking facilitates management control in that it draws attention to these factors which are most likely to affect profits. For example it is evident from table 1 that it would be worth paying an extra $7,12 per tonne for creep feed if this increased the number of piglets weaned per litter by as little as 0,0074. From the research viewpoint, V.F.A. assists in determining the order of priority which should be placed on different research projects. Once again, from table 1 it is apparent that factors affecting fecundity, grading and feed conversion are more important than factors influencing labour efficiency and housing costs.

Apart from drawing attention to the priority of these factors. V.F.A. has some serious limitations. Perhaps the single greatest limitation is that V.F.A. is a static concept. By this it is meant that if a factor such as the number of pigs weaned per litter changes

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Table 1: VITAL FACTOR ANALYSIS FOR PIG PRODUCTION[7]

Factor	Standard	Change in Standard	Change as a Percentage of Standard
(1)	(2)	(3)	(4)
Pigs marketed/sow/annum	13	0,0534	0,41
Pigs/litter	7,2	0,0074	0,103
A grade (%)	80	1,479	1,85
A grade price (c/kg)	44,5	0,160	0,36
Other grade price (c/kg)	35,75	0,64	1,79
Sow feed (kg)	1 200	−18,86	1,57
Sow feed cost ($/tonne)	53	− 0,83	1,57
Creep feed (kg)	141	−18,52	13,13
Creep feed cost ($/tonne)	54	− 7,12	13,13
Bacon feed (kg)	3 592	−20,0	0,56
Bacon feed cost ($/tonne)	50	− 0,28	0,56
Man days	22	− 1,82	8,27
Wage/man days ($)	0,55	− 0,045	8,18
Boar price ($)	100	−40,0	40,0
Sows/boar	20	−13,3	66,56
Building space (m^2)	16	− 0,95	5,9
Annual building cost (per m^2)	1,05	− 0,063	5,95

in either direction, it is assumed that the grading of these extra pigs, their feed conversion, labour and building requirements, etc., will change in proportion to that existing before the change. This may, or may not be a valid assumption, and certainly such assumptions require critical analysis by the person employing V.F.A.

Because V.F.A. is limited to the consideration of only one factor changing at a time, other methods of determining the impact of changing feed prices on husbandry practices and research priorities was sought. It appeared that some form of systems analysis would be most appropriate in order that the effects of several factors varying simultaneously might be taken into account.

The major objective of this investigation was to determine whether increased feed costs, particularly of protein rich ingredients, might influence the pig husbandry methods currently employed, and if so whether further husbandry research might be required. The rationale prompting such investigation was that as protein prices increased, producers would tend to use lower protein levels in their rations, which might in turn lead to lower reproductive performance of the sow and slower growth rates in the piglet. Such behaviour would lead to poorer feed conversions, but with less costly rations and a more extensive use of buildings.

In order to simulate the effect of current and anticipated future prices on husbandry practices, a linear programming approach was adopted [6]. Any problem which has three quantitative components, viz., an objective, alternative methods of attaining the objective and resource limitations and other restrictions on production, can be expressed as a linear programming problem. The objective can be either in the form of profit maximization or of cost minimization, depending upon the nature of the problem. The different methods of attaining the objective are known as processes or activities and describe a complete system or subsystem. For example, a particular method of sow husbandry during pregnancy might specify the nutritional regime, type and period of occupation of housing, labour requirements, mortality and replacement rates, etc.

By allowing the computer to select those processes

Table 2: PROCESSES CONSIDERED AND SELECTED IN PROFIT MAXIMIZING MODEL

Processes Considered	Description			Results* Replacement Gilts valued at:	
	Feed	Pigs weaned/ annum	Productive Sow Life	$40	$30
Baconer 2	13,5% CP No meat & bone meal	–	–	1100	1100
Weaner 3	15% CP No meat & bone meal	–	–	1100	1100
Sow 1	17% CP for lact. and preg.	18	4 litters	–	–
Lactation 1	15% CP. min. 2% fish	18	–	64	64
Lactation 2	15% CP. No min on fish	17	–	–	–
Lactation 3	14% CP. Min 2% fish	18	–	–	–
Preg. Sow 1	12% CP	–	4 litters	64	–
Preg. Sow 2	10% CP	–	3 litters	–	64
Gilt Purchase	at $40 or $30	–	–	32	42

* Identical Results were obtained with 1972, 1973 and 1974 ingredient price levels

Table 3: MAXIMUM & MINIMUM CONSTRAINTS EMPLOYED IN LEAST COST FEED FORMULATION

Ration No.	1	2	3	4	5	6	7	8	9		
	Sow 1 16%CP	Preg 1 12%CP	Lact 1 15%CP Min2% Fish	Lact 2 15%CP	Preg 2 10%CP	Lact 3 14%CP Min 2% Fish	Wean 1 15%CP	Wean 2 15%CP meat max 2%	Wean 3 15%CP meat max 0%	Bacon 1 13,5% CP	Bacon 2 13,5% CP
Protein min.	16,0	12,0	15,0	15,0	10,0	14,0	15,0	15,0	15,0	13,5	13,5
Lysine	0,85	0,0	0,70	0,70	0,0	0,70	0,85	0,85	0,85	0,70	0,70
Methionine	0,60	0,0	0,0	0,0	0,0	0,60	0,50	0,50	0,50	0,50	0,50
TDN min.	69,3	69,3	69,3	69,3	69,3	69,3	72,9	72,9	72,9	69,3	69,3
TDN max.	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	72,0	72,0
Fibre max.	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0
Calcium min.	0,90	0,80	0,80	0,80	0,80	0,80	0,50	0,50	0,50	0,50	0,50
Calcium max.	1,30	1,00	1,00	1,00	1,00	1,00	0,80	0,80	0,80	0,80	0,80
Phosphate min.	0,60	0,60	0,60	0,60	0,60	0,60	0,60	0,60	0,60	0,60	0,60
Phosphate max.	1,00	1,00	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90
Salt max.	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50
Cotton max.	3,00	3,00	3,00	3,00	3,00	3,00	5,00	5,00	5,00	5,00	5,00
Blood max.	2,50	2,50	2,50	2,50	2,50	2,50	2,50	2,50	2,50	2,50	2,50
Meal & bone max.	100,00	100,00	100,00	100,00	100,00	100,00	100,00	2,0	0,0	8,00	0,00
Maize max.	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00	75,00	75,00
Millet max.	0,0	0,0	0,0	0,0	0,0	0,0	100,00	100,00	100,00	100,00	100,00
Bran max.	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00
Bran & pollard max.	30,0	30,0	30,0	30,0	30,0	30,0	30,0	30,0	30,0	30,0	30,0
Fish min.	0,0	0,0	2,0	0,0	0,0	2,0	0,0	0,0	0,0	0,0	0,0
Bulk	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0

which maximize profit subject to the constraints of available building space, capital limitations, market demand, etc., it is possible to determine how systems of production might change in response to variation in factors such as feed cost.

Table 4: INGREDIENT PRICES EMPLOYED IN LEAST COST FEED FORMULATION*

Ingredient	Price/tonne (R$) 1972	1973	1974
Blood	96,00	187,00	187,00
Fish	142,00	265,00	495,00
Meat & bone	96,00	119,00	119,00
Skim milk powder	467,00	467,00	467,00
Maize	44,00	44,00	44,00
Millet	50,00	50,00	50,00
Sorghum	79,00	98,00	105,00
Maize bran	29,00	29,00	29,00
Wheat bran	29,00	37,00	37,00
Wheaten pollard	39,00	39,00	39.00
Sugar	150,00	180,00	180,00
Bone meal	64,00	64,00	64,00
Dicalcium phosphate	600,00	600,00	600,00
Limestone flour	11,00	13,00	13,00
Monocalcium phosphate	100,00	100,00	100,00
Monosodium phosphate	167,00	199,00	222,00
Soyabean (full fat)	121,00	167,00	175,00
Sunflower meal	69,00	76,00	76,00
Lucerne	45,00	51,00	54,00
Cottonseed cake	69,00	79,00	79,00
Groundnut cake	70,00	93,00	93,00
Lysine	1 950,00	3 000,00	3 000,00
Methionine	1 500,00	1.500,00	2 000,00

*Acknowledgement to the Rhodesian Milling Co. (Pty.) Ltd.

PROCEDURE

The model developed for this particular investigation consisted of two major stages. The first consisted of a profit maximizing model, including three different methods of sow husbandry during pregnancy, four methods of husbandry during lactation, three methods of producing pigs from the weaner to porker stage and two methods of finishing pigs from porker to baconer stage (Table 2), plus the opportunity to build additional housing and to purchase replacement gilts. The objective was to maximize profit for a herd supplying beconers for a 1000 bacon contract. The contract could be under- or over-supplied by 10 per cent.

The second stage consisted of a least cost feed formulation model to provide the specified rations required for the profit maximizing model. Twenty-three different ingredients were available for selection in formulating the ration. For each ration the desired minimum and/or maximum levels of protein, energy, lysine, methionine, plus cystine and mineral content was specified to comply with the various husbandry methods selected. In the case of the finisher and the grower rations minimum protein levels were 13,5 per cent and 15,0 per cent respectively. Differences between rations in these cases consisted of different maximum levels of meat and bone meal which could be included in the ration. Recent research in Rhodesia has shown that the inclusion of up to eight percent meat and bone depresses growth rate by ten per cent[3]. It was anticipated that, as fishmeal prices increased, more meat and bone meal

would be substituted for fish and the production system selected would change.

In order to determine the impact of feed ingredient price level on systems of production, three different sets of ingredient prices were employed. These price levels approximated prices prevailing in Rhodesia in 1972, 1973 and anticipated prices for 1974 respectively (Table 4).

RESULTS

a) *Ration Formulation*

The ingredient composition of the various rations formulated and their cost in Rhodesian dollars ($) per tonne are shown in table 5. It is noteworthy that the constraint on maximum levels of meat and bone meal in grower and finisher rations made a negligible difference to these rations' cost (e.g., $0.31 per tonne at 1974 prices for grower rations).

Consequently only one method of grower production and one method of finisher production was included in the profit maximizing second stage model.

Also of interest was the fact that full-fat soyabean was not included in any ration at any of the three sets of price level employed. As fish-meal price increased, there was a tendency to substitute meat and bone meal and cotton, up to prescribed maximum limits, for fish meal. Groundnut cake meal was included at levels as high as 19,17 percent in grower rations at 1972 price levels, but declined at 1973 and 1974 prices. Available research results in Rhodesia suggest that groundnut cake meal can be included safely in rations up to a 16,75 percent level in grower rations [8], but it would seem that confirmation on this point is required.

b) *Profit Maximising Model*

The combination of processes which maximized profits, and hence the system of production employed, remained the same for all three sets of feed ingredient price level employed. That is, husbandry methods did not alter in response to changes in feed price. This would suggest that even with the fairly dramatic changes in price ratio between protein and energy rich feedstuffs recently experienced, it still pays the producer to follow an intensive system of pig husbandry. It should be noted, however, that since only one method of weaner production and one method of finisher production were included in the profit maximizing model, the impact of feed prices on the growth stage of pig production was not investi-

Table 5: RATION COMPOSITION AT THREE INGREDIENT PRICE LEVELS

Ration No.	1	2	3	4	5	6	7	11
Description	Sow 1 16%C.P.	Preg 1 12%C.P.	Lact. 1 15%C.P.. Min.2% Fish	Lact. 2 15%C.P.	Preg. 2 10%C.P.	Lact. 3 14%C.P. Min.2% Fish	Weaner 15%C.P.	Baconer 13.5%C.P.
				1972 Prices				
Cost ($/tonne)	53,21	41,81	45,13	44,13	40,71	51,38	51,63	61,13
Protein	18,88	12,0	15,0	15,37	10,0	14,0	19,23	13,50
Lysine	0,85	0,47	0,7	0,7	0,37	0,7	0,85	0,7
Methionine	0,6	0,16	0,21	0,19	0,15	0,6	0,5	0,55
TDN	76,71	77,47	77,16	77,0	77,87	76,90	78,05	72,0
Fibre	6,0	6,0	6,0	6,0	4,60	6,0	6,0	6,0
Calcium	1,3	1,0	1,0	1,0	1,0	1,0	0,8	0,8
Phosphate	0,6	0,6	0,64	0,6	0,6	0,6	0,6	0,9
Salt	0,15	0,11	0,17	0,14	0,18	0,18	0,13	0,14
				1973 Prices				
Cost ($/tonne)	59,69	43,69	51,18	48,87	41,53	55,74	58,11	68,10
Protein	16,59	12,0	15,0	15,0	10,0	14,14	17,66	13,50
Lysine	0,85	0,48	0,7	0,7	0,36	0,7	0,85	0,70
Methionine	0,6	0,17	0,22	0,20	0,15	0,6	0,5	0,55
TDN	76,84	78,30	78,10	77,8	79,0	77,10	78,10	72,0
Fibre	6,0	6,0	6,0	6,0	4,56	6,0	6,0	6,0
Calcium	1,3	1,0	1,0	1,0	1,0	1,0	0,8	0,8
Phosphate	1,0	0,6	0,65	0,62	0,6	0,75	0,87	0,9
Salt	0,27	0,10	0,16	0,13	0,08	0,19	0,21	0,14
				1974 Prices				
Cost ($/tonne)	61,89	43,78	55,91	49,00	41,53	58,00	59,55	70,80
Protein	16,59	12,0	15,0	15,0	10,0	14,14	17,66	13,5
Lysine	0,85	0,46	0,7	0,7	0,37	0,7	0,85	0,7
Methionine	0,6	0,18	0,22	0,20	0,16	0,6	0,5	0,55
TDN	76,84	79,71	78,10	77,80	79,0	77,10	78,10	72,0
Fibre	6,0	4,78	6,0	6,0	4,56	6,0	6,0	6,0
Calcium	1,3	1,0	1,0	1,0	1,0	1,0	0,8	0,8
Phosphate	1,0	0,6	0,65	0,62	0,6	0,76	0,87	0,9
Salt	0,27	0,07	0,16	0,13	0,08	0,19	0,21	0,14

gated. Of interest is the fact that neither the high protein level sow feeds recommended by the Standards Association of Central Africa [4], nor the very low protein level rations currently advocated by some European workers [5], were selected as contributing to a profit maximizing system under the price levels considered. Low protein regimes for pregnant sows did come into the programme if the cost of replacement gilts was dropped from $40 to $30 per gilt (Table 2).

CONCLUSION

The model, as described, was of an experimental nature, designed specifically to determine the impact of increasing protein prices on the husbandry system which might be employed by farmers. It was unfortunate that the available data precluded the possibility of testing a range of growing and finisher pig systems, but it is intended that these systems will be tested as soon as technological information is available. In fact, much of the data used in the current model need to be verified through either a more thorough perusal of the literature, or by specifically designed experimentation, because the validity of the results is highly dependent upon the accuracy of the data employed in the model.

Finally, from this preliminary analysis it would appear that pig production will continue on an intensive basis, despite rapidly rising feed prices. It is likely that efficiencies will be greatest for those farmers with a high level of husbandry, i.e., the largest number of pigs marketed per sow per annum and the fastest growth rate of market pigs. These production parameters will in turn be influenced by:
(a) genetic quality of stock,
(b) disease control,
(c) building design and environment control,
(d) nutritional quality of rations.

Certainly more research information is required on various nutritional aspects, but particularly the impact of various levels of amino acid on growth and reproduction. Nevertheless, it is believed that systems analysis could play a major rôle in the application of research findings to commercial farm practice and in the allocation of priorities to future research projects.

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PROGENY TESTING*

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SUMMARY

Using selected examples of South African and Israeli data, the author indicates the need for proper progeny testing, which he then describes briefly. The method of choice is contemporary comparison of milk production of a sire's daughters. The provisional scheme currently in operation in Natal, in lieu of the National Progeny Testing Scheme which is still being developed, is outlined.

The cornerstone of animal improvement and the basis for any successful breeding program is progeny testing. Without this tool it is impossible to know what one is breeding from, let alone know what one will get next. Without the progeny test attempts at animal improvement result in little more than maintaining the *status quo* in the population.

This paper will be restricted to progeny testing of dairy cattle. A sample analysis of the present position in South Africa, where progeny testing is not yet undertaken (Table 1), and a comparison with Israeli data (Table 2) before and after introduction of progeny testing will serve as illustration.

Table 1: AVERAGE MILK PRODUCTION AND PERCENTAGE BUTTER FAT FOR REGISTERED FRIESLANDS IN SOUTH AFRICA

Year	Milk kg	% Butter fat
1953	4752	3,65
1965	4672	3,75
1971	4525	3,72
1971	(5045)	–

During 1953, approximately 80 per cent of the herds were milked three times daily as compared to 20 per cent in 1971. Adjusting the 1971 figure by the correction factor of + 15% for milking three times daily as compared to twice daily milking, the 1971 figure becomes 5 045 kg, which reflects an increase of 300 kg in 18 years or 0,3 per cent per year. The comparative figures for the same period for Israeli cattle are shown in table 2.

Table 2: AVERAGE MILK PRODUCTION AND PERCENTAGE BUTTER FAT FOR ALL RECORDED COWS IN ISRAEL

Year	kg Milk	Butter fat %	% Increased milk
1934	3 690	3,69	–
1941	3 554	3,70	–
1953	3 868	3,60	+ 4,8 (0,3 per year)
1965	5 847	3,25	–
1970	6 431	3,27	+ 66,3 (3.0 per year)

The significance of these figures is underscored by the fact that during the 20 years preceding 1953 no progress was made whatsoever. In fact, the figures are exactly the same as our figures are at present. In 1953 a start was made with progeny testing in Israel, with dramatic results. Conditions in Israel are very different from those in South Africa, and it cannot be expected that we would equal the tremendous genetical progress made in Israel. The Israeli figures, however, serve as an indication of what can be attained.

Prerequisites for a proper progeny test are:

1. Definition of the trait to be improved.
2. A method to measure the trait.

Dairy cows are kept to produce milk; the trait to be improved is the ability to produce milk efficiently in whatever environment is provided. The means to measure this trait also exists, namely our official milk recording schemes, which are at present undergoing extensive improvements, especially with regard to owner sampling.

The factors that determine the rate of genetic change are basically three in number, and they function according to the formula:

Rate of genetic change =

$$\frac{\text{Hereditability X Selection Differential}}{\text{Generation Interval}}$$

The larger the numbers in the numerator, or the smaller the values in the denominator, the faster the rate of genetic change. Briefly, hereditability and selction differential should be kept as high as possible and generation interval as short as possible in order to make the most rapid progress.

Table 3: HEREDITABILITY OF TRAITS

	Percentage
Milk & butter fat production	20-25
% Butter fat and % S.N.F.	50
Head - clean cut strong	17
Head - short (undesirable)	44
Rump - long & wide nearly level	18
Rump - sloping	46
Hind legs - strong, clean flat bones	28
Hind legs - sickle, or too close at hock	17
Too straight	39
Fore quarters -	
moderate length, firmly attached;	37
broken and very faulty	33
Rear quarters -	
strong suspensory ligament and clearly defined halving;	21
broken suspensory ligament and weak floor	35
Teat size and placement-	
plumb desirable and squarely placed;	22
rear teats too far back	83

* Paper read at the Biennial Scientific Congress of the South African Veterinary Association, Pretoria, 15-19 October, 1973.

** Natal Animal Breeding and Milk Recording Cooperation, P.O. Baynesfield, Natal, 3770.

Hereditability reflects the fraction of the total difference between individuals caused by genetic differences. It is not constant, but normally does not vary much from the accepted figures. Table 3 illustrates the hereditability of a few of the more important traits. Some are negative ones and it is important that cognisance be taken of their hereditability when selecting bulls or their dams.

Generation interval represents the average age of parents. In dairy cattle this is four-and-a-half to five years. Like hereditability, it cannot be changed significantly. The only way to do this is to get bulls into test at as early an age as possible.

Selection differential represents the superiority of animals selected to be parents of the subsequent generation. This is the only factor that can be influenced to any marked degree, and it is the factor through which progeny test results can be applied to best effect. Unless selected parents are superior to the average ones of the present generation, no improvement can be made. The factors that determine the degree of the selection differential are:

(a) *Accuracy of selection:* If parents are selected on environmental advantage rather than genetic superiority the selection is invalidated.
(b) *Intensity of selection:* The more intense the selection, the larger the selection differential: the top 5 per cent of animals are superior to the top 10 per cent. This factor is of great significance in selection of bulls. Heifer selection can do very little in this regard, because most heifers are required as replacements.
(c) *Number of traits:* The number of traits utilized for selection has a profound effect on selection pressure. If selection is undertaken for one trait only 100 per cent of the selection pressure can be devoted to that trait. When selecting for two traits, pressure drops to 71 per cent, and to 58 per cent when selecting for three traits. In this way selection pressure can be eroded away completely if too many traits are employed for selection.

These forces are effective only through the genetic pathways that link the generations. There are four pathways. Table 4 gives the relative value of each pathway in a system designed for optimum improvement.

Table 4: SOURCES OF GENETIC PROGRESS*

Sources	Percentage
Sires of bulls	43
Dams of bulls	33
Sires of cows	18
Dams of cows	6
	100 Total

* Rendel & Robertson. Journal Genetics 50: 1 - 8

These figures illustrate the requirement for an accurate progeny test. The requirement is to locate the truly superior sires which should serve as sires of bulls to be tested and also of sires of the dams of bulls to be tested. Thus it is more important to aim progeny testing at the source of sires than at any target in the breeding programme. Once the parents of the young bulls have been located accurately, the coninued progress by testing the young bulls is only 18 per cent. The selection of dams of the cows only contributes 6 per cent simply because of the low selection pressure possible at this level. Table 5 illustrates the importance of selecting high rating, progeny-tested sires to sires young bulls for testing. The table illustrates that for sires with an RBV of +112 the chances of a son having a contemporary comparison of +450 kg or more is nearly one in five as against only one in seventeen for sires with a low RBV.

The accurate selection of a dam to be a bull mother is similarly dependant on an accurate progeny test. Table 6 illustrates the important factors in evaluating a cow's expected average transmitting ability (EATA). The important fact is that the weight of 0,330 given to paternal sisters, or, expressed differently, the weight given to the cow's sire's progeny test is over twice that of the cow's own records. The weight carried by the other factors is relatively low. The weight given to the cow's own records would increase marginally with each successive record. Similarly, the weights given to paternal sisters would be reduced very gradually with decrease of numbers of such sisters to approximately 30, after which it would reduce rapidly to nil as daughter numbers reduce to one.

The really important animals in the young bulls pedigree therefore are his sire, his dams' sire, and his dam, in that order, provided a progeny test on the two sires is available. If there is no progeny test avail-

Table 5: COMPARISON OF SIRES AND SONS IN THE MILK MARKETING BOARD PROGENY TESTING SCHEME

Sires		Sons		Percentage of sons with contemporary comparison of their daughters' milk yield			
No.	RBV*	No.	Contemporary comparison	Over 990lbs	0 to 990lbs	0 to -990lbs	Below -990lbs
67	112	214	+310	18	48	31	3
102	104-111	342	+220	13	53	30	5
102	98-103	341	+ 40	6	49	40	5
93	90- 97	214	- 90	7	36	50	7
47	/89	88	-110	6	39	46	10

* RBV = Relative Breeding Value: A measure used to give an index on the sire as a percentage of the breed average (100%).

Table 6: CALCULATION OF ESTIMATED AVERAGE TRANSMITTING ABILITY (EATA) OF A COW

Source of information	Av. difference from herd mates	X	Proper weight	=	Contribution to EATA
Cow herself (3 records)	+ 2800	X	0,140		+392
1000 Paternal sisters (one record each)	− 800	X	0,330		−264
Dam of cow (5 records)	+3,160	X	0,070		+221
Daughters of cow (1 record each)	+130	X	0,055		+ 7
2 Maternal sisters (1 record each)	+980	X	0,025		+ 25
					EATA = +381.

able on these two sires then the most powerful tool in genetic improvement, Selection Differential, is lost, because nothing of real value is known about the bull.

Selecting bulls for progeny testing on the basis of present-day published pedigrees and, in many cases, on the total knowledge available on many bulls, reduces the possible genetic gain to less than 20 per cent of the total gain possible, if all the factors already discussed are taken into consideration. If it is considered that the high rate of genetic gain obtained in Israel over the last 20 years is 3,9 per cent per annum, then the best that can be expected is 20 per cent of that, a mere 0,05 per cent, a gain so slight that the cost of the progeny testing scheme will negate any possible economic gains that might be achieved by increased milk production.

In the planning of a progeny testing scheme, it is imperative that the source from which the young bulls for testing are drawn be part of the scheme as well. If this is not the case, the population on which the tests are performed will soon outstrip the source from whence the genetic imputs are drawn, resulting in stagnation. Ideally, therefore, in a country like South Africa, where the use of registered bulls in A.I. is a statutory requirement of the A.I. Act, the stud industry must become an integral part of the progeny testing scheme if the whole scheme is not to be aborted even before it starts. Failing the desired integration of the stud industry with the progeny testing scheme, there is only one way in which progeny testing can achieve its aim of genetic gain, and that is by the regular importation of semen from proven bulls in other parts of the world. This semen is then to be used on top cows in South Africa to breed young bulls for progeny testing.

There is today much talk about a National Progeny Testing Scheme in which the Department of Agriculture, Stud Book and the A.I. Co-operatives will co-operate. There are hopeful signs that this scheme, which has now been under discussion for several years, will become a reality within the next year or two. The long delay in getting the national scheme started has caused the A.I. Co-operatives to start their own schemes. These semi-private efforts, praiseworthy as they are for their endeavours, are nonetheless inadequate, merely because they are fragmented and also suffer grievously from ineffective forward planning because of the uncertainty under which they operate.

Because of these uncertainties, it is quite impossible to give a clear indication of the way in which progeny testing will be applied in South Africa. Although details differ, the basic principle applied by all the schemes throughout the world, with, until recently, the exception of Holland and one or two other small schemes, is the one of contemporary comparison, instead of dam-daughter comparisons. Dam-daughter comparisons have been relinquished because several factors inherent in the system cause excessive bias. The main factors are:

a) change in management between the first lactation periods of the dams and daughters;
b) season of calving;
c) age at first calving; and
d) impossibility of comparing sires accurately.

The contemporary comparison does not suffer from any of these disadvantages, because by definition the dams of daughters are excluded. Contemporaries in this sense are other bulls' daughters of the same age, milking at the same time in the same herd. Ideally, only daughters calving in the same month should be considered. This restriction however, would reduce the number of contemporaries to the extent that the figures would become invalid. In practice, therefore, contemporaries are classed as all those daughters of the approximate same age, calving in the same season (the year being divided into four seasons).

Production figures obtained for daughter groups of different bulls from different farmers in different seasons and even in different years, can then be

Table 7: EXAMPLE OF CONTEMPORARY COMPARISON OF MILK YIELD OVER THE SAME PERIOD ON THE SAME FARM

	Daughters			Contemporaries					
Bull	No.	Yield	B.F.	No.	Yield	B.F.	Difference	Weight	Weighted av.
A	8	10038	3,85	13	9458	3,9	+580	4,95	+2871
B	8	9888	3,9	13	9550	3,9	+338	4,95	+1673
C	5	8770	3,9	16	9963	3,9	-1193	3,80	-4533

$$\text{Weight} = \frac{\text{No. of daughters x No. of contemporaries}}{\text{No. of daughters + No. of contemporaries}}$$

Weighted average = Difference x Weight.

Table 8: CONTEMPORARY COMPARISON FOR THE BULL "MILKMAN"

Herd	Daughters		Contemporaries		Difference	Weight	Weighted average
	No.	Yield	No.	Yield			
A	10	8795	25	7546	+1249	7,14	+8922
B	6	6767	26	6688	+ 78	4,88	+ 380
C	2	10021	17	8160	+2461	1,88	+4403
/	/	/	/	/	/	/	/
N	3	10600	10	8713	+1886	2,3	+4353
O	2	7560	14	8000	- 440	1,8	- 770
P	1	14031	19	10456	+3575	0,9	+3396
TOTAL 57						43,1	+36517

Contemporary Comparison +36517 ÷ 43,1
= + 849

Accuracy of Contemporary Comparison:

$$R = \frac{W}{W+15} = \frac{43,1}{43,1+15} = \frac{43,1}{58,1} = 74\%$$

combined to give the over-all contemporary comparison of all the bulls involved. This end result is accurate because the figures are based on grouped data. Actual production figures are not used; instead, the differences in production are used. What we are interested in is, how much more or how much less milk will a particular bull's daughters produce than those of his contemporaries on the same farm and during the same period. Tables 7 and 8 are very simplified examples of the process.

This process is repeated with respect to various farmers and the different seasons and years. Eventually all the data are collected and tabulated with respect to individual bulls.

These are the basic principles on which any progeny testing scheme rests. The results may be expressed in different ways and the mathematics differ in detail but never in general. The predicted difference of the Americans and the breed class average rating of the Canadians are just other methods of expressing contemporary comparisons.

A National Progeny Testing Scheme for South Africa is in the process of being developed, but there seems to be some *uterine inertia*, and the exact obstetrical procedures to follow are still under discussion; therefore I cannot give you a description of what the scheme will look like when it is eventually born. In detail it probably differ considerably from the scheme currently in operation in Natal. In general, however, it will be similar.

Briefly, the Natal scheme operates as follows:-

a) Six or seven Friesland bulls, as young as possible, are selected annually, giving as much weight as possible to the principles described earlier on. Often, however, a compromise has to be made. This is unfortunate, but inevitable at this stage.

b) There are approximately 100 co-operating herds. These are herds under milk recording and the owners are willing to make 20 - 25 per cent of their herds available for testing young bulls.

c) As many young bulls are used as the cows available in the herd will allow. Five cows only are put in calf in each herd to each of the young bulls used in that particular herd. In this way we expect to get over 100 heifers from each of the test bulls. These heifers are spread over 30 - 50 herds, which has the advantage of greatly increasing the number of contemporaries they are compared with and thus the accuracy of the results.

d) Once the correct number of cows are in calf, the young bulls are withdrawn from service to await their progeny test results which will only become known four years later.

No more than three tested bulls are expected to be brought into use every two years, which gives a selection pressure at this stage of 1:5. This number is acceptable under the circumstances; it should really be 1:10.

Although Frieslands only have been mentioned, this does not mean that the other breeds are being neglected. It is merely a reflection of the greater number of Frieslands involved as compared to the other dairy breeds.

BOOK REVIEW — BOEKRESENSIE

NAHTVERFAHREN BEI TIERÄRZTLICHEN OPERATIONEN

KARL AMMANN

Berling and Hamburg: Verlag Paul Parey, 2nd Ed. 1973.
pp. 63; Figs 65. Price: DM 16, 80

This booklet, after giving an introduction to suturing materials, instruments and techniques of tying knots, presents a large number of suturing methods illustrated by very clear drawings. Even if the reader is unfamiliar with German, the drawings are very nearly adequate by themselves.

As is inevitable, taking into consideration the time lag between preparation of the manuscript and publication, some of the more recent suturing materials are not mentioned. With the tremendous number of different possible ways of suturing, it is virtually unavoidable that there would be some which are left out. It is also recommended that the author should, in subsequent editions, give some space to suturing methods used for the lung, liver and kidney, as these lie within the orbit of the modern veterinary surgeon.

As this booklet will give some stimulating ideas also to experienced surgeons, its acquisition is recommended.

C.F.B.H.

Jl S.Afr. vet. Ass. 45 (1&2): 65 - 70 1974.

OORSIG REVIEW

DIE INVLOED VAN VOEDING OP DIE VRUGBAARHEID EN VOORTPLANTINGS-VERMOË VAN DIE KOEI*

H.M. TERBLANCHE**

SUMMARY

A brief review (in Afrikaans) and an extensive list of references are given concerning the influence of feeding on the fertility and reproductive ability of the cow.

INLEIDING

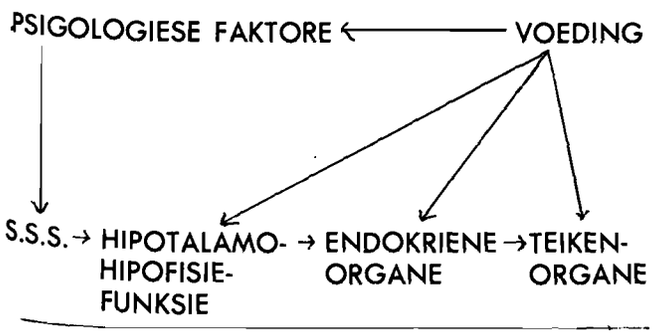
Aangesien dit vandag vry algemeen bekend is dat gesonde en gebalanseerde voeding in mens en dier essensiëel is vir die handhawing van 'n normale, gesonde en produktiewe lewe en gesien in die lig van die hoë vlak van ontwikkeling wat bestuurpraktyke, siektebeheer en siektevoorkoming reeds bereik het, vind 'n mens dit tog vreemd dat die algemene peil van voortplantingseffektiwiteit en vrugbaarheid in baie veestaples nie optimaal is nie. Derhalwe is dit noodsaaklik om te let op beskikbare resultate waar daar ondubbelsinnig bewys is dat voeding 'n uiters belangrike rol speel in die handhawing van 'n optimale en doeltreffende voorplantingsvermoë in die koei.

Weens die geweldig volume werk wat in dié verband in die afgelope aantal jare gedoen is, word die leser verwys na verskeie artikels waarin vroeëre kennis en inligting pragtig saamgevat word [1-21]. Enkele algemene stellings is egter ook hier ter sprake alvorens spesifieke voedingsomstandighede in die koei bespreek kan word, naamlik dat ondervoeding gedefinieer kan word as voeding benede die onderhoudsbehoeftes maar gebalanseer in terme van bestanddele, terwyl wanvoeding daarteenoor voortspruit uit 'n rantsoen wat foutief saamgestel is, hetsy oormatig of gebrekkig ten opsigte van spesifieke bestanddele [19].

Reeds in 1949 het Folley [22] 'n reeks punte gestipuleer waarvolgens voedingsaspekte die vrugbaarheid van vroulike diere in die algemeen kan beïnvloed, naamlik:

1. invloed op die voorste hipofise kwab,
2. invloed op die senuweestelsel,
3. invloed op die metabolisme van geslagshormone,
4. invloed op die reaksie van sekondêre geslagskliere op geslagshormone, en
5. invloed van eksogene hormone.

Die leser word ook verwys na 'n hoofstuk deur Leatham [23-26] waarin die effek van wanvoeding op die vrugbaarheid van laboratoriumdiere breedvoerig bespreek word. In hierdie gevalle blyk dit asof tiroïed-adrenaal- en hipofisefunksie in terme van proteïenvoeding die belangrikste aspek is. Laastens dien die volgende skema ter illustrasie van die wisselwerking tussen voeding en endokriene funksie [27].



Vervolgens sal enkele voedingselemente en/of praktyke wat in die koei van spesifieke belang is, kortliks bespreek word.

ENERGIE

Dit is een van die mees belangrike faktore by die bepaling van vrugbaarheid en onvrugbaarheid in koeie [21 28 29]. Dit staan in verband met die voorkoms van anestrus [21 28 30-33], opheffing van eierstokfunksie [21 30], bevrugtingspeil [31 32 34 35] en die voorkoms van estrus *post partum* [20 31-33 36]. Enkele outeurs het ook spesifieke negatiewe invloede van hoë energiepeile beskryf [37-39], veral in terme van aborsies, fetale resorpsie en vrektes onder eerste kalwers.

Eksperimente wat deur Dunn *et al* [40] gedoen is, dui daarop dat die vroeë periode *post partum* hoofsaaklik deur die energiepeil *pre partum* beïnvloed word, asook deur 'n lae energiepeil na kalwing, terwyl die laat periode *post partum* en die voorkoms van estrus *post partum* deur 'n hoë energiepeil na kalwing beïnvloed word. 'n Lae energiepeil *pre partum* bevorder konsepsie terwyl 'n lae energiepeil *post partum* anestrus tot gevolg kan hê. Die verskyning van 'n 10 mm follikel vind in koeie wat hoë energiepeile ontvang ongeveer 6 dae vroeër plaas as in koeie op 'n lae energiepeil *post partum* [41 42].

'n Belangrike sindroom wat ontstaan as gevolg van akute energie-tekort is deur McClure [14 43-45] in Australië en Nieu-Seeland beskryf. Lakterende melkkoeie op vinniggroeiende aangeplante weidings openbaar die volgende simptome in die afwesigheid van sistemiese en kliniese simptome, naamlik:

1. lae persentasie nie-terugkerende koeie na eerste dekking,
2. spontane herstel, maar lae persentasie dragtige koeie na 3 maande,
3. uitermatige gewigsverliese tussen partus en teling, en
4. hipoglikemie.

Eksperimente wat deur McClure [46-49] in hierdie verband met muise gedoen is, het aangetoon dat die hipoglikemie 'n primêre biochemiese letsel is wat in 'n veranderde gonadotropienafskeiding as gevolg van sekondêre hipotalamiese wanfunksie gereflekteer word. Hipoglikemie tydens laat di-estrus in koeie vertraag die voorkoms van die volgende estrus; waar dit tog voorkom, is die konsepsiesyfer besonder laag [50].

Hoë-konsentraat-voeding blyk uiteenlopende gevolge te hê. Dit varieer van estrus-stimulering [51], verhoogde aantal dekkings per konsepsie [52] en hoër persentasie stille estrus [52 53] tot 'n korter lewensduur van sodanig gevoerde koeie [54].

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LAKTASIE

Verskeie outeurs [41 55–59] beskryf 'n onderdrukking van vrugbaarheid tydens laktasie as gevolg van 'n sogenaamde "voedingstress" tydens hierdie tydstip. Symington[60] verklaar hierdie effek in terme van die ooreenkoms tussen die Hipofise-Inhiberende Faktor (HIF = Prolaktien-Inhiberende Faktor = PIF) wat prolaktien afskeiding beheer en die vrylatingshormoon vir luteïeniserende hormoon (LH-RH). Tydens laktasie is HIF-afskeiding minimaal en LH-RH-afskeiding vanweë die ooreenkoms met HIF dus ook. Gevolglik vind finale rypwording van die follikel nie plaas nie en lei dit dan tot 'n tydelike verlaagde vrugbaarheid.

LIGGAAMSGEWIG

Ondervoeding en wanvoeding lei spoedig tot gewigsverliese en 'n lae liggaamsgewig is deur verskeie outeurs gekorreleer met verlaagde vrugbaarheid [14 20 43–45 61–67].

MINERALE

Ca : P-verhouding

Die belangrikheid van 'n korrekte verhouding van Ca : P is reeds lank bekend [68 69] en is in latere jare weereens herbevestig [70–76]. Volgens Neseni [72] moet dit nie 10:1 oorskry nie, terwyl 'n ander outeur [73] abnormaliteite gevind het met 'n verhouding van 3,6:1. Afwykings sluit onder andere die volgende in, naamlik, konsepsiesteurnisse, follikulêre siste, vertraagde ovulasie, blywende *corpora lutea* en verlengde tussenkalf-periodes (TKP).

Fosfaat

Die nadelige invloed van 'n P-tekort op die vrugbaarheid van koeie is deur die jare goed geboekstaaf [77–89]. Die effek blyk hoofsaaklik in versteurde eierstokfunksie met atrofie en stil bronstigheid gesentreer te wees [86 91], asook in verlaagde estrogeenproduksie [3]. Ander afwykings sluit die volgende in, naamlik, lae konsepsiesyfers en meer dekkings per konsepsie [92].

Fluoor

Van Rensburg en De Vos [93] het in 1966 breedvoerige resultate gepubliseer oor die effek van fluoor in die drinkwater op die vrugbaarheid van koeie. Hulle het bevind dat hoë F-inname tot anestrus, ovulasiesteurnisse, bevrugtingsteurnisse, anovulatoriese brons en 'n lae dragtigheidspersentasie lei, selfs in die afwesigheid van kliniese simptome. Hierdie effekte word verklaar in terme van 'n inmenging met jodiumopname deur die skildklier, verminderde tiroksien-afskeiding en gevolglik verminderde gonadotropien-afskeiding as gevolg van veranderde metabolisme van die endokriene kliere.

Jodium

Tekorte blyk wel 'n nadelige effek te hê, aangesien byvoeging in probleemkuddes 'n vroeëre estrus *post partum* tot gevolg het, asook korter teelseisoene, hoër konsepsiesyfers en minder dekkings per konsepsie [94–96].

Koper

Cu-tekorte lei oor die algemeen tot anestrus [97 98] en eierstokwanfunksie [99] wat varieer van totale anestrus tot vertraagde ovulasie. 'n Enkele hipotese in dié verband[98] meld dat dit die gevolg van ' „stress"-reaksie is wat tot 'n vertraging van endokriene-funksie van veral die eierstokke lei.

Mangaan

Oormaat Mn word geassosieer met aborsies en sistiese eierstokke [100], terwyl tekorte geassosieer word met anestrus [100], verhoogde konsepsiesyfers [101–104], vertraagde ovulasie [1 101 104] en subestrus [103–106].

ESTROGENE

Beeste op klawerweidings vertoon volgens Thian [107–109] anestrus, eierstoksiste, hoë persentasie terugkeer na dekking, sistiese endometritis en 'n verlengde tydperk tussen kalwing en eerste teling.

PROTEIENE

Volgens Ward [90] het die byvoeging van 2 lb grondbone-oliekoekmeel per koei per dag tydens die winter-maande by verre die grootste invloed op vrugbaarheid, terwyl Bembridge[110] van mening is dat lae proteïenpeile tydens die winter die belangrikste oorsaak van 'n lae voortplantingsvermoë is.

RU-VOER

In 'n breedvoerige eksperiment in hierdie verband het Franzos [111] bevind dat lae ru-voer rantsoene indirek via die bottervetpersentasie met vrugbaarheid in terme van tydperk tussen kalwing en konsepsie, en met uitskotpersentasie gekorreleer kan word. Die spesifieke effek word toegeskryf aan lae asetaat-konsentrasies, waar asetaat essensieël vir die biosintese van steroïedhormone is.

UREUM

Ten spyte van uiteenlopende opvattings, blyk dit in baie gevalle asof ureum byvoeding geen nadelige effek op die vrugbaarheid van koeie uitoefen nie [112–120]. Nogtans is daar etlike outeurs wat ureum byvoeding met vrugbaarheidsteurnisse korreleer [112 113 121–126]. In hierdie gevalle blyk verlaagde konsepsie die mees algemene simptoom te wees [123 124 126].

Om die presiese invloed van ureum byvoeding op die vrugbaarheid van koeie te bepaal, het Garverick *et al* [121 127] koeie vir 60 dae met kontrole- en ureumbevattende rantsoene gevoer (145g ureum per koei per dag). LH-, progesteroon- en kortisol-bepalings is op die twaalfde dag van die siklus gedoen en weinig verskille is gevind. Die belangrike is egter dat die *corpora lutea* van die ureum-groep ligter, sagter en meer breekbaar was as dié van die kontrole-groep. Die progesteroon-inhoud van die *corpora lutea* was dieselfde, maar na inkubasie *in vitro* het die *corpora lutea* van die ureum-groep slegs 77 μ/g progesteroon geproduseer teenoor die 146 μ/g van die kontrolegroep.

VITAMIENE

Vitamien A

Die belangrikheid van vitamien A vir optimale vrugbaarheid is reeds lank bekend; die effek mag gesetel wees in die rol wat vitamien A in die biosintese van steroïed-hormone speel [128], of in die sinergistiese aksie daarvan met progesteroon [129]. Tekorte lei tot embrionale afsterwe, fetale abnormaliteite, aborsies en swak en/of doodgebore kalwers [128]. Byvoeging kan lei tot hoër besettingspersentasies [130 131] en verbeterde konsepsies [132].

Vitamien D

Tekorte lei tot afwesigheid van brons terwyl byvoeging die intensiteit van brons verbeter en 'n korter tydsbestek tussen kalwing en konsepsie kan bewerkstellig [76].

Vitamien E

Insluiting van plante ryk aan vitamien E in gekontroleerde veldproewe kan die konsepsie van kuddes verbeter en vitamien-E-terapie het al goeie

resultate gelewer in gevalle van simptoomlose steriliteit, sistiese veranderings van die eierstokke en stille brons [129].

VOEDINGSPEIL

Die belangrikste effek van voedingspeil op die vrugbaarheid van koeie is ongetwyfeld die effek op die *voorkoms van puberteit* [133–141], *naamlik*, dat 'n lae voedingspeil verantwoordelik is vir 'n laer liggaamsgewig en dus 'n vertraagde intrede van puberteit. 'n Liggaamsgewig van 650 lb blyk ook krities te wees vir konsepsie. Hierbenewens kan 'n lae voedingspeil ook aanleiding gee tot meer dekkings per konsepsie [137 139], verlaagde konsepsiesyfers [142–146], siklussteurnisse [144–146] en onaktiewe eierstokke [146]. Daar is ook bevind dat 3-maande-oue verskalwers wat slegs 60% van die aanbevole voedingspeil ontvang, kleiner *ovaria* het as kontrole kalwers [147].

Verskeie gunstige invloede is daarenteen deur verskeie outeurs beskryf in koeie wat op 'n hoë voedingspeil aangehou word [148–150], naamlik intensiewe brons [144], hoër persentasie brons binne 30 dae na kalwing [151], stimulering van sikliese aktiwiteite [152] en beter konsepsie [152 153].

Daar bestaan egter ook verskeie publikasies waarin daar gewys word op spesifieke nadele verbonde aan hoë voedingspeile, naamlik eierstok- en baarmoedersiektes tydens opvolgende laktasies [137], kalwingsprobleme, aborsies en doodgebore kalwers [145], hoër uitskotpersentasies [154] en korter lewensduur van sodanig gevoerde koeie [155].

Etlike hipoteses ten opsigte van die juiste meganisme van aksie van ondervoeding is ook in die laaste aantal jare gepubliseer. Franzos [156] en Rommel [157] skryf dit toe aan abnormale hipotalamiese en hipofise-funksie, terwyl Symington [60] van mening is dat ondervoeding tot verlaagde voortplantingsvermoë lei vanweë verminderde gonadotropien-afskeiding deur die hipofise as gevolg van 'n afname in grootte van die hipofise wat deur ondervoeding veroorsaak word.

Lamond [19] is van mening dat ondervoeding 'n direkte invloed op follikulêre groei en steroïed-afskeiding deur die eierstokke het, maar meld tog die moontlikheid van veranderde hipotalamiese en hipofise-funksie.

Short en Bellows [158] skryf 'n lae dragtigheidspersentasie in koeie op 'n lae peil van wintervoeding toe aan lae persentasie dekking, lae persentasie konsepsie en hoë persentasie dragtigheidsverliese. Donaldson *et al* [159] het bevind dat koeie onderworpe aan lae voedingspeile verlaagde progesteroonkonsentrasies in die periferele bloed tydens die daaropvolgende luteale fase van die siklus het. Ondervoeding tydens die eerste paar maande van dragtigheid lei ook tot 'n drastiese verlaging van periferele progesteroon-vlakke.

Hill [160] het in 'n soortgelyke eksperiment gevind dat ondervoeding 'n kleiner follikulêre populasie gedurende die 15e-17e dag van die siklus tot gevolg het en dat die *corpora lutea* van hierdie koeie tot 30 persent ligter is as dié van kontrole koeie. Hierdie werkers meld ook voorts dat ondervoeding binne 5 dae 'n effek op plasma-progesteroon het, binne 10 dae op follikulêre ontwikkeling en binne 11-20 dae op vrugbaarheid oor die algemeen. Voortspruitend uit hierdie resultate het Wordinger *et al* [161] die histologiese en histochemiese effek van ondervoeding ondersoek en gevind dat ondervoeding tot 'n verhoogde vaskulariteit en edeem van die endometrium lei met 'n verlaging van die epiteelselle en 'n atrofie van die endometriale klierweefsel 18 dae na teling.

WEIDINGS

Dit blyk oor die algemeen asof verbeterde aangeplante weidings beter voortplantingsvermoë in die hand werk in soverre dit gemeet is in dragtigheidspersentasies [162–166]. Vinniggroeiende onvolwasse weidings is ook reeds onder die hoof van energie as 'n oorsaak van swak voortplantingsvermoë in lakterende koeie [14 43–45] genoem.

Ten slotte is dit dus duidelik dat die invloed van voeding op die vrugbaarheid en voortplantingsvermoë van koeie 'n komplekse probleem is waarin energie, proteïene, minerale, vitamiene, voedingspeil, en moontlik ureum, sleutelrolle speel. Dit is ook duidelik uit die voorgaande dat daar geen enkele voedingselement is wat enkel en alleen verantwoordelik vir doeltreffende voortplantingsvermoë is nie [28 167]. Hierbenewens is die wisselwerking tussen voeding, liggaamsgewig, produksie en reproduksie ook van kardinale belang. Met die nuwere analitiese metodes vir hormoonbepalings wat tans beskikbaar is, behoort dit egter in die afsienbare toekoms moontlik te wees om huidige hipoteses met 'n groter mate van sekerheid as onwaar of waar te bewys.

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CAUSES OF VARIATION OF COPPER, IRON, MANGANESE, ZINC AND MAGNESIUM LEVELS IN BOVINE LIVERS

2: THE DISPERSION OF TRACE METALS IN BOVINE LIVERS AND THE EFFECTS OF FORMALINIZED STORAGE ON MINERAL CONCENTRATIONS AND MOISTURE CONTENT†

P. F. THERON,* R. RIMMER,* H. A. NICHOLLS* AND W. J. EHRET**

SUMMARY

The need to preserve liver specimens for periods up to 19 months led to a study of the effects of formalin preservation on the mineral concentrations and moisture content of the specimens. Prolonged storage in plastic and in glass bottles was investigated and both were shown to be satisfactory for the storage of formalinized liver samples. The differences between sample sites within the caudate lobe of the liver were demonstrated to be small when compared with the variations between mineral-deficient and normal livers.

INTRODUCTION

The investigations which are to form the basis of a further paper to be published, involve the determination of copper, iron, manganese, magnesium and zinc levels in bovine livers with a view to correlating these levels with the metabolic state of the livers. Methods of determination of these elements by atomic absorption spectrophotometry have already been investigated[5]. Although the liver kspecimens were collected over a period of 15 months, to coincide with the slaughtering of the animals, the actual determinations were carried out in bulk afterwards. For this reason a specimen, approcimately 20g in mass, was taken from the caudate lobe of each liver and preserved in a glass bottle containing sufficient 10% formalin to cover the sample completely. Each bottle was fitted with a bakelite lid. The present investigations were aimed at examining the effects that preservation and storage may have had on the mineral concenttrations.

FORMALIN PRESERVATION

In order to interpret the effects of formalin preservation, random multiple samples were taken from the caudate lobe of a fresh liver as soon as possible after slaughtering, and replicate determinations were carried out on them. (The problem of trace element dispersion within a liver is discussed later). Further portions of this liver were preserved in formalin for 22 days, after which the analysis was repeated. The results of the analyses are given in table 1. No statistically significant differences were noted for any of the five elements. It was concluded that formalin preservation up to 22 days did not affect the trace element levels.

PROLONGED STORAGE

Because the storage periods ranged from four to 19 months, investigations were carried out to evaluate any possible effect this may have had on the trace metal concentrations. The tests took the form of storing the caudate lobe of a liver in formalin, random samples being removed after six weeks, and again after six months. In each case multiple determinations were carried out. The results appear in table 2.

The results indicate that the concentrations of copper, iron and magnesium were not affected by prolonged storage in formalin. The changes in the levels of manganese and zinc however, were, statis-

Table 1: COMPARISON OF FRESH AND FORMALIN PRESERVED LIVERS

		Cu	Fe	Mn	Zn	Mg
Fresh	Mean	29,1	121	5,9	20,8	221
	Standard Deviation	9,16	39,2	1,96	7,41	88,6
Preserved	Mean	27,53	143	5,3	26,8	178
	Standard Deviation	1,80	23,2	0,75	10,39	11,62
Results	Analysis of Variance	NS	NS	NS	NS	NS
	t	NS	NS	NS	NS	NS

NS = Not Significant at 95% limit of confidence

The values in tables 1-5 and 7 are given in mg/kg.

† Based on a dissertation submitted by W.J. Ehret to the University of Pretoria in partial fulfilment of the requirements for the degree M.Med. Vet. (Zootech.)

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** Abattoir and Livestock Market Department, Johannesburg, 2001.

Table 2: COMPARISON OF MINERAL LEVELS AFTER SIX WEEKS AND SIX MONTHS

Storage Period	No. of Determinations		Cu	Fe	Mg	Mn	Zn
Six weeks	30	Mean	31,0	74,0	159	3,3	39,4
		Standard Deviation	2,5	9,4	10,1	0,41	8,5
Six months	30	Mean	31,0	78,2	154	3,7	33,9
		Standard Deviation	4,5	10,9	22,2	0,45	3,1
		t	0,0	1,56	1,17	3,08	3,18

At the 95% limit of confidence the statistical difference "t" is significant if $t > 1,96$.

Table 3: MINERAL LEVELS AFTER STORAGE IN GLASS AND PLASTIC BOTTLES

	No. of Determinations		Cu	Fe	Mg	Mn	Zn
Glass	10	Mean	27,1	93,5	104	4,3	39,9
		Standard Deviation	5,46	8,14	16,05	0,47	14,54
Plastic	10	Mean	26,0	98,6	129	4,3	34,4
		Standard Deviation	7,19	24,28	32,20	0,67	4,97
		t	0.19	1,67	1,98	0,00	1,09

At the 95% limit of confidence the statistical difference "t" is significant if $t > 2,23$.

tically significant. Conclusions drawn from comparing the levels of these two elements in livers of differing storage periods would be of somewhat doubtful value.

USE OF GLASS AND PLASTIC BOTTLES FOR STORAGE

The possibility that the choice between glass and plastic bottles for the preservation of liver specimens may have had some bearing on the concentration of the trace elements after prolonged storage gave rise to the following investigation. Portions of a liver were formalin-preserved in plastic and glass bottles for one year. After this period, analyses were performed on random non-homogenized multiple samples from each portion. Table 3 gives the results of the analyses. No statistically significant differences were found for any of the metals, indicating that either type of bottle could be used.

DISPERSION OF THE METALS WITHIN A LIVER

The multiple analyses detailed in the previous sections indicated that the trace elements were not homogeneously dispersed throughout the liver. The lack of homogeneous dispersion of minerals within specific lobes as well as amongst the various lobes of bovine livers has been observed by Henderickx & Van der Heyde[3]. Likewise, Cassidy[1] found variations within porcine livers. Furthermore, Chapman, Cox, Haines & Davis [2], on comparing different sample sites of entire bovine livers found significant variations in copper levels.

In order to confirm that the indicated variations were due to the non-homogeneous dispersion within the liver, rather than to a fault in the analytical procedure, the following study was conducted. Thirty random samples, approximately 1 g in mass, were taken from the caudate lobe of a fresh liver and analysed individually. The remainder of the same lobe was then analysed thirty times after homogenization. The caudate lobe of another liver was preserved for two weeks and analysed in the same manner as for the fresh liver. The results appear in table 4.

The analysis of variance of the trace element concentrations demonstrated that the minerals were not homogeneously dispersed within the caudate lobe of the liver. In all cases, except manganese significant improvement in dispersion was obtained after homogenization.

The anomalous behaviour of manganese may be attributed to the fact that the concentrations present approached the limit of detection by the method. Table 4 further indicates that a degree of homogenization appears to take place during storage. It is thus apparent that it is advantageous to store livers for a couple of weeks before analysing them since homogenization on a routine basis is not practical.

MOISTURE CONTENT OF FRESH AND FORMALINIZED LIVERS

All trace element concentrations in this investigation are expressed on a wet basis. Since any significant variation in the moisture content of different livers would have had profound effects on the mineral concentrations, a study was made of the variation in moisture content of fresh and preserved livers. The method of desiccation followed standard procedure[4], which involved drying liver samples under vacuum for four hours at 95°C to 100°C.

Table 4: VARIANCES OF MINERAL LEVELS FOUND IN HOMOGENIZED AND NON-HOMOGENIZED LIVERS

		No. of Determinations	Cu	Fe	Mg	Mn	Zn
Fresh	Non–Homogenized	30	28	93	464	0,15	102
	Homogenized	30	7,8	39	164	0,33	60
	F		3,56	2,39	2,84	0,45	1,69
Preserved	Non-Homogenized	30	81	43	174	0,30	3,7
	Homogenized	30	23	14	66	0,46	1,4
	F		3,52	3,02	2,63	0,652	2,641

The variances differ significantly at the 95% level for $F > 1,84$.

Dispersion of Moisture within a Fresh Liver

The possibility that moisture, like the trace elements themselves, may not be homogeneously dispersed within a liver led to a comparison of moisture determinations, done on homogenized and non-homogenized samples taken from a fresh liver. The results, given in table 5, indicate a lack of homogeneous dispersion within a fresh liver.

Table 5: DISPERSION OF MOISTURE WITHIN A FRESH LIVER

	Non-Homogenized	Homogenized
Mean	63,3	65,0
Standard Deviation	4,2	0,0

Variation in the Moisture Content of Different Livers

Moisture content was determined in each of ten fresh livers. In view of the conclusions of the previous paragraph, each liver was homogenized prior to the determinations. The results are given in table 6.

Table 6: MOISTURE CONTENT OF FRESH HOMOGENIZED LIVERS

Liver	% Moisture
1	67,5
2	65,7
3	60,6
4	67,5
5	67,8
6	69,4
7	68,4
8	64,5
9	63,5
10	68,4
Mean	66,4
Standard Deviation	2,6

Table 6 shows that the variation in moisture content which may be expected in fresh livers, and hence the effect of this variation on mineral levels, is small when compared to proven biological variations. From this it may be concluded that trace element concentrations expressed on a wet basis are comparable for fresh livers.

Dispersion of Moisture within a Formalin-Preserved Liver

The dispersion of moisture within an individual liver after storage in formalin was investigated in the same manner as for the fresh liver. Table 7 indicates that the irregular dispersion of moisture within a formalinized liver is not significant. By comparing table 7 with table 5 it may be seen that moisture apparently becomes more homogeneously dispersed on storage.

Table 7: MOISTURE DISPERSION IN A FORMALIN-PRESERVED LIVER

	Non-homogenized	Homogenized
Mean	71,0	75,5
Standard Deviation	1,07	0,87
F = 1,53 F (5%) = 3,87		

Variation of Moisture in Different Formalinized Livers

Moisture content was determined in eight livers. Because no significant difference was found in the variances of homogenized and non-homogenized stored livers, the eight livers were not homogenized prior to the determination.

Table 8: MOISTURE CONTENT OF LIVERS OF VARIOUS STORAGE PERIODS

Days Stored	% Moisture
216	68,4
330	72,8
441	66,6
477	69,1
516	70,0
612	65,6
648	64,2
729	67,2
Mean	68,0
Standard Deviation	2,53

Comparison with table 6 shows no statistically significant difference at the 95% level, indicating that livers may be stored for up to two years without affecting moisture content significantly. In the light of the above study, it was concluded that mineral levels expressed on a wet basis are directly comparable for fresh and stored livers.

CONCLUSIONS

1. Formalin preservation, up to three weeks, had no

significant effect on trace element concentrations. Significant differences in the levels of Zinc and Manganese, however, were detected after six months.
2. Both glass and plastic bottles were found to be satisfactory for storing liver specimens.
3. Significant variations in mineral concentrations at different sampling sites were found in both fresh and preserved livers, but the effect was less noticeable in the latter instance.
4. Moisture dispersion appeared more uniform in a preserved liver than in a fresh liver.
5. The moisture contents of different livers were within a relatively confined range and were not affected by storage. Trace element concentrations for both fresh and preserved livers are thus comparable.

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INFORMATION — INLIGTING

BRITISH VETERINARY NON-PROPRIETARY NAMES

List No. 17 December, 1973

The British Veterinary Codex Committee has adopted the following non-proprietary names for the veterinary substances indicated.

Apramycin (Antibacterial)

O^4-(3α-amino-O^6-(4-amino-4-deoxy-α-D-glucopyranosyl)-2,3,4,4aβ,6,7,8,8aα-octahydro-8β-hydroxy-7β-methylaminopyrano [3,2-b]pyran-2α-yl]-2-deoxy-D-streptamine

(an antibiotic from *Streptomyces tenebrarius)*

Nitrovin (Growth promoter in pigs and poultry)

1,5-bis(5-nitro-2-furyl)penta-1,4-dien-3-one amidinohydrazone

1Payzone, Panazon and CL 48 401 are the hydrochloride

CORRECTION TO LIST 16

Robenidine The chemical name and graphic formula should be amended to indicate that the name robenidine applies to the base, not the hydrochloride. *Cycostat* and *CL 78,116* are the hydrochloride of robenidine.

In the list above British Veterinary Non-proprietary Names are printed in **bold** type. They are reported to be free from conflict with trade marks registered in Great Britain and Northern Ireland and these names or names resembling these names, will not be registered as trade marks for pharmaceutical products or drugs in those countries. Some of the names, other than the chemical names appearing above are registered trade marks, which may be used to describe preparations of the substance to which the British Veterinary Non-proprietary Name is applied.

The British Pharmacopoeia Commission has agreed that in the future it will provide Approved Names for substances used in veterinary medicine. Facilities for providing British Veterinary Non-proprietary Names are there fore being discontinued, and applications for Approved Names should be made to the Secretary of the British Pharmacopoeia Commission, 8 Bulstrode Street, London W.1.

The Secretary, British Veterinary Codex Committee,
The Pharmaceutical Society of Great Britain,
17, Bloomsbury Square,
London, WC1A 2NN.

Jl S.Afr. vet. Ass. 45(1&2): 77-79 1974

DOSAGE REGIMENS OF CHLORAMPHENICOL IN DOMESTICATED ANIMALS*

LLOYD E. DAVIES AND CAROL NEFF DAVIS**

SUMMARY

Dosage regimens adequate to maintain chloramphenicol levels in the blood in excess of the minimal effective concentration were computed for cats, dogs, swine, goats and ponies. Doses and intervals recommended in the past were probably inadequate. An oral loading dose of 100 mg/kg followed by 50 mg/kg every eight hours would be adequate for all species considered except ruminant animals. An intramuscular regimen of 50 mg/kg every eight hours should be effective in all species.

INTRODUCTION

Chloramphenicol is a broad spectrum antimicrobial drug which readily diffuses into intracellular fluid, central nervous system and aqueous humour and has a low order of toxicity in domesticated animals[4]. Since chloramphenicol has these advantages over some of the other broad-spectrum antibiotics, more data concerning appropriate dosage schedules for the various common domesticated animals are needed. The relevant pharmacokinetic parameters have been determined and were published previously[1]. These constants are summarized in table 1. It is apparent that marked species differences exist in duration of plasma levels and apparent specific volumes ot distribution. These two parameters determine the dose required to produce a given blood level and the dosage interval necessary to maintain therapeutic concentrations of drug in the body fluids. The purpose of the present communication is to provide recommendations concerning chloramphenicol therapy in the common domesticated animals.

METHOD

The kinetic constants determined in a previous investigation[1] were employed to compute dosages and dose intervals. The total dose required to produce a given drug concentration in plasma is related to the apprent specific volume of distribution as follows[2]:

Dose (mg) = V'd (*l*/kg) x Body Mass (kg) x Desired Concentration (mg/*l*) where V'd is the apparent specific volume of distribution of the drug.

The interval between doses required to maintain a drug concentration in plasma above a certain minimal value (Δt) is related to the plasma concentration of the drug at zero time (Co) and to the apparent first-order disappearance rate constant (Kd) by the following equation[5]:

$\Delta t = \ln \{(1 + Co)/Pmin\} /Kd$ where Pmin = minimal drug concentration desired.

It has been determined that plasma concentrations of chloramphenicol in excess of 5 μg/m*l* are effective in the treatment of most infections[3]. These relationships were employed to compute intravenous dosage regimens for the various species.

Table 1: MEAN KINETIC CONSTANTS FOR DISAPPEARANCE OF CHLORAMPHENICOL FROM BLOOD PLASMA OF DOMESTICATED ANIMALS

Species	Co mg/*l*	T½ (hr)	Kd (hr^{-1})	V'd *l*/kg
Dogs	12,4	4,2	0,24	1,77
Cats	9,3	5,1	0,14	2,36
Swine	21,0	1,3	0,53	1,05
Goats	16,5	2,0	0,35	1,33
Ponies	21,5	0,9	0,77	1,02

Co = Plasma concentration of drug at zero time.
T½ = Plasma half-life.
Kd = apparent first-order disappearance rate constant.
V'd = apparent specific volume of distribution of the drug.

The constants shown in table 1 and absorption rate constants were employed in a computer program for the simulation of concentrations of chloramphenicol in plasma resulting from repetitive administration of the drug by the oral and intramuscular routes.

RESULTS

Using a value of 5 μ g/m*l* for Pmin and values of 9, 19 and 29 μ g/m*l* for Co, dosage intervals were computed for each species, along with the intravenous dosage necessary to produce these concentrations in plasma. These values are tabulated in table 2.

The calculated values illustrate the influence of differences in pharmacokinetics on dosage regimens. The cat would require the largest amount of drug per kilogram of body mass, and the pony would require the least, to produce comparable drug concentrations in the plasma. In contrast, chloramphenicol would have to be administered most frequently to the pony, and least frequently to the cat to maintain plasma concentrations in excess of u g/m*l*.

Drug concentration in plasma following the oral administration of chloramphenicol capsules as a 100 mg/kg loading dose followed by 50 mg/kg every 8 hours was simulated by computer. These data are shown in the figure. It may be seen that this regimen maintained drug concentrations in the plasma in excess of the minimal effective level throughout the period of therapy. Oral administration of chloramphenicol to ruminant animals was ineffective because of destruction of the drug within the ruminal environment[6].

* This paper was presented as part of one delivered at the Biennial Scientific Cfongress of the South African Veterinary Association, Pretoria, 15 -19 October, 1973.

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Table 2: CALCULATED VALUES FOR INTRAVENOUS DOSE TO ATTAIN VARIOUS INITIAL DRUG CONCENTRATIONS IN PLASMA AND DOSAGE INTERVAL REQUIRED TO MAINTAIN DRUG CONCENTRATIONS IN EXCESS OF 5 μg/ml IN VARIOUS SPECIES

	9 μg/ml		19 μg/ml		29 μg/ml	
Species	(mg/kg)	Δt (hr)	mg/kg	Δt (hr)	mg/kg	Δt (hr)
Dogs	15,9	2,9	33,6	5,8	51,3	7,5
Cats	21,2	4,9	44,8	9,9	68,4	12,8
Swine	9,5	1,3	20,0	2,6	30,5	3,4
Goats	12,0	2,0	25,3	4,0	38,6	5,1
Ponies	9,2	0,9	9,4	1,8	29,6	2,3

Co = Plasma concentration of drug at zero time (for ease of computation, values of 9, 19 and 29 were arbitrarily selected).
Dose = amount of drug necessary to produce the given initial drug concentration.
Δt = interval between doses which would be just sufficient to maintain blood concentrations of drugs in excess of 5 μg/ml.

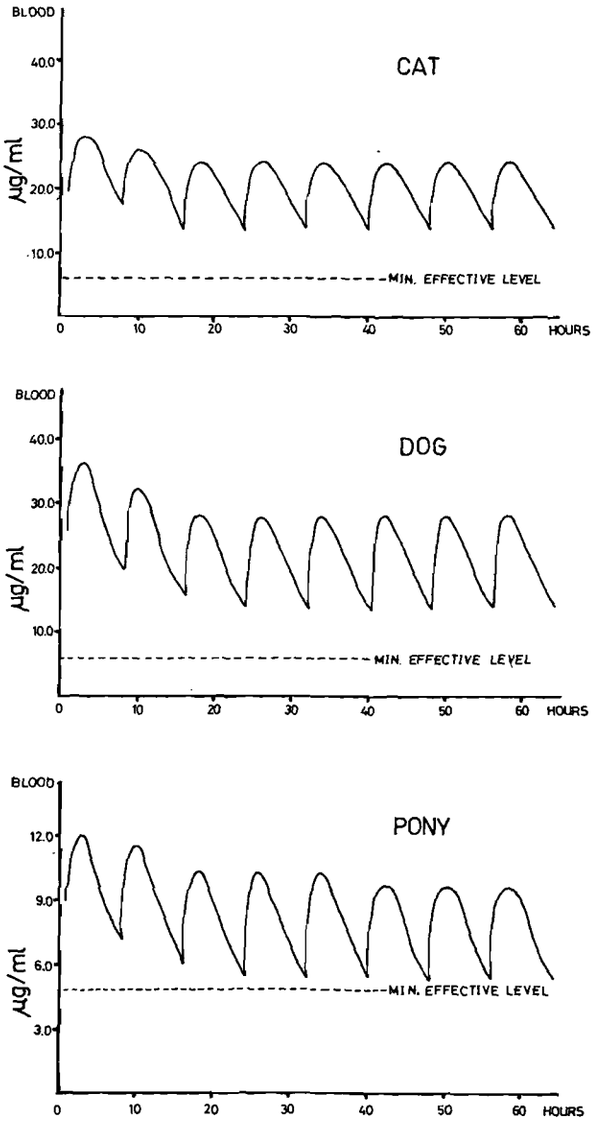

Figure: Computer simulated blood level curves for chloramphenicol administered orally as a 100 mg/kg loading dose, followed by 50 mg/kg every eight hours.

Following the intramuscular injection of chloramphenicol sodium succinate at the rate of 50 mg/kg, therapeutic blood levels were obtained; an 8 hour dosage interval was adequate to maintain drug concentrations in excess of 5 μ g/ml. The intramuscular administration of chloramphenicol base failed to produce detectable concentrations of drug in the plasma, presumably because of its extreme insolubility in water.

DISCUSSION

In order for a drug to exert its pharmacologic effect it is necessary that it be present at the receptor site in adequate concentration for an interval of time. This is particularly true of antimicrobial drugs which exert a bacteriostatic effect on pathogens, as the reticuloendothelial system must have time to eliminate the offending organisms and it is known that exposure to subinhibitory concentrations of antibiotics is conducive to the emergence of resistant strains of organisms.

The present data indicate that dosage regimens which have been recommended previously [4] are probably inadequate. A daily intramuscular dose of 11 mg/kg or a daily intravenous dose of 16 mg/kg would not be expected to maintain effective concentrations of chloramphenicol in the plasma. Furthermore, there seems to be no justification for differences in recommended intramuscular doses in large animals as compared with small animals. It is recommended that ruminant and equine animals be treated by the intramuscular route because of the very rapid elimination of chloramphenicol following intravenous administration. An oral loading dose of 100 mg/kg followed by 50 mg/kg at 8 hour intervals should be adequate to maintain effective plasma levels throughout the period of therapy in all species except ruminants.

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BOOK REVIEW

BOEKRESENSIE

VERERBUNG UND KRANKHEIT BEI HAUSTIEREN

H. MEYER AND W. WEGNER

Hannover: M. & H. Schaper. Second Edition. 1973. pp 157. Graphs: 18 Tables: 33 Price: DM 39,60 = ± R10,00

In the second edition of the book the authors followed their original idea of giving a survey of the influence of genetical factors on diseases. The latest information available could be included and the list of references stand at over 600.

Basically the book consists of two parts, the first part on inherited defects and disease inheritance and the second part on diseases with genetically determined predisposition

The part on inherited defects includes a completely new section on chromosomal aberrations and deals with the diagnosis of inherited defects. This is of great importance, since it is the duty of the veterinarian to the community to use whatever influence and power he possesses to prevent the production of anatomically defect animals.

The larger part of the book deals with diseases which have been proved to be related to a genetic predisposition of the animal. The reader will be surprised to see how many of the well-known infectious diseases, diseases caused by parasites, metabolic disorders and climatic influences and diseases of different organs have in actual fact a genetic background, that all species show a variable degree of genetically determined predisposition to a great number of diseases.

The authors also explain the biological background to these differences of disposition and resistance to diseases and put forward new ideas of animal breeding for disease resistance.

In the evolution from simple farming practice to highly sophisticated, large-scale animal production, the survey and eradication of inherited defects alone is not sufficient; inclusion of diseases with a clearly defined genetical background is also indicated.

The veterinarian and the animal breeder must be aware of these facts to be able to use this knowledge in the planning of genetic progress on the population basis. The selection for disease resistance is only possible if Mendelian inheritance, biostatistics and population genetics can be combined into a workable synthesis.

Towards this end, the book wil be of great help to the veterinarian and the animal breeder and should be used by all veterinary and animal husbandry students, because it provides an easy readable introduction and an excellent survey of the field 'Genetics and Disease'. D.R.O.

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CANINE HERPESVIRUS INFECTION: LITERATURE REVIEW AND CASE REPORT+

R.C. BARTSCH*, O.J.B. HUBSCHLE** AND H.J. ELS***

SUMMARY

A diagnosis of herpesvirus infection was made pathologically and virologically in a litter of puppies from a breeding kennel in South Africa. Discussion of this first confirmed case in South Africa and a brief literature review are presented.

LITERATURE REVIEW

Introduction

Infection with canine herpesvirus (CHV) produces an acute, afebrile, rapidly fatal, viraemic disease in the neonatal puppy [8]. As in neonates of other species, mortality rates in puppies are higher than in mature animals. Trauma during parturition, abondonment, congenital anomalies, cannibalism, lactation failure, overheating or chilling, infectious canine hepatitis, distemper, toxoplasmosis and various bacterial infections are well-known causes of neonatal death in the dog. CHV was first recognized as a disease entity in young puppies in 1964 and is now known to be widespread throughout the world.

In adult animals, growth of herpesvirus is usually restricted to the oral mucosa, upper respiratory tract or external genitalia[6]. In contrast, fatal generalized disease occurs in the very young of several species affected with herpesvirus infections. Generalized disease produced by CHV has only been seen in puppies less than two weeks old [8]. Fatal generalized infections also occur in foals affected with equine rhinopneumonitis [11], in newborn calves infected with infectious bovine rhinotracheitis [2], and in pseudorabies of very young pigs[3].

Route of Infection

The virus in spontaneous infections is thought to gain entrance to the neonatal dog by inhalation or ingestion of infective material [4 9]. This may occur *post partum*, resulting from direct contact with infected dogs [10], or the virus may gain entrance to the respiratory or digestive tracts during parturition in infected bitches [4 9]. The virus may multiply in the genital tract and has been isolated for up to two weeks from the vagina after oral-nasal inoculation [1]. Furthermore, puppies from dams inoculated intravaginally 1-2 weeks before whelping, developed fatal infections [8]. Also, pups may be infected *in utero* by transplacental infection [10].

Clinical Signs

The first clinical signs of CHV infection usually are seen in 7-10 day old puppies [9 18]. The signs observed are not constant or pathognomonic and consist of inappetence, chilling, persistent crying, dyspnoea, mild nasal discharge, painful abdomen and a soft, odourless, yellow-green stool [8 9 18]. Characteristically, no febrile reaction is present. Prostration and death usually occur within a few hours of the appearance of clinical signs [18]. Experimentally infected puppies have the same general clinical signs except that vomiting has been reported in one experiment [20]. Paddling movements of the legs and opisthotonus have been noted in some experimental cases; often no clinical signs are observed in inoculated pups [9]. It is interesting that one pup suffered epileptiform convulsions beginning 45 days following a CHV experiment [5].

The mortality of CHV infection is about 30 per cent; 80 per cent of these deaths occur during the first week after birth [8].

Pathogenesis

The pathogenesis of CHV has been studied in puppies inoculated oral-nasally and intraperitoneally [4 16 20]. Immunofluorescence of the nasal epithelium and tonsillar crypts was seen 24 hours after oral-nasal exposure and on the third day after intraperitoneal injection [4 20]. Fluorescence of the fibres of the olfactory nerve was occasionally observed but did not progress into the olfactory bulbs or into the brian via this route [16]. By the fourth day after inoculation, dissemination indicated by fluorescence may be observed in virtually all viscera and the central nervous system [4 16 17]. The route of dissemination is believed to be a leucocyte-associated viraemia [20].

Macroscopic Findings

The necropsy lesions of CHV infection are haemorrhagic and necrotizing. Some puppies may have petechial haemorrhages in the skin and subcutis of the abdomen and pharynx [8]. The lungs and kidneys present the most constant lesions [18]. Often frothy material is found in the trachea, indicating some degree of pulmonary oedema. Mild pulmonary oedema and congestion are commonly seen along with the more characteristic lesion of diffuse petechial and ecchymotic haemorrhages. These haemorrhages, which reach 1 cm in diameter, may appear as red foci in acute deaths or as gray foci in deaths less acute [8 9 18]. The renal lesions are of diagnostic importance, consisting of focal cortical haemorrhage and necrosis [8]. These foci appear as mottling of the subcapsular cortical surface and extend in typical wedge-shaped fashion into the medulla. The centres of these foci later become gray, denoting parenchymal necrosis [8]. Haemorrhagic foci (1-3 mm diameter) are common in the gastric and intestinal serosa, liver, heart (endocardial and epicardial), urinary bladder, ovaries, oviducts and uteri. A small amount of serosanguinous fluid may be seen in the body cavities [9]. Splenomegaly and generalized lymph node enlargement is a constant finding [8 9]. Macroscopic lesions of the brain are not evident. Lesions of experimental and natural cases are similar.

Microscopic Findings

The initial microscopic lesion is necrosis of the walls of small blood vessels and subsequent haemorrhage [8 9]. These necrotizing lesions then extend into the surrounding tissue of the organ concerned (Figure 1). Inflammatory reaction is not usually a part of the necrotic foci. Necrotic, haemorrhagic lesions are to be found in all the major

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organs: kidneys, liver, spleen, lungs, adrenals, small intestine and brain [9 17]. To a lesser extent, histopathological lesions are seen in the stomach, pancreas, omentum, retina and myocardium.

Factors Affecting the Clinical Course

CHV infection has been described as a serious illness only of very young puppies. Only animals less than two weeks of age are killed by experimental inoculation of CHV [8 9].

The virus has been isolated from adult dogs with mild respiratory disease [13] and is thought to be the same virus which produces tracheobronchitis in adult dogs [12]. Tracheobronchitis, or kennel cough, characterized by rhinitis, sneezing and coughing, was produced by inoculating CHV into six-months-old dogs. Most dogs inoculated with CHV after two weeks of age only suffer from subclinical or mild rhinitis and pharyngitis [1 10 12 13]. Mild lesions of rhinitis, pharyngitis and vaginitis accompany viral multiplication in these sites[9]. The virus may be shed via nasal, oral and vaginal secretions for approximately two weeks after inoculation.

Attempts to demonstrate any development of cellular resistance to explain the rapid change in the neonate puppy from high susceptibility to high resistance have failed so far [5 6]. There was no difference in growth of CHV in the macrophages from neonatal and three to four-months-old puppies [5]. No cell receptors or interferon mechanisms could be discovered.

The newborn puppy, like many other very young mammals, is somewhat poikilothermic. It is only during the second week that the pup begins to develop adequate thermoregulation [5]. Also, febrile reactions do not occur in pups until they are two to three weeks old.

The optimal temperature of CHV growth in dog kidney cells and macrophage cultures is about 35-36°C [5]. Growth was inhibited at 37°C or higher. The body temperature of puppies less than two weeks old usually fluctuates between 34-37°C, therefore approximating the optimal growth temperature of CHV [5]. Furthermore, viral growth in dog kidney cells and macrophages at 38°C, a common rectal temperature of pups with adequate thermoregulation, was less than 10 per cent of the amount of growth obtained at 35°C.

That temperature is an important factor in pathogenesis of CHV has been more convincingly shown *in vivo* [5]. By increasing the ambient temperature (and thus the body temperature) of CHV inoculated neonates, prolonged survival time, diminished gross and microscopic lesions and decreased viral growth were obtained. In fact, only two of seven puppies in this study group died of CHV infection. Furthermore, hypothermic four to eight-week-old pups inoculated with CHV suffered more severe signs of infection than the inoculated normothermic controls. Viral isolations failed and immunofluorescence and histopathological lesions of lymph nodes, spleen, kidneys and liver were either not observed or negligible in the normothermic group. In the hypothermic animals occasional microscopic lesions and numerous immunofluorescent foci were seen; positive viral isolations were obtained from the above organs[5].

Maternal antibody protects newborn puppies from severe or fatal CHV infection [4 10]. Challenged pups however, do shed the virus and develop some of the lesions of the fatal disease. Vaccination of bitches prior to breeding with inactivated virus and injection of immune serum into newborn pups have been used successfully to stop pup losses in kennels where CHV infection has been a problem [4].

The latent or inapparent infections in challenged infant puppies may be of some epizootiologic consequence. In the experiment cited, puppies suckling a seropositive bitch (serum neutralization titre 1:4), did not develop clinical signs when challenged with CHV. Nevertheless, the virus was recovered from the throat, nasal conchae, brain, lung, liver, kidneys and urine. Characteristic CHV lesions and intranuclear inclusions were also observed microscopically.

Herpes simplex virus is known to produce latent sites of localization in the lacrimal and salivary glands and trigeminal nerve and ganglion in man [14]. CHV is only known to be viable in canine tissues, either *in vivo* or *in vitro*. If a carrier state exists, it must be in the canine host. Possibly these spontaneous, inapparent CHV infections represent a type of carrier state.

CASE REPORT

History and Clinical Signs

The owner of a 50 bitch breeding kennel near Pretoria presented three dead Bull Terrier puppies for *post-mortem* examination at Onderstepoort. These puppies had been the last survivors of a litter of six from a 4½-year-old bitch. Two of the puppies were 12 days old and the other 13 days old at death. All six littermates had died between 10 and 13 days of age with the same clinical symptoms of persistent crying, anorexia and death within 24 hours of onset.

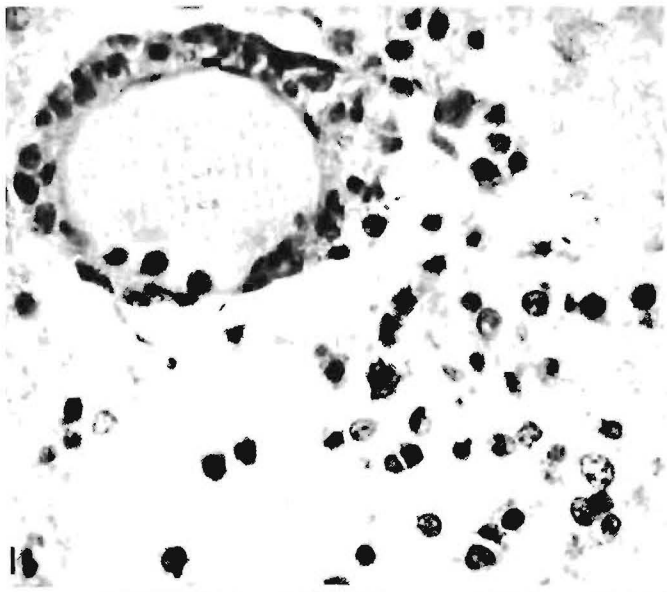
The Bull Terrier bitch was born in South Africa and had raised one previous litter successfully. Occasionally, the owner had imported bitches from the United States and England, but had not noticed similar neonatal mortalities previously.

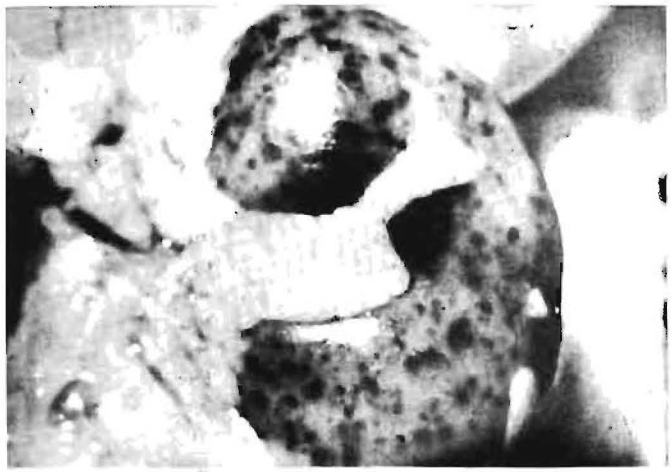
Necropsy Findings

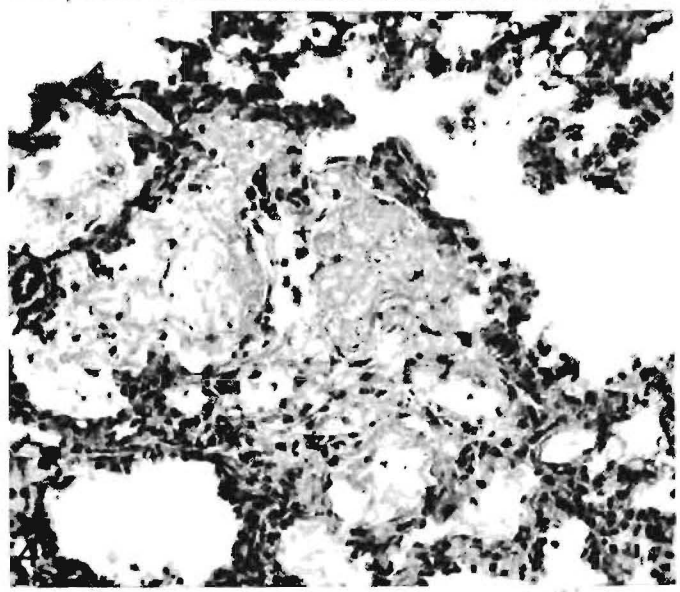
Essentially identical lesions were observed in all three puppies. The puppies appeared to have been well nourished and displayed little *post-mortem* autolysis. The most striking lesion upon first examination was generalized petechial and ecchymotic haemorrhages. Petechiae and ecchymoses were observed on the serosa of the stomach and small intestine, thymus, pancreas, liver, visceral pleura of the lungs, kidneys and mucosa of the urinary bladder. The livers also contained yellow to gray foci 1-2 mm in diameter diffusely scattered throughout the parenchyma and beneath the capsule (Figure 2). Mild hydrothorax was uniformly observed as were severe pulmonary congestion and oedema. Yellow to gray subpleural foci were observed in the lungs of one animal. The kidneys had a markedly speckled appearance owing to the many 1-5 mm diameter haemorrhages (Figure 3). The larger renal haemorrhages were wedge shaped on cross section, originating at the corticomedullary junction. There was moderate to severe splenic enlargement with a predominance of red pulp. Severe congestion of the brain and generalized lymph node enlargement were noted in all three cases. Gross lesions in other organs were not observed.

Microscopic Findings

The basic lesion of CHV – focal coagulative







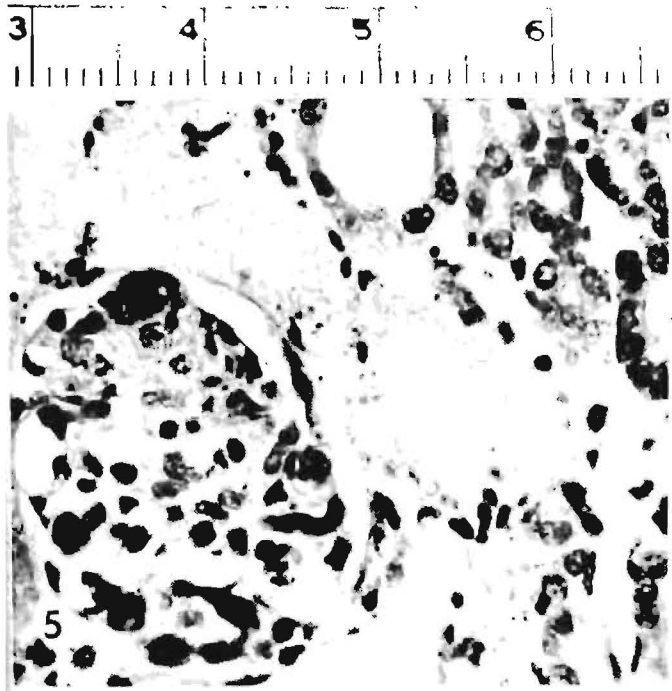


Figure 1. Brain stem (500X) demonstrating vascular necrosis and inflammation. Note the focus of gliosis in close proximity to the affected arteriole.

Figure 2. Gross photograph of liver depicting focal, disseminate necrosis and haemorrhage.

Figure 3. Gross photograph of kidney demonstrating the characteristic "bird's egg" appearance of disseminated focal haemorrhage and necrosis.

Figure 4. Photomicrograph of the lung (200X) demonstrating focal necrosis and fibrinous alveolar exudate.

Figure 5. Photomicrograph of the kidney (500X) depicting coagulative tubular necrosis.

Figure 6. Photomicrograph of nasal pharynx (75X) demonstrating a fibrino-necrotic focus which may be indicative of the portal of entry.

necrosis with or without haemorrhage – was found in the following organs: liver, lungs, kidneys, pancreas, adrenals, small intestine and brain. These necrotic areas accounted for the grossly observed pulmonary and hepatic foci and were characterized by coagulative necrosis, scant reactive cell infiltration and scarce intranuclear inclusions typical of herpes infection. Necrotic foci were randomly distributed throughout the liver lobules and portal tracts. The portal tracts were prominantly enlarged by histiocyte and lymphocyte infiltration and oedema. Examination of lung sections revealed thickened, oedematous alveolar walls with diffusely scattered fibrinous alveolar exudate. In many necrotic pulmonary foci there was little disruption of the normal architecture (Figure 4). Focal coagulative necrosis and haemorrhage in the kidney was limited to the cortex and mainly involved tubules of the labyrinth (Figure 5), as well as a few glomeruli. Most pancreatic necrotic foci were small, encompassing one or possibly two acini. In one animal's pancreas however, there was necrosis of entire lobules. Necrotic foci of the adrenals were scattered throughout the cortex but absent in the medulla.

Sections of lymphoid tissue contained no discrete necrotic foci. Diffusely scattered groups of three to four pyknotic cells were seen throughout the spleen, lymph nodes and thymus. The lymphoid nodules of the spleen appeared poorly developed and overshadowed by the predominance of red pulp. Hassel's corpuscles were very prominant in the thymuses of all three puppies.

In sections of the small intestines the petechiae and ecchymoses were located in the *lamina propria mucosae*. The necrotic lesions were characterized by pyknosis, necrotic debris and haemorrhage. Likewise, the urinary bladder haemorrhages were found just beneath the mucosa.

Microscopic examination of cardiac tissue revealed scattered focal lysis, pyknosis and Zenker's necrosis of muscle fibres in the atria and ventricles. There was perivascular lymphocyte infiltration adjacent to these lesions and occasional replacement of the necrotic muscle fibres by lymphocytes. Mild, diffuse vacuolar degeneration was a constant finding. Oil red O staining identified these vacuoles as lipid droplets.

Microscopic lesions of the brain were characteristically peri-arterial (Figure 1). Necrotic arteritis of small vessels plus focal necrosis, haemorrhage and gliosis were found in the pryamidal and polymorphous cell layer of the cerebrum, corpora quadrigemina, cerebellar peduncles, white matter of the cerebellum, pons and medulla. Focal accumulation of large mononuclear leukocytes were common throughout the meninges. No microscopic lesions were observed in the eyes.

Examination of the mucosa of the nasal pharynx revealed numerous ulcers heavily infiltrated with lymphocytes and polymorphonuclear leukocytes in a fibrinous matrix (Figure 6). No inclusion bodies could be found in the adjacent nasal mucosa.

Diagnosis

Generally, diagnosis of CHV is based on finding characteristic clinical signs, gross and miscroscopic pathologic lesions. In this instance, however, the diagnosis was confirmed by culture and identification of the aetiologic agent.

Kidney cell cultures were prepared from a moribund puppy with suspected CHV infection by the trypsin dispersion technique [19,21] and incubated at 37°C. A confluent monolayer of kidney cells was present after 24 hours with small numbers of rounded, highly refractile cells scattered throughout. After 48 hours these areas of rounded cells appeared as bunches of grapes. Clear plaques appeared after 72 hours following detachment of many areas of refractile cells. Cytopathic changes affected about three-quarters of the monolayer by the fourth day and nearly all of it by the fifth day. Rounding up and refractivity of infected cells are highly specific cytopathic effects of the herpesviruses.

Negative-staining of kidney samples and examination under the electron microscope revealed viral particles characteristic of herpesviruses. The particles were hexagonal with tubular capsomeres arranged in icosahedral symmetry on the particles' surface. Examination of empty capsids confirmed the capsomere morphology and also revealed the hollow central region. Particles surrounded by envelopes were studied by electron microscopy revealing subdivided, irregularly shaped, electron dense central bodies within a zone of low density and surrounded by a single or double membrane.

DISCUSSION

A tentative diagnosis of CHV had been made on several occasions in this laboratory based on history, clinical signs and histopathology. Only in this instance was it possible to perform necropsies and obtain specimens for virus identification, thus providing a definitive diagnosis. Study of previous case material, when compared with specimens from the present cases, revealed entirely similiar microscopic lesions. It would appear, therefore, that CHV has existed in South Africa as a sporadic infection of neonatal puppies.

A possible method of treatment may be ascertained from experiments establishing 35-36°C as the optimal growth temperature of the virus and that experimental elevation of the ambient temperature decreased viral growth, CHV lesions and mortality [5,6]. Use of heat lamps and other warming methods coupled with supportive therapy, therefore, may be indicated in the treatment of affected litters. Commercial vaccines are not available and the poor or variable immunogenicity of CHV makes effective use of anti-serum questionable [9]. It has not yet been soundly established that neutralizing antibody titres have protective qualities against CHV infection [4].

Speculation is interesting concerning the importance of latent or inapparent infections and recovered infections on the development of sequelae. CHV infection in neonates produces lesions in almost all organs of the body. In terms of current immunologic thought on certain other diseases, CHV infection may also act to initiate damaging autoimmune responses or lead to complications appearing in later life. For instance, the sole survivor of CHV infection in five littermates suffered from ataxia and blindness [15]. Subsequent pathological examination of this animal at the age of 31 days revealed advanced interstitial nephritis, cerebellar hypoplasia with disseminated focal gliosis and retinal dysplasia. This animal had a serum

neutralization titre to CHV of 1:64. These lesions may represent rapidly fatal, complicating sequelae to CHV infection.

There are many animals surviving clinical and subclinical CHV infection. Possibly, CHV may play a rôle in initiation of disease processes leading to epileptiform seizures, cerebeller hypoplasia, trigeminal neuralgia causing severe pain when the mouth is opened, early unexplained interstitial nephritis or retinal dysplasia. All of these conditions are occasionally presented to the small animal practitioner and are of unknown aetiology.

This case report and literature review might help colleagues to familiarize themselves better with this relatively new infectious disease in South Africa.

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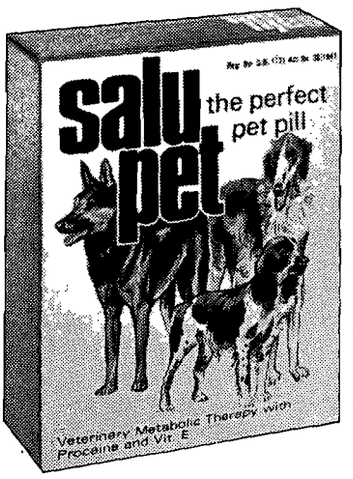

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AN INVESTIGATION OF THE EFFICACY OF THREE *BRUCELLA* VACCINES IN CATTLE

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MARIA S. G. MULDERS*, I. S. MCFARLANE** AND A. P. SCHUTTE**

SUMMARY

Strain 19 vaccination protected 75% of heifers challenged intraconjunctivally with 1,5 x 10^8 living *Brucella abortus* strain 544 organisms. Protection levels afforded by two non-agglutinogenic vaccines against a similar challenge were 17% and 30%. The complement fixation, Rivanol agglutination and mercaptoethanol agglutination tests appeared to be reliable tests for distinguishing titres caused by infection with virulent *B. abortus* from those caused by S19 vaccination. The rose bengal plate agglutination test was shown to be well suited for use as a rapid and reliable initial screening test for the diagnosis of brucellosis. Vaginal discharge and foetal cotyledon were the best materials for microscopic and bacteriological examination.

INTRODUCTION

Vaccination by the attenuated *Brucella abortus* strain S19 has been used for many years for the protection of cattle against brucellosis; S19 can be relied upon to reduce the incidence of infection to low levels but vaccination usually does not eradicate infection entirely in a herd. Manthei (as quoted by Morgan [19]) stated: "As with any other vaccine, the degree of protection afforded is not absolute: 65-70% of vaccinated animals are completely protected whilst the remainder have varying degrees of protection. It was estimated that, where the majority of heifer calves are vaccinated, animal infection is reduced by 80% and herd infection by 20%."

In South Africa severe outbreaks of abortion owing to brucellosis have periodically been reported in herds in which S19 vaccination is practised[3]. It is usually difficult to establish whether the vaccination was correctly and regularly carried out by the farmers involved. This type of vaccine breakdown seems to be more likely to occur where intensive farming methods are practised and has given rise to questions about the efficacy of the vaccine.

In addition to occasional vaccine breakdowns, S19 has the serious disadvantage that it induces agglutination titres in vaccinated animals which subsequently interfere with the use of the agglutination test for the diagnosis of natural infection. For this reason vaccination should be confined to heifer calves [9 12 15 19 21]. This problem can be overcome to a great extent by using a suitable battery of serological tests, of which the complement fixation (CF) test is probably the most important, to distinguish vaccinated animals from animals infected with virulent Brucella organisms [1 4 8 10 11 13 14 15 20 21 30 33 35].

Serological methods, however, are time consuming, hence the development of the so-called non-agglutinogenic vaccines has received much attention in recent years. Most non-agglutinogenic vaccines make use of the rough *B. abortus* strain 45/20 which was developed by McEwen [17 18]. The rough strain does not induce high levels of agglutinating antibodies against smooth *B. abortus* antigen. Because of the danger that it may revert to the virulent form, killed oil adjuvant vaccines are used. Many reports on the use of these vaccines have appeared in the literature [5 6 7 16 23 27 28 29 30]. We have tested various commercially available 45/20 adjuvant vaccines in guinea-pigs and in natural outbreaks of brucellosis in cattle. In our experiments somewhat lower protection rates were obtained in animals vaccinated with these vaccines than with S19.

More recently, another type of non-agglutinogenic vaccine, known as "PB" vaccine, has been developed. This vaccine consists of an inactivated suspension of *B. abortus* which is rendered non-agglutinogenic by saturation with hyperimmune serum [2 26]. Bonneau *et al*[2] reported that the vaccine had good non-agglutinogenic properties and the immunity produced by the vaccine was at least as good as that produced by S19 and H38 vaccine (H38 vaccine is killed adjuvant vaccine made from the rough *Brucella melitensis* strain H38).

The object of this study was to compare the immunity induced in cattle vaccinated by S19, 45/20 adjuvant vaccine and PB vaccine to a heavy challenge with virulent *B. abortus*.

MATERIALS AND METHODS

Experimental Animals and Vaccination Methods

One hundred unbred Afrikaner heifers from a brucellosis-free herd were tested twice at monthly intervals by agglutination and CF tests. All animals were negative to both tests and were divided into four groups of 25 and vaccinated as follows:

Group 1: Unvaccinated controls.

Group 2: Received a single dose of Onderstepoort S19 vaccine containing 100 x 10^9 viable organisms per dose.

Group 3: Received two doses of PB+ vaccine given at an interval of 4 weeks.

Group 4: Received two doses of Onderstepoort 45/20 adjuvant vaccine given at an interval of 8 weeks. The vaccine was prepared by emulsifying 27 parts of water phase (22% packed volume of killed 45/20 organisms) with 72 parts of Bayol 72, 8 parts of Arlacel A and 1 part Tween 80. The vaccine contained 4 x 10^{11} killed organisms per 2 m*l* dose. The batch of vaccine used had been tested in guinea-pigs and the immunity was found to be at least as good as several batches of commercially available 45/20 adjuvant vaccine which were tested in parallel.

Breeding

After vaccination, the heifers were allowed to run with a bull under ranch conditions and regularly tested for pregnancy. When a heifer was found to be pregnant, she was removed from the herd and kept in a small camp until challenged. Twelve pregnant heifers were used from each of groups 1, 2 & 3 and 10 from group 4.

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+PB vaccine was kindly supplied by l'Institut Mérieux Lyon, France.

Challenge

All animals were challenged within less than one year of vaccination, when they were between 100 and 135 days pregnant. Each animall was given 1,5 x 10^8 viable organisms of *B.abortus* strain 544 obtained from Dr A. McDiarmid, Agricultural Research Council Field Station, Compton, Berkshire, England. The strain was kept in freeze-dried form in vials containing a known number of viable organisms. The challenge suspension was adjusted to contain 7,5 x 10^8 viable organisms per m*l* and 0,1 m*l* instilled under the *membrana nictitans* of each eye. On the day of challenge counts were made of the number of living organisms in the challenge suspension to check that the correct dosage had been given.

The heifers were challenged in eight separate batches, using the same freeze-dried challenge material. Plating of the organisms at the time of exposure showed that the number of living organisms varied from 1,1 - 2,0 x 10^8 per challenge dose (mean 1,5 x 10^8, standard deviation 0,28 x 10^8).

Serological Tests

All animals were bled at monthly intervals throughout the entire experiment, unless they had just calved or aborted and were discharging large numbers of organisms. In the early part of the experiment, agglutination and CF tests were done on the sera. Later Rivanol agglutination, mercaptoethanol agglutination (ME) and rose bengal plate agglutination tests (RBPT) were also done. The agglutination, Rivanol and ME tests were performed as described previously[35]. Sera of cattle which had not yet been challenged were tested to a titre of 1/80. After challenge all sera were tested to a titre of 1/320. Our agglutination tests gave 50% agglutination with a serum antigen mixture containing 1,6 IU of agglutinin per m*l*, i.e., a serum containing 64 IU per m*l* would have a titre of 1/40. CF tests were done by the method described previously[34]. In this test the South African National anti-*B. abortus* serum has a titre of between 1/64 and 1/128. In vaccinated animals a titre of 1/4 is regarded as suspicious and 1/8 as positive, and in unvaccinated animals 1/2 is regarded as suspicious and 1/4 as positive. It is normal to refer to CF antibody titres in terms of the serum dilution used in the test, not in terms of the final dilution of the serum when all other reagents have been added. In this article we have, however, used the latter method as the results are more closely comparable to the agglutination test in analysing the results, i.e. serum dilutions of 1/2, 1/4, 1/8, etc. are multiplied by the further dilution factor of 5 and become 1/10, 1/20, 1/40, etc. Rose bengal plate agglutination tests were done with a rose bengal coloured *B. abortus* antigen (strain 99) produced by the method given to us by Dr W.J. Brinley-Morgan of the Central Veterinary Laboratory, Weybridge, Surrey, England (1971).

Bacteriological Examination

The following examinations were done on all cows which aborted or calved. Cultures were made from foetal stomach contents, cotyledon, vaginal discharge and milk on blood-tryptose-agar containing 10 mg cycloheximide, 2500 units of bacitracin and 600 units polymixin B per 100 m*l*. In cases in which cultures of milk were negative, milk was also tested biologically by injection into guinea-pigs. In many cases only a few m*l* of thick, sticky udder secretion could be obtained from heifers which had just aborted. In these cases a few loopfuls of this material was smeared onto culture plates and when required 1-2 m*l* was injected directly into guinea-pigs. Cultures were incubated at 37°C in 10% CO_2 for up to 6 days (well developed colonies of strain 544 are usually visible within 2 days). Colonies resembling *Brucella* were identified by making smears and staining these with Gram's, Stamp's and Hansen's staining methods and by slide agglutination with monospecific *B. abortus* antiserum. In the animals vaccinated with S19, special attention was paid to the differentiation of S19 from Strain 544. In these cases subcultures were incubated in air and in 10% CO_2 and erythritol resistance determined.

Smears made from vaginal discharge, cotyledon, foetal stomach contents and foetal stomach scrapings and stained by Stamp's method, were examined microscopically for the presence of typical, red *Brucella* organisms.

RESULTS

During the course of the experiment an outbreak of plant poisoning resembling cardiac glycoside poisoning [24], occurred in a group of the animals which had already been challenged. Although none of the animals died a number of them aborted, during the recovery period. In some of these animals no *Brucella* could be recovered from the foetuses or from the animals: the serological picture was typical of non-infected animals. In others, there was a massive infection with *B. abortus* which would almost certainly have caused abortions at a later stage. The abortions caused by plant poisoning could also be differentiated clinically from brucellosis because the foetal membranes had loosened entirely from the uterus some days previously and the foetus which had obviously been dead for a day or more was aborted within an unbroken bag of foetal membranes. The animals affected by the poisoning included five animals in the PB group and four from the S19 group. All five from the PB group were extremely heavily infected with *B. abortus*, while only one from the S19 group was very lightly infected. The most meaningful results in this experiment are therefore those based on bacteriological examination at the time of calving or abortion and not on the number of abortions. These results are given in table 1.

Table 1: Number of animals infected with *B. abortus* at time of calving or abortion in groups of cattle vaccinated with three different vaccines and challenged with 1,5 x 18^8 living *B. abortus* strain 544 organisms.

Vaccine	No. of animals	No. infected	% infected.
S19	12	3	25
PB	12	10	83
45/20	10	7	70
unvaccinated controls	12	10	83

The efficacy of the bacteriological diagnostic procedures can be judged from the results shown in table 2, where the methods are compared in the 30 animals which became infected with brucellosis after challenge.

Table 2: Comparison of microscopical and bacteriological methods used to diagnose brucellosis in 30 infected heifers

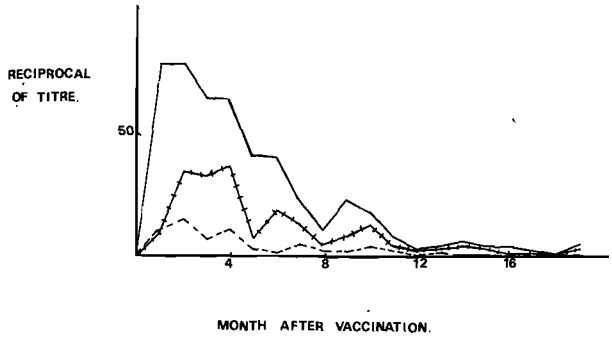
		Bacteriological examination				microscopical examination	
Material examined	No. samples examined	No. pos.	No. neg.	No. contam	% pos.	No. pos.	% pos.
Cotyledon	17	13	1	3	76	16	94
Vaginal discharge	30	29	1	0	97	27	90
Foetal stomach	26	20	6	0	77	13	50
Milk	27	21	5	1	81	N.T.+	N.T.+

+ N.T. = NOT TESTED

Vaginal discharge drawn from the vagina and/or uterus with a sterile pipette was the most efficient method of diagnosis. The material was always available and cultures were never heavily contaminated. By culturing this discharge, 29 positive diagnoses could be made. The case that was missed was negative in all the bacteriological tests except the biological test on milk, and gave birth to a healthy, full term calf. Examination of smears of vaginal discharge was slightly less efficient than cultural examination, as only 27 positive diagnoses could be made. Examination of cotyledons was also an efficient method of diagnosis where placenta is available, but in 13 out of 30 cases no placenta was available (retained for long periods or eaten by the dam). Contamination of culture plates was somewhat higher in cultures made from cotyledons than from other materials because the placenta's were often dirty and covered with soil. Microscopical examination of cotyledon smears thus proved to be slightly more efficient than the cultural method. The only case in which the diagnosis could not be confirmed by examination of cotyledons was the case already mentioned in which *Brucella* could only be demonstrated by biological examination of milk.

The examination of udder secretion or foetal stomach contents was less efficient than the examination of cotyledon or vaginal discharge for establishing a diagnosis of brucellosis. In four cases where calves were born alive, foetal stomach material was not available and in three cases no udder secretion could be obtained. The diagnosis could not be confirmed in six out of 26 cases by culturing stomach contents and in five out of 27 cases by culturing milk. Smear examination of stomach contents and of stomach scrapings only demonstrated *Brucella* in 50% of cases.

The serum agglutinating antibody levels induced by vaccination are shown in figure 1, in which the geometrical mean of the reciprocal of the antibody titre is plotted against the time after vaccination. Clearly the S19 vaccine produces the highest antibody response but the 45/20 vaccine also induced considerable agglutinating antibody titres. In the period two to four months after vaccination about 50% of the 45/20 vaccinated heifers had titres of 1/80 (maximum titre tested). The PB vaccine produced only very low titres and could be regarded as nearly ideal as far as its non-agglutinogenic properties are concerned. The S19 vaccine also caused a sharp rise in complement fixing antibodies but CF titres generally returned to negative levels within a few months and six months after vaccination no further titres were found. Vaccination with the 45/20 vaccine caused only occassional slight rises in CF titres; the PB vaccine did not cause any rise.



MONTH AFTER VACCINATION

Fig. 1. Geometric means of the serum agglutinatin antibody titres in heifers vaccinated with ——— S19; - - - - - - PB; and ++++++ 45/20 adjuvant vaccines.

The serological response in 30 animals which were infected after challenge is shown in figure 2. In contrast to the vaccinated animals the agglutination titres rose more slowly and generally only became positive two months after challenge. The aggutinating antibody titres usually remained high throughout the experiment and CF, Rivanol and ME test titres also remained at positive levels. In four cases the agglutination, CF, Rivanol and ME titres fell to negative levels (1/20 or less). These animals were assumed to have undergone spontaneous cure. The inclusion of these results in the averages has tended to bring down the mean values shown in figure 3 in the later months.

In this experiment, nine S19 vaccinated animals were exposed to *B. abortus* but proved to be resistant. In these animals the agglutination titres either did not show a rise after challenge (4 cases), or a transient rise of one to three steps which persisted for one to four months, was seen. The CF titres either remained negative (3 cases) or a transient rise up to a titre of 1/40, which persisted for only one month in 5 cases and 3 months in one case, was observed.

The RBPT was shown to be a very valuable serological method for the diagnosis of brucellosis. In the 30 animals which became infected with brucellosis following challenge, the RBPT became positive at least as soon as any of the other serological tests, and

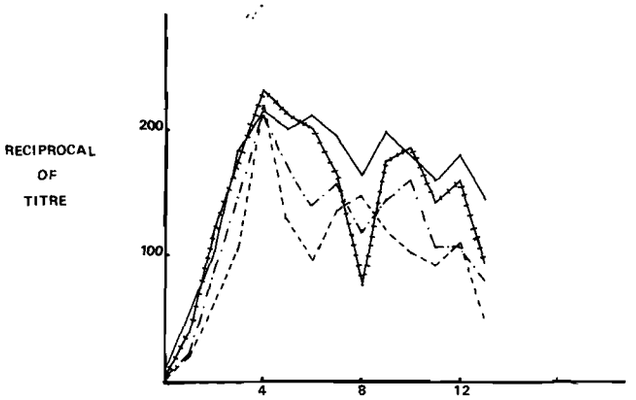


Fig. 2. Geometric means of the serum antibody titres in 30 heifers infected with *B. abortus*. ——— agglutination test; - - - - - - CF test; –.–.–.–.–.–. Rivanol test; ++++++ ME test.

remained positive as long as the other tests remained positive. On the other hand, no positive titres were ever seen in the unvaccinated, unchallenged controls (210 tests). In unifected animals vaccinated with S19 and 45/20 adjuvant viccine, RBPT and agglutination titres persisted for a considerable time in some animals, while CF, Rivanol and ME titres became negative within six months of vaccination. The correlation between agglutination test results and RBPT during the period 6-20 months after vaccination is shown in table 3. It can be seen that in PB-vaccinated animals and unvaccinated controls the RBPT and the agglutination test were virtually always negative. In animals vaccinated with S19, the tests were in complete agreement in 83,7% of cases (both tests positive or both tests negative). In 4,1% the RBPT was positive and the agglutination titre was less than 1/40 and in 12,3% the RBPT was negative while the agglutination titre was $\geq$ 1/40. In the heifers vaccinated with 45/20 adjuvant vaccine, the corresponding figures were 91,4%, 5,2% and 3,4%.

DISCUSSION

The results of this investigation clearly demonstrated the superiority of S19 vaccine over the non-agglutinogenic vaccines. (Table 1). The animals in this experiment were exposed to a very high challenge ($1,5 \times 10^8$), which was probably responsible for the high breakdown rate in animals vaccinated with the non-agglutinogenic vaccines. The immunity induced by S19 was, however, good enough to withstand this challenge satisfactorily. It is therefore considered essential that in doing trials of this nature a severe challenge method should be used to expose inadequate immunity produced by weakly immunogenic vaccines. A vaccine which induces an immunity which can withstand a small challenge dose but breaks down when challenged with a heavy challenge will surely be less satisfactory for field use than a vaccine giving adequate immunity to the high challenge dose.

The advantages of using a non-agglutinogenic vaccine are obvious, but the first requirement of vaccination must surely be to induce the best possible immunity in vaccinated animals. We can see no justification in recommending any of the presently available non-agglutinogenic vaccines for general use. Under the present circumstances one should continue to rely on S19 and to use the available battery of serological tests to distinguish 'vaccine titres' from infection. Correct use of S19 in heifer calves will in any case reduce this problem to a minimum. Other vaccines should only be introduced for general use when they have been proved to be at least as effective as S19.

This study also afforded the opportunity to study bacteriological and serological methods of diagnosing brucellosis. It was quite clearly shown (Table 2) that cultural and microscopical examination of stomach contents is not a reliable method of diagnosing brucellosis. Better results were obtained when small amounts of vaginal discharge, collected with a sterile pipette, or fresh foetal cotyledons are examined. Examination of smears made from vaginal discharge should prove to be a rapid and efficient method of diagnosing brucellosis in the field. A positive result would be sufficient to confirm the diagnosis but a negative result should be followed by

Table 3: CORRELATION OF RBPT AND AGGLUTINATION TEST RESULTS ON SERA FROM UNCHALLENGED HEIFERS IN THE PERIOD 6-20 MONTHS AFTER VACCINATION

Vaccine group	Aggl. titre $\geq$ 1/40 (positive)		Aggl. titre $<$ 1/40 (negative)		% of total		
	RBPT +	RBPT –	RBPT +	RBPT –	Both tests positive or negative	RBPT + Aggl. –	RBPT – Aggl. +
S19	18	33	11	207	83,7	4,1	12,3
PB	0	1	1	234	99,1	0,5	0,5
45/20	15	10	15	249	91,4	5,2	3,4
Unvaccinated controls	0	0	0	210	100	0	0

In this table a serum containing 64 1U agglutinin/ml is taken as positive (titre = 1/40) and less than 64 1U agglutinin/ml as negative.

further serological, cultural and biological tests before making a negative diagnosis.

The serological findings serve only to confirm the findings of other workers. The heifers used in this experinent were overage when vaccinated, with the result that a number of animals had persisting agglutination titres. These titres were usually around the 1/40 level and tended to fluctuate from one test to the next. The CF, Rivanol and ME tests became negative within six months of vaccination in unchallenged animals but remained well above the levels generally regarded as indicating infection in infected animals. As the Rivanol and ME tests are technically much simppler to perform than the CF test, these results seem to indicate that after further large scale field trials they may be used to replace the CF test.

The RBPT has many qualities desired for a rapid screening test for brucellosis and could to a large extent be used to replace the conventional tube agglutination test. The test could be used by veterinarians in the field to test animals on the farm while they are being bled. Negative results could safely be regarded as negative. Serum from positive reactors could be submitted to the laboratory for further testing to distinguish vaccine reactors from infected animals. Alternatively, the test could be used as a rapid screening test on sera submitted to a laboratory. The reader is also referred to the extensive investigations on the RBPT which have been reported in the literature [21 22 25].

A question that is often posed by investigators trying to interpret puzzling results of serological tests is: "what effect does exposure of S19 vaccinated cattle to *Brucella* infection have on cattle that do not become infected as a result of the exposure?" Judging by the results from the nine cattle in this experiment in which this situation was known to occur, the answer would apparently be that only a small transient rise in agglutination and CF titres might occur. If the immunity is overwhelmed and infection results, the animal reacts like any other infected animal.

ACKNOWLEDGEMENTS

The authors thank Dr L. Valette for supplying the PB vaccine used in the investigation. This work was done at the Veterinary Research Institute, Onderstepoort.

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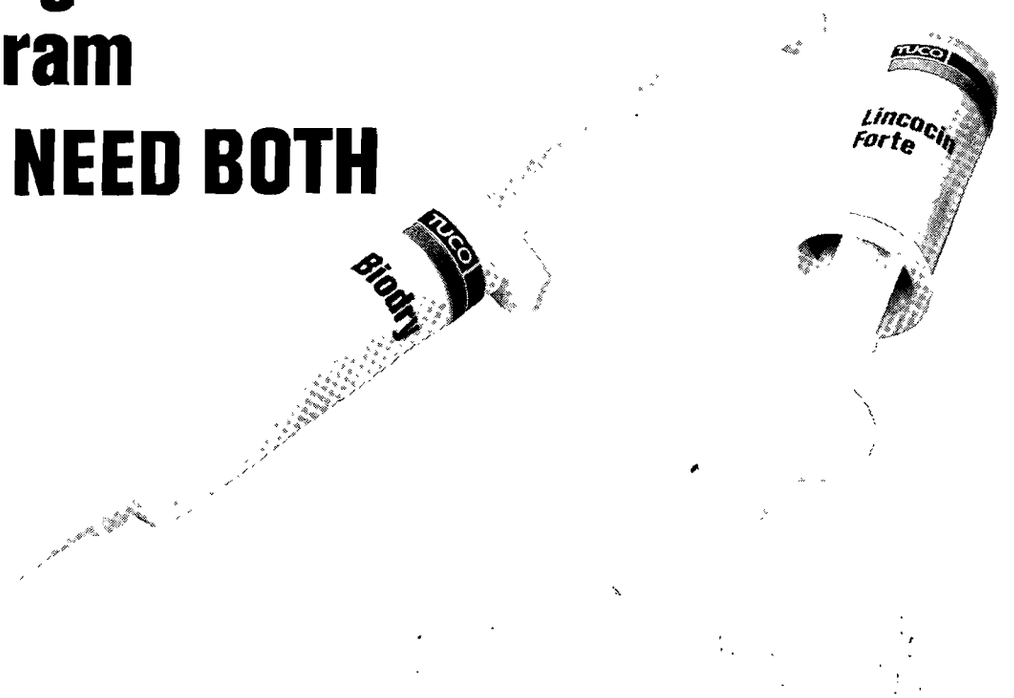

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NOTE AANTEKENING

A NOTE ON THE USE OF XYLAZINE HYDROCHLORIDE (ROMPUN, BAYER) IN A BLACK WILDEBEEST

J.K. THOMSON*

SUMMARY

The administration of xylazine hydrochloride to a black wildebeest *(Connochates gnou)* is described. No response to a total dose of 240 mg of the drug was observed.

A female black wildebeest sustained a fracture of the left femur during capture operations and it was decided that it should be sedated with xylazine to facilitate its transport to the captive pens for further examination with minimal discomfort and suffering.

The mass was estimated at 120 kg and, as there was no information on dosage, 4 m*l* of a 2% solution were injected intramuscularly. After 20 minutes there was no response and a further dose of 4 m*l* was given intramuscularly. After ten minutes there was no sign of sedation and 4 m*l* were injected intravenously. After 20 minutes there was no response and the wildebeest was moved to the enclosure. There was no reaction of any kind from then onwards after a total dosage of 240 mg xylazine.

This, of course, is a single isolated case from which very little may be deduced. Recumbency was enforced by the injured limb, but in view of the experience of Young & Whyte[1], it would appear that *Connochaetes* species do not respond readily to doses proportionate to those used on other species. Further experimental work using higher doses is definitely indicated.

* Department of Nature Conservation of the Cape Province, P.O. Box 659, Cape Town, 8000

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YOUNG E. & WHYTE I.J. 1973 Experiences with xylazine hydrochloride (Rompun, Bayer) in the capture, control and treatment of some African wildlife species. *Jl S.Afr. vet. Ass.* 44:177

ACKNOWLEDGEMENT

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SELECTED ABSTRACTS KEUR VAN UITTREKSELS

RHODESIAN VETERINARY JOURNAL

Volumes 1 – 3&4 (Nos. 1-3)

HUCHZERMEYER F.W. 1970 Respiratory acariasis of cagebirds. 1:64

Respiratory acariasis is the common and most important respiratory disease of canaries and Gouldian finches in Rhodesia. A typical clicking respiratory noise can be heard when the bird is held close to the ear. On post-mortem mites can easily be seen in the trachea. Dipping affected and in-contact birds in a 0,15% suspension of Dylox appears to be the most effective treatment (Author's summary).

BOYT W.P., LAWRENCE J.A., MACKENZIE P.K.I. & FRENCH R.L. 1971 The toxicity of diminazine (Berenil) in donkeys. 1:75

Of thirty-one donkeys treated with Berenil at 7 mg/kg, twenty developed nervous signs 48 to 96 hours later and six died. The condition was reproduced experimentally in one donkey.

Cerebellar lesions, characterized by degeneration and haemorrhage were detected in three acute fatal cases. The condition bears a resemblance to Berenil toxicity in the dog. (Author' summary).

LAWRENCE J.A. & GOLDSCHMIDT M.H. 1971 Cerebrocortical necrosis in Rhodesia. 2:32

A young ewe from the Marandellas area of Rhodesia was examined. It was recumbent, in opisthotonus, with legs outstreched. There was evidence of hyperaesthesia, and convulsions occurred at intervals. Body temperature was normal. Antibiotic administration did not lead to improvement and the animal was destroyed. The gyri of the cerebrum were noticed to be somewhat flattened, and those close to the midline in the central portion of the cerebrum were soft to touch. Transverse section of the cerebrum revealed a narrow yellowish line between grey and white matter in the affected gyri, with softening of the overlying grey matter. Histological examination confirmed the laminar necrosis of the cortex characteristic of cerebrocortical necrosis.

The condition has been shown to be due to a thiamine deficiency and responds well to thiamine therapy in the early stages. Recommended dosage is up to 500 mg for calves and 400 mg for sheep by intravenous or intramuscular injection.

LAWRENCE J.A. & EFSTRATIOU, Sue. Canine ehrlichiosis in Rhodesia. 1973 3: 55

A survey of 366 blood specimens from dogs, the majority in the Salisbury area, revealed a 2,7% incidence of *Ehrlichia canis*. Of nine positive cases, four were considered to be uncomplicated clinical ehrlichiosis, three showed clinical evidence of ehrlichiosis in conjunction with some other condition, and two showed no clinical evidence of the disease. Uncomplicated cases showed a variable degree of anaemia and a moderate leukopaenia with relative monocytosis and eosinopaenia. (Authors' summary).

CLATWORTHY R.H. 1973 The effect of enterotoxaemia/tetanus vaccination on the incidence of bloat in cattle. 4: 45

Over a four month period and while grazing irrigated pastures, the incidence of bloat in cattle inoculated with entorotoxaemia/tetanus vaccine was half that in comparable unvaccinated controls.

(Farmers in South Africa have long held that vaccination against anthrax had a protective effect against bloat in cattle ED. Jl S. Afr. vet. Ass.)

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LEGAL INFORMATION WETSINLIGTING

THE LEGAL CONTROL OF THE USE OF IMMOBILIZATION DRUGS IN THE REPUBLIC OF SOUTH AFRICA*

W.P. STEYN**

The dangerous dependence-producing substances which are mainly used today in order to immobilize animals for the purpose of capture and handling or treatment are controlled internationally as well as nationally. These substances which, in terms of the international 'Single Convention on Narcotic Drugs, 1961' to which South Africa is a party, are listed as Narcotics under Schedules I and IV of the Convention and the importation and exportation thereof are strictly controlled by the International Narcotics Control Board in Geneva as well as by the Department of Health of South Africa. The International Narcotics Control Board is responsible to the Commission on Narcotic Drugs of the Economic and Social Council of the United Nations Organization.

The substances in Schedule I of the Single Convention are termed 'Dangerous Dependence-producing Substances' in South Africa and are named in Part II of the Schedule to the Abuse of Dependence-producing Substances and Rehabilitation Centres Act, 1971 (Act 41 of 1971).

The substances listed in Schedule IV of the Convention are also included in its Schedule I and are subject to all the measures of control applicable to drugs in the latter schedule, but in addition special measures of control are necessary having regard to the particularly dangerous properties of the drugs so included. For instance, Reckitt and Colman will not supply anyone with M99 unless he is a veterinarian, or a scientist who has been authorized by the Secretary for Health to possess the drug. Medical practitioners and dentists cannot acquire these particular drugs in the ordinary course of their practices.

Each country is allocated a quota of each narcotic according to the estimates which the responsible body of that country works out every year. The estimates of drug requirements are determined by adding the quantities of the drugs consumed for medical and scientific purposes the previous year to the stocks to be held at the end of the year and the quantities of drugs necessary for addition to special stocks. The body responsible to the International Narcotics Control Board in this country is the Department of Health.

The Department of Health also exercises national control over these narcotics by implementing the terms of the Medical, Dental and Pharmacy act, 1928 (Act 13 of 1928).

Until 1971 these narcotic drugs or 'Habit-forming Drugs' (H.F.D's.) were listed under the Fifth Schedule to the abovementioned Act. When, the Department of Social Welfare and Pensions promulgated its Act on the Abuse of Dependence-producing Substances and Rehabilitation Centres, 1971, the Fifth Schedule to the Medical, Dental and Pharmacy Act was repealed and the 'Habit-forming Drugs' listed therein were renamed 'Dangerous Dependence-producing Drugs' and placed in Part II of the Schedule to its new Act. Part I of this Act names all the Prohibited Dependence-producing substances, none of which is of veterinary interest. In order to diminish the confusion caused by this action, the Department of Health very soon promulgated the Drugs Laws Amendment Act, 1971 (Act 95 of 1971), in terms of which the 'Dangerous Dependence-producing Drugs' were re-identified as 'Habit-forming Drugs' and subjected to control as laid down in the Sixth Chapter of the Medical, Dental and Pharmacy Act.

The Dangerous Dependence-producing Substances or Habit-forming Drugs which are primarily involved in the immobilization of animals and which are controlled legally, are: 19-propylorvinol hydrochloride (Etorphine or M99, Reckitt) and phenethyl piperidinyl proprionanilide citrate (Fentanyl or Sublimaze, Janssens Pharmaceuticals). Another drug used as a narcotic analgesic for dogs is diethylthiambutene hydrochloride (Themalon, Burroughs Wellcome). These are all highly dangerous narcotic drugs and are listed as Dangerous Dependence-producing Drugs or Habit-forming Drugs in Acts 41/71 and 13/28 respectively.

Norovipavine hydrochloride (Cyprenorphine or M285, Reckitt) and nalorphine hydrobromide (Lethidrone, Burroughs Wellcome), the antidotes to Etorphine and Fentanyl, although chemically related to morphine, are not listed as Habit-forming Drugs and are therefore not under consideration here. The same applies to succinyl choline chloride, or suxamethonium (Scoline, Glaxo-Allenbury's), an immobilization drug which, however, is not a narcotic.

In terms of section 62 of the Medical, Dental and Pharmacy Act, a pharmacist, a medical practitioner, dentists or veterinary surgeon may import a Habit-forming Drug from outside the Republic when, on application, he is authorized thereto by an import certificate issued by the Secretary for Health.

In terms of section 65 of the Act, a medical practitioner, dentist, veterinary surgeon or pharmacist may acquire a Habit-forming Drug from a licensed producer or manufacturer, on production of a written order signed by such a medical practitioner, dentist, veterinary surgeon or pharmacist. A Habit-forming Drug may also be supplied to any person by a pharmacist on production of a prescription written and signed by a medical practitioner, dentist or veterinary surgeon. Furthermore, the interpretation given to this section of the Act by the Department of Health implies that a medical or dental practitioner may *not* prescribe such a drug for a third party (or animal), but only for his own patients and, strictly

* Lecture given at Onderstepoort, 1972.

** Department of Health, Private Bag X88, Johannesburg, 2000.

speaking, only for therapeutic purposes. Consequently, it would be illegal for such a practitioner to prescribe such drugs for a person for use on an animal.

An order or prescription referred to above shall be given by a veterinary surgeon only for the treatment of animals and shall be headed by the words 'For animal treatment only – Alleen vir behandeling van diere'.

Every order or prescription shall state:
(a) the name and quantity of the drug;
(b) the name and address of the person or institution for whom the drug is required or ordered;
(c) the name, address and profession or qualification of the person signing the order; and
(d) the date of issue of such prescription or order.

Not more than one issue of the drug mentioned in any such prescription or order shall be made and every such prescription or order shall be retained and preserved by the person selling or supplying the drug.

Every pharmacist, medical practitioner, dentist or veterinary surgeon shall keep a 'Register of Habit-forming Drugs' and in it shall be entered:
(a) the quantity of any such drugs possessed, imported or acquired by him;
(b) the date of importation or acquisition;
(c) the name of the person from whom and the place from which the same were imported or acquired; and
(d) the quantity which has been disposed of and whether by sale or by process of manufacture, or dispensing, or use in the ordinary course of practice.

Every register shall be retained and preserved for a period of at least three years and shall be open to inspection by any person authorized thereto in writing by the Minister of Health, Commissioner of Customs and Excise, or by any member of the police force authorized thereto in writing by a magistrate, or by any person authorized thereto in writing by a magistrate, or by any person authorized thereto in writing by the Registrar of the South African Medical and Dental Council.

Section 66 of the Act prescribes the correct labelling of containers of Habit-forming Drugs. The name of the drug and the amount, or percentage, or total content should be clearly stated, except when dispensed by, or on the prescription of a medical practitioner, dentist or veterinary surgeon.

In terms of paragraph 5(1) and (2) of Government Notice No. R.1995, dated 15th December, 1966, the Secretary for Health may, on application made to him, with full particulars, issue a permit authorizing the importation, purchase, acquisition, keeping or use of any Habit-forming Drug for scientific or educational purposes. The issue of such a permit shall be subject to such special conditions or requirements as may be stated therein, including the keeping of a Habit-forming Drug register as outlined below. Scientists who are not veterinary surgeons themselves, but are engaged in scientific or educational fields, are catered for by this particular concession.

It must be remembered that all Habit-forming Drugs are included as Division I Poisons in the Fourth Schedule to the Medical, Dental and Pharmacy Act and *all* the provisions in regard to the safe keeping, supervision and labelling, etc., which apply to Poisons, also apply to Etorphine, Fentanyl and Thiambutene. These provisions also apply to Nalorphine, Cyprenorphine, Phencyclidine and suxamethonium, which are also listed as Divison I Poisons.

The following salient points in the legal control of Etorphine, Fentanyl and other Habit-forming Drugs are important:-

I A veterinary surgeon may:

(1) import the substances when so authorized by the Secretary for Health;

(2) acquire the substances by a written and signed order to a licensed manufacturerer, or producer, or registered pharmacist;

(3) use the substances for veterinary purposes only.

II A veterinary surgeon must keep a 'register of Habit-forming Drugs', which must be balanced every three months on the last day of March, june, September and December of each year.

Finally, there are some drugs used by veterinary surgeons which, although not qualifying as immobilization drugs, are used in conjunction with immobilization drugs, or by themselves for their tranquillizing properties. These tranquillizing drugs, such as the phenothiazine derivatives (e.g. promethazine and chlorpromazine) and the barbiturates amongst others, are listed under the Sixth Schedule to the Medical, Dental and Pharmacy Act as Potentially Harmful Drugs and some of them are also included in Part III of the Schedule to the Act on the Abuse of Dependence-producing Substances as Potentially Dangerous Dependence-producing Drugs.

The legal control over the Potentially Harmful Drugs as laid down under section 65*bis* of the Medical, Dental and Pharmacy Act is mainly the same as that for Habit-forming Drugs, except that no written and signed order is required for the acquisition of these drugs by the veterinary surgeon and no register need be kept. The drugs may be ordered by telephone, provided that they are not named in Part III of the Schedule to Act 41/1971, as *none* of the substances mentioned under that Schedule can be acquired without a written order.

The Potentially Harmful Drugs named under the said Part III as Potentially Dangerous Dependence-producing Drugs are: amobarbital, cyclobarbital, pentobarbital, secobarbital and glutethimide. With the exception of the last-named, there are a great many of these very soluble, rapidly absorbed barbiturate hypnotics on the market under different proprietary names.

All the substances mentioned in this paper, because they are Fourth Schedule Poisons, must be kept under lock and key. **Game rangers and other assistants who handle narcotic dugs cannot legally assume responsibility, as the acquisition, storage and use of these Habit-forming or Dangerous Dependence-producing Substances are acts which may only be performed under the supervision of the Veterinary Surgeon in charge, and he alone is legally responsible.**

All Parties to the international Single Convention on Narcotic Drugs of 1961 have undertaken to apply the measures of control laid down by the Convention. The signatories to the Convention, which include many African States, all apply much the same strict measures as are applied in South Africa, and in much the same way.

Jl S.Afr. vet. Ass. 45(1&2): 97-116 1974

INFORMATION

INLIGTING

EXCERPTS FROM/UITTREKSELS UIT

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UNITED STATES OF AMERICA

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TOEKOMSTIGE VEEVOERE?

Allerhande nuwe idees of bestanddele word tans ondersoek om die huidige voersoorte so doeltreffend moontlik te benut, of om dit met goedkoper bestanddele te vervang. Die volgende is 'n paar voorbeelde hiervan.

Sojaboonplantpastille

Volgroeide sojaboonplante word gekerf en die groen stof ontwater. Dit word dan gepastileer. Op 'n 95% droëstofbasis bevat sojaboonplante 15,3% ruwe proteïen, 8% vet, 27,9% ruwe vesel, en 36,8% stikstofvrye ekstrak, met ander woorde persentasies wat gelyk is aan dié van lusern behalwe vir die vetinhoud (wat maar 1,8% is in lusern).

Onlangse proewe wat deur die Cotton Branchnavorsingstasie te Marianna, Arkansas, met drie groepe jaarlingversies uitgevoer is, het die volgende resultate getoon: (Die massatoenamesyfers is nie baie indrukwekkend nie, maar word toegeksryf aan die swak gehalte van die proefdiere en 'n 30-dag tydperk van besonder slegte weersomstandighede. Nietemin is geen verteringsprobleme ondervind nie en karkasvetkleur is geensins geaffekteer nie).

	Daaglikse Massatoename
Rantsoen A	
100% sojapastille	0,778kg
Rantsoen B	
90% sojapastille	
10% gemaalde graansorghum	0,823kg
Rantsoen C	
80% sojapastille	
20% gemaalde graansorghum	0,761kg

In vorige proewe (Winter 1970/71) is die mieliepastille en sojaboonplantpastille vergelyk. Jaarlingossies, wat in drie groepe verdeel is, het soos volg opgetree:

	Daaglikse Massatoename
Rantsoen A	
100% mieliepastille	0,914kg
Rantsoen B	
100% sojaboonplantpastille	0,918kg
Rantsoen C	
80% sojaboonplantpastille	
10% fynmielies	
10% gemaalde graansorghum	0,959kg

Sojaboonplantpastille kan ook maklik gehanteer word en skep geen probleem by gebruik deur grootmaatselfvoerders.

Gepastileerde Vet

Die Universiteit van Arizona se Veekundige, dr William H. Hale, is van mening dat beeste gouer groei en vinniger vet word indien hulle meer vet vreet. Reeds kon hy 6% vet sonder herkouingsprobleme voer – 2% meer as die aanvaarde persentasie vet wat beeste gewoonlik kan vreet voordat probleme voorkom.

Dr Hale beraam om die huidige 6% na 10-15% te verhoog deur die vet op so 'n metode te voer dat dit die dier se pens verbygaan en eers in sy dermkanaal beskikbaar is.

Proewe was tot dusver baie suksesvol met vet wat in gepastileerde vorm aan proefbeeste gevoer is. Met omhulde vet is 16% minder voer vereis as wat die geval was met voer wat 6% onomhulde vet bevat het.

Die pastileermetode was soos volg:

Saffloerolie is vir die proewe gebruik. Dit is gemeng met kaseïen en spuitgedroog en daarna onoplosbaar gemaak deur dit met formaldehide te behandel.

Droëlandgewasse

Droëlandgewasse speel 'n belangrike rol in finale rantsoene wat Suckla Farms, Inc., 'n voerplaas naby Denver, Colorado, tans vir die vetmaak van honderde beeste gebruik.

Gars, koring, erts en rog, saam met plukmielies en kuilvoer, word beskou as 'n uitstekende finale rantsoen.

Petroleumproteïen

Na aanleiding van die onlangse bevinding dat proteïen verkry kan word deur paraffienwas met gis te behandel, en die groot mate van belangstelling wat in die V.S.A. en in Japan tans hieroor getoon word, word die vraag geopper of petroleumgisproteïen in die toekoms in die sojaboonuitvoermark sal meeding.

Sojabone (die oorgrote merendeel waarvan vanaf die V.S.A. ingevoer word) is tans een van die hoofbestanddele van Japan se lewendehawekragvoere, 'n nywerheid wat na raming teen 1975 nagenoeg 300 000 metrieke tonne sal bereik.

Reeds is bewys dat petroleumgisproteïen gebruik kan word om vis en ander onekonomiese pluimveevoerbestanddele te vervang, en dat sulke proteïen in braaikuiken- en eierproduksie uitstekend funksioneer.

Grassnoeisels

Die Cal-Turf maatskappy van Camarillo (Kalifornië) berig dat turfgrassnoeisels voordelig is vir kuikenvoer.

Biologies beskikbare bladgeel en karoteen is volop vir die voorsiening van die kleurstof in eiergeel en die vel van braaikuikens, en die snoeisels het ook 'n hoë proteïeninhoud.

(*Progressive Farmer*, Januarie 1973; *National Livestock Producer*, Januarie 1973; *The Farm Index*, Januarie 1973, *The American Farmer* Januarie 1973). Rapport Nr. 68.

CHOLESTEROL **NIE** DIE OORSAAK VAN HARTKWALE NIE

In drie aparte studies is cholesterol nie allen as „gesond" verklaar nie, maar ook aanduidings waargeneem dat persone wat dit in hul eetpatrone vermy moontlik meer vatbaar is vir arterosklerose.

– Navorsers op 'n Australiese universiteit, onder leiding van dr R.S. Parsons, kon in proewe die vetagtige stof wat as stollingsagens in hartaanvalle optree, afsonder. Die werk word nou voortgesit om vas te stel hoekom bloed stol

en hoe stolling voorkom kan word. Hierdie bevinding sluit cholesterol dus uit as die hoofoorsaak van hartkwale.

Proewe deur 'n biochemikus van Texas A&M Universiteit, Raymond Reiser, dui op die moontlikheid dat 'n toename in gebruik van poli-onversadigde plantolies in babavoedingsmiddels die oorsaak van stygende voorkomssyfers van aterosklerose in jongmense is. Resultate van proewe met rotte dui daarop dat 'n cholesteroltekort in baba-eetvoorskrifte die gevolg het dat liggaamsorgane self meer van dié behoefte ontwikkel, wat versterking van cholesterol, verklaar dr Bernard Caffey van Clemson 'n tekort is aan die ensieme wat cholesterol uitsuiwer.

Alhoewel eetpatrone in verband blyk te staan met cholesterol, verklaar dr Bernard Caffey van Clemson Universiteit, Noord-Carolina dat sulke verband presies die teenoorgestelde is van die Amerikaanse Hartvereniging se onderstelling. Ondersoek wat hy ingestel het, lei tot die gevolgtrekking dat teenwoordigheid van cholesterol in die bloed die mens in staat stel om emosionele spanninge, wat somtyds tot hartaanvalle lei, die hoof te bied. Dr Caffey, professor in Sielkunde, wys daarop dat rotte op rantsoene wat baie cholesterol bevat het, afsienbaar vinniger geleer het en baie beter in staat was om emosionele spanninge baas te raak as dié wat rantsoene met min vet ontvang het.

(Poultry Digest, Januarie 1973 : aangehaal uit *Egg Producer,* December 1972).
Rapport Nr. 68.

BEEF FROM BULLS

Recent findings indicate that bulls could become the top choice of beef producers, provided better marbling could be obtained or, alternatively, if the present USDA meat-grading standards, which favour the higher marbling of steer beef, were to be amended. Tests indicate that although meat from castrates is slightly more tender, bulls and short-scrotum males produce in the region of 12-15% more carcass protein and 14-15% less carcass fat than the castrates. They also gain faster and produce heavier carcasses with more lean meat than steers.

The use of bulls in feedlots could possibly eliminate all need for synthetic chemical boosters such as DES, and results already obtained indicate great possibilities for future beef production if feeding and management techniques can be refined. Although management practices vary, most steers fattened to masses of 500kg to 545kg and are then 17 to 22 months of age, despite the use of the synthetic growth hormone, DES, while bulls attain these masses within 15 months.

In experiments at the U.S. Meat Animal Research Centre, Clay Centre (Nebraska), nutritionist Hudson A. Glimp compared the effects of various sex treatments on 60 Angus and 60 Hereford bulls. These included two normal castration methods, two short scrotum methods and one Russian castration method of sex alteration. Intact males were also included in the tests.

The two normal castrations were conducted at birth and weaning, and the two short-scrotum treatments included short-scrotum at birth and short-scrotum at weaning. (The short-scrotum treatment, which is believed to reduce or eliminate production of life sperm by raising the heat of the testicles, involves pushing the testicles up against, or partially into, the animal's body, and applying a tight rubber ring or elastrator to the lower part of the scrotum which gradually shrinks away over a period of time. This treatment apparently allows the animal to produce enough testosterone for development of the usual male characteristics.) Russian castration was performed at weaning. (In this method, only the seminiferous tubules which convey the semen are removed. The rest of the reproductive organs are left intact).

Calves used in the study were weaned at approximately 200 days of age and were placed in a commercial feedlot for a further 210 days. Angus and Hereford males responded similarly to the various sex treatments.

Results show that bull meat poses no problems as far as tenderness and overall acceptability are concerned, provided bulls are under 15 months old when slaughtered. No advantage is to be gained, however, by using short-scrotum males in preference to bulls.

(USDA Agricultural Research, January, 1973; *The Washington Post,* 21 January, 1973)
Report Nr. 70

RECYCLING LIVESTOCK AND POULTRY WASTES

Livestock and poultry wastes, potential sources of pollution to-day, may well be useful products of tomorrow.

Researchers at Peoria, Illinois, are currently engaged in studies on wastes from feedlots and poultry cages, with research emphasis on such diversified products as protein-rich feed for livestock, cellulose for fibre and pulp products, and enzymes to digest fibre. The work concludes a two-step fractionation process by chemists.

A feed fraction obtained in the study weighed 43% as much as the dry whole manure and compared favourably with soybean meal in protein content and amino acid balance as determined by chemical analyses. Based on a standard of $100 per ton for 49% protein soybean meal, the feed fraction is estimated as being worth $60 a ton. Fractionation costs are estimated at only $40 per ton, although cattle feeders with lot-capacities ranging between 5 000 and 7 000 head could produce the feed at an even lower cost, according to contract study reports submitted to USDA's Agricultural Research Service.

Amino acid analyses of the feed fraction indicated high levels of lysine and methionine. It was suggested that the protein was produced by micro-organisms in the digestive tracts of the cattle, and microscopic examination supported this suggestion.

In addition to low strength board and other fibre products, the residue fraction may also serve as a nutrient for a fungus that produces a fibre-digesting enzyme. The fungus, *Trichoderma viride,* feeds and grows on the fibrous fraction or on the fibre in whole manure, sparing the protein present. The fungal tissue itself is 47% protein. Used to treat chicken feed, the enzyme markedly improved digestibility of the feed. In studies with baby chicks, those fed enzyme-treated feed ate less, produced less manure, but gained as much weight as controls fed two types of regular feeds.

Results of another study, involving fibre digestion with enzymes and heat, hold promise of complete recycling of chicken manure. In studying compositional changes in recycled chicken manure, it was found that contrary to expectations, cellulose and hemicellulose did not build up in waste that was dried and refed as 25% of the chick's feed ration through 23 cycles.

A recent summary of 10 year's work at Virginia Tech. on recycling broiler litter as a feed for beef cattle and sheep concluded that litter can contribute substantially to the nutrient requirements of the animals, that it does not affect the taste of meat from the animals, that pesticide residues are not a problem from feeding the litter and that it can be processed to render it free of disease-causing organisms. One cause for concern remains and that is the possible carry-over of medicinal drug residues used to prevent or treat disease in poultry.

In the recent experiments, a study of micro-organisms in feedlot wastes revealed only one pathogen, viz. *Salmonella,* among 1 500 isolates. Microbiologists warn, nevertheless, that indiscriminate refeeding of under-sterilized feedlot waste could be hazardous.

(Canadex Bulletin Beef/Feeds 420.60, 1972; Agric. Research, USDA, January, 1973).
Report No.70.

ENERGIEGEHALTE EN NIE MEER DIE „TVV" VAN RANTSOENE NIE

Die totale verteerbare voedingsstowwe („TVV") van voerrantsoenbestanddele is vandag die algemene basis waarop rantsoene vir lewendehawe geformuleer word.

Dr Rod Kromann, veekundige van Washington Staatsuniversiteit voorspel egter dat netto energiebepaling TVV en ander metodes sal vervang as 'n basis waarop rantsoene vir lewendehawe in die toekoms geformuleer sal word. Suid-Afrikaanse voedselkundiges dra reeds op dié gebied kennis, maar dit is interessant om te verneem dat dr Kroman 'n wiskundige metode ontwerp het vir die berekening van die optimale gehalte van elke rantsoenbestanddeel en dat hy uitgenooi is om dit te bespreek by geleentheid van die „First International Green Crop Drying Congress" wat te Oxford, Engeland, vanaf 8 - 13 April 1973, gehou word.

Omdat die huidige metodes nie die begeleidende effek van die verskillende bestanddele in die rantsoen (soos bepaal deur Duitse navorsers in 1896 en deur navorsers van Pennsylvania se Staatsuniversiteit in 1917) in berekening bring nie, bevat rantsoene soms te veel van sekere bestanddele. Hierdeur word 'n onnodige uitgawe van tot 38% van die betrokke bestanddeel se totale koste gedoen, aldus dr Kromann.

(National Livestock Producer, Februarie 1973)
Rapport Nr. 72.

PROTEIN FOR HORSES

Very little literature on the requirements and digestion of proteins in horses has been available until recently. In South Africa, as in many countries, most farmers can boast at least one foal, and certain important facts about these animals, which are midway between the ruminant and the non-ruminant, should be brought to their attention. Comparing the requirements of horses of all ages, protein intake (both quality and quantity) is probably the most critical in the young foal. The young horse grows faster than almost any other animal for the first 6 months to one year of age (80% of mature size in 12 months) and is often nursed for periods of as long as 6-9 months. In addition, mares are usually selected for every reason except lactation. With this combination of hurdles, it is not at all surprising that most horses are not given the opportunity to achieve their optimum performance.

Unlike the ruminant, the horse has his 'fermentation vat', and thus his microbial population, in the large intestine which is beyond the area of enzymatic digestion, this latter apparently being the horse's most significant absorptive area for nutrients. The very rapid rate of passage through the upper intestinal tract, where enzymatic digestion takes place, may have a futher bearing on the quality of protein required by the horse.

Horses work harder at 2 and 3 years of age than at any other time in their lives and should therefore be provided with sufficient nutrients at an early age to ensure adequate growth. To ensure this, foals should be exposed to and taught to eat feed, beginning at seven days of age, and weaned when not older than three months. This initial feed should contain 18-20% protein consisting of highly digestible and high-quality material. Linseed meal, long used as a protein source for horses, has limitations in quality as well as digestibility, and the preferred protein for the young foal is soybean protein or something comparable. Lucerne is also acceptable. Milk is often used as a protein source but the value is more in sales effect than in nutritional advantage. As the foal reaches six months of age, the level of pretein may be dropped to 16% or 18%. The protein level can again be lowered when the horse reaches 2-3 years of age. At maturity (3-4 years of age) the protein level need not be any higher than 12%-14% and, contrary to popular belief, need not be increased when mature horses go into training. Protein requirement for reproduction is only slightly, if at all, higher than that for maintenance. This applies to both mares and stallions. Requirements for lactation in mares that lactate heavily, will approach 16%. The use of non-protein-nitrogen has recently come to the fore as a replacement for protein. Limited work indicates that horses can tolerate higher levels of urea or biuret than is generally accepted for ruminants –. no doubt because the absorptive area in the horse precedes the fermentation area. No urease activity is present to hydrolize urea, thus the urea is absorbed prior to the time that it is converted to ammonia. If urea is fed in excessive quantities (5% or more of the ration), however, toxicity will result, apparently from material that enters the caecum.

Once again, it should be stressed that the protein requirements (both quantity and quality) for horses are most critical at early ages.

(Paper : Maryland Nutrition Conference for Feed Manufacturers, 1973 : Dr W.J. Tyznik, Ohio State Univ., March 15, 1973).
Report No. 74.

FOCUS ON NEWCASTLE DISEASE

As at February 14, 1973, more than 11 million birds, most of them poultry, have had to be destroyed since 'Exotic' (Viscerotropic Velogenic) Newcastle Disease erupted in Southern California – the outbreak having thought to have been caused by the importation of infected pet birds. The cost to the U.S., thus far, is in region of $26 million. The current programme, aimed at eradicating the disease, has given rise to widely differing opinions among many well-qualified people, the main differences of opninion being voiced on the question as to whether the disease should (a) be eradicated; or (b) controlled with a strong vaccination programme. Some authorities are of the opinion that by continuing a vaccination programme, the disease would have been virtually eradicated, and that the 'depopulation' programme was 'unmanageable, and impractical', owing to the vast numbers and species of privately-owned pet birds, pigeons, etc., game birds and other wild species and millions of laying hens, backyard flocks, etc., existing in the area concerned.

The 'depopulation' approach is thus considered unrealistic by many and recent findings of the USDA tend to support this contention, since they show that:
(a) the larvae of the lesser horsefly carry the virus in manure heaps;
(b) dead birds will retain the live virus, at room temperature, for 6 days after their death;
(c) the virus remains viable in water at room temperature for a period of 17 days; and
(d) field mice are able to transmit the virus for a period of 11 days after exposure (and may therefore be a possible source of dispersion of the disease over very considerable distances).

Factory farms are cited as creating the potential for spreading Newcastle DIsease (*FAO World Animal Review 1972*, pp.33-34), by creating a new set of ecological conditions favourable to ND virus.

Poultry Digest (March, 1973 Editorial) suggests that a symposium, including scientists from foreign countries, would be an appropriate step for the American Veterinary Association. This may however, be unnecessary if the 15th World Poultry Congress, to be held in New Orleans during August next year, achieves the desired, and **necessary,** progress: only 22 countries in the world are free of Newcastle disease!

(Communication : Dr R.E. Omohundro, USDA, Hyattsville (Maryland); *Poultry Digest*, March, 1973, Box 1220, Redlands, Calif.92373; *Feedstuffs*, March 1973, Box 1289, Minneap., Minn. 55440; *Penn. Farmer*, Feb. 10, 1973, Harrisburg, Pennsylvania 17105.)
Report No. 74.

A TON OF BEEF FROM AN ACRE OF FORAGE

A ton of beef from an acre of forage alone is a worthy challenge, but one which is not unattainable, as was demonstrated by Frank Roebuck, a farmer of Hampton County in South Carolina, a few years back when he produced just short of 1 000 kg gain with twelve stocker calves entirely from hay and pellets cut from a measured acre. No supplements were fed over the 12-month time period.

There cannot be much wrong with the economics either, when viewed in terms of the potential estimated for the

State of Kentucky. A survey there reveals that forage crops, when consumed by and marketed through livestock, can generate 3 to 4 times more return than cash crops. At today's U.S. prices, a ton of beef, on a live basis, would be worth about $700. Furthermore, ample research shows that good quality, good eating beef can be produced in the vicinity of 20 cents per kilo on southern forage. This is surely incentive enough to accept the challenge.

Kentucky farmers have obviously noted the financial advantages of growing beef on grass, as in 1971 they earned more dollars from cattle than from tobacco for the first time in history. Animal forage agriculture captured the lead in the State's farm economy.

This climaxes a 10-year trend that saw beef cow numbers more than double and milk production climb in spite of a 30% cutback in dairy cattle numbers. Much of the credit goes to the Kentucky Forage Council for promoting greater forage production and better utilization of it.

These councils are composed of farm leaders, working with their County Agent, who draw up a strong local action programme, organize farm-day-demonstrations and generally advise on and publicize the forage theme. To illustrate their composition one successful council had serving on it five livestock producers, two agribusinessmen, a banker and a veterinarian. The success of County Forage Councils, working under the State organization, provide the heartbeat of a growing forage and livestock industry. Members of the C.F.C. have pinpointed some of the basic forage problems. They put top priority on grassland renovation, putting legumes into balance with stands of grass. They stress heavier fertilization rates and autumn applications. They promote different harvesting methods to take advantage of peak production periods and to extend them. They urge making hay or silage from surplus grazing for use when grazing is in short supply and to produce about 20% more forage than is actually needed. When a producer reaches his goal of producing 20% more forage, he can sell the surplus for cash or retain more cows or hold calves longer.

The Council also urges beef producers to synchronize their calving schedules with forage production curves.

(Progressive Farmer, Vol.88, No.1, January 1973; 821 North 19th Street, Birmingham, Alabama 35202.)
Report No. 78.

TURKEY BREEDING

The half billion dollar turkey breeding industry is flourishing in the United States, but annually suffers millions of dollars worth of losses from infertile eggs and embryonic deaths. These losses are presumed to be due to lethal genes which, if they could be eliminated by controlled parthenogenesis, would result in greater genetic uniformity in a turkey population.

Poultry scientists at Pennsylvania State University are also convinced that controlled parthenogenesis will result in the development of a 'super turkey'. At present very few – less than one half of one percent of parthenogenic birds – survive, but those that do are presumed to be free of the lethal genes and, therefore, superior.

Research to control parthenogenicity is now considered well advanced with the discovery of a virus influence on the genetic make up of a small percentage of the progeny. Dr Edward Buss and M.W. Olsen of the U.S. Department of Agriculture, of Pennsylvania State University, have been able to rule out prevailing explanations of parthenogenicity.

Dr Patricia Sarvella at Beltsville, Maryland, who is working on parthenogenesis suggested, during an interview with her, that the most likely explanation for this phenomenon is a reduction division with a subsequent fusion of nuclei. She has recently established that the sex contribution of the triploid chicken is ZZW.

(Personal Communication)
Report No. 78.

RABIES DRUG FOR YOUNG PETS

A new, safe vaccine to protect puppies and kittens from rabies has been developed and licensed for general use, the U.S. Agriculture Department announced on 6 April 1973.

The vaccine, a 'killed virus' type, was said to provide 'high levels of potency, along with a high degree of safety and freedom from side effects. It is being manufactured by its developer, Douglas Pharmacal Industries, Inc., Lenexa, Kansas. It is made from rabies virus grown in brain tissue taken from suckling mice and may be administered only by veterinarians. Puppies and kittens should be vaccinated at three months of age, or re-vaccinated then if they were vaccinated earlier. Vaccination should be repeatedyearly.

Washington Post, 7 April 1973.
Report No.78.

LESS SOYBEAN MEAL FOR AN INCREASED RATE OF GAIN

Results of experimental work conducted at Kansas State University indicate that an increase of as much as 6,9% in the rate of gain of steers can be achieved, with a reduction of 8,4% in the dry matter requirement per kg of gain, by omitting soybean meal (the most expensive ingredient) for the final 28 days of the full feed period.

The researchers explain that the protein requirements of cattle tend to be met as a result of the quantity of grain which they eat during the last portion of the finishing-period.

In the 112-day feedlot test, 280 yearling steers of mixed breed were used, their average mass being 332 kg at the start and 462kg at the end of the test. During the final 28 days, the average daily gain of steers not receiving the soybean meal was 0,91kg, as compared to 0,85kg in the case of the controls.

The ration for the final 28 days (in dry matter) was as follows:

14,2% sorghum silage
40,4% flaked milo
40,4% cracked corn
5.0% supplement

The supplement consisted of 70,2% soybean meal, 15,6% limestone, 10% salt, 2,3% urea and 1% trace minerals plus Aureomycin and vitamin A. Soybean meal in the supplement was replaced with rolled milo in the experimental group.

Half of the 140 steers on the 8,9% crude protein (no soybean meal) ration, had been fed a basal ration of 11% crude protein for 84 days prior to withdrawal of the protein supplement. The other half of the group had been on a 15% crude protein ration for the first 28 days, a 13% crude protein ration for the following 28 days, and on an 11% crude protein ration for the next 28 days. In this test, feeding more than 11,2% crude protein at any stage of the feeding phase did not improve gains significantly.

All but 40 steers in the test were implanted with DES (diethylstilbestrol) or zeranol at the commencement.

(Successful Farming, April, 1973. P.O. Box 461, Des Moines, Iowa 50302)

TESTING FOR PREGNANT EWES

The discovery of a simple, accurate and rapid technique for pregnancy testing of sheep promises to save sheepmen millions of dollars annually, otherwise wasted on feeding non-pregnant ewes and ewe lambs through most of the winter. Cost of feed frequently exceeds the total value of the ewe, especially if she is old and not pregnant.

Animal physiologist, Clarence V. Hulet, of the U.S. Sheep Experiment Station Dubois, Idaho, has developed a method of pregnancy testing of sheep that is nearly 100 percent accurate. Early evaluation of the method indicates that when proper handling equipment, including a holding cradle, has been devised, ewes can be pregnancy tested by a technician and three assistatns at a rate up to 150 per hour.

The Dubois method of pregnancy testing uses the holding cradle and a hollow, plastic palpation rod with a

solid, bullet-shaped tip about five-eights of an inch in diameter and 20 inches long.

After the sheep has been laid on its back in the cradle, the rod is inserted into the rectum to a depth of about 12 to 14 inches in the posterior abdominal region. It is pressed gently but firmly upward and the pregnant uterus can usually be felt to twist and roll when manipulated by the rod. The free hand placed on the abdomen of the sheep just in front of the udder is used to feel and identify the relatively solid form of the foetus. If no foetus is felt after examining from the extreme left to the extreme right of the posterior abdominal cavity, the ewe is not pregnant. The rod can be clearly felt through the abdominal wall in all positions in the non-pregnant ewe. Pregnancy testing can be done 60 to 115 days after breeding, but for greater speed and accuracy 70 to 110 days are suggested.

Pregnancy testing provides an efficient way of selecting early breeders, and shows promise of being relatively accurate in detecting twin bearing ewes.

(Agricultural Research, Vol.21, No.10; U S. Department of Agriculture Washington, D.C.)
Report No. 80.

PARATHION AUTOSYNERGIST

A new pesticide problem which may be cause for concern has just been reported. Researcher Grunwell of Miami University (Ohio) claims to have discovered that Parathion forms its own synergist. After parathion has been sprayed, some of it changes in sunlight to form O,O,S-triethylthiophosphate, which enhances to the toxic effects of the remaining parathion and of successive parathion applications – a very desirable situation from the point of view of the pesticide's effectiveness against insects, which, however, may endanger man and animals. Instances of farm workers having been poisoned by parathion a considerable while after they had applied the chemical, were reported earlier. Grunwell suggests that a long-range build-up of parathion and its synergist in the fields may have been what afflicted the workers.

(Science in Agriculture : vol. XX No. 3, Spring 1973, Pennsylvania State University, University Park, Pennsylvania 16802; *Science News*, April 21, 1973, 1719 N Street, N.W., Washington, D.C.20036)
Report No. 81.

COMPARATIVE PRODUCTIVITY OF BULLS, CASTRATES AND CRYPTORCHIDS

Latest experiments at the Pennsylvania State University indicate that Holstein dairy bulls are superior in most respects to steeers as well as to partially castrated Holsteins. While steers produced the best carcasses in fat thickness, bulls and partial castrates had longer loin-eye areas, highter cutability and slightly more desirable lean meat flavour and total acceptability scores. The partial castrates (cryptorchids) were produced by retaining the testicles within the body cavity. The results show no apparent reason for making Holstein bulls into cryptorchids, according to Lowell L. Wilson, Professor of Animal Science.

The bulls, steers and crytorchids were all slaughtered when 402 days old. Average daily mass gains after 190 days of age were 1,2 kg for the bulls, 1,1 kg for cryptorchids and 1,02 kg for steers. Bulls averaged 3,5 kg of feed for each kg of mass gained. Cryptorchids were close behind at 3,6 kg and steers needed 4,0 kg of feed per kg of gain. The percentage of usable meat per carcass was significantly higher for bulls than for either cryptorchids or steers.

(Animal Science Research 1972. Room 324, Animal Industries Building, University Park, Pennsylvania 16802.)
Report No. 83.

HOLSTEIN BULLS AND TREFOIL

A study recently concluded at Penn State after five years of investigation indicates which pastures will give the highest beef yields from these animals. The top producing pastures were those seeded to birdsfoot trefoil and combined with any one of the following grasses – orchard grass, smooth bromegrass, or reed canary grass. This combination provided 375 grazing days per hectare per season and gave yields ranging from 6,2 to 8,6 tons of dry matter per ha per annum. Orchard grass used alone furnished 360 grazing days per hectare each season and yielded from 5,8 to 9 tons per hectare.

Crude protein and total digestible nutrient content of first grazed forage tended to be lower than for second, third and fourth grazings. Except at first harvest, pasturage containing birdsfoot trefoil was higher in crude protein than were grasses alone. Seasonal average for crude protein ranged from 15,3% for the Kentuckly blue grass herbage to 18,5% for the trefoil-grass mixtures.

Marginal land can be planted to these pastures and will produce up to 392 kg per hectare of beef per season with stocker cattle. Another alternative is to utilize such land for a cow-calf operation.

(Pennsylvania Farmer, P.O. Box 3665, Harrisburg. 14 April, 1973.
Report No. 83.

USDA LICENSES HOOKWORM VACCINE FOR DOGS

On 14 June, 1973, the U.S. Department of Agriculture licensed a new vaccine for preventing hookworms in dogs; the first hookworm vaccine to be marketed anywhere in the world.

Licensing by the Animal and Plant Health Inspection Service of Jensen-Salsbery Laboratories, Division of Richardson-Merrell, Inc., Kansas City, Missouri, was based on data submitted by the company, showing the vaccine to be pure, safe and effective.

The vaccine requires special handling and vaccination involves certain precautions on the part of the veterinarian. The precautions include the need to treat puppies already suffering from a mild infestation of parasites, including hookworms, with a specific drug at the time of vaccination. In fact, if puppies are severely infested, vacination should be delayed until two or three weeks after other treatments are given. Vaccination is done by subcutaneous injection of puppies three weeks of age, or older, with a repeat dose two to four weeks later.

In the preparation of the vaccine, hookworm larvae are exposed to ionizing radiation, causing them to be infertile and unable to complete their life cycle, thus posing no material harm to vaccinated dogs.

(News, U.S. Department of Agriculture, (1827), Washington, D.C.)
Report No. 90.

TENDEROMETER RATES BEEF CARCASS QUALITY

Present beef quality grades purport to group cattle or their carcasses into homogenous grades that reflect eating quality of meat. These quality grades are based largely upon marbling in the rib eye. Marbling is a difficult trait for the producer to evaluate, yet quality grade is a major determinant of price paid for fed cattle. Tenderness is the most important single quality trait in beef; however, the correlation between quality grade (or marbling) and tenderness of beef is relatively low.

The tenderometer is a new device designed to estimate tenderness in the chilled beef carcass. The tenderometer is non-destructive and carcasses can be measured rapidly and easily in the beef cooler. Since tenderness is heritable, these data could be used by producers in selection programmes with other important traits.

The tenderometer consists of 10 pointed probes connected to a force transducer. When the probes are pressed into the exposed rib eye surface of the carcass, the resistance to penetration is registered electrically on a meter calibrated in pounds of force. Presumably, tough meat will offer more resistance to penetration than tender meat.

To evaluate the tenderometer, 193 cattle were slaughtered at the Auburn University meat laboratory and chilled at 2,2°C for 24 hours. Tenderometer readings and

U.S. Department of Agriculture quality grade data were recorded. U.S.D.A. quality grade correctly predicted tenderness 59% of the time when compared with tenderness measured by the taste panel; while marbling score was a slightly more accurate prediction of tenderness (64% for taste panel and 60% for Warner-Bratzler shear). The tenderometer provided 79% and 76% correct judgements with respect to taste panel evaluations and Warner-Bratzler shear scores respectively.

Incorporation of the tenderometer reading into the present U.S.D.A. quality grade standards could reduce tenderness variation within the U.S.D.A. quality grades.

Highlights. Vol.20, No.2 (Summer 1973); Agricultural Experiment Station, Auburn University, Auburn, Alabama 36830).
Report No. 90.

BEEF MANAGEMENT : OVA TRANSFER

Ova transfer has left the research stage and is now being offered as a commercial service by a growing number of firms across the United States and Canada. International Cyro-Biological Services, Inc., (ICBS), of St. Paul, Minnesota recently announced its entry into commercial ova transfer in cattle.

The combination of ova transfer with artificial insemination offers the possibility of speeding up production of genetically superior cattle. Ova transfer currently can enable a breeder to produce as many as three or four calves per ovulation from a superior cow. Current practise permits ova transfer from one donor cow only twice; then she returns to natural breeding and gestation.

Five days after artificially produced super-ovulation and service, the ova are recovered and transfered surgically into the reproductive tract of waiting cows, their pregnancies being diagnosed about a month later. Each then carries the valuable calves to birth, without contributing genetically to the calf.

Scientists working in the field are already talking about the possibility of freezing ova for future implantation. The technique has worked with mice. It seems only a matter of time before cattle ova are successfully frozen.

Another possibility is the recovery and freezing of thousands of eggs from sexually immature heifers of genetic merit.

(Ralph Sanders, Beef Editor: *Successful Farming.* Vol.71, No.8 June-July, 1973, 1716 Locust Street, Des Moines, Iowa 50336).
Report No. 93.

RUMEN ORGANISMS 'TURBOCHARGE' FEEDLOT STEERS

Feedlot steer performance was greatly increased in recent Kansas State University trials with drenches containing adapted rumen micro-organisms (ARM). After 90 days on feed, steers drenched with ARM increased rate of gain up to 15% and efficiency of gain up 12,5% the next 60 days on feed over control steers not drenched.

In the tests, different groups of steers were drenched with 93 g, 187 g or 373 g of ARM. One group of steers that got the 373 g drench gained 6,5 kg more each over the next 60 days than steers not drenched. Another group of 49 steers gained 9 kg more each. Those that received 187 g drenches gained 4,5 kg more each than steers not drenched; 93 g drenches had little or no effect.

Test rations were 15% sorghum silage and 85% concentrate feed of rolled milo and supplement. No antibiotics or diethylstilbestol (DES) were used.

Average daily gain of one group of steers given the 373 g drench was 1,1 kg compared with 1 kg for the control animals that received no drench with the adapted micro-organisms. The other group given the 373 g drench averaged 1,2 kg daily compared with 0,98 kg for the average of its control group.

Kilograms of feed per kilogram of gain were 4,5 kg and 4,1 kg in favour of the drenched steers in the first group and 4 kg and 4,7 kg in favour of the drenched steers in the second group.

(*Successful Farming.* Vol.71, No.8, 1716 Locust Street, Des Moines.)
Report No. 93.

DISEASE AND PEST CONTROL

New Swine Disease

The USDA-Agricultural Research Service's Plum Island Disease Laboratory, at Greenport, New York, reports that a new swine disease causes lesions indistinguishable from those of foot-and-mouth disease, vesicular stomatitis, and vesicular exanthema. The disease is caused by an enterovirus unrelated to these other diseases. (Brescia Laboratory, Italy, 1968. During the last half of 1972, the disease appeared in Poland, Austria, Italy, Great Britain and possibly also France.

Avian Infectious Bronchitis

The National Animal Disease Laboratory at Ames, Iowa, reports that an inactivated virus vaccine has been prepared by their scientists, which appears to be as effective as, and safer than, live-virus vaccines now used to protect chickens against avian infectious bronchitis (AIB). In laboratory tests, the vaccine (a beta-propiolactone-inactivated virus of the Connecticut strain) was administered by aerosol, in 2 doses, 3 weeks apart. A challenge dose of Massachusetts strain vaccine was administered two to four weeks after the second aerosol exposure. Vaccinated birds were negative for virus isolation, while unvaccinated birds were 80%-100% positive for the same post-challenge test period.

The findings indicate that the inactivated virus is effective in preventing primary infection of the trachea and that it would reduce the possibility of latent AIB infections in chickens immunized with live-virus vaccines. Because the vaccine is prepared with inactivated virus, its use would also eliminate the chance of accidental spreading of brochitis from vaccination with the modified live virus; its use might also reduce the amount of synergistic reactions from multiple infections commonly found in present live-virus immunization programmes.

Report No. 94.

LIGHT HELPS EMBRYO GROWTH

Exposing fertilized eggs to fluorescent light from the fifth to the fourteenth day of incubation produces heavier embryos on any given day than those obtained from non-illuminated eggs. Egg size has no effect upon embryo mass during the period of incubation.

These are the findings of a co-operative research team comprising scientists of the Agricultural Research Service, Purdue University Agricultural Experiment Station, Lafayette, and Tennessee State University at Nashville, Tennessee.

The study was conducted because, although it was known that illuminated eggs hatch sooner, it was not known if this was caused by an accelerated rate of embryonic development. Embryos exposed to light in the experiment required an average of 20,6 days to hatch, compared with 21,5 days for those not exposed. Rates of embryonic mass gain for the two treatments increased differentially.

(*Notes from Washington,* June 1973, USDA-Agr.Res.Serv., Hyattsville, Maryland 20781; *Agricultural Research,* July 1973, USDA, Washington DC 20250).
Report No. 94.

FIELD MOUSE VALUABLE IN FEEDING EXPERIMENTS

To determine the nutritional quality of plants, large quantities of food are required for feeding trials with livestock or humans. Nevertheless, agronomists involved in plant breeding programmes or studies of plant growth and development in controlled environmental chambers may have only 500 grammes or less of plant material for nutritional evaluation.

The weanling meadow vole (field mouse) has been used successfully to evaluate the nutritional quality of such small quantities of plant forage and cereal grains. The adult is capable of digesting greater quantities of plant fibre than most rodents. It has an enlarged caecum which allows microbial digestion of ingested food.

Although the vole's digestive system functions similarly to that of a mono-gastric or single-stomach animal, weanlings fed diets consisting mainly of forage quickly develop the capacity to digest plant fibre. Diets containing 60 to 80 percent legume forages are usually high in protein and fibre, and growth of the weanling is believed to be limited primarily by the energy available from the forage. A few forages, however, contain undesirable substances and weanling voles are very sensitive to these antiquality constituents. In contrast, where diets consisting entirely of cereal grains are low in fibre and protein, weanling response appears to be primarily a function of protein availability and quality.

If the weanling pup is fed a nutritionally adequate diet of either grain, forage, or both, it will gain mass at nearly one gramme per day, consume about four to five grammes of diet each day and digest approximately 65 percent of the diet.

The vole was first used in an alfalfa breeding programme at Michigan State University to determine the forage quality of experimental varieties. These varieties were developed with the assistance of a laboratory artifical rumen procedure which allowed the breeder to select plants that were readily, or poorly, degraded in a 6-hour period. It was found that voles grew best on all diets containing forages from varieties selected to be readily solubilized in the artificial rumen technique.

When fresh-cut artificially dried crownvetch forage was fed to weanling voles, they did not respond favourably. Chemists at the U.S. Regional Pasture Research Laboratory at University Park, Pennsylvania, have found that the property responsible for the deleterious effects could be removed by extracting the forage with ethanol. This experiment led to the conclusion that a substance was present in crownvetch forage that was either unacceptable or toxic to weanling voles. The present research thrust is directed toward isolating and identifying the substance using the weanling vole to monitor the chemical fractionation procedure.

Although the digestibility of crownvetch forage was similar to that of alfalfa and birdsfoot trefoil, they comsumed less food, lost weight and often died when fed this forage. They responded better when fed crownvetch forage harvested by conventional hay making equipment under field curing conditions. Intake and growth of weanlings were entirely normal when fed crownvetch stored as haylage.

Present research results indicate the most interesting and potentially promising areas of research with the weanling vole are in analyzing for improved protein quality early in the cereal breeding programmes when sufficient grain for rat evaluations is not available.

(Science in Agriculture, Vol.XX, No.4, (Summer 1973); The Pennsylvania State University Agricultural Experiment Station, University Park, Pennsylvania 16802)
Report No. 95.

NEW TEST FOR PORCINE STRESS SYNDROME (PSS)

Because of a recent breakthrough by researchers at Iowa State University, early detection of PSS is possible. Lauren Christian, Iowa State researcher and the first to focus industry attention on the PSS problem in swine, has come up with a test to screen 4- to 8-week-old pigs which might be stress susceptible.

Operating under the idea that the PSS condition is an inherited trait, Christian has perpetuated a strain of stress-prone seed stock at the university farm. From this line it has been possible to make several comparisons. Susceptible pigs, when exposed to halothane gas, experience symptoms which are very simliar to the malignant hyperthermia experienced by humans.

Normal pigs can withstand 2-6% halothane gas with no apparent effects. On the other hand, certain pigs tend to go very rigid, have an elevated temperature and a blotchy skin tone after as short as a 10-second exposure to halothane. Once detected, halothane can be removed and the pigs will return to normal within 3-5 minutes. From 23 litters with a known history of stress, 24 which showed positive symptoms when exposed to halothane and 24 which had reacted normally to the test, were selected. When carried to slaughter mass 20 of the 24 stress suspect pigs either died or were in danger of dying when exposed to halothane and vigorous excercise before slaughter. All 24 littermate controls accepted pre-slaughter stress without difficulty.

(Rodney J. Fee: *Successful Farming.* Vol. 71, No.9, August 1973. 1716 Locust Street, Des Moines, Iowa 50336.)
Report No. 98.

POULTRY RESEARCH

Effect of Antibiotics on Turkey Herpesvirus Vaccine

In a study conducted by University of Georgia researchers, certain antibiotics were found to have a deleterious effect on Turkey Herpesvirus (HVT) vaccine. These are:

Chlortetracycline;
Erythromycin phosphate; and
Oxytetracycline hydrochloride

Dihydrosteptomycin sulfate, neomycin sulfate, potassium penicillin G, spectinomycin dihydrochloride pentahydrate and tylosin tartrate were found to be compatible with HVT vaccine but it is suggested that they be 'used with caution'.

Only tylosin tartate was tested for efficacy in chicks. No benefit was derived from using tylosin tartrate with HVT in day-old chicks from *Mycoplasma synoviae*-infected breeders.

The mixing of antibiotics and other vaccines with HVT vaccine is regarded as being 'risky' and the results can be disastrous, according to the researchers.

HVT and Marek's Disease (MD) Vaccines – Effect on Humans and Animals other than poultry

Inoculation of monkeys with Marek's disease virus and turkey herpesvirus apparently failed to produce clinical signs of the disease, according to results of co-operative studies conducted by USDA studies at East Lansing, Michigan and researchers at Rush-Presbyterian St. Luke's Hospital and the University of Illinois' Medical Centre in Chicago.

Genetic Resistance to Marek's Disease (MD)*

According to researchers R.N. Brewer and L.W. Johnson of Auburn University, Alabama, development of genetically resistant parental lines in combination with a vaccination programme may provide long-range control of Marek's disease in chickens. In trials involving six commercial broiler breeder and Auburn Leghorn lines, MD tumors in the different lines ranged from 9,6% to 24,9%, according to *post-mortem* examination of all birds and necropsy results on the survivors at nine weeks of age.

The fact that all groups of birds were housed on old litter in pens known to be infected with MD, would appear to reinforce the claim that certain lines *do* have genetic resistance potential against the disease.

Arsenic Tolerance level Raised

The U.S. Food and Drug Administration has changed the "safe tolerance level" for arsenic in chicken and turkey livers, gizzards, kidneys and hearts, rrom 1 part per million to 2 ppm., the same level currently approved for similar meat from swine.

A review of toxicology data and other scientific information from several years of studies reveals, *inter alia,* that arsenic levels considerably higher than the new tolerance level of 2 ppm are commonly found in certain products of the human diet, for example:

2,1 – 9,4ppm in flounder;
1,2 – 7,4ppm in domestic cod; and
3,5 – 9,0ppm in haddock

while oysters can have arsenic concentrations of as much as 25 ppm.

Recycling Poultry Waste not for Small Operator

Conclusions of a USDA inter-agency task force on the economic feasibility regarding the use of processed waste material in poultry rations indicate that recycling poultry wastes as feed may not be the answer for small egg producers seeking inexpensive ways to curb animal waste pollution.

Feeding of DPM to a 10 000-layer operation was found to be uneconomical regardless of the level at which the waste was fed, owing to higher feed costs per bird, higher per unit costs for handling and spreading the manure as a result of the low volume involved, and poorer layer performance. Only in the case of flock sizes of 50 000 or more did the feeding of DPM result in appreciably lower unit costs per dozen eggs and this only when it was fed at the 12½% level.

In the case of the 10 000-layer operation used for the experiment, costs rose by 0,8c per dozen eggs when DPM was fed at the 12½% level and by 4,4c when fed at the 25% level.

Only about 3% of the U.S.A.'s layer operations have more than 10 000 birds – consequently only this small group of producers would find it economically feasible to recycle their poultry wastes as feed, in an effort to cope with pollution problems.

(*Poultry Digest*. August, 1973, P.O. Box 1220, Redlands, California 92373)
Report No. 99

ANIMAL RESEARCH

Two New Leptospirosis Vaccines

Two new vaccines which protect against leptospirosis infection caused by the bacteria *Leptospira hardjo* and *L. grippotyhosa* have just been licensed by the U.S. Department of Agriculture. The licenses, granted for a period of 1 year to an Illinois firm, Affiliated Laboratories of Whitehall, for production of the vaccines, are conditional in that the licensee must continue studies on how well the vaccines withstand challenge by disease organisms, both in the laboratory and in actual farm use. In addition, the firm has to develop an improved quality control test to evaluate potency of each serial of the vaccine against *Leptospira hardjo*.

Although vaccines are on the market against leptospirosis infection caused by *L. pomona*, no vaccines against the above have been available until now.

Leptospirosis causes abortion in dairy and beef cattle and also swine and, in dairy herds, a sharp drop in milk production. After tests are conducted to establish which types of leptospirosis organism are involved, the whole herd should be vaccinated and then revaccinated 4 - 6 weeks later.

*Anaplasmosis Vaccine Available Soon**

The University of Illinois has announced development of a vaccine to immunize cattle against anaplasmosis, the disease which it is estimated costs U.S. cattlemen some $50 million a year. The vaccine has been tested extensively and found to be effective and now awaits clearance for use. According to Dr Miodrag Ristic of the University's College of Veterinary Medicine, the product should receive clearance within 6 months to a year and is expected to cost between $2 and $3 per head.

Dr Ristic says that immunization could help open new grazing land, particularly in Latin America and other tropical areas, and could increase the world beef supply by 20%.

(*National Livestock Producer*. August, 1973. 155 North Wacker Drive, Chicago, Illinois 60606. *News – USDA*. August 24, 1973)
Report No. 99.

* How many decades does it take for information to cross the Atlantic? – **ED.**

FARM TECHNOLOGY ON TRIAL

Farm chemicals, notably feed additives, have become the target of environmentalists and health authorities in America. In this era of intensified production goals to meet food requirements, not only in the U.S.A. but elsewhere, the threat of more stringent legislation, which would curtail still further the use of these chemicals, is of very real concern among grain and beef cattle producers throughout the country.

New legislation on weed and insect control chemicals could depress the present yield-and-return levels, while banning or restricting still further the use of various additives in livestock production could mean increased morbidity in livestock or a reduction in total production. This, in turn, would result in increased food costs or simply in a reduction in availability.

This report focuses attention on developments pertaining to chemicals used in the beef cattle industry.

Many eminent agronomists, veterinary researchers and economists have taken up the cudgels in the interests of agriculture as a whole and on behalf of the farmer, urging that legislation on the use of these chemicals be based on sound, scientific and economic considerations (i.e. a risk-to-benefit basis) rather than on unrealistic, or 'emotional ideals and distorted risk factors without expressing the significance of the quanitites which would constitute such risk.

The banning of diethylstilbestrol (DES), the popular growth-promoting drug previously used extensively by beef cattle producers in the U.S.A., has been sharply criticised by many knowledgeable researchers. The inconsistency of legislation on the use of drugs is clearly apparent when one takes a closer look at the figures involved; e.g., one would have to ingest 4,5 to 9,0 metric tons of liver (with DES residues at 2 parts per billion to 5 ppb) at a single sitting, to receive the equivalent of the DES dose contained in the so-called 'morning after' birth control pills currently on the market. The need for a realistic evaluation of such chemicals, which are considered invaluable to agriculture, has been stressed repeatedly by Secretary of Agriculture, Dr Earl Butz. As a result of all this pressure, the Food and Drug Administration (FDA) and other governmental agencies have already called for the assistance of the agricultural scientific and production community in an effort to formulate guidelines for realistically evaluating or re-evaluating growth promotants and for effectively interpreting the Delaney Clause which has virtually tied the hands of legislators, now that super-sophisticated methods are available which detect infinitesimal quantities of drug residue.

The current beef situation is likely to have profound effect on the research effort throughout the country and several universities are conducting intensive studies in this direction, while at least one agricultural journal intends to publish an open-discussion, forum-type series of articles reflecting the various opinions.

Substitutes for DES, such as Synovex H (for heifers), Synovex S (for steers), MGA and Ralgro (Zeranol) seem to be very satisfactory, as revealed by recent research results from South Dakota State University and the University of California which have shown that Synovex implants result in average daily gain and feed efficiency figures comparable with those obtained with DES. Similarly, good results have been obtained with MGA and Ralgro (Zeranol). A new product, Estradiol (or E-two) a natural hormone produced by animals but which can be synthesized, has been shown to increase feedlot gains by as much as 22% and in trials at the University of Arizona resulted in a reduction of 15% in the cost of gain. This product, however, is still awaiting FDA clearance.

So much for growth-promoting hormones.

As far as antibiotics are concerned, almost every animal that goes to market nowadays has been fed a ration containing antibiotics or sulphonamides for a considerable portion of its life. This widespread use of antibacterial drugs as subtherapeutic feed supplements raises two important questions, viz. (a) whether the practice has led to the emergence of drug-resistant bacteria which directly cause disease in man and domestic animals; and (b) whether it has caused the resident bacteria in farm

animals to become drug-resistant and to act as a reservoir of drug resistance for the bacteria in man.

In this context, the remarks of Dr E.A. Epps (Jnr.), Chief Chemist at the U.S. Department of Agriculture in Louisiana, may well come to the fore again (see 'Landbou-Rapport' No. 42 of July 7, 1972), particularly those pertaining to the findings of the Task Force on Antibiotics. Leading universities are investigating the effects, on man and domestic animals, of antibacterial drugs at subtherapeutic levels.

It has been pointed out that one of the five antibiotics currently cleared for use in beef cattle feeds has been found to result in residues above established tolerances when used at subterapeutic or nutritional levels. It is felt that, since livestock will respond to antibiotic additives, this indicates no real problem of antibiotic resistance. In addition, studies in humans have failed to show that transfer of resistance factors has played any significant rôle in bacterial infections – a fact highlighted by Dr Epps.

The University of Illinois, however, has already reported some results of research on drug resistance in animals which substantiate the contention that agricultural uses of antibacterial drugs cause substantial levels of drug resistance in the microflora of farm animals, a condition which may have practical consequences not only to the farmer but also to the consumer. Results of research at other laboratories corroborate these findings.

Under normal circumstances, the great majority of the organisms in the gastrointestinal tracts of man and animals do not cause disease, therefore their resistance to antibacterial drugs would not normally be considered of any consequence. It has been well established, however, that most (and possibly all) antibacterial drug resistance in gram negative enteric bacteria can be transferred from one organism to another; i.e. most (and possibly all) resistance is mediated by R factors. The contacts are more likely to be frequent in the resident flora of animals that have been fed antibacterial drugs than of animals that have had minimal or no exposure to these drugs a contention evidenced by the work of Illinois University's College of Veterinary Medicine, and supported by other researchers. The possible advantages gained by continuous use of antibacterial drugs at subtherapeutic levels, for animal production purposes (*not for the treatment of disease*) may thus be outweighed by the creation of drug resistance in resident bacteria and pathogenic bacteria.

The current system of licensing additives has been criticized in other ways, e.g. the lengthy process through which 'modern nutrients' such as selenium, must pass before they are approved for use in correcting deficient rations. Livestock producers deplore the fact that well-documented livestock losses occurred because of deficiency of this nutrient. Also, legislators have not been substantially influenced by the fact that carcinogens (cancer-producing substances) are materially present in all animals and plants. To-day, however, philosophy of element of risk is no longer the prime question but rather that as to whether or not America can produce enough food under 'unrealistic' restrictions.

The publicity which this controversial issue has received during the past few months is but an indication as to how anxious all concerned are about the future basis for legislation on these chemicals and, until all the facts are in, no clarity is expected. (*Illinois Research*. Summer 1973, 123 Mumford Hall, Urbana, Illinois 61801; *National Livestock Producer*. August, 1973, 155 N. Wacker Drive, Chicago, Illinois 60606)
Report No. 102.

Illinois Research. Summer 1973, 123 Mumford Hall, Urbana, Illinois 61801
National Livestock Producer. August, 1973, 155 N. Wacker Drive, Chicago (Illinois 60606)
Report No. 102.

WATER RECOVERY IN THE ARID SOUTH-EAST

Predictions, on a national scale, indicate that multiple reuse of water will be necessary by 1980, when water for all uses in the U.S.A. is expected to equal or exceed the present recoverable streamflow and groundwater supply. Soil scientists in Texas are preparing themselves to meet this situation and have studies in progress which show great promise.

In Amarillo, an important feedlot area of Texas, U.S.D.A. scientists at the Southwestern Great Plains Research Centre have found, with the use of shallow basins, that ground water reservoirs can be safely recharged with turbid (sediment-loaded) water. Their studies show that more than 35% of the sediment suspended in recharge water remains on the surface of the basin floor and more than 90% of the sediment is filtered in the top 2,5cm of the floor. Sediment that accumulates on the surface of the basin floor tends to plug the surface during filtration but this thin coating can be removed easily and inexpensively between recharge cycles.

The soils in the area where these trials are in progress have a high clay content necessitating removal of the overburden to a depth of 1 metre or more to expose a free draining calcareous type lower horizon.

Using cesium-134 radio-tracer techniques to follow the sediment in an experimental basin (the floor of which was cultivated to break up naturally-occurring large soil pores to prevent sediment from running deep into the soil), the scientists found that the small amount of sediment which moved deeper than the top 2,5cm of soil did not appreciably reduce the infiltration rate after seven cycles of recharge with turbid water. Less than 3% of the sediment went beyond 15cm deep and no labelled sediment was found below 7,6cm.

In another study, researchers at the Centre have found that feedlot runoff affords no apparent pollution threat to groundwater in the area. Concentrations of runoff constituents are considerably highter than those in other areas as, in addition to having less rainfall, cattle stocking rates* and evaporation levels are higher in the Amarillo area. (*This finding has been substantiated by the work of the USDA Soils Laboratory at Fort Collins (Colorado) under Dr Viets who states that seasonally-used feedlots, or those with a low density of animals, do create underground water-pollution problems).

The potential of the feedlot to pollute the water table appears to be very slight in this area, according to the scientists, soil moisture readings in core samples from beneath the playas (shallow, natural surface lakes) having shown no appreciable deep percolation. Water from these catchment basins has traditionally been used by some growers for irrigation, and these studies indicate that feedlot runoff could also be used for this purpose provided it is diluted with well water. Whilst runoff caught in basins where the area of the feedlot is about one-tenth or less of the total runoff area, could be considered as having a low or medium salinity hazard, any use of feedlot irrigation requires a close watch on the amount of salts in the water and soil. For most catchment areas in the Southern High Plains, a dilution ratio of about 4 parts of well water to 1 part of feedlot runoff is suggested as being advisable to reduce the salinity hazard from 'very high' to 'medium.'

Utilizing methods researched since 1967 on a USDA Pilot Project known as 'Flushing Meadows', a team of USDA-Agricultural Research Service scientists in co-operation with the main local irrigation authority, the Environmental Protection Agency and the city of Phoenix, are engaged in a water recycling operation known as the Phoenix Wastewater Reclamation Project. Financed by the EPA, the waste treatment facility may also serve as a model for other cities with sewage disposal and water shortage problems. Results of the 'Flushing Meadows' project showed that under favourable soil and hydrogeologic conditions, infiltration basins acan cleanse 100 hectare-metres or more of secondary sewage effluent per year per

hectare or filter for unrestricted irrigation, recreation or other uses, secondary effluent being the final product of most present-day sewage treatment plants. These basins use natural reclamation methods, the filters being grass-covered or bare soil shallow basins which, when flooded, allow the effluent to infiltrate the soil, percolating deep beneath the surface to the underground factors of length and time of underground travel all aid in removing nitrates, phosphorus, faecal bacteria, virus and organic waste matter from the water and by the time it is pumped from the ground it has become sparkling-clear, 'renovated' water. The 16ha site will be divided into four 4ha plots by earthen dikes, the centre dike housing several large wells. The basins will be inundated with effluent which will filter down about 15m beneath the surface and then travel horizontally from 3m to 150m to these centre wells. Nearby Rooseveld Irrigation District will be buying this water at a cost of about half that which is presently expended on water from their dwindling underground supplies, for use on crops, the water being pumped into irrigation canals of the District.

(News – USDA 2682-73, 2690-73, 29 August, 1973; 2665-73, 28 August, 1973; USDA, Washington, D.C.20250; *Personal Communication)*
Report No. 102.

LACTATING COWS REQUIRE SULPHUR

Although the rôle of sulphur in ruminant digestion has been known for some time, its importance as an essential component of ruminant diets has been recognized only recently. Sulphur is an important constituent of all animal tissues with much of it in the form of the two amino acids, methionine and cysteine; although may other biochemical entities are involved. Although there is no essential requirement for inorganic sulphur, ruminants consuming diets containing high levels of non-protein nitrogen need inorganic sulphur for protein synthesis.

Experimental test carried out by Rejean Bouchard at the Canada Department of Agriculture Research Station, Lennoxville, Quebec, concluded that the dietary sulphur level should be maintained within the 0,12 to 0,26 per cent range in order to provide a positive sulphur balance, and at the same time, avoid the problem of overloading the urinary secretion system.

(Canada Agriculture. Vol.18, No. 3, Summer 1973. Ottawa, Canada.)
Report No. 103

BONE BREAKAGE IN POULTRY

Bone breakage in poultry is frequently observed, the ribs, tips of the keel bone, clavicles (wishbones) and wing bones (radius, ulna) being the bones most likely to break. The problem of bone breakage is much greater in caged hens (especially in the light breeds) than in heavy breeds or birds on flooring.

Attempts to improve the strength of bones have been made by altering dietary ingredients, especially calcium, phosphorus and vitamin D (e.g. (d) below), and by changes in management procedures but although some improvements have been noted in research results, no satisfactory solution has been found to bone breakage in spent hens. This is probably due to the fact that the mechanism of bone development and egg shell formation are not fully understood.

)a) *Portland Cement Supplement*

Recent studies by American researchers have shown interesting pointers to possible solutions, one of these being the addition of Portland cement to diets. In a study at Texas A&M University, researchers Ferguson, Scott, Bradley and Creger employed Portland cement supplements (fed at the rate of 0, 0,25, and 1% of the diet) in order to establish whether or not any effect on bone strength or shell thickness might result.

Breaking strength of the radius was increased with each increase in cement. Shell thickness at the 0,5 and 1% level was greater than the non-supplemented group, and bone breaking strength and shell thickness of groups supplemented with cement were highly correlated ($P < ,001$).

Results suggest that slight dietary changes may influence bone strength and shell quality and that minerals other than calcium and phosphorus may be more important than was previously considered to be the case. The work is progressing.

(b) *Blowing Air*

In a study on the problem of brittle bones in cage-grown broilers, researchers J.W. Merkley and George Chaloupka of the University of Delaware's Georgetown Substation conducted tests with air, blown by fans several times a day through the floor of the cages, past the birds and out again at the top of the cage. (This was done at the stage between six and eight weeks of age). They found that birds subjected to blowing air had stronger bones than those raised in the cage groups without benefit of fans.

(c) *Restricting Head Space*

In another part of this study, a group of broilers were raised on the floor but, by the use of screens, their headspace was restricted to that of the broilers in the cages. Birds rased on the floor with limited head space had more brittle bones than the floor birds without screens.

(d) *Hot Weather Linked to Soft Bones*

According to T.H. Eleazer, Livestock-Poultry Health Department, Clemson University (quoted from *Clemson University Laboratory & Field Notes* No. 2, 1973) hot weather seems to put a strain on calcium and/or vitamin D_3 demands in caged layers. 'This appears as a bone softening, with resulting fracture of one or more long bones in the legs of high-producing birds'. Affected birds are unable to stand to get feed and water and they become dehydrated and die.

Various treatments were tried in these studies. The best results were obtained from the addition of 9 kg of dicalcium phosphate and 2 million units of vitamin D_3 per ton of feed. (It is regarded as important that the vitamin D_3 be fresh and in a stable form). A good U.S.P. grade of cod liver oil at 4,6 or 9,1 litres per ton appears to supply an adequate amount of D_3, according to the researcher.

The addition of 13,6 kg of oyster shell (already used by some for eliminating egg shell breakage) and 4,5 kg of small-sized grit per ton was also found to be helpful. With grit in the ration, it is believed that oyster shell will be held in the gizzard longer and be better utilized, thus supplying a source of calcium during the dark hours when the birds are not eating.

(Poultry Digest. September, 1973, P.O. Box 1220, Redlands, 92373)
Report No. 104.

ALTERNATIVE PROTEIN SOURCES FOR LIVE@ STOCK PRODUCTION

In the words of J.E. Oldfield of Oregon State University, at the July, 1972 symposium sponsored jointly by the National Research Council's Committee on Animal Nutrition and the American Society of Animal Science: 'If . . . the animal proteins (i.e. meat, milk and eggs) are to contribute significantly to the lessening of man's world food problems, sufficient protein must be allocated to the nutrition of the livestock . . .' To accomplish this is no small task when viewed on a global basis, even although the situation may not yet be critical in certain localized regions such as the United States and Canada.

While the quality and economy of protein supplies from known nitrogen-bearing materials have been altered by advances in production technology, with special reference to cereal grains, forages, oil seeds, and meat by-products, and significant discoveries are being made in connection with hitherto unused or little-used protein sources, including various plants, proteins from the sea, microbial or single-cell proteins, and proteins recycled from animal wastes, much remains to be done.

The symposium report, entitled 'Alternative Sources of Protein for Animal Production,' now released by the National Research Council, summarizes several approaches – some relatively new, some long under investigation, and some limited by factors other than science and technology.

Changes in patterns of oilseed use offer the best immediate solution to supplying protein to critical areas of need, the idea being that additional conventional, protein would be freed for use by non-ruminants if 'unconventional nitrogen sources' were used for rations of ruminants 'less critical in their protein needs,' according to Mr K.J. Smith who represented the National Cottonseed Products Association at the symposium. He feels that oilseed production is not currently controlled by the need for protein but rather according to 'how these oilseeds fit into complex interrelationships of world trade.'

Dried blood has been used in animal feeds, as have meat and bone meal – all from animal processing, but D.M. Doty of the Fats and Protein Research Foundation reported a need for more information on composition and nutritive quality of the byproducts of animal-raising and livestock slaughter. He cites the following as possibilities worth exploring:

(a) 'Much of the animal by-product material that is currently incompletely recovered or poorly utilized could be processed and used in human food or animal feeds. Protein from animal blood can be produced in highly purified form. These blood protein preparations have excellent nutritional and physical characteristics and, with appropriate processing, animal offal proteins and a high-protein fraction from meat and bone meal of high nutritive quality can be produced;

(b) Collagenous proteins, containing limited amounts of the essential amino acids, can be converted to a single-cell protein of high nutritive quality by fermentation; and

(c) Keratin proteins (hair and feathers) can be processed to make their constituent amino acids almost completely available to poultry. These proteins can be recovered and utilized entirely as ingredients in poultry rations.'

Also mentioned is the work already in progress toward developing economically practical ways of separating protein from fibre in such major forage crops as lucerne and toward improving the protein quality and yield of cereal grains particularly through development of new cultivars, thereby enhancing the protein value of conventional sources. The potential of fish meal and fish-meal products, much discussed as an alternative protein source, is also raised and the variety of problems which minimise its potential – one of these problems being the present world price which has increased to such an extent that it is rapidly becoming uneconomic to use it as a feed supplement.

Recycling animal wastes is also discussed, the attitude of the Agricultural Research Service delegate L.W. Smith being that success will depend on favourable production economics and demonstrated high-quality and safe animal products. 'Animal recycle systems for utilizing undigested feed nutrients and by-products of digestion and metabolism could place animals in an improved competitive position for supplying an even greater part of the world's future protein needs'. It should be understood, however, that only a portion (unknown at present) of the total estimated nitrogen in animal waste is economically recoverable as a potential protein source for animals. Also, there are obvious problems, including 'unwanted recycle' e.g. certain medicants, pathogens, and other contaminants, all of which require study.

Based upon nutritive value and freedom from medicants that often occur in other wastes, droppings from caged poultry, especially layers, appear to be the most suitable for recycling to ruminants.

Copies of the proceedings (numbering 183 pages) are obtainable at a cost of $6.00 per copy, from –

The Printing and Publishing Office, N.A.S.,
2101 Constitution Avenue, N.W.,
WASHINGTON, D.C. 20418

(News Report, August/September, 1973. National Academy of Sciences (National Research Council), 2101 Constitution Avenue, Washington, D.C. 20418)
Report No. 104.

YOUNG BEEFERS

Young cattle are efficient users of feed energy (almost equal to any meat-producing animal) but traditional systems of growing and finishing do not take advantage of this, according to W.B. Anthony, Department of Animal and Dairy Sciences at Auburn University, Alabama. The economics of feeding young cattle for rapid growth can be judged from the following example quoted by Anthony in respect of daily maintenance requirements of animals in different age groups. A 362 kg steer requires 2,9 megacalories of feed energy per day, as compared with 1,7 megacalories for a 181 kg calf. If the 362 kg steer gains 0,9 kg daily, energy cost of gain is 2,0 megacalories. When the 181 kg calf gains 0,9 kg per day it requires only 1,2 megacalories of feed energy. Thus 'pushing' for rapid growth while animals are young offers opportunities for conserving feed energy.

Two groups of bull calves were placed in dry lot at weaning, in one of the Auburn experiments and fed a corn silage-protein supplement ration. The data relating to this trial are shown in the table below. Feed dry matter per unit of gain averaged 6,36 kg, which confirmed that young animals grown rapidly to slaughter mass have relatively low feed requirement.

ENERGY UTILIZATION BY CHAROLAIS-CROSS CALVES AND PERFORMANCE FROM 180 TO 390 DAYS OF AGE

Item of measure	Result	
	Pen 1[1]	Pen 2[2]
Calf performance		
180-day weight, lb.	446	449
Final weight, lb.	1,053	1,110
Total gain, lb.	607	661
Average daily gain, lb.	2,85	3,07
Average daily feed consumption		
Corn	14,93	13,79
Corn silage	6,56	5,98
Auburn 65 supplement	0,55	0,49
Cottonseed meal	1,47	1,24
Coastal hay	1,57	1,78
TOTAL FEED	25,08	23,28
Energy use		
NRC requirement for maintenance, megcal	6,16	6,35
Feed required for maintenance lb.	9,07	9,37
Ration remainder for gain, lb.	16,01	13,91

[1]Fed corn-silage-supplement ration prepared daily.

[2]Fed same ration as Pen 1, except it was ensiled before feeding.

(Highlights of Agricultural Research. Vol. 20, No.3. Auburn Auburn, Alabama 36830)
Report No. 104.

DRAGTIGHEIDS DIAGNOSE OP SÕE

Ultrasoniese ontleding word toegepas om dragtige sogge in die kudde uit te ken. Deur middel van geluidsgolwe kan hulle so vroeg soos 30 dae na bevrugting uitgeken word, wat natuurlik voerbesparings vir boere beteken in die sin dat onproduktiewe eenhede in 'n vroeë stadium vervang kan

word. Die tegniek vereis 'n 3 kg ultrasoniese ontleder (wat in die hand vasgehou word), met 'n katodestraalskerm. 'n Voelpen, wat hoërekwensiegeluidsgolwe uitstraal en ontvang, word aan die ontleder gekoppel. In die V.S.A. kom die totale koste van hierdie toerusting op sowat $1 200 te staan.

Toepassing van die toets, wat maar 'n paar sekondes neem, geskied soos volg: Die sog moet gestaan laat word en redelik ontspanne wees. (Lê- of ineengedoke posisies is geneig om onbetroubare resultate tot gevolg te hê). 'n Paar druppels olie word om die punt van die voelpen gesmeer en die pen dan onder, teenaan die boud, ongeveer 5cm agter die naeltjie en net buite die speenlyn gehou. Die voelpen tel dan weerkaatste geluid op van die vloeistof om die fetusse en die weerklanke verskyn dan aan die regterkant van die katodestraalskerm indien die sog dragtig is. Weerklanke uit die liggaamswande van sogge wat nie dragtig is nie verksyn aan die linker kant van die skerm.

In die V.S.A. bestaan reeds verskeie ander tegnieke soos bv. die intrarektale-Dopplervoelpen (Lindahl, 1969) wat met welslae op skape toegepas word maar minder doeltreffend is op varke, aangesien die geskreeu van die sog die weerkaatste geluid deels verdoof. Dragtigheid kan gewoonlik eers na 50 dae vasgestel word. Voelpenne blyk ook die rektum te irriteer en verhoogde rektale verskuiwingssyfers tot gevolg te hê. Alhoewel hierdie probleme deur verdowing verhoed kan word en akkurate resultate verkry word, is hierdie prosedure nòg so vinnig nòg so goedkoop as die ultrasoniese metode.

Met gebruik van die ultrasoniese ontleder het fisioloog Philip J. Dziuk van die Universiteit van Illinois (Urbana) onlangs in veldproewe byna 100% akkurate resultate gehad in sy vasstellings t.o.v. dragtigheid onder 'n paar duisend sogge. Op 'n na-bestelling basis, kan die koste per sog so hoog wees soos $2. In groot kuddes, egter, kan dit so min wees as die voerkoste vir een dag.

(Agricultural Research.)
September 1973. V.S. Departement van Landbou, Washington, D.C. 20250)
Rapport Nr. 107

OPBLAASSIEKTE

Die hoë voorkomssyfers wat op sommige voerplase ondervind word het tot gevolg gehad dat sommige voerplaaseienaars die oorsaak van opblaassiekte aan kragvoer wyt. Op die Lethbridge Navorsingstasie van die Kanadese Departement van Landbou, sowel as op verskeie kommersiële voerplase, kom opblaassiekte as gevolg van kragvoerrantsoene wat op 'n vry-keuse basis gevoer word, baie selde voor. Dit is dus vermoedelik die gevolg van ander faktore, moontlik met betrekking tot voervoorbereiding, of verskille in diere-fisiologie, en nie die rantsoensamestelling as sulks nie.

Navorsers op Lethbridge het onlangs gevind dat die herkouingsvloeistof van koeie op fynkorrelvoer baie skuimerig was, terwyl dit geensins of skaars skuimerig was op dieselfde rantsoen wat net grofgemaal was. 'n Ondersoek van die mikroflora binne die grootpens van koeie op die fyner voerrantsoen het breuke in baie van die bakterieë en protosoë getoon.* Hierdie ontdekking het gelei tot die vermoede dat mikrobiese selinhoud wat in die herkouingsvloeistof uitloop, 'n verhoging in herkouingsvloeistofviskositeit mag veroorsaak.** Aangesien opblaas gewyt word aan gas in die skuim wat deur die mikroflora van die grootpens opgewek word, is dit nie onwaarskynlik dat die meer viskeuse vloeistof die oorsaak van opblaas mag wees. Trouens, die viskositeit van herkouingsvloeistof van koeie op die fyner voerrantsoen was meer as tweemaal so dik as die vloeistof van koeie op dieselfde rantsoen wat net grofgemaal is.

*Hierdie stelling is bespreek met dr Snyder, mikrobioloog van die V.S. Departement van Landbou se Dierevoedingslaboratorium te Beltsville. Hy meen dat glukose moontlik as gevolg van die fyner voer makliker beskikbaar is, wat oorvulling van die groter protosoë asook die gevolglike breuk daarvan kan veroorsaak, maar dat dit nie die herkouingsbakterieë op sodanige wyse sou affekteer nie.

** Alhoewel hierdie stelling betwisbaar is, is die ontdekking dat opblaassiekte waarskynlik deur benutting van grofgemaalde voer verminder kan word, nietemin van groot belang.)

Skuimweerders

Amerikaanse navorsers berig dat 'n nuwe skuimweerder met die handelsnaam Polyoxalene teen opblaassiekte doeltreffend is vir 'n tydperk van twaalf ure mits dit in genoegsame hoeveelhede ingegee word. Die koste van aanvullingstoediening en die vereiste van akkurate en reëlmatige toedienings moet egter in berekening gebring word.

Weiding

Die opblaaseienskappe van peulplante soos lusern en sommige van die klawersoorte is bekend. "Sainfoin" *(Onobrychis viciaefolia)* is egter baie voedsaam en geen probleme met opblaas is tot dusver ondervind nie. Die rede hiervoor word tans ondersoek. Die navorsers het reeds gevind dat peulplante wat opblaas veroorsaak, soos lusern en sommige klawersoorte, 'n hoë oplosbare proteïeninhoud het, waar dié van "Sainfoin" maar laag is. Hierdie ontdekking was verbasend aangesien die totale proteïeninhoud van iedere peulsoort vergelykbaar is. Die vermoede is dat een of ander bestanddeel in "Sainfoin" chemies met die oplosbare proteïene reageer wanneer die plant vergruis word.

Tannien presipiteer proteïene. Hierdie reaksie kan egter deur gebruik van poliviniel-pirrolidoon (PVP) voorkom word. Die hoeveelheid oplosbare proteïene wat op hierdie wyse uitgehaal is, is gelykstaande aan dié van lusern en klawer. Dit wil dus voorkom dat die rede hoekom „sainfoin" nie opblaas veroorsaak nie die feit is dat die tannien wat dit bevat 'n presipiterende uitwerking op die opblaas-veroorsakende proteïene het. Ander proewe het bewys gelewer dat „sainfoin" baie meer tannien bevat as die opblaas-veroorsakende voergewasse. „Trefoil", „Crown vetch", asook „sericea" en „Korean lespedezas", geen waarvan opblaas veroorsaak, bevat almal aansienlike hoeveelhede tannien. Die tannieninhoud van „birdsfoot trefoil" wissel van nul in varieteite soos Leo en Empire, tot redelik baie in die Cascade-varieteit. Die variëteite wat nie tannien bevat nie, bevat egter min proteïen. In hierdie plant, wat nie opblaas veroorsaak nie, mag dus twee faktore betrokke wees, nl. lae proteïen en/of hoë tannien-inhoud.

Die ondersoeke dui ook aan dat geen van die opblaas-veroorsakende peulplante proteïen-presipiterende tannien bevat nie, terwyl sommige van die peulplante wat dit nie veroorsaak nie, aansienlike hoeveelhede bevat. Dit is nie te sê dat laasgenoemde dit nie veroorsaak omdat hulle tannien bevat nie. Moontlik is daar ander faktore by sulke voergewasse betrokke, bv. lae proteïeninhoud. Die moontlikheid is al geopper dat ondergrondse klawer 'n lae opblaaspotensiaal het omdat dit taai is en die plant-inhoud nie baie maklik losgelaat word nie. Indien tannien op genetiese wyse ingevoeg kan word binne die opblaasveroorsakende voergewasse, mag dit stamme tot gevolg hê wat nie opblaas veroorsaak nie.

Peulplante soos „crown-vetch" en „lespedezas" wat baie tannien bevat, word soms deur beeste afgekeur, waarskynlik a.g.v. tannieninhoud, „Sainfoin" en „trefoil"-soorte, wat ook baie tannien bevat, skep blykbaar nie hierdie probleem nie, wat tot die gevolgtrekking lei dat verskillende soorte tannien hier betrokke is. Plante mag dus in die toekoms geteel moet word met die oog op tanninesoort en nie net tannieninhoud nie.

Canadag Agriculture, Ottawa, Can. Vol. 18, Somer 1973, Kan. Dept. van *Landbou, Ottawa; Canadex.* No. 401.55, CDA Res. Sta. Lethbridge; *Range Devel. & Improvements.* Brigham Young University, Provo, Utah; Persoonlike Meded.)
Repport nr. 107.

ONCE-A-DAY FEEDING OF DAIRY CALVES

Feeding whole milk to dairy calves once a day has been shown to be practical provided it is coupled with high quality management. The use of a powdered milk replacer in place of whole milk on a once-a-day basis should also be satisfactory, according to researchers of the Utah State University at Logan, Utah. Although once-a-day feeding

reduces by nearly 50% the labour required for preparing feed, feeding and washing equipment, calves must be observed very closely at least twice a day for signs of sickness. If they do not have access to drinking water, this has of course to be provided twice a day. Possible disadvantages (other than the need for close observation of each individual calf) are:

(a) the slightly higher feed costs associated with the increased grain consumption resulting from once-a-day feeding; (This is, however, offset by the increased growth of the calf) and

(b) excess colostrum and unsaleable milk that would normally be fed to calves at the other feeding each day. (This could be eliminated by feeding some of the calves in the morning and the others at night, an additional advantage being that attention would then probably be given to them twice a day).

In a study conducted by the Utah researchers, calves fed milk once a day were healthier, started eating grain better, and grew faster (0,662 kg per day vs. 0,581 kg. per day) than those fed twice a day in an experiment a year earlier. The faeces of calves fed once a day appeared whiter (especially during the first few days) but were not loose and did not have the typical odour of scours. Presumably this condition resulted from the larger volume of milk fed at one time*; it did not appear to have a detrimental effect on the calves, however. (*Calves were fed 2,83 litres (3 U.S. Quarts) of whole milk once a day for 4 to 7 days, then 3,78 litres per day, all in one morning feeding, for a period of 5 weeks. The amount was then reduced to 1,90 litres per day for 1 week, after which milk feeding was completely stopped.)

Water was offered to each calf twice per day and, beginning at about 1 week of age, good-quality lucerne hay and free access to grain. Calves were housed in individual pens until 4 months of age.

In terms of sickness and death losses, the trial was a success. No deaths occurred among the calves fed once-a-day, while instances of scours and pneumonia were not higher than normal. It is suggested that once-a-day feeding probably did not reduce sickness or save any calves but that this could rather be attributed to the excellent care and very close attention by the herdsman.

Results of experiments conducted by researchers of the North Louisiana Experiment Station at Calhoun, Louisiana, support these findings and show that calves will make satisfactory gains when fed whole milk or a milk replacer once a day to 42 days of age. As far as milk replacers are concerned, the quality of the replacer is of utmost importance, especially on once-a-day feeding: in the Louisiana study, replacers derived from all-milk sources were found to be superior to those containing plant materials, the mortality rate in the four trials being the most significant factor.

(*Utah Science*. Vol. 34, Utah State University, Logan, Utah
Louisiana Agriculture, Vol. 17, No.1, Agricultural Experiment Baton Rouge, Louisiana 70803).
Report No. 109.

'SUDDEN DEATH' SYNDROME IN CATTLE

Cattle feeders in the Southwestern United States are becoming increasingly concerned about the high incidence of what is known as the 'Sudden Death' syndrome which results in mortality in the feedlot, involving beef steers or heifers. In the final days of fattening (at approx. 453 kg. mass) steers or heifers unexpectedly collapse and die, usually while eating at the feed trough and cause of death does not show up in an autopsy.

The injury which is observed most often at autopsy is haemorrhage and swelling in the tissue located near the thoracic inlet and extending forward along the trachea. Bloat is often noticed and there is often a distention of blood vessels in front of the diaphragm. In some reports, gas formation was present in the affected tissues. Careful dissection and examination of the heart muscle have not shown any tissue injuries. It is believed that the bruised neck regularly found in victims, comes from the animal leaning against the concrete bunk when reaching for feed. In some cases, however these troughs are only 45,7cm high and the steer has merely to bend down to eat out of them, which would not explain the ruptured blood vessels in the necks of some victims.

Promising theories which have emerged thus far appear to be –

* that an animal weighing 408 - 499 kg possibly establishes an area of irritation and increased vascularity in the region of the thoracic inlet by leaning against the feed trough and reaching out in the normal process of eating. If there is an increased vascularity in the area and possibly the vessels become more fragile, this would enable a sudden shower of clostridia organisms to occlude the vessels and permeate the surrounding tissues, initiating a site of infection;
* over-consumption of high-concentrate rations, although this is difficult to evaluate on an individual animal. (In all cases the rumen is full of recently consumed ration);
* lactic acidosis – although diarrhea is not observed;
* changes in climatic conditions;
* minute changes in the physiology of the rumen, which might enable some of the microflora to produce a lethal toxin;

Sudden death, incidentally, occurs in straight-bred animals as well as in crossbred steers and heifers; ancestry and sex apparently have no bearing on the problem, therefore.

(*National Livestock Producer*, Sept. 1973. 155 N. Wacker Drive, Ill. 60606)
Report No. 112.
(Rapporte Nrs. 92, 96, 100, 105 en 114 bevat keure uit die literatuur.)

SOUTH AMERICA

Agricultural Counsellor, South African Embassy, Marcello T. de Alvear 580-8° Piso, Buenos Aires, Argentina

Report No. 8 gives a review of 'Beef Production in Paraguay, Report No. 11 'Results and Possibilities of Crossbreeding in Beef Cattle on the Pampa of Argentina" and Report No. 12 outlines the CREA movement (farmer-sponsored regional study groups with reference to agricultural productivity).

UNITED KINGDOM AND SCANDINAVIAN COUNTRIES

Agricultural Counsellor (Scientific).
South African Embassy, Trafalgar Square, London W.C.2N 5DP, England.

FROZEN EMBRYOS OPEN UP NEW EXPORT HOPES

The birth of a healthy Hereford-type bull calf at a Cambridge research unit may lead to a totally new way of exporting livestock. The calf was born after being deep frozen for six days as an embryo. Agricultural Research Council scientists who developed the technique say it should be possible to store embryos for decades – even centuries. Valuable stock could then easily be transported

as frozen fertilized eggs to any part of the world.

The technique of freezing cattle embryos was pioneered at the ARC' unit of reproductive physiology and biochemistry. Key to the whole operation was the slow rate of freezing the embryos. Fertilized eggs were taken from a Hereford x Friesian heifer in its tenth day of pregnancy. The heifer had earlier been injected with pregnant mare serum to induce superovulation.

The embryos, each containing several hundred cells, were placed in a medium containing an anti-freeze agent to cut down the amount of ice formed in the freezing process. The eggs were cooled at 0,2°C a minute, and stored in liquid nitrogen at -196°C.

Six days later two eggs were thawed rapidly at 36°C a minute. The medium was washed off and one egg was implanted in each horn of the uterus of a non-pregnant heifer – the host mother. One foetus died early in pregnancy, probably as a result of freezing damage. But the other survived and was born as an 80 lb bull calf.

Much research remains to be done before the process is perfected. Though it has since been repeated 10 times, no more host mothers have become pregnant. But the potential of the technique is enormous. When two eggs are transferred to non-pregnant heifers by planting eggs in each horn of the uterus, 73 per cent produce twins. When techniques have been developed by which embryos can be stored and then transferred into the uterus by a nonsurgical method it will be possible to produce twins on a large scale.

Mr. L. Rowson, the unit's deputy director, said a method of low-temperature preservation would ease the transport of embryos both within and between countries. It would also be possible to apply the same quarantine regulations as are now applied to frozen semen. This would allow the transport of valuable genetic lines into countries like Australia, which enforced strict health regulations.

Report No. 114.

PICK THE WINNER BEFORE THEY HATCH

Poultry breeders may soon be improving their stock through selection based on embryonic heart beats. Scientists at the Poultry Research Centre, Edinburgh, have developed a method of measuring the rate of heart beat of developing chick embryos in incubators, and have discovered that there is considerable variation between different strains and families of chickens.

"We are going to check on the performance of chicks hatched with different heart beat rates, and if there are significant differences breeders could soon be selecting stock on the basis of heart beat rate", said Mr K.F. Laughlin, scientists in charge.

Special incubators have been built to carry out the experiments. Simultaneous monitoring of 84 different embryos is possible in one 400 egg incubator. To record heart-beat rate, three probes are pushed through the shell of each egg. The probes are wired through an electronic device to a computer which records the data from the 84 developing embryos.

The heart-beat recording technique has been applied to several types of egg, including the small egg laid by the Japanese quail. With chickens the embryo heartbeat signal is strong enough to be recorded from the 14th day of incubation. The biggest variation in the rate in the individual chicken embryo occurs from the 19th day of incubation until hatching at 21 days. Heart beat rates between different families have varied from 250-274 pulsations a minute. Turkey and duck embryos have a rate of 220-230, while quail embryos were discovered to have a rate of 310 pulsations a minute.

Heart beat rate was also found to vary with small changes in incubator temperature. A 1°F change in incubator temperature was found to give as much as a 10% difference in the rate.

Should incubator selection become a commercial proposition it is expected to reduce the overall costs of breeding programmes, as wastage in growing chicks and selecting from them at a later stage will be reduced.

Report No. 114.

SYNTHETIC FOOD

Single-cell Proteins

In the next hour, the world's population will increase by 6,000 and, using conventional techniques, it will require another two-and-a-half square miles of intensively cultivated land to feed them. Using unconventional techniques, however, the total protein requirement of that same 6,000 people could be met by the output of a medium-sized protein factory, using waste products and growing yeast or bacteria instead of crops and cattle.

On average, cattle take two to four months to double in weight, chickens take two to four weeks and plants between one and two weeks. Yeasts and bacteria can double their weight in twenty minutes. To put it another way, a 1000 lb steer takes a day to add ½ lb of useable protein to its weight; 1000 lb of yeast can produce four tons of protein in the same time.

Proteins from yeasts, bacteria and algae are at present more likely to be used in animal feeds.

These so-called single-cell proteins (SCP) are likely to have a big impact on animal nutrition in the near future. A plant built and run by British Petroleum, capable of producing 100,000 tons of protein a year, will be in operation in the next few years. Trials with SCP by BP show that use as a substitute for high-grade protein in pig and poultry feed causes no problems.

Production of single-cell proteins has been stimulated by protein shortages this year which have put the pressure on compounders and animal feeders. An examination of requirements of high-grade proteins shows the demand that could exist for micro-organisms. In the UK 14,2 million tons of animal feed a year are needed. This contains 1,9 million tons of high-grade protein such as fishmeal or soya. In the EEC the total feed requirement is 45 million tons, containing 6 million tons of protein.

Anything that makes protein supply more reliable will be used. Governments in Western Europe are expected to encourage the production of single-cell protein from these novel sources. The EEC farm fund (FEOGA) is said to be considering the possibility of giving grant aid to such developments with an eye, no doubt, to ensuring that enough animal feed is available to provide the meat that Europe will need in the 1980s.

'Tropina', the first commercially produced single cell protein (SCP) derived from petroleum, has been placed on the market by the French BP subsidiary in Cap Lavera. The product, said to be tasteless and odourless, has 70% protein and contains 7,8% lysine.

The yearly capacity of the Cap Lavera facility is 16 500 tonnes. A larger plant with an output of 100 000 tonnes per year is planned. Chances to market the synthetic protein are viewed as good by the BP concern, since in 1972, France imported 1,4 million tonnes of protein feeds of which 1,3 million tonnes were soyabean and 80 000 tonnes fishmeal.

Two types of calf feeds are also marketed by Cap Lavera. Trials are underway of enriching the SCP with carbohydrates such as starch, dextrose and lactose.

In Italy, an associate of Esso reports signing an agreement with Kanegafuchi of Japan to produce synthetic protein (for animal feed) through a process developed in Japan. Construction has begun at Reggio de Calabria on a factory that will annually produce 100 000 tonnes of proteins, 50 000 tons of citric acid and derivates, 100 000 tonnes of fatty acids, and 10 000 tonnes of amino acids. The protein producing facility will be supplied with N-paraffins by a plant now under construction in Augusta, Sicily, which will produce 650 000 tonnes annually. Both plants will be the largest of their kind in the world and both are scheduled to reach full production in 1974.

(This was before the oil crisis. **Ed.**)

Mycoproteins

The scientists at the Lord Rank Research Centre, High Wycombe, Bucks, have devised a process for converting relatively cheap and carbohydrate-rich raw materials into a nutritious, highprotein food. The Ranks Hovis McDougall process offers the prospect of a virtually limitless supply of mycoprotein to compete with meat – and to sell at about 20p to 25p a lb.

RHM is challenging the livestock industry with a microscopic fungus which occurs naturally, and widely, in the soil. It is far bigger than either yeasts or bacteria and grows to form a mycelium. Under optimum conditions – which do not occur naturally – mycelia cluster into a tangled mat of fibres. This mat is itself the protein product of the RHM process. And it is on the creation of such favourable mycelia growing conditions that research and development work at High Wycombe has been concentrated.

A £3 million investment over seven years has produced a two ton a week capacity from a small pilotplant. And, more important, the process has progressed from production of mycoprotein in batches to a continuous flow system.

First step is the preparation of the nutrient medium in which the microfungus grows. The carbohydrate source is mixed with essential salts and minerals and the solution sterilized by high temperature treatment. At this stage the microfungus is introduced from a master culture produced in RHM's laboratories. Fermentation, the process in which the organism grows on the nutrient medium, is then carried out in large, stainless steel vessels. Environmental conditions during fermentation are critical. Such factors as temperature and acidity are controlled within narrow limits, and oxygen is bubbled through continuously. Any change in conditions is monitored and corrected by computer every 10 minutes.

Through the system of continuous flow, nutrients are constantly fed into the fermentation vessel and mycoprotein is constantly drawn off. The relatively large size of the microfungus simplifies the job of harvesting. It is first separated from the nutrient solution by a basket centrifuge; the mycoprotein emerges in a form similar to sheets of damp cardboard. After chopping, it is dried in a current of warm air which leaves a free-flowing, granular solid. Particle size can be controlled. The end-product is a buff coloured material with a slightly savoury flavour and a protein content of up to 50%.

The High Wycombe researchers claim that RHM mycoprotein is the first vegetable protein with the biological value of animal protein. RHM mycoprotein has an amino-acid profile very close to that of the FAO standard. Bacterial and yeast proteins by contrast, are low in the essential sulphurcontaining amino-acids. The achievement of animal protein quality by a vegetable protein is considered an important breakthrough.

The filamentous structure of RHM mycoprotein means it can be produced in a number of different forms without texturing. It can be chopped while wet into meat-like chunks. It can also be baked, fried or puffed into a product like rice. Thus in its final form it can be adjusted to suit the customs of the market to which it is being sold.

Supplementation with the missing amino-acids is common for animal feeds, but for human foods it is difficult, because the added substances could produce undesirable flavours, or be lost in the cooking water.

Microfungi grow at a slower rate than yeasts or proteins. This produces lower levels of RNA in the microfungal protein and results in it being more suitable than the other organisms for human consumption.

RHM scientists do not claim that mycoprotein will oust meat from the protein market. But they expect it to complement increasingly expensive meat supplies.

RHM's microfungus has one big advantage over its farmyard competitors. It can convert carbohydrates to protein with an efficiency no class of livestock can match. The mycoprotein process operates at a conversion rate of 2:1. And the final product contains no water – just 50 per cent protein and 50 per cent energy. By contrast pigs have a food conversion ratio of 3 or $3\frac{1}{2}$ to one, and cattle of about 5:1. And 75 per cent of the final meat product is water.

Investigations into nutritional quality and possible toxic effects are being made. If these are favourable, RHM aims to start commercial production of its mycoprotein in three years' time. An annual UK production of 15 to 30 thousand tons should then be possible.

Mycoprotein holds the promise of cheap protein for all parts of the world because it can be produced from any local carbohydrate-rich crop such as potatoes, yams and sugar. It should do much to ease the protein shortages in underdeveloped countries. In the developed world its high quality and fibrous texture should guarantee its competitiveness as a meat replacement and general food raw material.

Vegetable Proteins

Courtaulds are nearer to developing the perfect "beansteak" than anyone else in Europe. Behind their development is the field bean, not the more popular soya bean that has been used so extensively for protein extraction and protein fibre production in the U.S.A. Both beans, however, contain high proportions of protein and have long been major world food sources. The development of mock meat has given the bean story a suitable 20th century boost.

Although the Courtauld system, producing the bean-based food called Kesp, is using field beans, most of the large-scale development work on bean protein isolates and concentrates has been carried out with soya. Technically, protein from field bean is similar to that in soya, the field bean protein being slightly higher in lysine.

In the USA the soya production and protein industry is large and technologically advanced. About 30 million tons of soya beans are produced there each year, and a steadily increasing quantity is going into protein production for human consumption.

Bean protein is established as a human food because of its good functional properties. Defatted isolates and concentrates are normally white powders. When used as additives, as in bread making, they do not harm the appearance or consistency of the product.

There have been problems. Removing the bitter, beany falvour in soya extract has been difficult. However, the application of moist heat has been partially effective, although this process produces other taste side effects. There are also digestibility problems. Some constituents pass into the bean flour and can cause trouble although a smaller quantity is contained in concentrates and isolates than in the raw bean. This factor can, however, be removed to some extent by enzyme digestion treatment of the protein isolate.

There has been less work on field beans but, since Ranks Hovis McDougall linked with Courtaulds, the field bean development has been dramatic. Roughly, the programme is split in half. RHM buys the beans and processes them to extract the fat and carbohydrate. The protein isolate goes to Courtaulds for Kesp and the residue is used by RHM for mycoprotein production as a base on which to grow the organisms.

Courtaulds spin the isolate into protein fibre. The process is different from that used by companies in the USA like General Mills. These companies are producing extruded, rather than spun, protein. Courtaulds claim a quality advantage. It was a natural progession for them to move on from spinning nylons to spinning proteins. The technology for spinning out socks and stockings is the same as that for spinning out the raw material for steaks. But spinning makes Kesp expensive compared with other new protein foods, especially as Courtaulds also prepare and freeze the product. Nevertheless, the firm claims that Kesp foods contain protein and fat in the same ratio as stewing steak but that they are 30 per cent richer in each. This is where they differ from the extruded protein foods, the main ingredients of which are protein and carbohy-

drates – not fats. Particular advantages claimed over traditional meat include elimination of waste – no bone, gristle or extraneous fats to deal with. In all other respects Kesp can be treated as traditional frozen food. The real advantage that Kesp has over meat as a protein source is its cost. Even though it is acknowledged to be more expensive than vegetable-based competitors because of its texturing and freezing, Kesp, marketed as 'beef-like' chunks, cost only 18p a lb. The 'chicken-like' chunks cost 25p a lb and unflavoured chunks cost 15p a pound.

Courtaulds also market a dehydrated form of Kesp, which is similar in constitution and appearance to the many dehydrated soya bean-based protein foods already on the market. The 'beef-like' dehydrated Kesp costs 42p a lb but, with water added, the price is proportionately less than the frozen product. Other, similar products can be even cheaper. A soya bean-based textured protein on sale in Britain costs only 7p a lb when reconstituted with water.

Although meat cannot compete with these prices, the texturised protein foods are only on the fringe of the consumer market. Their outlets are through health foods shops which push the vegetable base as a selling point to people who are afraid of eating too much animal fat. The other main outlet is to caterers and food manufacturers. Food manufacturers are using the meat analogues as additives in meat products. Kesp and similar products do not reduce in bulk during cooking like real meat and are useful as additives.

Dr Magnus Pyke, leading enthusiast for the new generation of protein foods, forecasts that the growth of spun and extruded bean-based proteins will seriously affect traditional meat eating habits of Western society. If this happens, the development of texturised protein like Kesp could be the best thing that has happened to field bean production in the crop history.

(Farmer's Weekly, Britain. *Agra Europe.* 2 May, 1973)
Report Nos. 114, 115, 116 + 117 and No. 8 of the Europe Series.

Gas Proteins

Imperial Chemical Industries agricultural division intend to produce 100,000 tons of high protein animal feedstuff a year from North Sea Gas.

Protein level will be in excess of any other feed ingredient available, the company claims.

The £15 million project has to be passed by the firm's main board, but Teesside is the likely site, and building should be finished by 1976. A 1,000-ton pilot plant should be commissioned in the next few weeks.

At present the UK consumes about 2 million tons of protein feedstuffs yearly. Protein supplies are short – fishmeal has almost disappeared from the market, and the price of soya beans has risen by more than 300 per cent this year.

Report No. 117.

SELECT-A-SEX A.I. SERVICE

During the last two months farmers in Holland have become the first in western Europe to select the sex of calves when arranging for normal artificial insemination. The scheme is operated by the farmer-owned AI service and costs an extra 60p an insemination. While it does nog give 100 per cent success, it does give the farmer a 65 per cent chance of getting the sex of calf he wants rather than the normal 50 per cent probability.

The scheme is being operated in two provinces where top secret East German machines for separating male and female sperm have been installed, and operated under licence. The East Germans plan to patent the idea and only those involved in operating the scheme are allowed near the machines. 'I have not seen them myself', said Mr J.H.G. van Wijhe, director of the farmer-financed Provincial Animal Health Service for Zuid Holland at Gouda. 'We are lucky to have one at this centre and we are in at the beginning of one of the most exciting developments yet in animal breeding. The potential is tremendous and this is the third revolution folowing the development of AI itself and deep-freezing techniques'.

While it was too soon to measure the success of the method, the East Germans had guaranteed a 65:35 ratio of births according to choice and two months' experience had clearly indicated higher than average sperm fertility and successful first services.

(Farmer's Weekly. Britain)
Report No. 116.

FOOT-AND-MOUTH VACCINE PRODUCTION IN THE U.K.

A British-owned international drug company, the Wellcome Foundation, says it can produce millions of doses of foot-and-mouth vaccine in a single batch for emergency use and claims to be the only manufacturers producing vaccines against all seven types of foot-and-mouth virus. Its research and production unit at Pirbright, Surrey, can produce large amounts of vaccine with a new 4,000-litre culture vessel using hamster kidneys instead of live animals. The virus is inactivated so it can be transported without risk. Eight manufacturing centres around the world are geared to the same production method.

Report No. 116.

UK BEEF PRODUCTION

Output of beef from UK farms will rise rapidly over the next two years, according to the preliminary results of a study by Prof. George Allen, professor of agricultural economics, Aberdeen University. Output in 1972 was estimated at 902 000 tons but would rise to between 922 000 and 938 000 tons this year, 1 006 000 to 1 022 000 tons in 1974 – equivalent to an annual percentage rise of 2,2 to 4 per cent and 9 to 9,1 per cent respectively. Imported stores are expected to fall from 476 000 last year to between 360 000 and 440 000 in 1973 and 320 000 to 400 000 in 1974.

Report No. 116.

NOW MILKERS CAN HAVE THEIR CAKE AND DRINK IT

The 60 cows on the Dutch ILR research station at Duiven support British findings that cows will eat more concentrates faster in liquid form. The Duiven herd gobbles up liquid feed at least twice as fast and occasionally three times as fast as they would eat dry cubes or pellets.

Unlike other liquid feed systems ILR uses an instant-mix. There are no holding tanks to keep clean and stirred, where feed can get stale, only hoppers containing the 'floured' concentrates and a supply of water at 20°C. The meal is metered down a chute above the manager by vibrator with an accuracy claimed to be within 1 per cent. It passes through a curtain of warm water formed by nozzles $\frac{1}{2}$ cm apart in V-formation and emerges into the trough as a slurry in the proportion of one part water to $2\frac{1}{4}$ parts meal.

The Duiven herd used to eat 350 grammes a minute of 8 mm pellets or 450 grammes a minute of 5 mm pellets. On the liquid feed they consume an average of one kilo. Some take in twice this amount.

The device built by the institute uses an electric valve from a washing machine to control the flow. Feed amount is controlled from a central panel as the cows file into the 5:5 herringbone. Eventually the researchers hope to develop electronic neckbands that will identify the cow and instruct the feeder to deliver her individual ration as she puts her head in the manger.

Report No. 116.

DRIED GRASS IN THE DAIRY RATION

Experiments in Northern Ireland, at the Agricultural Research Institute, Co. Down, and at Loughry Agricultural College, Co. Tyrone, have indicated that to feed dairy cow-

4,2 lb of dried grass a gallon would give the same milk yield and body mass changes as dairy concentrate fed at 3,9 lb a gallon.

Thirty-four Friesian and Shorthorn cows were used in the experiments which were carried out over a 10-week period during winter, when the basic ration was silage with an analysis of 20-21 IDM and 14-14 protein. During the three-week standardization period before the trial started, all the cows were given 3,9 lb a gallon of concentrate made up of 36 per cent barley, 38 per cent maize and 22 per cent groundnut meal plus minerals.

	Dried Grass	Concentrate
Dry matter	89,1	86,7
Crude protein	20,8	19,4
Crude fibre	24,5	4,8
Ash	10,4	6,8

The composition of the concentrate and of the dried grass are compared in the table.

During the experiment, one group of cattle remained on the concentrate and the rest were fed dried grass at four different levels: 2,8 lb; 3,9 lb; 5 lb and 6,1 lb a gallon of milk. At these different feed levels the output of milk in gallons a day was approximately 2,83; 3,5; 4,1 and 4,2 and the control batch of cows on concentrates was given 3,7 gallons a day.

All the cows were individually weighed to give details of their biomass change during the trials. The results of milk production combined with biomass change indicated that the conventional 3,9 lb a gallon of concentrates could be replaced by 4,2 lb of grass wafers of this quality.

The trial gave better results from dried grass than have been obtained in other experiments. The research workers, F. Gordon and J. Kormos, suggest that higher digestibility may be obtained from feeding mixed diets of silage and dried grass than might be expected from their individual digestibility.

Report No. 116.

SCOTS TRY TO STANDARDISE FAT CHECKS

A method of describing the body condition of cattle has been developed by East of Scotland College of Agriculture in an attempt to establish a universal system of measurement. The system, called condition scoring, is designed to assess more scientifically the degree of fatness in cattle. The college has issued a bulletin on condition scoring in which Mr Ken Runcie, head of the Animal Husbandry, Advisory and Development Department, says: 'We hope condition scoring will provide a standard basis of description for use by workers in the research and development field of beef production. We also hope it will improve communications between them and make the results of trials more understandable to the progressive farmer'.

The college initially applied the system to suckler cows, monitoring changes in body condition over a two-year period. Then it included condition scoring of beef animals and suckled calves.

An animal's body score is calculated by the level of fat covering five areas of the body. These are the hip bones, around the tail head, at the second thigh, over the lower rib cage, and on the thorny parts of the lumbar vertebrae. The level of fatness is assessed by handling the animal at each of these five areas. After examination an overall score is awarded on a 0-5 scale.

An animal scoring 0 would be emaciated with hip bones, tail head, ribs and vertebrae projecting prominently. No fatty tissue would be detected and neural spines and transverse processes would feel sharp.

An animal scoring 1 would still have prominent hips, tail head and ribs, but would feel less 'sharp' when touched. There would still be no fat round the tail head and individual vertebrae would be sharp to the touch.

An animal recording a score of 2 would have some tissue cover round the tail head, above the hips and flank. Ribs would still be felt with slight hand pressure, but would no longer be obvious. The vertebrae could be identified individually when touched.

Animals scoring 3 would have some fat on either side of the tail head, which could be easily be felt. Hips would be less prominent and feel rounded. The lumbar vertebrae could be felt only with strong pressure.

Score 4 animals would have slight rounds of fat on the tail head while hips would be covered with tissue and no longer feel hard. Spinous processes would no longer be felt and folds of fat would be developing over ribs and thighs.

The bone structure of an animal scoring 5 would no longer be noticeable and the animal would have a blocky appearance. Hips and tail head would be almost completely buried in fatty tissue and there would be folds of fat over ribs and thighs. Vertebrae would be completely covered by fat and the animal's mobility would be impaired by the amount of fat carried.

While these examinations are possible by hand, the college also uses a scanogram provided by the Meat and Livestock Commission, which gives an accurate measurement of fat depth. It scans the animal's body over the ribs from the backbone towards the bottom of the rib cage. The college has carried out tests using both methods and found a high level of agreement in the results.

Report No. 117.

HEIFERS AT RISK WHEN PUT TO EXOTIC SIRES SAYS BRITISH INVESTIGATION COMMITTEE

German and Swiss Simmental and Limousin produce high rates of mortality and serious difficulty when used on heifers. This is the conclusion of Professor William Holmes's committee at the end of its calving survey of these breeds. The committee examined the records of 13 German Simmental, 10 Swiss and six Limousin sires all owned by AI organisations, on Friesian and Ayrshire dams.

Results in terms of calf death and difficult calvins are shown below. The figures 'provide ample confirmation of the warning given at the outset by the tests committee, the Ministry and the AI organizations that bulls of large breeds should not be used on heifers.' The Charolais and Herefords used for comparison were progeny-tested for progeny traits at about the same time as the imported sires. Figures issued by the MMB for its 11 Simmental sires showed a range in mortality from 2,6 to 9,2 per cent and for dystokia from 1,3 to 7,5 per cent. The Milk Marketing Board has compared these results with figures for 27 Herefords and 10 Charolais. The Herefords' percentage of difficult calvings averaged 0,9 and ranged from nil to 2,7. Calf deaths averaged 2,7 per cent and ranged from 0,6 to 5,1.

Percentage difficult calvings for the Charolais averaged 3,6 and mortality was 4,7. Dystokia ranged from 1,3 per cent to 6,5 and deaths from 1,7 to 7,7.

The Holmes report shows that average gestation length for cattle in-calf to Charolais and Simmental were similar – 285 days for cows. With cows the gestation was two to three days longer than when Hereford crosses were carried, three to four days longer than Friesians carrying a pure-bred calf. Limousin showed the longest gestation, five days more than the Hereford cross, six days more than the Hereford, six days more than the Friesian. Longer gestations were associated with greater calving problems.

Average birth mass for calves out of Friesian heifers were 90 lb for German Simmental in Scotland, slightly more for the breed in England and Wales, and 88,9 lb for Swiss Simmentals. With cows the figures were 95 lb and 97,2 lb. Limousin-sired calves out of heifers averaged 84,3 lb at birth and out of cows 91,5 lb.

Examination of difficult calvings from Friesian cows shows the close relationship between long gestation, high birth mass and hard calving. For instance, in difficult calvings involving Swiss Simmentals the average birth mass was 118,3 lb and the gestation length 288,4 days. Limousin crosses were carried longer than any breed in the survey.

Colour markings were also investigated. The committee says: 'It seems clear that the Simmental breeds do not colour-mark their progeny as consistently as the Hereford breed. They also produce a wider range of colours and fewer white heads'.

The committee points out that the data on calving is only part of the over-all evaluation of these breeds. It is necessary to 'balance, in economic terms, the advantages and disadvantages from these traits with those from other production traits, growth rate, feed efficiency and carcass quality.'

	Calves X Friesian cows		Calves X Friesian heifers		Calves X Ayrshire cows	
Sire	% mortality	% dystokia	% mortality	% dystokia	% mortality	% dystokia
German Simmental	4,0	3,3	6,4	5,5	5,7	4,3
Swiss Simmental	4,8	3,7	19,4	13,9	6,1	2,5
Limousin	3,2	2,4	11,8	8,8	4,7	0,8
Charolais	5,5	5,4	..	..	..	..
Hereford	2,7	0,9	5,0	2,5	..	..

Report No. 117.

BOOK REVIEWS

BOEKRESENSIES

AN ATLAS OF VETERINARY SURGERY

JOHN HICKMAN AND ROBERT G. WALKER

Edinburgh: Oliver and Boyd, 1973. Pp. x + 208. many figs. Price £9

Before embarking on the description of operations, operating theatre routine, preparation of the patient and surgical approach are described. The following chapters are concerned with regional or body system surgery.

As the name of the book indicates, it is an atlas; the photos mainly show phases in operation theatre routine and instruments. Surgical technique is illustrated by numerous drawings which serve the purpose for which they are intended.

The operations include all domestic species. Mostly common procedures are described, although rarer operations are included, while other common operations are left out. A complete presentation without any gaps would have been too much to expect in any book of such a limited size.

The authors recommend it particularly for students and general practitioners. Both groups will derive benefit from reference to this book. The existing gaps, however, will require the surgical lecturer, if he prescribes it as a textbook, the augment it copiously or supplement it with other works on operative surgery. The practitioner will find it a handy reference for brushing up his knowledge of various techniques, as this work has the necessary attributes of clarity and aesthetic appeal.

C.F.B. H.

EVALUATION OF MERCURY, LEAD, CADMIUM AND THE FOOD ADDITIVES AMARANTH, DIETHYLPYROCARBONATE, AND OCTYL GALLATE

WHO FOOD ADDITIVES SERIES NO. 4

Geneva: World Health Organisation, 1972. Pp. 84, Tabs 10. Price: 75 pence/$1,80

This is a series of evaluations prepared by the Joint FAO/WHO Expert Committe on Food Additives which met in Geneva, 4-12 April, 1972. It brings together the most recent and valid information concerning the 'accidental' presence of the more important and toxic heavy metals in food, under headings such as introduction, sources, transformation, methods of analysis, levels in food, effects, observations in man, animal studies, assessment of hazard to man and finally, conclusions and evaluation. Deliberate food additives are dealt with in basically the same way. The booklet commences with a general introduction in which terms used in the text are clearly defined.

This publication is invaluable to those concerned with harmful residues and the use of food additives; it provides, in concise form, the essential and factual information necessary for an understanding of these problems. A comprehensive list of references is provided for those seeking more detailed information.

L.W. v.d. H.

IN MEMORIAM

GILBERT B.MAY
July, 1880 – October, 1973
AN APPRECIATION

Gilbert B. May was one of the band of British veterinarians of the first quarter of the century, who had to learn the hard way in disease-ridden South Africa. They came, either as members of the Veterinary Division of the Remount Department or as civil veterinary surgeons attached to the corps, during and after the Anglo-Boer War, and stayed on to join either the South African Constabulary or the Veterinary Service under Major Sanderson in the newly formed Department of Agriculture of the Transvaal.

During his period of study at the Royal Veterinary College, London, May was fortunate in getting an assistantship with the well-known firm of veterinarians, Stanley & Sons, at Southwark, near London Bridge. 'This firm had, as a standby, contracts for 5 000 horses, including one of 900 for the London-Brighton-South Coast Railway, whose stables were at London Bridge and who had their own horsemaster, and other big firms who never had fewer than 100 horses each. Stanley & Sons also had three farrier shops. Each morning's inspection usually showed 40 – 50 cases of lameness.' By the time he left this establishment, it can be assumed May was au fait with the management of horses and the treatment of minor ailments.'

Whilst a student at Camden Town, he shared digs with George Wooldridge (later Professor of Surgery and Dean of the College), who arranged for him to see veterinary practice with the veterinarian James Wilson of Nantwich, Cheshire. Wilson held all the Board of Agriculture's official appointments. Thus all outbreaks of animal diseases, glanders, anthrax, strangles, mange, scab, etc., were reported to him, so that upon qualifying in 1901 May had a thorough knowledge, not only of horses, but also of the contagious animal diseases prevalent in Great Britain at the time, as also of Court-work relative to cruelty to animals and other offences.

At this time veterinary journals were announcing that the War Office required more veterinary surgeons to supplement the Army Veterinary Corps of the Remount Department. May reacted and was told to report to the Veterinary School at Aldershot. There he had to undergo a six weeks' course of lectures in Army ways and on the treatment of horses on board ship: their food, inspection, etc. In due course he was detailed off to join the S.S. Morayshire, a converted cattle boat of about 4 000 tons, fitted out to carry 800 horses: some on the upper deck and about 150 in stalls, separated by (removable) wooden stanchions, each horse being allowed a space of 10' x 2'8", with an empty space between the 7th and 8th stall, so that a horse could be moved to an empty stall for cleaning purposes. The horses had to stand throughout the entire voyage. The labour consisted of one man to 30 horses. These men were so-called emigrants to Australia, being given a free passage and paid 1/- per month. Upon arrival in South Africa all deserted, making for the 'Golden City'. May's responsibilities began with the arrival of 300 Hunters from Colchester, a 'well-cared for healthy batch,' which harboured two horses suffering from strangles. Although these were taken away immediately, the damage was done, and before the voyage had ended at Port Elizabeth six weeks later, 356 cases had occured, 7 of which had had forms of irregular strangles and had died. In addition to strangles and to the pneumonia cases, mainly in the horses exposed on the upper decks, May had to deal with an outbreak of mange, and the with no facilities for proper treatment. He was to be plagued with this scourge of mange for quite a while after settling in South Africa. "At dawn I started inspecting in the holds, worked my way upwards and continued with rests till bedtime, hence was much relieved when at the end of 7 weeks of really hard work, all horses were finally landed – per derrick and flat-bottomed boats – at Port Elizabeth in December, 1901.' 'On these voyages, losses on board ship were so great that special bonuses were offered to the veterinary officers: 1/- per head under less than 7½% loss; 2/- under 5% loss and 3/- under 2½%. I drew the 2/- bonus. The boat before ours lost 50 in one night going through the notoriously rough Bay of Biscay.'

In the present era of mechanized transport, the number of horses needed by the British in the Anglo-Boer War is impressive. To quote from Veterinary Record, Vol. 14, 1901: 'Sparks & McGee of Kansas City say that since the Anglo-Boer War began, 125 000 horses and mules have been shipped from the company's barns for South Africa. This represents Britain's purchases in the last two years (i.e. 1899 – 1900) and there seems to be no reduction in the demand. There are now (June 28) 2 000 head of horses at New Orleans and the British Government is sending them away at the rate of two shiploads a week. It recently arranged for 8 ships that will carry 1 000 horses each to sail from New Orleans within a month. . . . A great many animals become crippled or die before they are ready to be shipped and more have to be killed at sea because of injuries.' Subsequent issues of that journal deal with treatment of horses at sea, but above all with the enormous wastage after landing and en route to the remount depots and to the fronts.

The Veterinary Record of February 22, 1902, gives these approximate figures:
Lord Kitchener captured 89 705; circa 25 000 were commandeered or purchased in South Africa. Purchases elsewhere, as between 1st October, 1899, and December 31st, 1901 were

United Kingdom	59 800
S. America	25 872
U.S.A.	77 101
Hungary	23 936
Australia	20 015

The total figure for mules and horses bought for this period approximate 228 000.

May then reported to Col. Beresford at the Veterinary Hospital associated with the Remount Depot at De Aar. During this period of 9 months, he became acquainted with parts of the Eastern Province, being moved around with the Highland Horse between Stormberg, Bowker's Park and Tarkastad, until the corps was disbanded when peace was declared in 1902.

He then reported to Major Sanderson, in the newly-formed Transvaal Agricultural Department and was promptly sent for a six weeks' course under Theiler at the Daspoort Bacteriological Laboratories. In September he was posted as District Veterinary Officer at Rustenburg. He was instructed 'to go to the Repatriation Camp near to the Leper Asylum, choose a Cape cart and four mules and a native driver, and drive to Rustenburg.' He spent two nights on the way!

Up till now he enjoyed robust health but in December his luck turned and he suffered an almost fatal attack of enteric fever, which left him with thrombophlebitis in one leg. After six months recuperative leave, he was sent to the Waterberg dis-

trict in June, 1903, with headquarters at Nylstroom, where he contracted malaria. This disease handicapped him during his six-months' leave in 1906 whilst following a course in Tropical Veterinary Medicine in Liverpool. Upon his return he was again sent to the Waterberg, but owing to the East Coast fever outbreak his headquarters were moved to Potgietersrust. 'When the Government decided on its policy of "slaughter with compensation to the farmers", I accompanied Senator Krogh and the Chief of Police to a farm to explain to the owner the reason for such action. We met with a very hostile reception, were accused of deliberately spreading the infection and when looking back on leaving we saw the owner vigorously spraying the area on which we had stood to destroy the infected ticks which we were accused of having dropped.' 'Soon after this, the Department decided to clear the infected area of N.W. Waterberg for about 100 miles inland from Potgietersrust, moving healthy cattle, under temperature tests, slowly to Lunsklip Siding, when 100 cattle a day would be slaughtered by the Johannesburg butchers Angehrn & Piel. I was put in charge of this opperation, which lasted nine months. During this period the Department was under much hostile complaint by Senators and M.P.'s. One bitter man was Henry Munnik, the Pietersburg member. Others were Erasmus and Swart. Blood smears taken by farmers from fowls were sent to Daspoort. These were properly diagnosed and Theiler hit the senders hard – he knew them – when the added to his diagnoses that the microscope was also able to identify baboon and 'coloured' blood! No more such slides were sent in.' 'To counter the claim by local farmers that they could prevent the disease and also to cure it, Theiler persuaded the Government to buy cattle on which he could place infected ticks, when the farmers could try to counteract the effects.' May was in charge of the tests at Lunsklip. 'The farmers used their remedies, mainly garlic placed in the dewlap, but the temperatures of the cattle began to rise after the stated incubation period, and deaths followed at the expected time. The result, when announced, finished the attacks on the government policy.'

VISIT OF DISTRICT VETERINARIANS
TO THE VETERINARY LABORATORY
ONDERSTEPOORT
1910

Front Row: W.G. Evans (Lichtenburg-Marico), J.P. Dumphy (?), ? Webster (?).
Middle Row: J. Chalmers ? (Witwatersrand), D.T. Mitchell (Relieving Officer, Onderstepoort), D. Kéhoe (Assistant Research Officer, Onderstepoort), A. Theiler (Director), W.H. Andrews (Relieving Officer, Onderstepoort), H.M. Webb (Lydenburg), G.W Lee (Rustenburg).
Second Back Row: T.M. Dale (Potchefstroom, Wolmaransstad, Bloemhof), J.M. Tate (Heidelberg, Standerton).
Back Row: W.G. Bush (Krugersdorp), J.I. Edgar (Zoutpansberg), F. Lindsay (Middelburg), G. McCall (?), G.B. May (Waterberg), D. McCall (?).
Absent: P. Conacher (seconded to Mocambique), S.J. Johnson (Wakkerstroom), J. Donaldson (Ermelo-Carolina), H.V. Turnbull (Barberton), R.S. Garraway (Pretoria), F.J. Dunning (Relieving Officer).
? Initials unknown.
name ? Name uncertain
(?) District unknown.

After seven years in the warm Waterberg, May was transferred in 1913 to Standerton, where a part of his duties was to buy horses for the South African Constabulary, his training at the Southwark stables standing him in good stead. In 1913 he married, took a honeymoon trip up the East Coast, through the Suez Canal, and visited the Holy Land en route to the International Veterinary Congress in London, which was opened and closed on the same day by Sir John McFadyean, as war was declared on that day. The return by intermediate boat, partly via the South Amercian route, was uneventful; other boats were sunk by enemy action.

Back in South Africa, he was posted to Carolina, where he had to cover Ermelo, Wakkerstroom, Volksrust, Bethal, Heidelberg, Johannesburg, Pilgrims Rest, Barberton, Nelspruit and Sabie as well, in that many district veterinary officers were on war duty. At the end of the 1914-18 War he was posted to Potchefstroom where, in addition to being the District Veterinary Officer, he also had to assist at the Potchefstroom Agricultural College. In 1921 he came to Pretoria as D.V.O. In the course of time he became Senior Veterinary Officer, with short spells at Pietersburg and Queenstown, until his retirement on pension in July, 1934. As an ex-Transvaal civil servant, despite Union, the compulsory retiring age was 55, further service until the age of sixty not being allowed.

For family reasons the Mays went to England. The 1939-45 War, spent in London, upset their plans to return to South Africa, a country which he knew intimately, which he loved and in whose future he was interested in that he and his veterinary contemporaries had helped to put on a healthy footing.

What was the nature of this band of veterinarians from Great Britain, who undertook the arduous duties of fighting and controlling animal diseases, some familiar but many unknown, in a wild, semi-tropical country, whose inhabitants, dour, hard-working but superstitious pioneers, were more inclined to trust their own intuition than to listen to advice from 'foreigners'? Obviously, like May, they all had a keen sense of duty, were prepared to learn as they went along, with occasional refresher courses at Daspoort and later at Onderstepoort. Like May, they took what knocks came their way in the course of their duties. May had a bad time in the 1930's when the East Coast fever control measures broke down and the farmers lost heavily. At a farmers' protest meeting he was slated heavily as Senor Veterinary Officer of Transvaal, but he remained his staid self and calmly replied: 'Well gentlemen that is the position'.

May died on October 29, 1973, at the age of 93, surenely content – one feels – after a full life in the service of his chosen profession and in his adopted country. We honour his memory in this brief sketch of his life amongst us, a life which spanned the transition form the Cape cart and oxwagon to the era of motor cars and aeroplanes.

We offer our sympathies to his daughter and son in England.

The Hawksley Micro-Haematocrit Centrifuge

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Catalogue No. A.809
All Centrifuges are now fitted with a rim gasket to work in conjunction with "Cristaseal" plastic tube sealer. This gasket is easily fitted to existing centrifuges and replacement, where necessary, is a simple operation.

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The automatic timer switches off the centrifuge, but if it is desired to stop the head quickly merely press the brake button for a rapid but controlled stop.

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In no case is it ever necessary to centrifuge for longer than five minutes. This is not only an important initial advantage but if a re-run is necessary the check reading is available in minutes.

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New catch for lid is an interlocking switch, that switches off the motor if the lid is opened before the timer is returned to zero. Conversely the centrifuge lid should be closed and securely clipped before the centrifuge is switched on.

Caution: The lid switch should not be used to start machine as its current switching capacity is not meant to be used instead of the timer.

MICROTOR

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This useful head spins up to 12 micro tubes with an approximate G force 10,000 Centrifuges small quantities of blood or other liquids. To fit this head merely remove the two screws holding the standard head. Replace the screws and slip the micro head over the spindle. Will also fit existing centrifuges.

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Catalogue No. A.810
This special Rotor has been produced to hold glass tubes of approximately 200 ul capacity. If further sampling is to be made of serum and/or cells after centrifugation it is possible to run the haematocrit in one slot and this larger tube in the adjacent immediate slot. The Macrotor can be purchased as an additional head for any new or existing centrifuges or as an alternative to the standard head in a new centrifuge. A Special reader for haematocrits taken in this larger tube is available on request.

GURR SURGICAL INSTRUMENTS Pty. Ltd.

Harley Chambers Kruis Street, P.O. Box 1562, Johannesburg

(WORLD DIRECTORY OF VETERINARY SCHOOLS)

WHO/FAO

Geneva: World Health Organization, 1973.

Pp. 260; two annexures. Price: paperbound, not stated; clothbound: £4.50

No one will quarrel about the excellence of the work done by the World Health Organization and the Food and Agricultural Organization. Leaving other considerations apart, numerous professional people, particularly those charged with academic administrative, executive and scientific technological duties in the field of human and animal health will be deeply grateful for the many excellent publications appearing under the auspices of WHO/FAO. Most of these are the result of an enormous amount of conscientious, hum-drum spadework and constitute works of reference or guide-lines of a type not readily undertaken by the average scientist.

The 'World Directory of Veterinary Schools' is no exception. It is the third to appear, the previous ones covered the data available in 1959 and 1964, the present issue reflects the situation in 1971. Of the various directories covering medical, dental, pharmacy and nursing schools, the Directory of Schools of Public Health and the one under review are the most up-to-date. It covers information on 254 schools in 68 countries, including recently formed states such as Bangladesh. The schools are listed by country in alphabetical order, and under each country either by state or republic (U.S.S.R., U.S.A., Brazil and India) or by city, and then by institution.

Introductory data on population, number of veterinarians, number of veterinary schools, number of annual graduates and livestock population (large animals, small animals and poultry) precede details concerning the administration of the schools, conditions of admission, subjects comprising the curriculum, nature of examinations, qualifications obtainable, the licence required to practice and a table setting out the name and address of the school, year instruction started, number of teaching staff (broken down into part-time and full-time where applicable), total enrolment (male and female where known), number of graduates in 1971 and annual tuition fees in local currency. Annexure 1 summarizes the number of veterinary schools in 1959, 1964 and 1971 by country, annexure 2 the postgraduate veterinary degrees and requirements.

The information given will also be of value to prospective students, all the more so in view of the almost global phenomenon of growing numbers of students wishing to enroll and the limited number of places available, despite the almost 40 per cent increase in the number of schools in 13 years. Veterinarians wishing to immigrate will find useful preliminary information under the heading; 'Licence to Practise.' Data on schools for animal health assistants are no longer contained in this Directory; they will form the basis of a separate volume to be published, hopefully soon.

Wisely, no attempt has been made to evaluate the different courses, a task fraught with more than factual difficulties, which in themselves constitute a formidable proposition. Yet it would have helped to have information on the number of formal hours of teaching spent on each subject.

Where selected samples of data could be checked, they were found to be correct. One minor error was noted: the Veterinary Faculty in Moçambique is listed as part of the 'Estudos Gerais Universitários de Moçambique'. The 'Estudos Gerais' became the fully-fledged 'Universidade de Lourenço Marques' in 1968.

The introduction offers a succinct, sober, factual analysis of recent developments in veterinary education; it ends with this all-important home-truth: 'The rationalization and integration of veterinary education, veterinary medical practice, and socioeconomic planning must take place at the highest governmental levels if the continued and expanding production of veterinarians is to have any utilitarian value'.

ASPECTS OF MEAT INSPECTION

HORACE THORNTON

London: Baillière Tindall. December 1973. Pp 273 Figs. 49 Plates 2, Price: £3.00

The author hardly needs an introduction to those concerned with meat hygiene. In fifty years of work as a veterinary surgeon, he has travelled widely as consultant and lecturer and is the writer of the more than well-known 'Textbook of Meat Inspection', now being revised and reprinted in its 6th edition. The book under review is what its title indicates it to be: a series of 10 chapters on various aspects of meat inspection in which the author gives of his wide knowledge and experience in dealing with matters which are of greatest concern to those working in this field. His approach is one which is essentially practical and yet based upon scientific observation and experimentation. His clear and lucid writing and illustrations add to the charm of the presentation, which is unlike most scientific works in that it has a 'chatty' air. This makes for easy reading and conveys a great deal of information in a painless manner. He provides a deeper insight into the background, cause and development of lesions and conditions seen in food animals than is usually found in textbooks on the subject.

He discusses vital matters such as stress before slaughter, liver abscesses, black beef, watery pork, internal bruising, salmonellosis, brucellar hygroma, the effects of *A. suum* infestation, to name but a few. Parasitic conditions are given special attention, and throughout his knowledge of conditions in Southern Africa give the book a special appeal to the South African reader, to whom it is particularly recommended.

L.W. v.d. H.

PUBLICATIONS

PUBLIKASIES

'MERLEN' INCOME TAX SERIES OF PUBLICATIONS

The second issue of the annual page replacement service of 'WHAT EVERY PROFESSIONAL PERSON SHOULD KNOW ABOUT INCOME TAX' as reviewed in this Journal (Vol. 44, No. 2 p. 193) is now available from the publishers, Legal and Financial Publishing Co. (Pty) Ltd., P.O. Box 3461, Cape Town 8000, at the price of R1,50 per set. This brings the book in line with the 1974 year of assessment. A review of the page replacements will occur in this Journal in due course.

SERIAL PUBLICATIONS

PUBLIKASIEREEKSE

MADOQUA

Madoqua Series I number 7 is now available at R4,15.

The journal is available from:

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BOOKS

SINESHCHEKOV A.D. Biological Principles of Increasing the Utilisation of Feeding Stuffs. /Biologicheskie Osnovy Povysheniya Ispol'zovniya Kormov; Sbornik nauchnykh rabot Vses. n-i Instituta zhivotnovodstva 1967 (4) 142pp/ Translated by A.S. Colley. Translation edited by Dr. B.A. Ochia. Price: £1.75 140 pages Issued: September 1973 ISBN/0/85350/108/4

SINESHCHEKOV A.D. The Biology of Nutrition of Farm Animals. (Biologiya pitaniya sel'skokhozyaistvennykh zhivotnykh:biologicheskie osnovy ratsional'nogo ispos'zovaniya kormov. 1965)
Translated by: A. Crozy. Translation edited by J.H.B. Roy. Price: £2.33 495 pages Issued: 1968 ISBN/0/85350/007/X

SINESHCHEKOV A.D. The Nutritional Physiology of Farm Animals. (Fiziologia pitaniya sel'skokhozyaistvennykh zhivotnykh. 1963) Translated by D.G. Maitland Muller. Price £5.00 380 pages (Xerox) Issued 1964 ISBN/0/85350/055/X

SINESHCHEKOV A.D. The Physiology of Agricultural Animals. Fiziologiya Sel'skokhozyaistvennykh zhivotnykh. 1962) Transplanted by D.G. Maitland Muller. Translation edited by D.L. Duncan. Price: £2.27 491 pages Issued 1968 ISBN/0/85350/006/1

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NUTRITION

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LEONT'EVA Z.A. The effect of superficially active oil substances on growth of young stock. Svinovodstvo 1965(1):37-38 RTS 3060 £0.25.

FROLOV Yu.P. The effect of an abrupt change in diet on certain aspects of an animal's complex nervous activity. Arch. Biol. Nauk 1922 21:159-170 RTS 3569 £1.50.

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KALMYKOV S.T. & BELYAEV M.G. The quantitative determination of urea in feeds and water. Veterinariya 1965 42 (12):61-62 RTS 4640 £0.25.

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OSADCHAYA I.F. The use of glucose oxidase and catalase in animal fat production. Molekulyarnaya Biol. (Kiev) 1971 6:115-116 RTS 7716 £0.40.

KOZLOWSKA T. Animal feeding economics: The costing of pasturage by an anlytical and zootechnical method, on an example of heifer grazing. Przeglad. Hodowlany 1970 38 (4):24-26 RTS 8285 £0.90.

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RUDENKO I.E. Use stimulants for fattening pigs. Svinovodstvo 1964 (2):28-29 RTS 3053 £0.25.

TOROSYAN S.E. A growth stimulant. Svinovodstvo 1964 (9):40 RTS 3055 £0.13.

SERGEEVA M.A. The effect of a diet with diversely correlated fats and carbohydrates upon the conditioned-response activity of dogs. Voprosy Pitaniya 1956 15 (1):9-15 RTS 3457 £0.75.

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POLYDACTYLY IN A WILDEBEEST

During May, 1973, following routine capture of surplus blue wildebeest, *Connochaetes taurinus* (Burchell), in Mkuzi Game Reserve, a young adult female was observed in the holding pens possessing obvious anatomical obnormalities of both fore limbs. Progression at both the walk and gallop, as well as the turn, did not appear to be affected by the abnormalities. She was always able to keep up with the other members of the herd during their characteristic restless movements within the enclosure.

On 1st June the wildebeest was immobilized and the legs were examined thoroughly. Both fore limbs were abnormal, while the hind ones were normal.

On the medial aspect of the right fore fetlock a definite additional joint could be identified by palpation and visual examination. From it proceeded a laterally compressed digit, consisting of three phalanges and a hoof. In the standing position the supernumerary hoof made contact with the ground and its palmar surface was normally worn. The third and fourth digits were normal in every way.

On the medial aspect of the left fore fetlock a similar additional joint and digit were present. They were wider and flatter, however, the digit projected further away from the normal ones at a greater angle of divergence and the hoof bore a median groove running the whole length from the coronary band to the bearing surface, suggesting an incomplete doubling.

Perusal of this photograph, and others, indicated some degree of dichotomy of the distal end of the metacarpus of both limbs.

In all cases of polydactyly in animals in the Onderstepoort Teratological Collection (one springbuck, one horse and three pigs), it was clear that one was dealing with an incomplete doubling of the *acropodium*, and definitely not with 'atavistic' development of digits supposedly lost during phylogeny. This case, contrary to the submitter's interpretation, does not appear to be an exception.

Text: Adapted from Dr Keep's description in the *Lammergeyer*, with acknowledgements to the Editor of that Journal and the Natal Parks, Game and Fisheries Preservation Board.

Submission: M.E. Keep, Veterinarian, Hluhluwe Game Reserve, P.O. Box 25, Mtubatuba, Zululand, 39-35.

Note: The animal in question is at present in the National Zoological Gardens, Pretoria, of which the Veterinorion-in-Charge, Dr J.P.J. Smit, kindly drew the Editor's attention to the case.

VEELTONIGHEID IN 'N WILDEBEES

Gedurende Mei, 1973, na roetine-vangs van oortollige blouwildebeeste, *Connochaetes taurinus* (Burchell), in die Mkuziwildreservaat, is 'n jong volwasse koei in die hou-krale opgemerk wat opvallende anatomiese afwykings van altwee voorpote gehad het. Haar gang, beide met stap, galop of draai, was skynbaar nie deur die abnormaliteite beïnvloed nie. Sy was altyd in staat om met die ander diere in die kudde by te hou gedurende hul kenmerkend rustelose gemaal binne die omheining.

Op 1 Junie is die wildebees ge-immobiliseer en die pote deeglik ondersoek. Albei voorpote was obnormaal, terwyl die agterpote heeltemal normaal was.

Aan die mediale kant van die regtervoorkootgewrig kon 'n duidelike bykomstige gewrig by betasting en visuele waarneming bepaal word. 'n Sywaartse saamgeperste *digitus*, bestaande uit drie kote en 'n hoef, het hiervandaan distaalwaarts gestrek. In die staan-posisie was die oortollige hoef in aanraking met die bodem en was sy palmare vlak in alle opsigte normaalweg geslyt.

Aan die mediale kant van die linkervoorkootgewring was daar insgelyks 'n bykomstige gewrig en *digitus*. Hulle was egter wyer en platter, en die „toon" het met 'n wyer hoek van die normales weggestaan. Die hoef was mediaan gegroef, van kroonband tot drarand, wat op 'n poging tot verdubbeling gedui het.

Beskouing van hierdie en ander foto's het 'n mate van dichotomie aan die distale uiteinde van die metacarpus gesuggereer.

In alle gevalle van polidaktilie in diere in die Onderstepoortse Teratologiese Versameling (een springbok, een perd en drie varke) was dit duidelik dat 'n mens te doen gehad het met onvolledige verdubbeling van die *acropodium*, en beslis nie met „atavistiese" ontwikkeling van *digiti*, vermoedelik verlore gedurende filogenie, nie. Hierdie geval, in teenstelling met die insender se vertolking, skyn nie 'n uitsondering te wees nie.

Teks: Aangepas van Dr Keep se beskrywing in die *Lammergeyer*, met erkenning aan die Redakteur van daardie Tydskrif en die Natalse Parkeraad.

Insending: M.E. Keep, Veearts, Hluhluwe-wildreservaat, Posbus 25, Mfubotubo, Zululand, 3935.

Opmerking: Die betrokke dier is op die oomblik in die Nasionale Dieretuin, Pretoria, waarvan die Veearts-in-Beheer, dr J.P.J. Smit, goedgunstiglik die Redakteur se aandag daarop gevestig het.