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TYDSKRIF VAN DIE SUID-AFRIKAANSE VETERINÊRE VERENIGING

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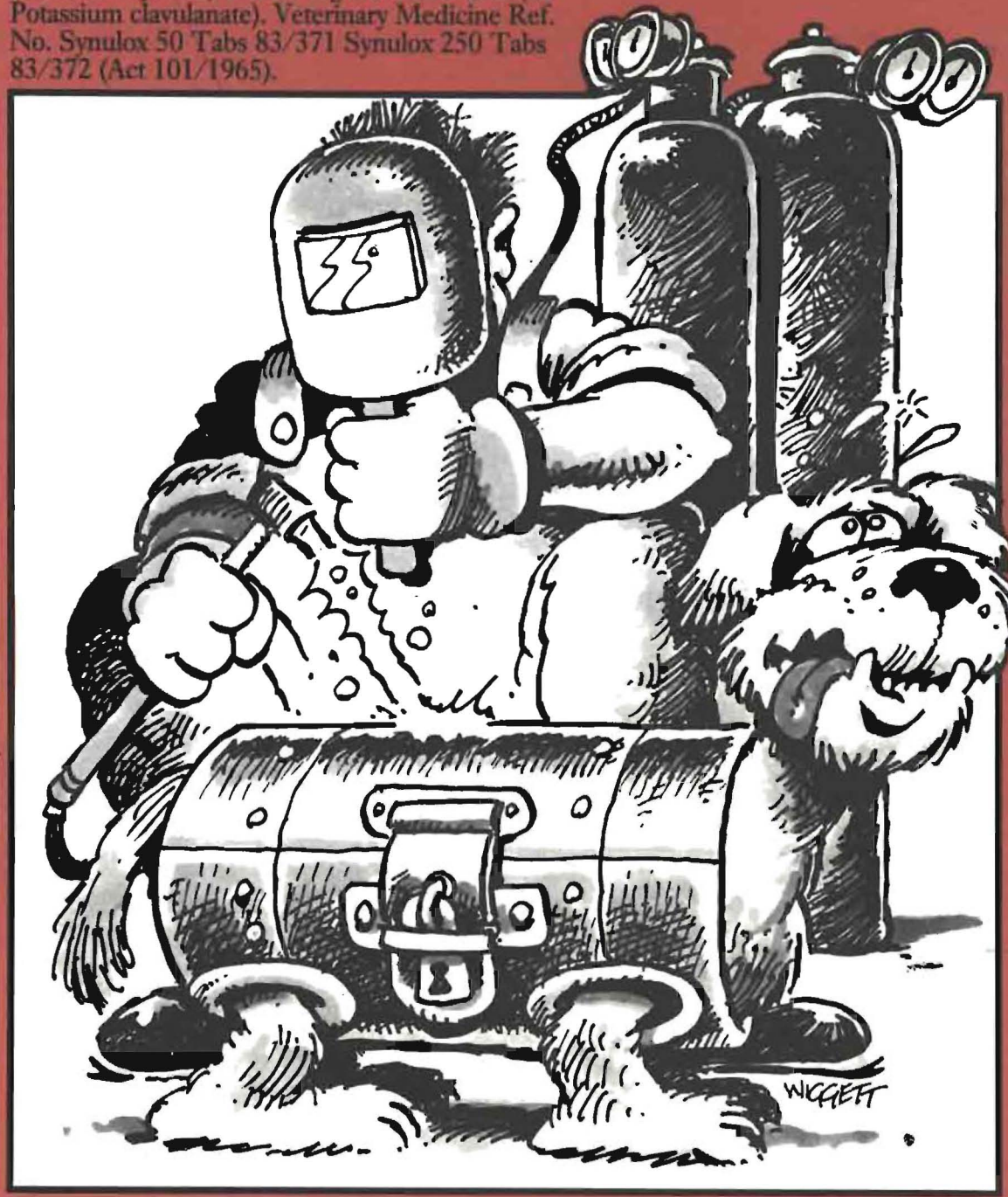

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POLICY STATEMENT **BELEIDSVERKLARING**

SOUTH AFRICAN VETERINARY ASSOCIATION POLICY STATEMENT ON LABORATORY ANIMALS

A. Preamble

The South African Veterinary Association:

1. Recognises that animals have been and will continue to be used for many purposes for the benefit of mankind.
2. That man has a moral obligation to respect all animals and have consideration for their capacity to be sensitive to pain, to suffer and to have a memory of such experiences.

In particular it:

1. Accepts animal experimentation to be fundamental to the biological sciences, not only for the advancement of man's understanding of the nature of life but also for the improvement of methods of prevention, diagnosis and treatment of disease in both man and animals and for promoting their well-being and productivity.
2. Supports the use of animals for experimental and other specific purposes but encourages the use of alternative approaches wherever possible.
3. Aligns itself with provisions for protecting laboratory animals in procedures which may cause them pain, suffering, distress or lasting harm and which will ensure that where this is unavoidable, these be kept to a minimum.

B. Scope of the policy statement

1. The Association's policy applies to all living non-human vertebrates.
2. Experimental procedure means any experimental, educational or other scientific use of a vertebrate animal.

C. Animal care and housing

1. Laboratory animals should be under the care and supervision of a veterinarian and qualified laboratory animal technologists.
2. Experimental animals should be provided with accommodation in a suitable environment with an acceptable degree of freedom of movement, have access to adequate supplies of food and water and be able to satisfy their physical and ethological needs.
3. The health and well-being of laboratory animals should be closely and frequently observed, expressly to enable illness, stress, pain and discomfort to be recognised and treated.

D. The conduct of experimental procedures involving laboratory animals

1. Investigators and educators who use laboratory animals should be appropriately qualified by training and experience to perform animal experiments. Appropriate training should be available at institutions to enable this requirement to be met.
2. The use of laboratory animals should be subject to review and authorisation by an institutional committee which is appropriately constituted to ensure that all proposed experiments comply with both institutional regulations and accepted ethical, legal and scientific practices.
3. Each experiment shall have a written protocol that clearly identifies the objectives of the study and provides details of all the steps which are to be followed in carrying it out.
4. Procedures which are likely to cause fear, stress, discomfort or pain should be performed under anaesthesia unless the effect of the procedure on the animal's well-being is less than that caused by anaesthesia.
5. At the end of an experiment, animals should be humanely euthanased if they are likely to remain in discomfort and pain.
6. Animals which have been used once for an experiment should not be subjected to further procedures unless the first procedure was a minor one and they are in good health.

E. Special provisions

Where they are quantifiable, norms and standards should be adopted on an institutional basis from those specified by recognised national or international authorities, advisory councils or other competent bodies to provide for:

(a) Appointment of institutional, animal care and use committees
(b) Acquisition of experimental animals
(c) Transportation
(d) Accommodation and animal husbandry
(e) Environmental conditions
(f) Nutrition
(g) Veterinary care and treatment
(h) Record keeping
(i) Euthanasia

F. Recognised standards, authorities and publications on the care and use of laboratory animals

1. Institute for Laboratory Animal Resources, National Research Council, 2101 Constitution Avenue N.W., Washington, DC 20418. Guide for the Care and Use of Laboratory Animals (Revised 1985)
2. Canadian Council on Animal Care. 1105-151 Slater Street, Ottawa, Ontario, K1P 5H3. Guide for the Care and Use of Experimental Animals, Volumes I and II (1980)
3. Biological Council, Institute of Biology, 41 Queens Gate, London SW7 5 HW. Guidelines on the Use of Living Animals in Scientific Investigations (1984)
4. Council for International Organisations of Medical Services 9CIOMSO. W.H.O. Distribution and Sales Service, 1211 Geneva 27, Switzerland. International Guiding Principles for Biomedical Research Involving Animals (1985)
5. Council of Europe. Strasbourg, France. European

Convention for the Protection of Vertebrate Animals Used for Experimental and Other Purposes (1985)
6. U S Governmental Principles for the Care and Use of Laboratory Animals. Federal Register 50 (97) 20864 – 20865 May 20th 1985

Note

A summary of the information contained in the above references is available on request from the:
South African Veterinary Association
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ARTICLE ARTIKEL

TRAUMATIC AVULSION OF THE PROXIMAL FEMORAL ARTICULAR CARTILAGE AS A CAUSE OF HIP DISLOCATION IN BROILER CHICKENS

J.R. MITCHELL* and H.P.A. DE BOOM*

ABSTRACT: Mitchell J.R.; De Boom H.P.A. **Traumatic avulsion of the proximal femoral articular cartilage as a cause of hip dislocation in broiler chickens.** *Journal of the South African Veterinary Association* (1986) 57 No. 3, 133-137 (En) Department of Anatomy, Faculty of Veterinary Science, 0204 Medunsa, Republic of South Africa.

Review of the normal anatomy of the coxofemoral joint in broiler chickens aged seven weeks and comparison with cases of so-called "hip-dislocation" revealed that the lesion is essentially an avulsion of the articular cartilage of the femoral head, traumatically caused by the manner of catching and handling of birds. No direct relationship to dyschondroplasia (osteochondrosis) was established.

Key words: Hip dislocation, avulsion, femoral head, broilers.

INTRODUCTION

Hip dislocation in broilers is a source of financial loss to the broiler industry, mainly because the discolouration around the hip joint as a result of haemorrhages renders the carcass unacceptable for marketing. Although the actual incidence of the condition is relatively low, the narrow profit margin on which the industry operates makes it imperative that all sources of loss be curtailed to a minimum.

An investigation into the anatomy of the hip joint relevant to this condition and the pathological anatomy thereof was considered to be prerequisite for proper understanding of the nature of the lesion and its possible cause. During the investigation it became clear that the actual dislocation of the hip joint resulted from avulsion of the articular cartilage of the femoral head (*Caput femoris*), hence this term will be used for correctness' sake.

A number of conditions affecting the skeletal system of broiler chickens is considered to be the result of malfunction of growth processes caused by the rapid growing and remodelling of the skeleton. One of the characteristics of present-day broiler chickens is their genetic capacity for rapid growth. The terms dyschondroplasia and osteochondrosis are frequently used to describe conditions characterised by the disturbance of normal differentiation of cells in the growing cartilage. Such disturbance will prevent provisional calcification of the matrix and subsequent ossification. The blood vessels from the bone marrow do not penetrate the cartilage, the result is that endochondral ossification does not take place and the cartilage is retained[6].

Whilst most of the research involved tibial dyschondroplasia, only passing references have been made to conditions affecting the femur. Avulsion of the articular cartilage of the femoral head has been dismissed as being a post mortem artifact[9].

The present investigation is concerned with the gross anatomy of the normal and abnormal hip joint and with a consideration of the conditions under which it occurs.

MATERIAL AND METHODS

The investigation was programmed to include five different approaches within one commercial broiler establishment.

I. Dissection of normal broiler carcases

To confirm the normal anatomy of the hip joint, eight carcases of normal birds were dissected, and the anatomy of the hip joint, joint capsule, ligaments, and muscles on the medial side of the thigh, were examined and the findings recorded.

II. Dissection of affected carcases

Carcasses affected or suspected to be affected by avulsion of the articular cartilage of the femoral head were divided into three groups:

(a) *Found dead on arrival (DOA) at the processing plant.*
The carcases were kept chilled or frozen until dissection was completed.

(b) *Hip displacement noticed during the processing.*
The carcasses were supplied by the processor. Only five such carcases were available for examination. The affected hip joints were dissected and examined in the same manner as in the previous group.

(c) *Suspected hip displacement noticed after processing.*
Frozen or chilled commercial thighs, supplied by the processor, had been downgraded because of the appearance of haemorrhages over the skin at the hip joint. These commercial portions were examined over a period of a few weeks in the same manner as above.

III. Observation of catching and loading of live birds in broiler houses

The observation was confined to one large unit and relevant points were recorded.

IV. Examination of clinical "cripples" collected from the broiler house

Collection of "cripples" was confined to one large unit selected by the processor; only six "cripples" were collected. The apparently lame birds were kept in cages for three weeks before the examination was carried out in the same manner as for the other groups.

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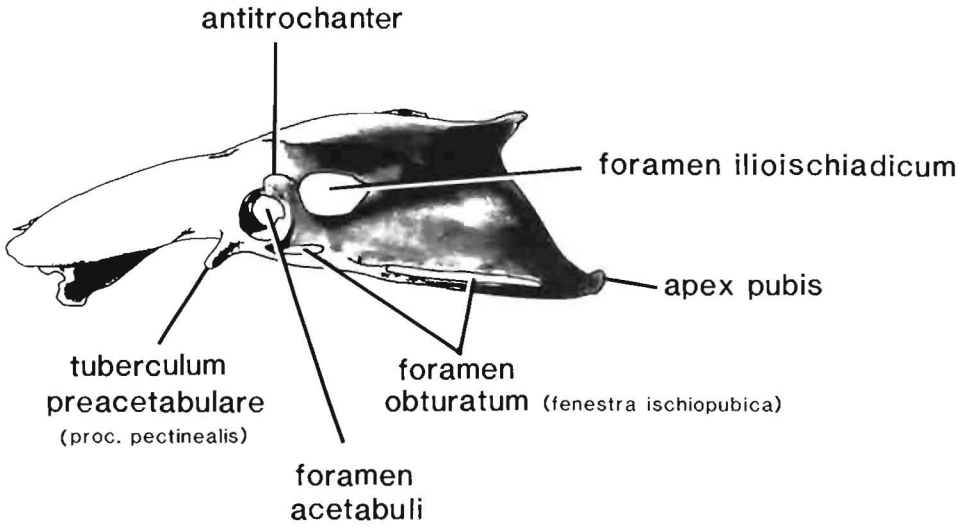

Fig. 1 Os coxae of broiler chicken, left side, lateral view.

V. Microscopic examination of the avulsed cartilage

Although the main purpose of this investigation was to study the gross anatomy, histologic preparations were made of one normal femoral head with its articular cartilage intact, and of an avulsed piece of articular cartilage. These were stained routinely with haematoxylin and eosin, Van Gieson and Mason's trichome stain.

RESULTS

I. The anatomy of normal hip joint in broiler chickens

The most outstanding features of the pelvis in birds (*Ossa cinguli membri pelvici*) are as follow:

(a) *The absence of a pubic symphysis*. The *os pubis* is represented by a narrow strip of bone, the shaft of the pubis (*Scapus pubis*) which is joined to the

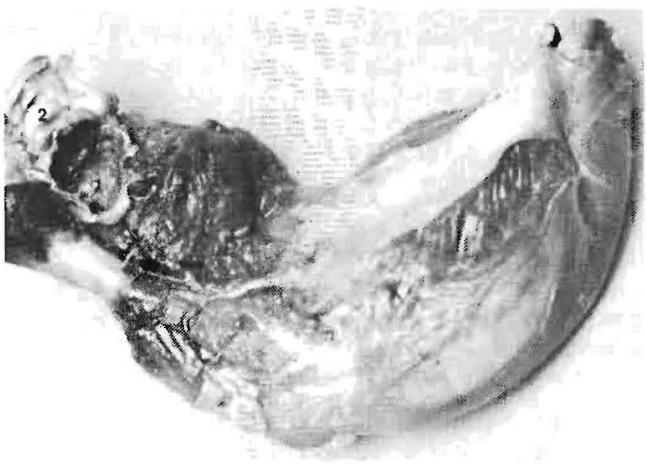

Fig. 2: Avulsion of proximal articular cartilage of the femur, left side, medial view.
- **2.1** Acetabular cavity vacated by femoral head, arrow pointing to torn edges of periosteum.
- **2.2** Articular cartilage of the femur.
- **2.3** "Raw" head of the femur.

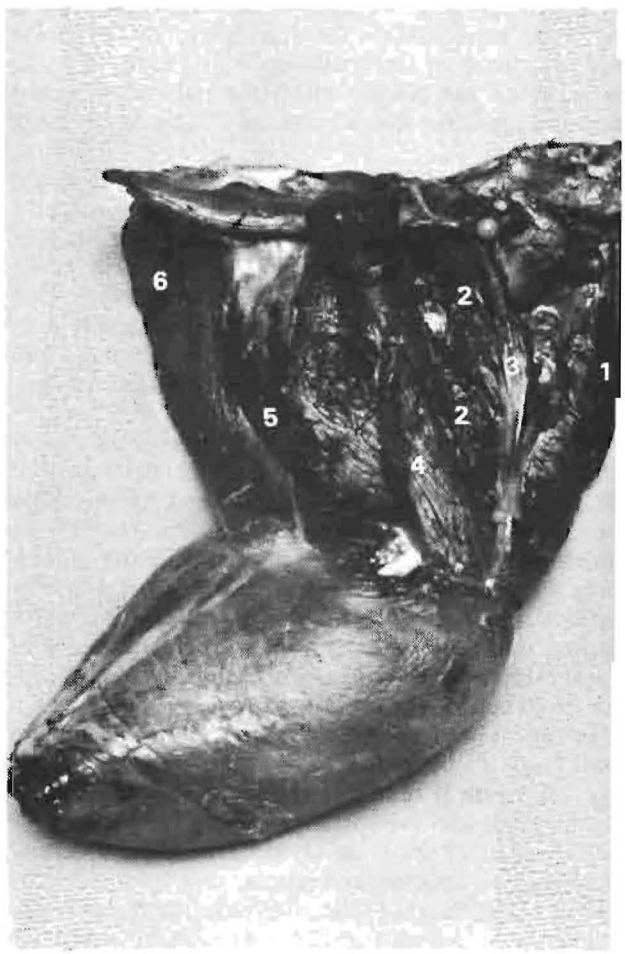

Fig. 3: Muscles damaged during avulsion, left side, me view.
- **3.1** *M. iliotibialis cranialis*; undamaged.
- **3.2** *M. femorotibialis medius*; torn edges along origin from the femur (arrow).
- **3.3** *M. ambiens;* torn edges at the cranial end (arro
- **3.4** *M. femorotibialis internus*; damaged along it origin from the medial surface of the femur (a rows).
- **3.5** *M. pubo-ischio-femoralis*; haemorrhages from ischiadica below the muscle.
- **3.6** *M. flexor cruris medialis*; undamaged.

ischium and runs alongside its border caudally. The cranial end of the pubis projects beyond the acetabulum as *Tuberculum preacetabulare* (syn. *Processus pectinealis*) which, according to Beddard[2], is formed by the ischium. The caudal border projects beyond the ischium as *Apex pubis*. The absence of a *Symphysis pubis* to strengthen the pelvis is compensated by an extensive fixation of the pelvis to the vertebral column forming the *Synsacrum*.

(b) *Articulation of the femur with the pelvis*. This occurs in two places: (1) head of femur with acetabulum and (2) trochanter with antitrochanter.

Because the head of the femur does not present a surface extensive enough to allow for a full range of movement within the acetabulum, the articular surface extends to the neck of the femur and to the trochanter. The antitrochanter, which is formed by ilium and ischium, articulates with the femoral articular surface situated on the proximal aspect of the neck and the medial aspect of the trochanter of the femur.

(c) *Ligaments of the hip joint.*

(1) *Ligamentum capitis femoris;* from the *fovea capitis* to the *fossa acetabuli*, where it blends with the ventral part of the *membrana acetabuli*.

(2) *Ligamentum ischiofemorale*; from the cranial border of the ischiadic foramen, from the *labrum acetabulare* and the caudal part of antitrochanter, to the trochanteric crest of the femur.

(3) *Ligamentum iliofemorale*; on the cranial aspect of the hip joint.

(4) *Ligamentum pubofemorale*; together with the *Ligamentum ischiofemorale* it forms the articular capsule.

Topographically associated with the hip joint is the *ligamentum ischiopubicum* extending from the *Processus obturatorius* (syn. *processes ventralis*) of the ischium to the pubis.

(d) *Muscles of the hip joint*. Only muscles on the medial side of the thigh were investigated, because it appears that only these muscles are subject to damage during avulsion of the articular cartilage of the femoral head. The names used in the text are those recommended by the Nomina Anatomica Avium 1979[1]; synonyms sometimes used are given in brackets.

M. iliotibialis cranialis	*(sartorius[4])*
M. femorotibialis medius	*(vastus intermedius[5])*
M. ambiens	*(pectineus[3])*
M. femorotibialis internus	*(vastus medialis[5])*
M. pubo-ischio-femoralis	*(adductor[1])*
M. flexor cruris medialis	*(semimembranosus[4])*
M. iliotibialis lateralis	*(tensor fasciae lata[5])*

Although the last muscle in fact lies on the lateral side of the thigh, it is included here because it can be seen from the medial side during dissection and it is topographically important as being in a triangle between *M. iliotibialis cranialis* and *M. femorotibialis medius*.

The blood supply to the above muscles is from the *a. femoralis* and *a. ischiadica*. The *a. femoralis* is the continuation of the *a. iliaca externa*. The *a. ischiadica* arises from the abdominal aorta and enters the thigh through ilioischiadic foramen between *M. pubo-ischio-femoralis* and *M. iliofibularis*.

II. Carcases affected by hip dislocation

(a) *Carcases of birds found dead on arrival (DOA) at the processing plant.*

The contents of five lorries, i.e. 19 790 broilers at an average age of seven weeks, were investigated. Ninety-six birds were found dead on arrival, namely 0.48% of the total number; of these fifty-two had dislocated hips (54% of DOA; 0.26% of the total). Dislocation of the left hip was recorded in 29 carcases, of the right hip in 22 carcases and one had both hips dislocated. In the group of 52 carcases with displaced hip all had lesions of forceful avulsion of the proximal articular cartilage of the femur. The degree of avulsion varied as did the extent of damage to and haemorrhages into the surrounding tissues. The observation was made that the percentage of DOA was greater during the months of January to March than in September, thus coinciding with the ambient temperature for the months in question.

In all cases the articular cartilage and the epiphyseal plate remained fixed within the acetabulum. The "raw" head of femur was separated from the articular cartilage and pushed cranioventrally causing damage to the surrounding tissues in the process (Fig. 2). The joint capsule was found to have sustained relatively little damage, except for the medioventral part, which appeared torn. The ligaments were relatively undamaged, except for the *ligamentum iliofemorale*. The *ligamentum capitis femoris* remained undamaged and had to be cut during examination in order to inspect the articular cartilage and the acetabulum.

The muscles found damaged during forceful avulsion of the articular cartilage were:

M. femorotibialis medius (Fig. 3 No. 2) was found torn along its entire origin from the cranial surface of the femur.

M. femorotibialis internus (Fig. 3 No. 4) was found extensively damaged along its origin from the medial surface of the femur.

M. ambiens (Fig. 3 No. 3) the cranial edge of which, running alongside of the *M. femorotibialis internus*, was found torn in many instances. Only the most cranial muscles of the thigh on the medial side appeared to be subjected to injury. The haemorrhages within the muscles were produced which leaves the *a. femoralis* at the level of *tuberculum preacetabulare* and runs within the *M. femorotibialis medius*. The haemorrhages visible on the surface of the *M. pubo-ischio-femoralis* (Fig. 3 No. 5) were from the damaged *A. ischiadica*.

(b) *Displacement of the hip observed during processing*. Only two carcases were found to have sustained avulsion before death. In the other three, displacement of the hip had occurred after death, during the processing, without any avulsion of the articular cartilage, i.e. a true luxation, which had occurred post mortem.

(c) *Suspected hip displacement noticed after processing.*

Of the fifteen chilled or frozen thighs, only five had avulsion of the articular cartilage, one had a partial avulsion and the remaining nine were normal without any sign of avulsion or displacement. The haemorrhages had been interpreted erroneously as a sign of avulsion having taken place.

III. Observation on catching and loading

The whole process of loading one truck containing 361 plastic crates, each holding ten live birds, kept nine men and a supervisor occupied for plus minus one hour. Five of the men were stationed inside the broiler house catching live birds. The act of catching was performed mostly from behind, that is to say the birds were running away from the catcher. During capture, each man pulled the grasped leg caudally, causing *hyperextension* of the hip joint as well as abduction of the femur. Immediately after capture, the captor transferred the bird to the other hand, holding the bird by its one leg only. The other leg was usually kept flexed against the bird's body. After ten birds had been caught in this way, the load was evenly distributed, i.e. five birds were held in each hand, and carried outside. Here a team of four men, working in a relay line, loaded the birds into crates on the truck. In other words, each bird was handled by five different men. It appears that the same leg was handled throughout, although this was difficult to ascertain in each and every case. The fact that the other leg was usually held tightly flexed against the body, would make for slower handling if it had to be grasped.

IV. Examinarion of clinical 'cripples'

Among the six "cripples" collected from the broiler house, no evidence of avulsion was found. Any lameness detected before catching appeared to be of a different nature and not the subject of the present investigation. One may hazard a guess that such birds, caught by the normal process, may have been predisposed to avulsion of the femoral articular cartilage.

V. Histological examination

The line of rupture lay in the zone of provisional calcification. Haemorrhages were widespread and the sinusoids dilated. Otherwise no abnormality was noted.

DISCUSSION AND CONCLUSIONS

The fact that no cases of avulsion of the articular cartilage were recorded amongst the clinically observed cases of lameness from the broiler house, appears to indicate that "spontaneous" avulsion does not occur. All the observed cases had been subjected to the catching procedure; i.e. to trauma, and one must conclude that avulsion of the proximal femoral articular cartilage is a physical, man-made phenomenon. Admittedly, more extensive observations on clincial "cripples" need to be done before this fact can be established unequivocally. In any case, it would be difficult to rule out those cases where the injury had been self-imposed, i.e. where the bird had accidentally got its leg caught by some impediment and had to struggle to free itself. It is clear that in the process of catching, with the birds almost invariably facing away from the catchers, over-extension of the coxofemoral joint and at the same time abduction, which is normally very limited in birds, occur. The weakest link in the chain, namely the junction between the femoral head and its articular cartilage gives way. If anything, the condition is exacerbated by the subsequent handling. In this respect it should be noted that there is no plate of epiphyseal cartilage between metaphysis and bony epiphysis in birds, ossification proceeding centrifugally from the dia- and metaphysis. The thickness of the articular cartilage depends on the degree of maturity of the bone.

The incidence for any particular age group could be expected to be influenced by certain variables, such as a) force applied during catching and holding; b) exact posture of the bird and the degree of extension and abduction at the moment of apprehension; c) the muscular tone at that time; d) the extent and degree of struggling after catching; e) inherent mechanical strength of cartilage to bone contact over the femoral head.

That the lesion in question was present in such a high percentage (54%) of cases of birds found dead on arrival at the processing plant and the correlation of this figure with the ambient temperature, suggests that affected animals, being unable to move normally, are prone to suffocation during transit.

It is clear that a limited number of cases of avulsion do survive and are slaughtered and processed. As the normal routine at the processing plant could not be interfered with, it was impossible to relate the number of cases discovered after processing to the exact number of birds at the intake point. Hence no figure for the incidence of such cases can be given.

No cases of true avulsion post mortem have been observed. They would be difficult to detect during routine inspection, as there would be no subcutaneous haemorrhages around the hip joint. Conversely, haemorrhages may be present owing to some other cause or causes. On the other hand, true luxation occurring post mortem has been observed in a few cases.

On the face of available evidence, avulsion of the proximal femoral articular cartilage bears no direct relationship to dyschondroplasia (osteochondrosis[7 8]). It is a one-time lesion, the result of trauma, and affects the femoral head. No histopathology of the articular cartilage comparable to that recorded for dyschondroplasia has been observed. Admittedly, microscopic examination was limited. Only by developing standardised mechanical tests for determining the strenght of bone-cartilage adhesion and by applying such tests to different classes of birds kept under different conditions, could one be able to detect whether predisposing causes are present, as has been postulated for dyschondroplasia[7 8].

It appears reasonable to expect a decline in the number of cases should the birds be allowed to attain a more mature stage. Such a solution would be unacceptable to the broiler industry on economic grounds. Consequently an improved mode of apprehending and handling the birds should be considered. In some countries the use of modules has been claimed to reduce the incidence (Personal observation).

ACKNOWLEDGEMENTS

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BOOK REVIEW **BOEKRESENSIE**

ZOO AND WILD ANIMAL MEDICINE

MURRAY E FOWLER (ED.)

2nd Edn. W.B. Saunders Company, Philadelphia, PA 19105. 1986 pp XI and 117, 515 illustrations and numerous tables, Price $85.00 (ISBN 0-7216-1013-7).

About seven years ago I acquired the first edition of this book. At this stage the book shows definite signs of wear – proof that it has been extensively used by myself and my colleagues in the Kruger National Park. I was, therefore, pleasantly surprised receiving this revised edition for review purposes.

This book is concerned with zoological medicine, which includes a broad spectrum of disciplines involved with the medical problems of all species of animals not classed as companion animals or livestock. The two major divisions of this field concern captive wild animals (zoo medicine) and free-living animals (wildlife medicine). Although this edition recognizes the growing interest in both captive and free-living wild animals, it overwhelmingly emphasizes the former. The impression is gained that the chapter on the significance of disease of free-living wild animals was added only on afterthought.

In its broadest sense zoological medicine is concerned with the whole spectrum of invertebrates, fish, amphibians, reptiles, birds and mammals. Being impossible to cover all animals known to mankind in a book this size, the authors endeavoured quite successfully to include representative animals of all groups; animals which at the same time also have either aesthetic or economic values. Fish were excluded. Although an attempt was made to cover all regions, heavy emphasis was placed on the United States, with southern Africa featuring less prominently. Although the book covers mainly zoo medicine, this is not considered a disqualification; principles and techniques remain to related species.

The book is arranged in five parts. The first part provides general information on wide ranging subjects such as the significance of diseases in free-living wildlife, stress, restraint, zoonoses, poisoning, etc. Parts 2 to 5 are allocated to special medicines of the different groups of animals, i.e. amphibians and reptiles, birds, mammals and a small section on invertebrates. Each part is further divided into sub-headings which are allocated to groups of animals which would require more or less the same treatment, e.g. Mustelidae, Viveridae, Felidae, etc. Different authors or specialists in the field handle the different sub-headings. Where available, information given throughout, includes relevant facts on taxonomy, comparative anatomy, physiology, nutrition, restraint, husbandry, pathology, infectious diseases, parasitology, behavioural aberrations and reproduction.

The book is aimed at the clinician who looks after captive wild animals and has some limitations for the veterinary researcher in the wildlife field. It does not present a complete review of the subject matter that is covered; only the most important aspects are covered and the most relevant references given.

This book, however, has great application for laboratory animal science. A great number of animals covered are being used under laboratory conditions. Sometimes the laboratory animal scientist is also required to handle some of the more "exotic" species and in this context this book should be of great value.

The second edition is an improvement on the first. It has better coverage of groups that did not receive the necessary attention in the first; knowledge is updated and material reorganized slightly without increasing the size of the book appreciably.

In South Africa, until very recently, zoo and wildlife medicine have been the forte of only a handful of specialized veterinarians. Wildlife medicine courses are still not taught in the veterinary schools. Knowledge that was acquired in this field was therefore self-taught. Economically and aesthetically wildlife is, however, becoming a factor to contend with in South Africa and more and more veterinarians are called upon to minister to wild animals; sometimes with considerable embarrassment to the vet! It is therefore not surprising that veterinarians in South Africa are becoming intensely interested in wild animal medicine. At this stage the Wildlife Group of the South African Veterinary Association has a membership totalling 81. It is therefore anticipated that this book will go far in alleviating the omission in veterinary education in S.A. and provide veterinary practitioners with the background to be able to minister to wild animals with some confidence. I therefore have no hesitation in recommending this book to all veterinarians in southern Africa, who have some interest in wildlife.

V. DE VOS

ARTICLE ARTIKEL

PATHOGENESIS OF SUBCLINICAL BOVINE MASTITIS: A COMPARISON OF THE DYNAMIC BALANCES OF VARIOUS SUBCLINICAL UDDER HEALTH STATES MONITORED BY MEANS OF SINGLE-, DOUBLE- AND TRIPLE-PARAMETER LABORATORY TECHNIQUES

W.H. GIESECKE* and MARIE-LUISE BARNARD*

ABSTRACT: Giesecke W.H.; Barnard Marie-L. **Pathogenesis of subclinical bovine mastitis: A comparison of the dynamic balances of various subclinical udder health states monitored by means of single-, double- and triple-parameter laboratory techniques.** *Journal of the South African Veterinary Association* (1986) **57** No. 3, 139-143 (En) Veterinary Research Institute, 0110 P.O. Onderstepoort, Republic of South Africa.

This comparison of results from parallel investigations, conducted on the small herd model already discussed, has made it abundantly clear that during lactation, udder health as such depends on the 3 major determinants of intramammary epithelial integrity, somatic cellular defence and bacterial challenge. Different subclinical health states and related dynamic fluctuations indicate that each of these conditions and changes depends on the type of major determinant of udder health as well as on the nature and magnitude of factors challenging that determinant, either singly or in combination with another of the main determinants. Because of the involvement of 3 important determinants, diagnostic techniques must of necessity facilitate the concurrent monitoring of each of the determinants and the integrated interpretation of results generated. Such an approach to investigations into subclinical mastitis is not feasible by means of either single- or double-parameter techniques. In contrast, triple-parameter determinations capable of monitoring each of the 3 major determinants of udder health and performed during this investigation by means of the IDF/BSA (International Dairy Federation/bovine serum albumin) criteria, clearly have facilitated the interpretation of results at unprecedented levels of diagnostic differentiations. In the light of this clearer insight into a comparatively extensive range of udder health states at the subclinical level and corresponding dynamic balances and pathogenetic developments, it is apparent that appropriately designed and standardized triple-parameter techniques of high diagnostic sensitivity and reliability, would make the diagnosis of udder health states far more specific, and the control and prevention of subclinical mastitis far more cost-effective, than generally thought possible under present conditions. Further progress in research and practical work on subclinical mastitis may well depend on efficient triple-parameter techniques for determinations on persisting, deteriorating and improving states of bovine udder health.

Key words: Bovine, sub-clinical mastitis, triple-parameter techniques.

INTRODUCTION

It has been reported[3 7] that results on the dynamic balance of udder health states may differ significantly, depending on the diagnostic techniques used for monitoring the fluctuating conditions. These differences have major implications which affect the general concept, definition and diagnosis of mastitis, the understanding of the pathogenesis and dynamic balance of subclinical health states, and eventually the cost-effectiveness and success of mastitis control.

Because the dynamic balance of udder health states is integral to bovine udder health, it may be pointed out that a considerable range of earlier investigations[2] into different physiological and pathological aspects of the bovine udder, has shown conclusively that during normal lactation, udder health at its normal and abnormal levels, depends on 3 major determinants, namely, intramammary epithelial integrity, somatic cellular defence and bacterial challenge. Their respective change from normal to abnormal condition, may apparently be determined by means of a wide range of different techniques available, particularly those for the diagnosis of subclinical mastitis[5 6 8-11].

However, all the techniques discussed by these workers are not necessarily equally compatible with the conclusive fact that udder health as such depends on the 3 major determinants mentioned above. After all, these techniques, though ostensibly used to investigate the same condition, i.e. subclinical bovine mastitis associated with intramammary infection, usually facilitate neither the concurrent investigation of all 3 main determinants involved, nor the integrated interpretation of results generated on each of them. Instead, techniques similar in principle to determinations limited exclusively either to levels of bovine serum albumin (BSA) or somatic cell counts (SCC) or the presence/-absence in milk of pathogenic bacteria, amount as a group to single-parameter techniques, each limited to evaluations of a different one of the 3 major determinants involved. Other techniques similar to determinations by means of the cytological and bacteriological criteria proposed by the International Dairy Federation (IDF)[12] amount to double-parameter techniques, each limited to evaluations of a different pair of the 3 major determinants involved. Again, other techniques similar to determinations by means of the combined IDF/BSA criteria[6], amount to triple-parameter techniques facilitating concurrent investigation and integrated interpretation of all 3 of the major determinants involved.

The above-mentioned facts may all suffice to indicate certain important differences in the various types of techniques generally available for determinations of subclinical health states of the bovine udder. The practical significance of such fundamental differences in the monitoring and interpretation of dynamic fluctuations of subclinical conditions has been further investigated below.

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MATERIALS AND METHODS

This investigation, similar to those described above[3,7], was conducted as an integral part of the same investigation already discussed elsewhere[4]. Its general experimental conditions were therefore identical to those of the other examinations except for the following:

1. Evaluation of results: In contrast to the results described in the 2 former papers which depended on combined double-parameter determinations by means of the IDF criteria[1,2] and triple-parameter determinations by means of the IDF/BSA criteria[6], the corresponding classes of findings on BSA, SCC and pathogenic aerobic bacteria in milk during this investigation were each assessed singly, thereby simulating single-parameter determinations.
2. Conditions determined:
   (i) Elevated intramammary epithelial permeability (EIEP): Similar to the initial suggestions[6] on the BSA test, presence (+) or absence (−) in a quarter of EIEP was determined depending solely on lacteal levels of BSA related to diameters of precipitation zones of $\geq$ 8.0 mm and $<$ 8.0 mm, respectively.
   (ii) Secretory disturbance (SD): Following the suggestions from several workers on the exclusively cytological diagnosis of subclinical mastitis as reviewed elsewhere[5], the presence (+) or absence (−) of so-called SD in a quarter was determined depending solely on its SCC values per ml of milk amounting to $> 500 \times 10^3$ and $\leq 500 \times 10^3$, respectively.
   (iii) Intramammary infection (IMI): Adapting to the suggestion of diagnosing intramammary infection by means of bacteriological examinations alone[1], the presence (+) or absence (−) of so-called IMI in a quarter was determined depending solely on the isolation from its milk of pathogenic aerobic bacteria commonly related to subclinical mastitis.
3. Presentation of results: Data presented below have been limited to those particularly applicable to dynamic balances of the health states EIEP, SD and IMI assessed and compared with corresponding data on the conditions of mastitis (M), latent infection (LI), aseptic mastitis (AM) and normality (N) diagnosed by means of the IDF criteria[7] and the conditions of septic (SM) and aseptic mastitis (AM), relevant (RTI) and irrelevant teat canal infection (ITI), specific (SHAG) and unspecific hyperalbumingalactia (UHAG), unspecific cellular reaction (UCR) and complete normality (CN) determined by means of the IDF/BSA criteria[3].

RESULTS

Diagnostic and supplementary characteristics of EIEP, SD and IMI

From the diagnostic and supplementary data (Table 1) it is clear that the absence in the quarters of one condition (e.g. IMI) did not preclude the presence of another abnormal condition (e.g. SD) in the same quarters. This means that neither of the single-parameter techniques used on its own facilitated completely correct differentiations between those quarters truly abnormal and others truly normal.

Dynamic balances of subclinical udder health states monitored by means of different techniques

1. Single-parameter techniques:

The dynamic balance of normal and abnormal conditions EIEP, SD and IMI (Fig. 1) was rather similar in principle. However, at the level of the actual numbers of quarters related to the fluctuations (Fig. 1) and the corresponding percentage values of quarters with persisting, improving or deteriorating values of quarters with persisting, improving or deteriorating conditions (Table 2), considerable differences are apparent.

Table 1: General prevalence, diagnostic and supplementary characteristics of EIEP, SD and IMI each diagnosed in 1826 quarters by means of corresponding single-parameter determinations*

Designations	Udder conditions, respective diagnostic parameters and cirteria, diagnoses x corresponding values					
	EIEP		SD		IMI	
	Diameter (mm) of BSA precipitation zone:		SCC x 10^3 per ml of milk:		Isolation of pathogenic bacteria:	
	$\geq$ 8,0	<8,0	>500	$\leq$ 500	+	−
	Present (+)	Absent (−)	Present (+)	Absent (−)	Present (+)	Absent (−)
General prevalence of conditions (Nos. of quarters involved)	145	1681	535	1291	760	1066
Mean values (x) ± standard deviations (sd) of diagnostic parameters	9,10 ±1,84	6,09 ±0,83	2839 ±2932	104 ±105	Pathogens present	Pathogens absent
x-persistence (days) of bacteriologically and diagnostically identical health state	1,77	10,70	4,20	7,98	3,72	8,74
$\bar{x}$ ± sd values of SCC x 10^3 per ml of milk	3177 ±2535	711 ±705	—	—	1573 ±2294	413 ±1616
$\bar{x}$ ± sd values of diameters (mm) of BSA precipitation zones	—	—	7,01 ±1,66	5,99 ±1,05	6,70 ±1,53	6,04 ±0,93

*For corresponding data on conditions determined by the IDF and IDF/BSA criteria see (3) and (7)

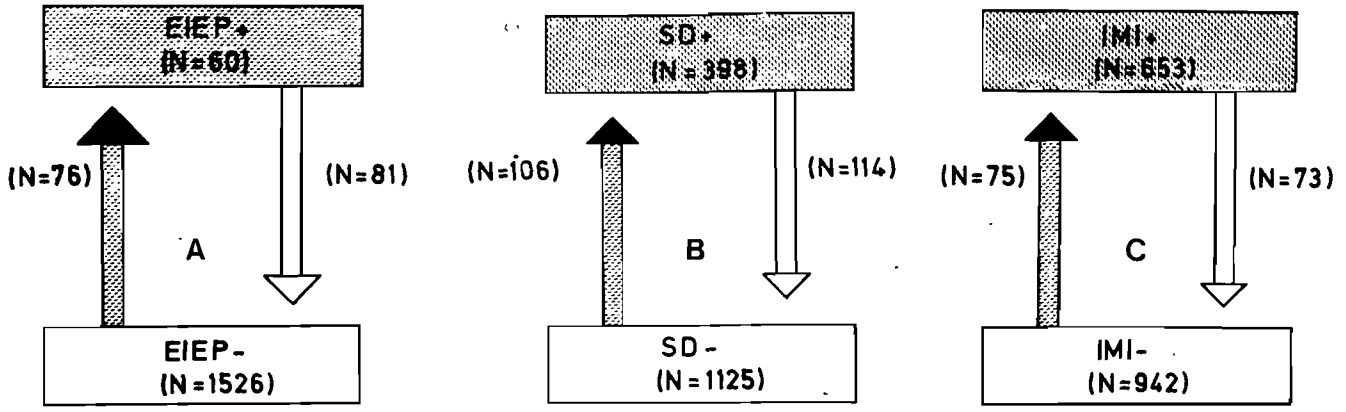

Fig. 1: Schematic presentation of the dynamic balance during 24 h periods of the 3 groups A, B and C of 2 interdependent subclinical health states each, diagnosed by means of the single-parameter EIEP, SD and IMI criteria and represented by the corresponding pools of quarters positive (shaded areas) or negative (unshaded area) relative to the condition, each subject to fluctuations of persistent (areas), improving (unshaded arrows) and deteriorating (shaded arrows) udder conditions. The arrows indicate dynamic changing of conditions along poorly differentiated pathways apparently related to the deterioration and restoration of bovine health as suggested by results in Table 2 above. N = numbers of quarters involved.

Table 2: Dynamic balance of udder conditions EIEP, SD and IMI each monitored during 24 h periods in 1743* quarters by means of corresponding different single-parameter determinations and expressed as the percentage values of quarters with persisting, deteriorating and improving conditions**

General descriptions of the different types of fluctuations of health states	Udder conditions determined by means of different techniques x corresponding % of quarters involved			
	EIEP	SD	IMI	Mean total value
Persistently present (+)	3,44	22,83	37,46	21,24
Persistently intermediate	—	—	—	—
Persistently absent (−)	87,55	64,54	54,05	68,72
Condition improved	4,65	6,54	4,19	5,13
Condition deteriorated	4,36	6,08	4,30	4,91

*For explanation of difference between 1826 quarters investigated and 1743 quarters monitored see (4)
** Data refer to Fig. 1

From the results (Table 2; Fig. 1) it is thus obvious that balances during the 24 h periods of the conditions EIEP, SD and IMI each depended on 4 pools of quarters where the relevant condition investigated was either persistently absent, had recently deteriorated, was persistently present or had recently improved. The corresponding mean percentage values of quarters involved (Table 2) amounted to 68,72%; 4,91%, 21,24% and respectively 5,13% on average for each of the conditions diagnosed.

Owing to completely different diagnostic parameters, the 3 techniques on average only agreed in 30,81% and 94,97% of quarters diagnosed positive and negative respectively for each of the 3 conditions. Corresponding diagnostic disagreements (i.e. errors) thus amounted on average to 69,19% false positive and 5,03% false negative diagnoses. Conditions intermediate to the 2 opposing poles at the extremes of udder health could not be determined as entities because diagnoses simply limited to the presence and absence of a condition do not facilitate the recognition of intermediate states of udder health.

2. Double-parameter determinations by means of the IDF criteria:

Table 3: Dynamic balance of 4 udder conditions monitored during 24 h periods in 1743* quarters by means of double-parameter determinations in terms of the IDF criteria and expressed as the percentage values of quarters with persisting, deteriorating and improving conditions*

General descriptions of the different types of fluctuations of health states	Udder conditions determined by means of the same double-parameter technique x corresponding % of quarters involved				
	M*	LI	AM	N	Totals
Persistently present (+)	19,39				19,39
Persistently intermediate		11,42	1,43		12,85
Persistently absent (−)				48,83	48,83
Condition improved	4,50	2,52	1,89	—	9,41
Condition deteriorated	—	3,33	1,66	4,53	9,52

* For corresponding detailed data and schematic presentation see (7)

From the results (Table 3) it is apparent that the balance during the 24 h periods between the 4 conditions M, LI, AM, and N depended on several pools of quarters where the relevant condition diagnosed either persisted or suggested improvement or deterioration of health relative to different conditions determined initially. Owing to the more detailed differentiation between conditions, facilitated by means of the IDF criteria, the results further indicated clearly that the conditions LI and AM are health states intermediate to the 2 major conditions M and N representing opposite poles at the extremes of udder health. The balance between udder health states at the 3 major levels of quarters where M and LI and AM, as intermediate states, and N persisted, and in other quarters where changing conditions indicated improvement and deterioration of health, therefore involved 19,39%; 12,85%; 48,83% 9,41% and 9,52% respectively of quarters monitored.

Owing to similarities of some diagnostic parameters, the double- and single-parameter techniques on average

Table 4: Dynamic balance of 8 udder conditions monitored during 24 h periods in 1743 quarters by means of triple-parameter determinations in terms of the IDF/BSA criteria and expressed as the percentage values of quarters with persisting, deteriorating and improving condition*

General descriptions of the different types of fluctuations of health states	Udder conditions determined by means of the same triple-papameter technique x corresponding % of quarters involved								
	SM*	RTI	ITI	SHAG	AM	UCR	UHAG	CN	Totals
Persistently present (+)	2,87								2,87
Persistently intermediate		13,08	11,25	0,06	—	1,26	—		25,65
Persistently absent (−)								46,53	46,53
Condition improved	2,75	3,96	2,52	—	0,17	1,89	1,15	—	12,44
Condition deteriorated	—	1,72	3,04	0,40	0,29	1,38	0,40	5,28	12,51

* For corresponding detailed data and schematic presentation see (3)

showed agreement in 69,81% and 74,21% respectively of quarters presumably affected with mastitis-like conditions and those free from them. However, owing to certain diagnostic similarities, the 2 different types of techniques did not only agree, on average, in 22,68% truly mastitic, but also in 47,13% of falsely mastitic quarters and in 72,61% truly normal, but also in 1,60% of falsely normal quarters if judged by the results of the triple-parameter determinations by means of the IDF/BSA criteria.

3. Triple-parameter determinations by means of the IDF/BSA criteria:

The results (Table 4) from triple-parameter determinations by means of the IDF/BSA criteria clearly indicate that the balance between health states monitored during 24 h periods may be far more complicated than suggested by comparable results from the above-mentioned single- and double-parameter determinations. Apart from the wider range of 8 conditions differentiated (Table 4), it is obvious that the health states differ in their respective importance to the persistence, improvement and deterioration of udder health at normal and abnormal levels. Between the major pools of SM and CN quarters, as opposite poles at the extremes of udder health, there are the pools of quarters with intermediate conditions RTI, ITI, SHAG, AM, UCR and UHAG. They, in turn, may be grouped into the conditions ITI, UCR and UHAG (= Class 1 conditions at the level of single-determinant challenging) and the conditions RTI, SHAG and AM (= Class 2 conditions at the level of double-determinant challenging) already discussed above[3]. Because udder health as such depends on the 3 major determinants of intramammary epithelial integrity, somatic cellular defence and bacterial challenge, the dynamic fluctuations of the different health states (Table 4) indicate that each of such states and its dynamic changes depend on the type of major determinant of udder health as well as the nature and magnitude of factors challenging that determinant singly or in combination with another of the main determinants.

DISCUSSION

From the results compared (Table 2 – 4) it has become evident that appropriate monitoring and interpretation of dynamic fluctuations of subclinical udder conditions does not depend so much on the development of new techniques[5 9], but rather on the correct combination of the techniques available[3 6]. Because udder health as such, clearly depends on the 3 major determinants of intramammary epithelial integrity, somatic cellular defence and bacterial challenge[3], the combined techniques must of necessity facilitate the concurrent monitoring of each of the determinants and the integrated interpretation of results generated. Such an approach to investigations into subclinical mastitis therefore requires appropriately designed and standardized triple-parameter techniques capable of diagnostically resolving different health states at high levels of sensitivity and reliability.

The determinations conducted by means of single-, double- and triple-parameter techniques[3 7] have made it clear in principle that the latter facilitate the interpretation of results at unprecendented levels of diagnostic differentiations. This, in turn, permits an advanced insight into different udder conditions which through their dynamic balancing singly and collectively, may be of eminent importance to further progress on the prevention and control of subclinical mastitis. Furthermore, the differentiation[3 7] between an extended range of udder conditions associated with different levels of intramammary challenging and pathways of pathogenetic developments is obviously of major significance to a more complete and correct understanding of subclinical mastitis. It seems unlikely that such new differentiations and findings would dramatically affect current knowledge on the pathogenesis of subclinical mastitis, in the broad sense. However, it seems conceivable that this knowledge augmented by more detailed data on pathogenetic developments, would facilitate more specific and cost-effective work on bovine udder health than thought possible under present conditions.

It therefore seems reasonable to conclude that further progress on subclinical bovine mastitis may significantly depend on diagnostic determinations by means of triple-parameter techniques similar in principle, though possibly more economic, than that used during this investigation[3].

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BOOK REVIEW **BOEKRESENSIE**

LABORATORY MANUAL FOR ANIMAL TECHNICIANS

VICTORIA SOLBERG

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This manual has been prepared to provide a structured course for training technicians in animal restraint and the administration of drugs to laboratory rodents, rabbits, dogs, cats and birds. The course comprises 15 exercises which will enable participants to become familiar with the use of simple laboratory equipment such as syringes, balances, restraint boxes, dosing needles and the routes of drug administration and blood collection. Most of the exercises comprise the administration of substances which produce physiological changes with clinically observable effects. These substances include ethanol, caffeine, sodium pentobarbital, tubocurarine, xylazine, dextroamphetamine and oestrogens. Each project requires students to answer a series of questions on the action and effects of the substance and to record their specific observations on a separate observation sheet.

Most of the exercises detailed in this manual produce rather stressful physiological changes on the animals. The induction of intoxication in mice with ethanol, stimulation of rats with amphetamine and paralysis of mice with tubocurarine raise the ethical questions of whether the educational benefits justify the stress and discomfort which these procedures cause. It is unlikely that these exercises would be approved for genefal classroom practicals by University or Technikon animal care and use committees in South Africa. They would, however, be acceptable if carried out as demonstrations by a skilled and experienced tutor on limited numbers of animals. The manual would therefore be of greatest value to teachers of laboratory animal technology and experimental biology in South Africa and can be recommended for this purpose.

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ARTIKEL ARTICLE

DIE ROL VAN DIE VEEARTS TYDENS DIE VERLIES VAN 'N GESELSKAPSDIER

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ABSTRACT: Odendaal J.S.J. **The role of the veterinarian during the loss of a companion animal.** *Journal of the South African Veterinary Association* (1986) **57** No. 3, 145-149 (Afrik) Department of Zootechnology, Faculty of Veterinary Science, University of Pretoria, Private Bag X04, 0110 Onderstepoort, Republic of South Africa.

The loss of a companion animal can be of intense importance to the owner of such an animal. The attitude of the veterinarian who often finds himself in the centre of the emotions experienced by the owner therefore becomes critical. His respectful and responsible handling of the animal, his empathy with the owner, and the realisation of his own sensitive position, are discussed. The veterinarian is led along practical guidelines to expand his professional role and enhance his image as caregiver.

Key words: Loss of companion animal, owner, veterinarian.

INLEIDING

Hierdie onderwerp mag vir sommige veeartse 'n verleentheid skep, maar dit lei geen twyfel dat dit 'n uiters belangrike onderwerp vir die meeste **eienaars** van geselskapdiere is nie. As die verlies van 'n geselskapdier dus belangrik is vir die eienaar, dan behoort dit ook belangrik te wees vir die veearts. Daarom val die soeklig op die rol van die veearts, omdat hy ten nouste betrokke is by die dood van die geselskapsdier.

Eienaars verloor geselskapsdiere onder verskillende omstandighede en daar word tussen 3 kategorieë onderskei, naamlik: Omstandighede waar die dier self sterf; omstandighede waar die dier gaan sterf, òf die eienaar besluit op genadedood voor dit gebeur (d.i. terminale gevalle); omstandighede waar die eienaar op genadedood besluit sonder dat die dier siek of beseer is.

ONVERWAGTE GENADEDOOD

Die dier sterf self: Diere kan tuis – in die áfwesigheid van 'n veearts – of by 'n veterinêre kliniek in die áánwesigheid van die veearts sterf, as gevolg van byvoorbeeld ongelukke, beserings, siektes en ouderdom. Al sou die dier tuis sterf is die veearts dikwels steeds betrokke, omdat dit gevalle is wat onder sy behandeling was, of waar daar 'n lang verbinding tussen veearts, pasiënt en kliënt bestaan het. Die veearts word dan telefonies of met 'n besoek in kennis gestel van die verlies. As die dier onder behandeling was, vind daar natuurlik ook 'n bespreking van die omstandighede van die dood plaas. Ander gevalle bereik wel die veearts, maar sterf by aankoms sonder enige behandeling. Laastens is daar die gevalle wat onder die veearts se behandeling by die kliniek/hospitaal sterf.

VOORSIENE GENADEDOOD

Dier gaan sterf: Die dier verkeer in so 'n toestand dat hy binne afsienbare toekoms self gaan sterf (terminaal), òf die eienaar kan weens ander menslike redes vra dat die lewe aktief beëindig word. By hierdie soort besluit speel die veearts 'n belangrike rol. Die eienaar maak dàn veral staat op die veearts se kennis en ondervinding om die regte besluit te neem. Dit plaas 'n groot verantwoordelikheid op die veearts se skouers omdat die besluit so finaal is, en omdat dit 'n herinnering is wat die eienaar altyd in verband kan bring met die veearts se aanbeveling. McCulloch gee 'n aanduiding van hierdie verantwoordelikheid, nadat hy bereken het dat geselskapsdierveeartse meer as 'n 100 miljoen mense per jaar in die VSA konsulteer: "Even if just a small percentage of these involve emotionally upset clients, the actions of the veterinarian can be significant (McCulloch, 1976, 1978). At the time of euthanasia of pet animals, the veterinarian may be the only health professional who can observe and intervene"[9].

Besluite oor genadedood in hierdie kategorie gaan meesal oor ouderdom, kankers en ander ongeneeslike siektes, aangebore abnormaliteite, uitgebreide trauma, siektes wat die dier se kwaliteit van lewe te nadelig beïnvloed, die verlies van die nut wat die eienaar uit sy dier kan haal as gevolg van siekte en besering en laastens finansiële oorwegings ten opsigte van langtermyn of ander duur behandeling.

Die besluit oor ouderdom en genadedood word 'n al hoe groter probleem. Na mate veterinêre dienste verbeter, verbeter ook die lewensverwagting van geselskapsdiere. Dit veroorsaak 'n langer en nouer band met die eienaar en maak die afskeid, as so 'n dier sou sterf, soveel meer intens en 'n meer emosionele belewenis. 'n Besluit oor genadedood is soms makliker met ongeneeslike siektes, aangebore defekte, uitgebreide trauma en finansiële oorwegings, as met ouderdom.

Dit is uiters noodsaaklik dat die veearts ten opsigte van al hierdie oorwegings die meerdere kennis sal besit om die eienaar só in te lig, en te lei, dat 'n rasionele besluit geneem word. Eers dan kan die veearts genadedood met selfvertroue uitvoer.

VERKOSE GENADEDOOD

Eienaar versoek genadedood: Hier besluit die eienaar dikwels op sy eie om genadedood toe te pas, terwyl die geselskapsdier nog in goeie gesondheid verkeer. Dit gebeur meesal dat die veearts en eienaar ná konsultasie, saamstem dat so 'n dier wel 'n genadedood toegedien moet word, maar daar is ook gevalle waar eienaars met eienaardige redes, sonder om 'n konsultasie aan te vra,

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'n dier uit die lewe wil help. Baie keer staan die diere in die weg van persoonlike probleme.

Van die redes wat aangevoer word vir genadedood sluit onder andere in: honde wat kinders byt, destruktiewe gedrag, besmettingsgedrag en onaanpasbaarheid, verhuising en vertrek met vakansie. Egskeidings en afsterwe van 'n eienaar van 'n dier in 'n gesin, kan ook tot versoeke van genadedood lei. Meer ongewone versoeke sluit in dat 'n testament bepaal dat die hondjie in dieselfde kis as die oorledene begrawe moet word of sommer net dat die hond die matte vuil trap. Soms is daar 'n persoonlike stryd oor die dier se genadedood in die huis aan die gang. Die ouers vertel aan die kinders die diertjie gaan "hospitaal toe", terwyl die ouers eintlik beplan het om die dier te laat sterf. Of die man of vrou is onversoenbaar met 'n huisdier en laat die dier sonder die medewete van die ander party, 'n genadedood toedien. Rondom hierdie situasies word daar dikwels van die veearts verwag om "saam te speel" en om 'n leuen wat by die huis vertel is, te ondersteun.

PRAKTIESE OORWEGINGS

Alhoewel daar baie oor hierdie onderwerp gefilosofeer kan word, is die praktiese oorwegings, uiteindelik vir die veearts van die grootste belang. Die veearts se betrokkenheid word as volg beoordeel: Die rol van die veearts teenoor die dier wat sterf, of 'n genadedood toegedien moet word; die rol van die veearts teenoor die eienaar van so 'n dier; die veearts se eie posisie.

Die veearts se rol teenoor die dier: Die dier moet met respek hanteer word: enersyds as respek teenoor die lewe self, ál word dit beëindig, en andersyds as die eiendom van iemand anders. Die dier moet dus tot en met sy dood deur die veearts in ag geneem word, omdat die veearts 'n verantwoordelikheid het om na die dier om te sien. Indien so 'n dier onbeheerbaar is, moet daar eers 'n berustingsmiddel toegedien word, voordat genadedood toegepas word. Tref alle voorsorg d.w.s. menslike maar effektiewe beheer, dat die dier nie iemand beseer tydens die genadedood nie. Versorg die karkas behoorlik, veral na 'n nadoodse ondersoek. Verseël dit in sakke om aansteeklike siektes na ander diere te beperk. Indien die eienaar 'n dier wil terug hê ná 'n nadoodse ondersoek, kan dit rofweg dog netjies weer toegewerk word. Die veearts moet toesien dat sy personeel ook ingelig is oor hoe diere tydens en ná genadedood behandel behoort te word.

Dit is belangrik dat 'n veearts 'n doeltreffende, flinke verwyderingsdiens van karkasse moet kan voorsien. Eerstens kan so 'n karkas 'n bron van besmetting wees vir ander diere en tweedens kan reuke ook die area besoedel. Dit is uiters belangrik dat karkasse ook doeltreffend verwyder word ter wille van die mense wat die veearts se perseel besoek. Dooie diere moet nooit deur die publiek gesien word nie. Karkasse wat rondlê, skep die "idee van dood" by kliënte – en dit moet vermy word, al is die dood van diere deel van die veearts se alledaagse ervarings. Reeds in die beplanning van 'n kliniek/hospitaal moet daar voorsiening gemaak word vir nadoodse ondersoek asook die verdere stoor en/of hantering van die karkasse op die perseel.

Indien die dier wat genadedood moet ontvang goedgeaard en gesond is, kan daar gerus eers na 'n ander tuiste vir die dier gesoek word. Hierdie benadering het al dikwels groot uitkoms vir so 'n finale situasie gebied. Aggressiewe groot honde kan byvoorbeeld vir waghondorganisasies geskenk word.

As die veearts eksperimentele behandelings, bloedoortappings of enige ander voordeel uit 'n genadedoodbestemde dier wil haal, moet daar eers toestemming van die eienaar verkry word. Dieselfde geld as daar beoog word om 'n nuwe tuiste vir die dier te vind. Die veearts is eties verplig om genadedood toe te pas indien die kliënt onder die indruk verkeer dat dit wel toegepas sou word. Moontlik kan die gebruik van diere deur 'n veearts voordat die genadedood toegedien word, reeds onder die kliënt se aandag gebring word, as die dier nog jonk is.

Genadedood bly deel van die veearts se professionele diens en hy moet sy pasiënt dienooreenkomstig hanteer.

Die rol van die veearts teenoor die klient: Hierdie aspek word in die moderne veeartsenykunde van al hoe groter belang. De Groot[2] meen dat die huidige siening in die kurrikulum en navorsing van veterinêre opleidingsentra, uit die hoogs suksesvolle negentiende-eeuse model van Newton spruit. Hierdie model se klem het geval op 'n onbetrokke rasionalisme en die strewe na 'n meganistiese benadering van 'n oorsaak en gevolgverwantskap. Sedert die middel van die twintigste eeu is hierdie model al hoe meer bevraagteken en vervang met 'n nuwe benadering. Bioloë, sielkundiges, antropoloë en fisioloë het gesamentlik die nuwe siening ontwikkel wat gegrond is op evolusionêre en ekologiese perspektiewe. Dit fokus op die komplekse en ewig-bewegende interaksies tussen die komponente van die materiesisteem. Hierdie interaksies moet begryp word om die realiteite van die natuur te omvang. Verder word realiteite en magte wat in die wetenskap aanwesig is, soos waardes, etiese oorwegings en emosionele betrokkenheid, erken. Hierdie veranderlikes word in ag geneem, eerder as om hul wettige teenwoordigheid as deel van wetenskaplikes se werk, te ontken. Die nuwe wetenskaplike benadering met sy klem op onderling beïnvloedbare oop sisteme, vorm 'n vrugbare raamwerk om met die probleme van die dood te handel, en dit behoort die sentrale siening van die leerplan en navorsing in vandag se veterinêre instellings te wees.

Die lewensverwagting van mense is hoër as die van huisdiere. Die oorgrote meerderheid van geselskapsdier-eienaars gaan dus die verlies van 'n dier beleef. In die VSA is in ondersoeke bevind dat 68% van alle huishoudings honde of katte aanhou en in 9 EEG-lande, 50% enige soort geselskapsdier[10]. Lewis het vasgestel dat ⅔ van die gesinne hulle geselskapsdiere as deel van die huisgesin beskou[6]. McCulloch het bereken dat genadedood alleen, meer as 2% van besoeke aan die veearts uitmaak[7]. Dit beteken dat daar jaarliks in die VSA aan tussen 13 en 18 miljoen honde en katte genadedood toegedien word[8]. Harris, soos aangehaal deur Beck & Katcher[1], het gevind dat 51% van kliënte huil of sigbaar aangedaan is by die kliniek nadat 'n geselskapsdier 'n genadedood ontvang het. In 'n ondersoek van kliënte wat maatskaplike werkers se ondersteuning nodig gehad het na die verlies van hulle geselskapsdier, het Quackenbusch & Glickman[12] bevind dat ongeveer 70% van sulke gevalle vroulik was en 30% manlik. Hierdie beperkte statistiek verleen tot 'n mate perspektief aan die belangrikheid van genadedood vir geselskapsdier-eienaars, asook die gepaardgaande stremming wat dit op die veearts kan plaas.

Net soos van die veearts verwag word om die dier in ag te neem, moet hy ook sy kliënt in ag neem. Alle

mense beleef nie die verlies van 'n geselskapsdier op-dieselfde manier nie. So 'n belewenis kan wissel van 'n patologiese verbintenis tussen mens en dier tot die skynbaar emosielose persoon wat die dier net as vervangbare voorwerp hanteer. Dan is daar ook dié groep persone wat 'n fisiese afhanklikheid van diere het sóos blindes, dowes en gestremdes. Hierdie mense se gevoelens word dubbeld beproef omdat die persoon afskeid moet neem van die fisiese hulp, sowel as die dikwels psigiese band wat tussen mens en dier in hierdie omstandighede vorm. Alhoewel die mensdom al die Dood hanteer so lank as wat die mens self bestaan, is die persoonlike ervaring van elke spesifieke mens steeds onvoorspelbaar teen die tyd dat die Dood wel opdaag – al is dit dan dié van 'n geselskapsdier. Tanatologie (kennis rondom die dood) is ten spyte van sy wye toepassing en lang geskiedenis 'n relatief onlangse veld van diepte-studie.

Die normale skok-reaksie wat tydens die aanhoor van slegte nuus ontstaan, kan ook by mense voorkom wat 'n geselskapsdier verloor. Hierdie reaksie is deur Kübler-Ross wat haar studie op kanker-pasiënte gedoen het, as volg verdeel[5]. Ontkenning: "Dr., jy speel seker". "Dit kan nie waar wees". Of mense wat met dooie diere na die kliniek jaag, selfs 3 uur in die oggend, net dat die veearts tog finaal bevestig dat die dier dood is. Aggressie: "Dr., jy sal weer van my hoor – deur my prokureur" of "Dr., jy sal nóóit weer van my hoor nie!" of "Die ongeskikte bestuurders!". (Onnodig om te sê dat hierdie mense soms verskoning vra na hulle tot hulle sinne gekom het). Skuldgevoelens en depressie: "Was die kos nie te ryk wat ek die hond gegee het nie". "Moes die hond nie binne geslaap het nie". "Moes ek nie vroeër gekom het nie". "Ek wil nooit weer 'n dier aanhou nie – ek kry hulle nie groot nie". (Fogle[3] haal vir Willbur aan wat meen dat 15% van kliënte nie weer diere wil aanskaf na hulle geselskapsdier se dood nie, omdat die afskeid te swaar was). Bedinging: Al is die geval hopeloos, sal die eienaar nog vra: "Is daar nie nog iets wat ons kan doen nie", of "Boetie kom huis toe oor 'n week, sal die hondjie tot dan lewe?". Aanvaarding: "Ek gaan nou vir my 'n ander hondjie kry". Dit is meesal, maar nie altyd nie, beter as die kliënte 'n afgestorwe geselskapsdier gou vervang. Mense wie se geselskapsdiere (katte) skielik dood gaan (ongelukke), is meer geneig om die diere eerder dadelik te vervang, as mense wie se diere eers lank siek was, voor dood[11].

Die dood is 'n finaliteit en die veearts moet sy rol so vervul dat dit nie ook 'n finale besoek van die kliënt is nie. Behalwe vir slegte gevoelens wat die kliënt by-bly, sleg pratery (geregverdig of nie), beteken 'n finale besoek ook minder kliënte en minder inkomste. Die veearts durf dus die belangrikheid van sy optrede teenoor die kliënt tydens die verlies van 'n geselskapsdier nooit onderskat nie.

Tanatologie mag dalk nie deel uitmaak van die veearts se aanvanklike visualisering van sy beroep nie, maar, omdat hy met lewe werk, word die dood netso 'n deel van sy werk. Op die wyse raak die veearts noodgedwonge betrokke by die kliënt se belewing van die geselskapsdier se dood. Hierdie betrokkenheid moet egter nie so ver gevoer word dat die veearts se professionaliteit in gedrang kom nie. Die veearts moet nie die kliënt só ondersteun tydens die verlies van die geselskapsdier dat hy/sy wens dat daar nog diere was wat kan doodgaan nie! Die veearts moet nie saam met die eienaar huil nie en hy kan nie te diep betrokke raak by 'n kliënt se persoonlike emosionele belewenisse nie. Wat hiermee duidelik tuisgebring wil word is dat daar 'n grens bestaan t.o.v. die veearts se betrokkenheid by die kliënte en hierdie grens sal deur elke eie omstandigheid bepaal word. Indien kliënte wel ernstige probleme ontwikkel, behoort die veearts hulle na ander professionele hulp te verwys. Kaartjies of telefoonoproepe kan dalk ná die tyd deur veeartse gestuur word, maar 'n mens moet versigtig wees dat oormatige deelneming nie lyk na verskoning vra, asof die veearts skuldig is aan die dier se dood nie. Aan die anderkant kan die veearts nie totaal koel en afsydig teenoor sy kliënt se persoonlike behoeftes staan nie. Empatie en begrip is die minste wat gevra kan word. In erge skok kan 'n stoel of 'n koppie tee aangebied word. Moenie die onstelde kliënt blootstel aan die ander mense in die wagkamer nie – bied 'n aparte vertrek aan waar die kliënt tot bedaring kan kom en indien moontlik, laat die kliënt die kliniek by 'n sydeur verlaat. Hierdie klein gebaartjies van bedagsaamheid word deur die kliënt onthou.

Bied die kliënt opsies oor die uitvoering van genadedood. Laat die eienaar kies of hy wil bystaan of nie, en of hy self die dier wil verwyder of nie. Toon en bespreek die genadedoodmiddel, indien die kliënt daarom vra en vertel presies wat en hoe dit gedoen gaan word. Laat die eienaar behoorlik afskeid neem indien hy wil, al moet die veearts die konsultasiekamer 'n paar minute verlaat om die eienaar die geleentheid daartoe te gee. Bied die kombersies, jassies, halsbande en kettings wat aan die dier behoort aan die eienaar aan sodat hy/sy self besluit of hy dit wil hê of nie. Doen 'n nadoodse ondersoek as die eienaar dit verkies. Stel die vervanging van die afgestorwe dier voor sonder om van die eienaar te verwag om onmiddellik 'n besluit te neem. Laat daar geen dwang uitgaan van die veearts se kant nie en beantwoord alle vrae geduldig totdat die eienaar tevrede is.

Maak seker dat die eienaar presies die redes vir genadedood verstaan. Die veearts moet nooit die indruk wek dat hy deur middel van genadedood van sy "mislukkings" kan wegkom nie. Daarom is deeglike konsultasie tydens genadedood uiters belangrik – miskien belangriker as ander konsultasies, want daar is geen opvolgkonsultasies oor die geval nie. Die veearts se optrede bepaal dus of die kliënt hoégenaamd gaan terugkom of nie. Die ideaal is dat die veearts sy inligting so oordra dat die kliënt self 'n intelligente besluit oor die dier se uitkoms sal neem. Sinvolle kommunikasie is hier 'n sleutelwoord. Die kliënt moet saam met die veearts geneem word, sodat veearts en kliënt mekaar nie by die finale handeling van die dier, verloor nie. Die veearts moet nooit die skok vererger nie: "Sit hom maar uit!", of sê: "Dit is maar net 'n hond of kat". Die eienaar moet ook 'n geleentheid gebied word om te praat, want deur eers na die kliënt se behoeftes en vrese te luister, kan die veearts hierdie behoeftes en vrese begryp. Die kliënt kan byvoorbeeld eers huis toe gestuur word, todat hy homself oortuig het dat die dier genadedood nodig het. Die kliënt moet nie die kliniek verlaat in erge skok, teleurstelling, ongeloof, wantroue, beskuldigings, verwyte en selfs aggressie as gevolg van 'n swak konsultasie nie.

Genadedood is soms ook die tyd vir deeglike konsultasie ten opsigte van voorkomende voorligting soos byvoorbeeld met hondesiekte. Die eienaar moet weet hoe om verder soortgelyke verliese te vermy. Die eienaar moet nie direk beskuldig word nie, want hy/sy beskik nie altyd oor die kennis nie en die eienaar voel reeds skuldig oor die genadedood. As die veearts meer skuld

op die eienaar laai, kan daar 'n weersin in die veearts ontstaan en niks word bereik nie.

Indien die dier onverwags onder behandeling, operasie of aan 'n siekte sterf, moet die geval opgevolg word. Die eienaar is 'n verduideliking skuldig. 'n Nadoodse ondersoek en/of 'n tweede opinie moet voorgestel word. Selfs monsters vir verdere ontledings kan weggestuur word, maar moenie feite probeer verdoesel nie. 'n Fout, as daar een was, moet liewer in nederigheid erken word. Sommige veeartse kan so 'n situasie moeilik hanteer en hulle word selfs kwaad vir die eienaar. Die veearts kan deur dieselfde stadiums van skok (aggressie), as die eienaar gaan, en dit kan groot probleme veroorsaak. Die werklikheid moet so gou moontlik aanvaar, en die situasie moet daarvolgens hanteer word. Hofsake moet eerder vermy word.

As 'n dier opgeneem is en die dier sterf in die afwesigheid van die eienaar, moet die veearts met die kliënt skakel voordat die kliënt die kliniek besoek. Dit sal verhoed dat die kliënt die skokkende nuus verneem in die teenwoordigheid van 'n vol wagkamer wanneer die dier kom haal word. Indien 'n kliënt nie vooraf verwittig kon word nie, moet die geval afgesonderd in 'n aparte kamer bespreek word. Selfs ontvangsdames of veterinêre verpleegsters moet nie die eerste doodstyding oordra nie – die verantwoordelikheid berus ten volle by die veearts om dit self te doen.

Sodra 'n veearts besef dat weens ouderdom, kroniese of ongeneeslike siektes die dier se gesondheid 'n onomkeerbare verloop neem, sal dit goed wees om die eienaar geleidelik vir die verlies van die geselskapsdier voor te berei. Die korrekte geneeskundige feite moet betyds oorgedra word, sodat die dood in hierdie gevalle nie as 'n erge skok kom nie. Aanvaarding moet dus bewerk word vóór die dood, indien dit enigsins moontlik is.

Kinders is potensieel toekomstige kliënte en spesiale aandag moet aan hulle geskenk word in hierdie omstandighede. Indien die skok nie verwerk word nie bly dit hulle by, en kan daar lewenslank 'n vrees of 'n wrok teen die veearts bly bestaan. Die veearts moet dus ook met die kinders praat en in eenvoudige taal verduidelik. 'n Kind verstaan méér as wat mens soms dink. Toon ook simpatie met die kinders. 'n Kind se aandag kan soms maklik afgelei word met 'n troosmiddel, soos lekkergoed.

Die veearts moet verhoed dat finansiële beperkings, as oorweging vir genadedood, vir die eienaar 'n verleentheid word. Dit is beter om 'n siek/beseerde dier 'n genadedood toe te dien as wat die eienaar in 'n behandeling ingepraat word, wat hy in elk geval nie kan bekostig nie. Dit moet eenvoudig aanvaar word dat in die veterinêre professie, finansiële beperkings 'n faktor is wat in berekening gebring moet word. By diere kan die lewe nie bo alles gestel word nie. As die veearts in hierdie geval kans sien om wel 'n dier te behandel om sy lewe te red, ter wille van die eienaar, moet hy dit eerder gratis doen.

Soms verwag eienaars van die veearts om leuens oor genadedood van diere aan ander lede van die huisgesin te vertel – veral aan kinders. So word dit 'n gewetensaak van die veearts. Die veearts moet besef dat hy sy professionele geloofwaardigheid op die spel plaas. Dit is beter om indirekte of neutrale antwoorde te gee, as om in familie-twiste betrokke te raak. As daar geen ander uitweg is nie, moet daar liewer by die waarheid gehou word. Dan kan die mense die saak tuis self uitspook, maar niemand kan later die veearts van oneerlikheid beskuldig nie.

Die veearts se eie posisie: Die veearts as "dokter" is in die eerste plek in 'n stryd om die lewe gewikkel. Daarom gee dood in 'n sekere sin, ongeag die omstandighede, 'n gevoel van "'n stryd wat verloor is". Die veearts is daarom eintlik nie die beste persoon om die kliënt in hierdie omstandighede by te staan nie. Eienaars verwag ook soms te veel van die veearts. Die veearts beskik maar tot 'n baie beperkte mate oor lewe en dood. Partykeer word 'n dier verloor ten spyte van voortreflike behandeling en sorg en ander kere moet 'n gesonde goedgeaarde dier genadedood ontvang. Dit kompliseer die saak vir die veearts.

Wanneer 'n veearts wel met onbehandelbare gevalle te doen kry, waarvoor hy genadedood moet aanbeveel, dan moet hy dit eerder in die lig sien van: "'n Dokter kan nie altyd genees nie, maar hy moet altyd verligting gee". Beskou dit dus eerder as "verligting vir die pasiënt" teenoor "mislukking van die veearts"!

Die veearts moet altyd navraag doen waarom die kliënt 'n genadedood aanvra. Dit toon sy betrokkenheid by en verantwoordelikheid teenoor die dier. 'n Veearts behoort nie net onnadenkend 'n dier se lewe te beëindig nie.

Professionele gedrag in die beste sin van die woord, is altyd, maar verál tydens genadedood, van uiterste belang vir die beskerming van die veearts. Dit sluit ook beheersing van die emosies in terwyl ander se emosies dikwels hand-uit ruk. Soos dit reeds gestel is, begrip en empatie, mét grense.

Indien daar enigiets geneeskundig is wat vir die veearts nie duidelik is, vóórdat die dier gesterf het nie, behoort hyself 'n nadoodse ondersoek aan te vra. So 'n ondersoek wat vir sy eie kennis, ervaring en gerusstelling uitgevoer word, kan gratis wees.

SAMEVATTING

Dit is duidelik dat die laaste woord oor die onderwerp nog nie gespreek is nie, want elkeen sal uit sy eie ervaring meer en ander riglyne kan trek, maar die blote begin om oor hierdie onderwerp te skryf, kan reeds stimulerende vir verdere bydraes wees. Uiteindelik gaan dit alles daaroor om veeartse beter voor te berei vir hulle beroep. Kay het dit as volg gestel: "With the ability to offer wise and informed counsel to bereaved clients, veterinarians will expand their professional role and enhance their image as caregivers[4]".

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BOOK REVIEW **BOEKRESENSIE**

FERTILITY MANAGEMENT IN DAIRY CATTLE

R J ESSLEMONT, J H BAILIE AND M J COOPER

1st Edn. Collins Professional and Technical Books. William Collins Sons and Co. Ltd. 8 Crafton street London W1X3LA. 1985 pp 143, tables 54, figures 27, Price £9.95 (ISBN.0-00-383032-2)

Fertility management plays an extremely important role in total herd health control. This book outlines in a practical and simple way the important managemental aspects of fertility in dairy cattle.

The first two chapters will help veterinarians (who in general are not well enough equipped to handle the economic principles of dairy farming) to become acquainted with basic dairy economics. In chapter one the present day economics of dairying in the U.K. are described. The authors describe the highly complex nature of dairy farming which involves large capital outlays. The principles can be quite easily adapted for S.A. conditions. In chapter two the economics of fertility and profitable milk production are discussed. This can help consultants to give sensible advice on the cost effectiveness of various available alternatives. The economic implications of lifetime performance, annual production cycle, calving patterns, calving intervals, heat detection and culling rate are discussed.

Chapter three deals with the basic reproductive physiology of the cow, acting as background for chapter four which describes planned cattle breeding. The authors discuss the advantages and disadvantages of the different techniques, managemental and economic aspects and factors influencing success.

Chapter five covers all aspects of the husbandry of cattle fertility. The authors discuss the policy of the farmer, the use of A.I. or natural service, heat detection, pregnancy rate and culling strategy. The significance of oestrus observation is stressed as cardinal to the attainment of many of the set objectives.

Chapter six deals with the role of the veterinarian in fertility work. Objectives are presented and discussed. Suggested figures for each parameter are given. The various categories of cows to be examined and some of the treatments are given.

Chapter seven discusses the basics of records and their analysis. Microcomputer systems are outlined, and pitfalls in choosing a computer, software etc. are pointed out.

The last chapter presents a case study which shows how improved husbandry and management has led to large improvements in profitability.

This book, written by leading experts, covers all the important facets of fertility management in dairy cattle. It is based on simple and practical guidelines which can be adapted as required and allows one to become acquainted with all aspects of fertility work in dairy cattle.

I highly recommend this book to all veterinary and animal husbandry students, veterinarians and other advisors in the field of dairy farming.

D.C. LOURENS

ARTIKEL ARTICLE

THE INFLUENCE OF HIGH LEVEL FEEDING ON THE DURATION OF PARTURITION AND THE INCIDENCE OF DYSTOCIA IN DAIRY COWS

C. MAREE*

ABSTRACT: Maree C. **The influence of high level feeding on the duration of parturition and the incidence of dystocia in dairy cows.** *Journal of the South African Veterinary Association* (1986) **57** No. 3, 151-153 (En) Department of Livestock Science, University of Pretoria, 0002 Pretoria, Republic of South Africa.

Dairy cows on high and controlled feed levels were observed to determine the duration of the parturition process and the incidence of dystocia. Maternal and foetal mass ratio at calving were recorded. The duration of parturition in cows on high level feeding was significantly prolonged to 5,2 ± 2,8 hours as compared to 1,34 ± 0,89 hours in cows on controlled feeding. The incidence of dystocia was significantly higher in over-fed cows. While maternal mass on high level feeding increased by 27,3%, foetal mass increased by only 5,4%.

Key words: Feed level, parturition time, dystocia, foetal mass.

INTRODUCTION

Factors that affect the ease of calving have been more throughly recorded in beef cattle than in dairy cattle. Age and size of the dam, pelvic size, the role of the sire, foetal mass at birth and maternal feed level have all been identified to be closely involved in dystocia in beef cattle[2 5 8 14 15]. In dairy cattle fewer reports are available on the causes and prevention of dystocia. Most efforts have been directed towards bull selection to produce smaller calves at birth and towards the improvement of clinical procedures for calf delivery. Also, the treatment of post partum metritis has received considerable attention in dairy herds as compared to beef herds[9 10].

In this study the effect of over-conditioning on the duration and ease of the birth process and early puerperal period of dairy cows was studied. Overfeeding admittedly is not justified as a good managemental procedure. It is, however, common practice in many herds and particularly in stud herds, and in the preparation of show animals.

MATERIALS AND METHODS

Twenty four Friesland heifers of comparable age were reared and inseminated. After the first calving they were divided at random into a high and controlled feeding group on the following diets:

	High feed level		Controlled feeding	
	Dairy concentrate	*Eragrotis* hay	Dairy concentrate	*Eragrotis* hay
	kg	kg	kg	kg
First lactation	12,7	1,9	4,1	7,6
Dry period	9,1	2,6	1,4	9,4
Second lactation	12,7	2,7	4,1	8,4

A standard dairy concentrate was used consisting of 300 parts by mass of yellow maize meal and 100 parts of urea free HPC (40% protein, 65% TDN). The *Eragrostis* hay was of good average quality throughout.

Inseminations for the second calving were delayed for five months after the first calving to enable the two feed levels to have full effect on the body reserves of the two groups during lactation and pregnancy. This naturally prolonged the subsequent dry period.

At calving, the onset of Phase 2 of parturition was recorded at the first signs of physical labour together with complete or near complete dilatation of the cervix as determined by vaginal palpation. Dystocia was recorded when labour had proceeded for more than two hours from the onset of Phase 2 without a calf being born.

Traction was decided on when it appeared that the natural birth of a live calf would not be possible. This was accompanied by one or more of the following clinical signs: frequent or severe straining, maternal discomfort, absence of straining, oedema of the maternal perineal area or oedema of the foetal legs or face.

In addition to the period from the onset of parturition, calving ease or dystocia was also recorded in terms of the degree of traction required for delivery namely unassisted, light traction or strong traction.

Calves were weighed at birth and all cows were weighed weekly after water had been withheld for twelve hours.

In adult cattle specific reference points for conditioning included fat deposition in the dewlap, over the ribs and at the root of the tail.

Standard statistical procedures were employed to compute analysis of variance on all collected data.

RESULTS

The high and control feeding levels were responsible for the following changes in average body mass of cows in the two respective groups:

Group	Average initial mass (kg)	Final mass (kg)
High feed level	386 ± 49,8	638 ± 36,4
Control feed level	429 ± 45,7	496 ± 28,1

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Average gain of cows on the high feed level therefore, was 252 kg as against 67 kg for cows on control. Cows on the high feeding level were also visibly over-conditioned.

The maternal mass at calving for each cow in the two feeding groups together with the foetal mass at birth, the relative birth mass of calves $(\frac{\text{Foetal mass}}{\text{Maternal mass}} \times 100)$ and the duration of parturition are presented in Table 1.

Table 1: Maternal mass at calving, foetal mass, relative birth mass and duration of parturition of Friesland cows on high and controlled feed levels

Cow no	Mass (kg)	Birth mass (kg)	Relative birth mass (kg)	Duration of parturition (hours)
High feed level group				
2	585	31,8	5,4	5
5	651	32,6	5,0	8
7	607	44,9	7,4	6
9	655	32,7	5,0	2
17	674	34,4	5,1	3
18	592	29,5	5,0	6,25
24	649	36,7	5,7	11
25	630	41,7	6,6	5
30	702	42,2	6,0	4
32	636	42,2	6,6	1,75
$\bar{x}$	638,10	36,87	5,78	5,20
SD	36,40	5,44	0,85	2,82
Control group				
1	463	22,7	4,9	0,5
3	468	32,6	7,0	2,0
1	503	29,5	5,9	3,0
6	488	32,6	6,7	0,75
8	506	32,6	6,5	3,0
10	527	32,7	6,2	1,0
13	477	37,2	7,8	0,75
16	525	33,1	6,3	1,5
20	530	33,1	6,2	0,5
21	452	24,5	5,4	1,0
27	483	32,2	6,9	0,75
29	530	36,3	6,9	1,33
$\bar{x}$	496,00	31,59	6,39	1,34
SD	28,07	4,23	0,77	0,89
F	106,98**	6,57*	3,15NS	20,22**
SE	32,09	4,81	0,81	2,00

*P <0,05
**P <0,01

Table 2 presents the incidence of dystocia in relation to the birth mass and relative birth mass of each calf.

According to Table 1 high level feeding was responsible for a statistically significant increase (P< 0,01) in foetal mass at birth which was 36,9 ± 5,44 kg in the high feed level group as compared to 31,6 ± 4,2 kg for the control group. Relative birth mass though, was significantly higher (P < 0,05) in the control group at 6,4 ± 0,1% than on high level feeding at 5,8 ± 0,85%.

The duration of the parturiton process was prolonged significantly (P < 0,01) to an average of 5,2 ± 2,8 hours on high level feeding as against 1,34 ± 0,89 hours in the control group.

The incidence of dystocia increased correspondingly. Six of the ten cows on high level feeding had to be assisted. In the control group, however, there was a complete absence of dystocia and all births were unassisted.

Table 2: The incidence of dystocia in relation to maternal and foetal mass in cows on high and controlled feed levels

Cow no	Duration of parturition (hours)	Nature of assistance required	birth mass (kg)	Relative Birth mass (%)
High feed level group				
5	8	light traction	32,6	5,0
7	6		44,9	7,4
24	11		36,7	5,7
25	5		41,7	6,6
17	3	strong traction	34,4	5,1
30	4		42,2	6,0
18	6,25	no assistance	29,5	5,0
2	5		31,8	5,4
0	2		32,7	5,0
32	1,75		42,2	6,6
$\bar{x}$	5,20 ± 2,82**		36,87 ± 5,44	5,78 ± 0,846*
Control level group (All births unassisted)				
1	0,5		22,7	4,9
3	2,0		32,6	7,0
4	3,0		29,5	5,9
6	0,75		32,6	6,7
8	3,0		32,6	6,5
10	1,0		32,7	6,2
13	0,75		37,2	7,8
16	1,5		33,1	6,3
20	0,5		33,1	6,2
21	1,0		24,5	5,4
27	0,75		32,2	6,9
29	1,33		36,3	6,9
$\bar{x}$	1,34 ± 0,864		31,591 ± 4,227	6,39 ± 0,769

* P <0,05
** P <0,01

The birth process in cows on high level feeding appeared to be interrupted. Contractions and all signs of labour ceased and cows started feeding and even ruminated while the cervix was dilated and the foetus present in the pelvic outlet. This was recorded not only where calves had to be delivered by traction, but also where calves were born without assistance.

DISCUSSION

Decreased energy intake during pregnancy and a decrease in maternal mass at calving resulted in decreased foetal mass at birth. In heifers, however, pelvic size was also smaller at calving and consequently calving problems could not be reduced by lowering the feed intake[18].

Underfeeding inhibits foetal growth only to a minor degree in adult cows because maternal reserves cover requirements sufficiently[9]. In over-fed cows foetal mass is not proportionately increased because fattening in prenatal calves is limited[8,11].

This is confirmed by the results presented in Tables 1 & 2. While maternal mass increased by 27,3% on high level feeding, foetal mass at birth increased by only 5,4%.

The variation in foetal mass at birth and the incidence of dystocia indicate that foetal birth mass in either group was not the primary cause of dystocia in this study. Calves of moderate birth mass (34,5, 36,7 and 32,7 kg) had to be delivered by traction while relatively heavy calves (42,2, 41,7 and 44,9 kg) were born without assistance or required at least only mild traction. The most distinct feature was interruption of the parturition process in cows on the high feed levels and the uninterrupted progress of parturition in those in the control group.

It is suggested that the disparity in parturition time between the two groups is due to uterine inertia, the underlying cause of which cannot be explained.

Calcium and phosphorus imbalance, lack of exercise, over-fatness, debility and hormonal imbalance have been suggested as underlying causes of uterine inertia[1,13]. Reports are also available implying that excessive feeding during pregnancy may be a predisposing cause of faulty uterine involution and post partum metritis[7] whilst short duration labour may benefit subsequent reproductive performance [4-6]. This trial confirms the role of over-feeding in dystocia and prolonged labour time.

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BOOK REVIEW **BOEKRESENSIE**

VETERINARY LABORATORY MEDICINE

J R DUNCAN and K W PRASSE

2nd Edn. The Iowa State University Press, Ames, Iowa 50010 1986, Price R132 (ISBN 0-8138-1916-4).

The second edition of Veterinary Laboratory Medicine by Duncan and Prasse has been brought out due to the tremendous growth in veterinary laboratory medicine that has occurred since the publication of the first edition in 1977.

The book's format is the same as that used in the first edition i.e. to relate abnormalities identified by laboratory procedures to organ dysfunctions or lesions with emphasis on the pathophysiologic basis for the development of the abnormal test result. The interpretive aspects of laboratory medicine are stressed, with the differential diagnosis created by an abnormal test value also coming under consideration. Throughout the book reference is made to the cases listed in Appendix II; the laboratory data of these cases are used to illustrate the concepts dealt with in the various chapters.

The chapters in the book deal with the following:

Erythrocytes (basics of production, metabolism, breakdown, evaluation, diagnosis of anaemia and polycythemia); Leukocytes (basics of function, production, kinetics, evaluation and interpretation of responses); Haematopoietic neoplasia; Haemostasis; Water, Electrolytes and Acid base; Proteins, lipids and carbohydrates, Liver, Digestive System, Urinary system, Muscle, Endocrine system and Cytology.

There are two appendices, the first one is of reference values while the second one deals with the case studies mentioned previously.

This book is easily read due to the text being concise and clear. In my opinion this book will be a valuable asset to both students and practicing veterinarians.

N.M. DUNCAN

SHORT COMMUNICATION KORT MEDEDELING

DIE BETEKENIS VAN DIE SIMMETRIE VAN DIE HARDEVERHEMELTERIFPATROON BY DIE HOND

S W PETRICK*

ABSTRACT: Petrick S.W. **The significance of the symmetry of the hard palate ridge pattern in the dog.** *Journal of the South African Veterinary Association* (1986) 57 No. 3, 155-157 (Afrik) Department of Surgery, Faculty of Veterinary Science, University of Pretoria, P.O. Box 12580, 0110 Onderstepoort, Republic of South Africa.

In order to find a parameter that could be used to differentiate between a pedigreed dog and a mongrel the symmetry of the hard palate ridge pattern was examined in 239 pedigreed dogs representing 30 breeds and 334 mongrels. A symmetrical pattern was found in 148 pedigreed dogs and in 15 mongrels. This difference according to the Chi-square test is very highly significant. Thus the symmetry of the pattern is a valuable parameter to be used to distinguish between pedigreed dogs and mongrels.

Key words: Dog, hard palate ridges

INLEIDING

Die teksboeke oor Anatomie van ons huisdiere verwys na die hardeverhemelte as twee gelyke dele of simmetriese helftes en dat die riwwe 6-10 pare uitmaak en nie altyd volledig is nie[2-4]. Daar is geen spesifieke beskrywing van die rifpatroon of 'n simmetriese voorkoms daarvan nie.

In sy vergelyking tussen die hardeverhemeltes van ons huisdiere het Kraft[1] gevind dat die rifpatroon spesie- en individueel spesifiek is. Ook hy maak geen melding van die simmetrie van die rifpatroon nie. Hy het na 21 honde gekyk waarvan 16 vyf rasse verteenwoordig het en 5 kruise.

Hierdie navorsing is gedoen om die reeds vroeë waarneming tydens praktykvoering te bevestig, naamlik dat daar 'n merkbare verskil was in die voorkoms van 'n simmetriese of asimmetriese rifpatroon tussen opregte honde en kruisings.

MATERIAAL EN METODE

Die 239 opregte honde het aan telers behoort of aan eienaars wat voorgegee het dat die diere raseg was. Die kruisings was herkenbaar of deur die eienaars bevestig.

Honde was fisies ondersoek deur die bek oop te maak en die riwwe van die hardeverhemelte te besigtig vir: 1 Die simmetrie van die rifpatroon; 2 die aantal volledige riwwe; en 3 rifeienskappe van familielede wat ooreengestem het.

Dikwels was dit tydens 'n kliniese ondersoek gedoen of met plasing van die endotragealebuis. 'n Aantal diere was spesifiek daarvoor ondersoek en ook 'n aantal nadoods.

Die ras van die dier, simmetrie van die rifpatroon en die aantal volledige riwwe was op rekord geplaas. Sketse was gemaak van die eienskappe van rifpatrone wat by familielede ooreengestem het.

Fig. 1 is 'n voorbeeld van 'n simmetriese rifpatroon terwyl Fig. 2 en 3 voorbeelde van asimmetriese rifpatrone is.

As volledige riwwe was beskou diegene wat weerskante tot teenaan die tandvleis teenwoordig was selfs met onderbrekings of ander abnormaliteite tussen die twee eindpunte. In Fig. 4 en 5 word aangedui hoe die riwwe getel was.

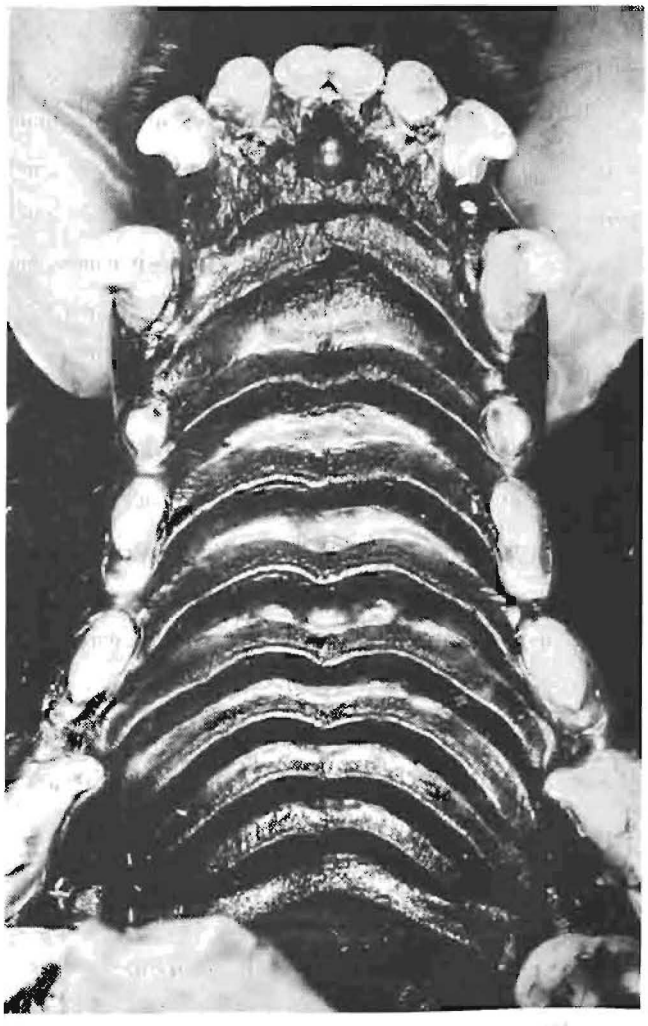

Fig. 1: Voorbeeld van 'n simmetriese verhemelterifpatroon.

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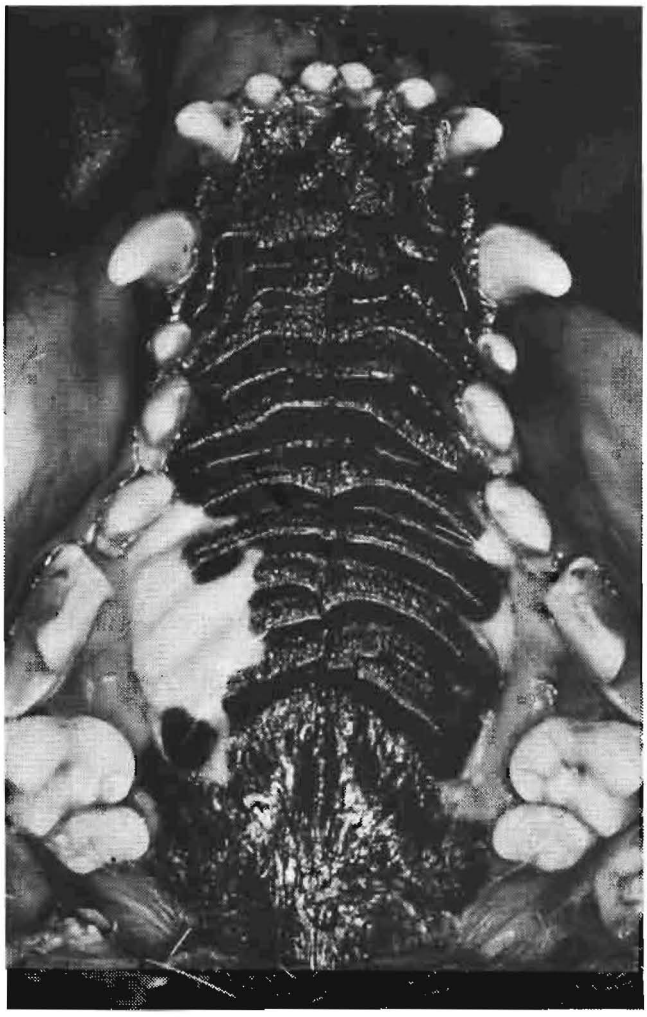

Fig. 2: Asimmetriese hardeverhemelterifpatroon

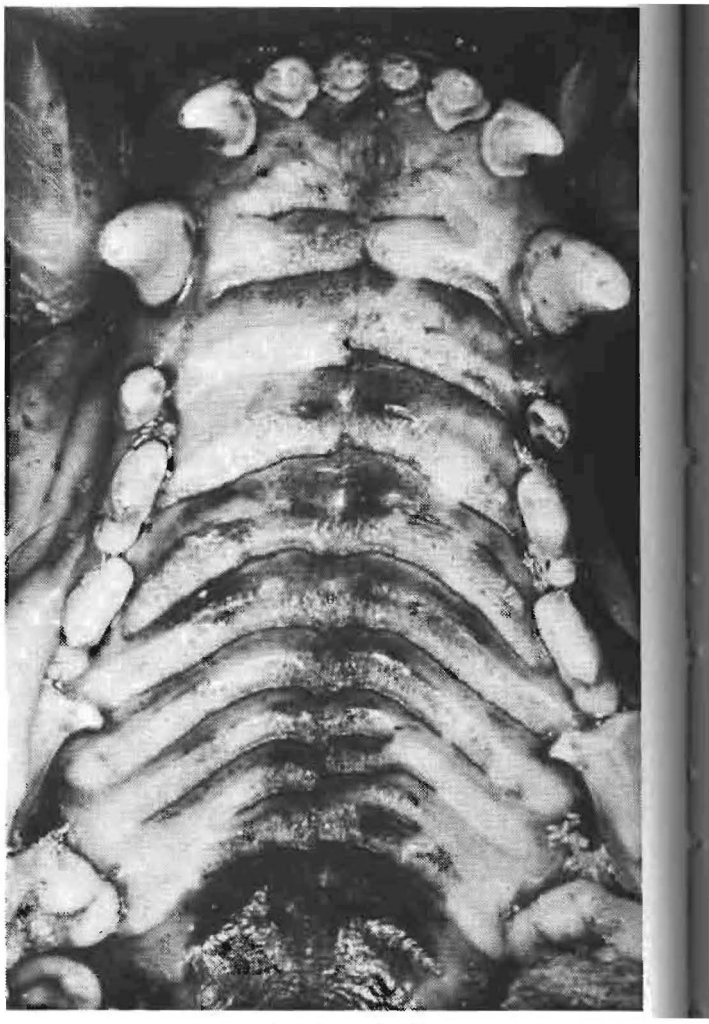

Fig. 3: Asimmetriese hardeverhemelterifpatroon

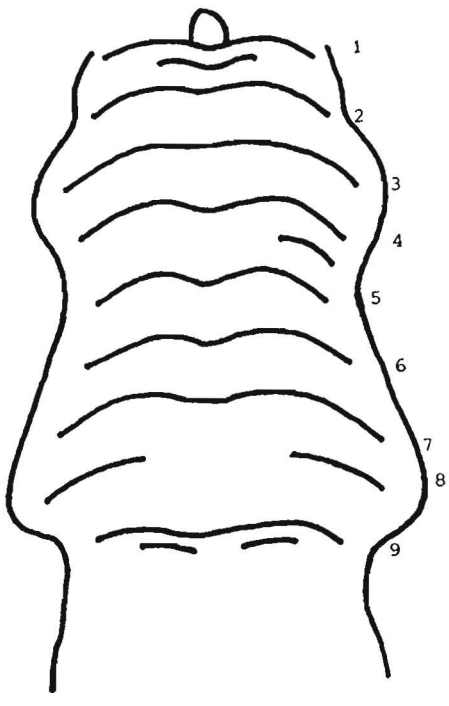

Fig. 4: Hoe die riwwe getel was. 'n Volledige rif is een wat weerskante aan die tandvleis raak.

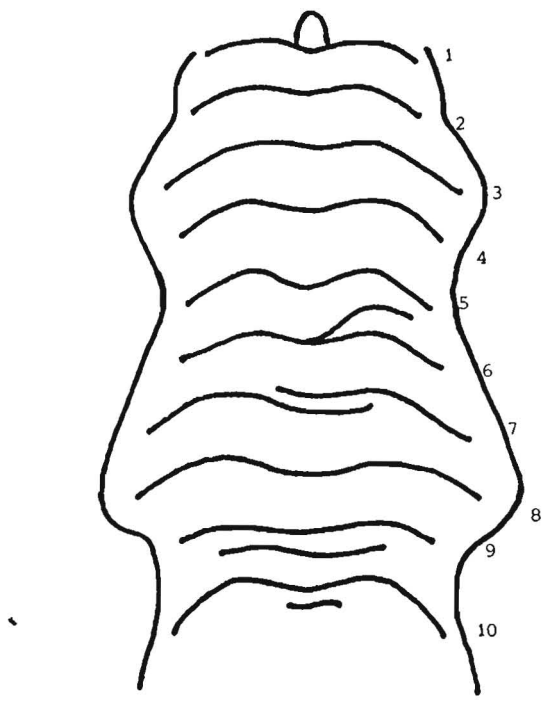

Fig. 5: Hoe die riwwe getel was

RESULTATE

Die aantal diere met simmetriese en asimmetriese hardeverhemelterifpatrone by opregte en gekruisde honde word in Tabel 1 weergegee.

TABEL 1 Simmetriese en asimmetriese rifpatrone by opregte honde en kruisings

	Simmetriese patroon	Assimmetriese patroon	Totaal
Opregte honde	148	91	239
Kruisings	15	319	334
Totaal	163	410	573

Wat die aantal volledige riwwe betref was daar van 6 – 11 teenwoordig met 9 riwwe in ongeveer 65% van die opregte honde en 75% van die kruisings

Spesifieke rifpatrooneienskappe wat by 'n reun of teef teenwoordig was, was ook aanwesig in lede van hulle nageslagte.

BESPREKING

Volgens die Chi-kwadraattoets is hierdie verskil tussen die simmetrie van die rifpatroon by opregte honde en kruising baie hoogs betekenisvol.

Dit moet ook hier gemeld word dat 21 telers vraelyste en diagramme voltooi het om inligting oor 177 opregte honde van 23 rasse beskikbaar te stel en dat soortgelyke resultate vir simmetrie, aantal riwwe en teenwoordigheid van patrooneienskappe in familielede gevind is soos in die opregte honde wat in hierdie navorsing gebruik is.

Volgens die resultate is dit dus duidelik dat die simmetrie van die rifpatroon 'n betroubare parameter blyk te wees om te kan onderskei tussen 'n opregte hond en 'n kruising.

DANKBETUIGINGS

Die outeur bedank graag die 21 telers vir waardevolle inligting, mnr T C Stuart van die Vrolijkheid Natuurbewaringstasie en Dr V de Vos van die Nasionale Krugerwildtuin vir inligting oor wilde Carnivora. Professor C J Roos word bedank vir sy kritiek met die skryf van die manuskrip.

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ABSTRACT

SAMEVATTING

PATHOGENESIS OF FACIAL ECZEMA AND GEELDIKKOP (*TRIBULOSIS OVIS*)

The subject of this study was the pathological and scanning electron microscopical changes in the biliary systems of sheep suffering from facial eczema or geeldikkop *(Tribulosis ovis)*, or made photosensitive by ligation of the common bile duct. While an obliterative cholangitis is responsible for the retention of phylloerythrin in facial eczema, the occlusion of bile ducts with crystalloid material (microliths) appear to perform a similar function in geeldikkop. The similarities and differences between the 2 diseases are discussed in the light of their pathogenetic mechanisms. (Coetzer, J.A.W., Kellerman, T.S., Sadler, W. & Bath, G.F., 1983. Photosensitivity in South Africa. V. A comparative study of the ovine hepatogenous photosensitivity diseases, facial eczema and geeldikkop (*Tribulosis ovis)*, with special reference to their pathogenesis. *Onderstepoort Journal of Veterinary Research,* 50, 59-71 (1983).)

ABSTRACT

SAMEVATTING

TUMOURS OCCURRING IN EQUIDAE IN THE REPUBLIC OF SOUTH AFRICA

A survey was carried out on the neoplasms of horses, donkeys and mules which are recorded in the registration files of the Section of Pathology of the Veterinary Research Institute, Onderstepoort, in the Republic of South Africa, over a 40-year period from 1935 to 1974.

A total of 378 tumours are recorded, 339 of which were in horses, 32 in mules and 7 in donkeys. Sarcoids (38%), squamous cell carcinomas (23,5%), fibromas (8,2%), melanomas (8,0%), papillomas (4,5%), fibrosarcomas (3,4%) and lymphosarcomas (3,0%) accounted for 88,6% of the total.

Of the 58 sarcoids for which the site or origin was determined, 46,5% occurred on the head, 32,8% on the chest and abdomen, 19% on the limbs especially below the level of the carpus or hock and 1,7% on the neck.

Fifty percent of the 89 squamous cell carcinomas occurred on or around the eyes, especially on the eyelids or nictitating membrane, 23% involved the penis and/or prepuce, while just over 20% arose on the skin. The melanomas involved the skin and eye, whilst papillomas originated primarily on the skin and less frequently on the penis. (Bastianello, Stella S., 1983. A survey on neoplasia in domestic species over a 40-year period from 1935 to 1974 in the Republic of South Africa. IV. Tumours occurring in Equidae. *Onderstepoort Journal of Veterinary Research,* 50, 91-96 (1983).)

ABSTRACT

SAMEVATTING

TUMOURS OCCURRING IN THE CAT IN SOUTH AFRICA.

A total of 243 neoplasms were recorded in a survey of all the feline neoplasms which are reported in the registration files of the Veterinary Research Institute, Onderstepoort, Republic of South Africa, covering a 40-year period from 1935 to 1974.

The tissues most commonly neoplastic were the skin, followed by the lymphoid tissue, the digestive tract and the genital system, which together accounted for 76,6% of the total tumours. Squamous cell carcinomas, the commonest type of tumour, accounted for 65 (26,7%) of the 243 neoplasms, followed by lymphosarcomas with 50 (20,5%). The majority of squamous cell carcinomas involved the skin, especially that of the ear and nose. A reasonably high proportion of these tumours also occurred on the tongue and eyelid. The commonest form of distribution for lymphosarcomas was the multicentric form, followed by the alimentary, the renal and thymic forms.

Squamous cell carcinomas were the most frequent type of skin tumours, followed by basal cell tumours, mastocytomas and melanomas. The digestive tract accounted for 33 (13,5%) of the neoplasms, the 3 most commonly encountered being squamous cell carcinomas, lymphosarcomas and intestinal adenocarcinomas. The mammary gland tumours accounted for 23 (9,5%) of the total, 61% of which were carcinomas.

Other tumours encountered were fibromas, fibrosarcomas involving particularly the skin, melanomas of the skin or eye, osteosarcomas, hepatocellular carcinomas and haemangiosarcomas. (Bastianello, Stella S., 1983. A survey of neoplasia in domestic species over a 40-year period from 1935 to 1974 in the Republic of South Africa. V. Tumours occuring in the cat. *Onderstepoort Journal of Veterinary Research,* 50, 105-110 (1983).)

CASE REPORT GEVALVERSLAG

PATHOLOGY OF CANINE LENTIGINOSIS PROFUSA

I.B.J. VAN RENSBURG* and O.M. BRIGGS**

ABSTRACT: Van Rensburg I.B.J.; Briggs O.M. **Pathology of canine lentiginosis profusa.** *Journal of the South African Veterinary Association* (1986) 57 No. 3, 159-161 (En) Department of Pathology, Faculty of Veterinary Science, University of Pretoria, P.O. Box 12580, 0110 Onderstepoort, Republic of South Africa.

Lentiginosis profusa was diagnosed in 3 pedigree Pugs namely two unrelated parents and their female offspring. Macroscopically the lentigines appeared as black macules up to 10 mm in diameter and occurred especially in the skin of the ventral parts of the body. Skin biopsies revealed localised acanthosis and hyperkeratosis with prominent rete ridges and epidermal hyperpigmentation in the absence of any other significant dermal pathology.

Key words: Canine lentiginosis profusa, lentigines, lentigo, skin.

INTRODUCTION

Lentiginosis profusa is a rare condition characterized by the formation of smallish black macules called lentigines (singular lentigo) in the skin of both man and the dog[2]. Recently Briggs[1] reported the occurrence of lentigines in 3 Pugs and compared the canine condition with that of humans which is also known as the "Leopard syndrome". He came to the conclusion that, as in humans, the canine condition also follows an autosomal dominant mode of inheritance[1]. It is the purpose of this paper to describe the pathological findings in representative skin biopsies obtained from the same 3 animals.

PROCEDURES

Wedge-shaped incision biopsies were taken so that part of a lentigo and normal adjoining skin were incorporated in each case. These were fixed in 10% formalin and embedded in paraffin wax for the preparation and staining of sections with haematoxylin and eosin in a routine manner.

RESULTS

Macroscopical findings

Case 1

In the male dog (sire of Case 3) multiple lentigines varying in size from 2-5 mm in diameter occurred in the skin of the ventral abdomen and distal limbs. Those on the limbs somewhat resembled pigmented naevi or moles in man as each had a slightly raised polypoid rather than macular appearance when viewed from the side (Fig. 1).

Case 2

In this bitch, the dam of Case 3, numerous lentigines were present on the limbs with lesser numbers on the ventral thorax, abdomen and in the axillae. Those on the limbs were generally smaller than those on the ventral trunk some of which were up to 10 mm in diameter. These lesions were not significantly raised above the normal surrounding skin and appeared as more-or-less round black blotches with a roughened surface and relatively indistinct borders (Fig 2 & 3).

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**Private practitioner, Heathfield.

Case 3:

By the time that this bitch, the off-spring of Cases 1 and 2, had reached the age of 2 years, numerous well demarcated lentigines varying in size from 4-10 mm in diameter, had developed on the skin of the limbs, ventral abdomen and forehead (Fig. 4). Their appearance closely resembled those of its dam except that they were more sharply demarcated and more intensely black.

Histopathological findings:

Case 1:

The normal epidermis adjacent to the lentigines consisted of a single epithelial cell layer of *stratum basale*, a *str. spinosum* of 2-3 layers, a very thin *str. granulosum* of about one cell in width and a *str. corneum* considered to be of normal thickness. The epidermis of the lentigines, however, was markedly thickened and thrown into folds, which explains their polypoid appearance observed macroscopically. This thickening was due to severe acanthosis, a *str. granulosum* of about 2-3 cells wide and conspicious hyperkeratosis manifested by a thick *str. corneum*, the layers of which were loosely arranged and consisting of keratin assuming a dirty greyish-brown colour due to remnants of melanin in the cornified cells (Fig. 9). Fairly prominent rete ridges and conspicious hyperpigmentation with numerous acanthocytes containing melanosomes were present. Melanocytes in groups of up to 8 cells occurred in the underlying dermis. No dermal cell infiltrate or other significant abnormalities were noticed.

Cases 2 and 3

The affected epidermis was much less folded than that in the dog. From the edge to the central part of the lesion a gradual increase in thickness of the epidermis was apparent which resulted in an area of acanthosis with rete formation, hyperpigmentation and moderate hyperkeratosis. These changes were of approximately the same proportion as in Case I. In some rete ridges, the *str. spinosum* attained a thickness of 10-12 layers of cells. The dermis below the lentigines and the adjacent normal epidermis (Figs. 7-9) showed a scant diffuse increase in the number of mast cells. As in Case I, groups of melanocytes were present in the superficial dermis.

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DISCUSSION

Lentiginosa profusa is a rare inherited condition in the dog[1]. Treatment in humans by dermabrasion is fairly successful[3] and probably this form of treatment would also be successful in dogs. Owners of affected animals should be enlightened about its hereditary nature and therefore be discouraged from having them treated. In addition, apart from cosmetic considerations, therapy is not warranted, the blemish being neither pruritic nor detrimental in any other way. They tend to reach a maximum diameter of about 10 mm and then remain static in size while the black colour tends to fade somewhat with increasing age.

Macroscopically the condition could be mistaken for a melanoma or, possibly, a haemangioma. Histopathologically, however, the changes occur mainly in the epidermis and therefore it should not be confused with either of those. From a histopathological point of view the changes closely resemble those of acanthosis nigricans, but clinically these 2 conditions cannot be confused.

ACKNOWLEDGEMENTS

We thank Prof R C Tustin and Mrs V Käber for reading and typing the manuscript, respectively. Mrs H Smit for printing the photomicrographs, the technicians of the Department of Pathology for preparing the sections for histopathological examination and the owner of the Pugs for his co-operation.

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Fig. 1: Multiple proliferative lentigines on the leg of Case 1.

Figs 2 & 3: Multiple plaque-like lentigines on the abdomen of Case 2.

Fig. 4: Multiple plaque-like lentigines on the abdomen of Case 3 – note how well demarcated these lesions are.

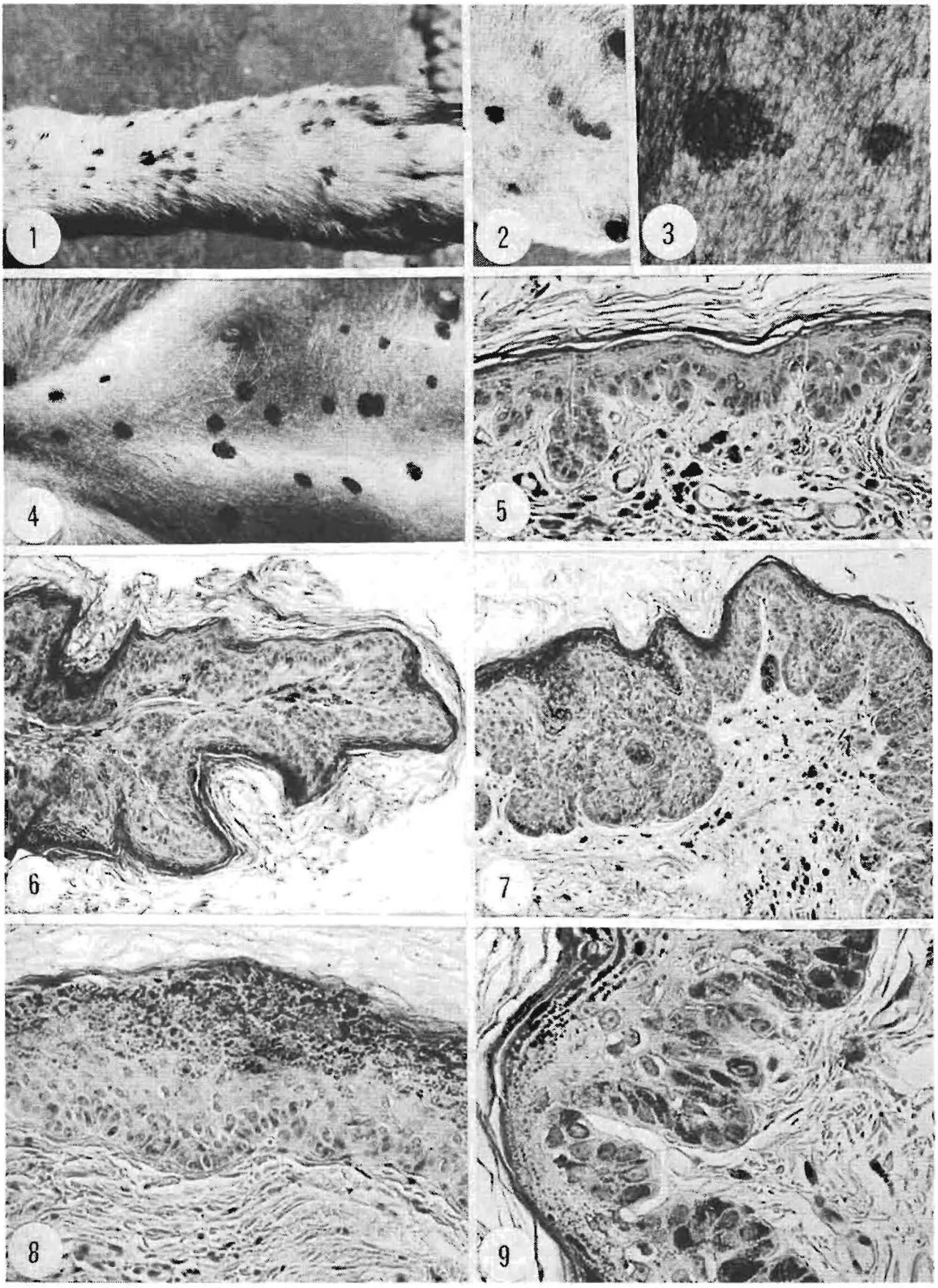
Fig. 5: Hyperkeratosis, moderate acanthosis with formation of rete pegs. Note melanocytes in dermis HE X 200.

Fig. 6: Proliferative fold in the lentigo biopsied from Case 1 HE X 40.

Fig. 7: Thickened epidermis with prominent acanthosis and dermal hyperpigmentation HE X 100.

Fig. 8: As above but with a prominent stratum granulosum HE X 200.

Fig. 9: Marked hyperpigmentation of strata basale and spinosum. Melanin granules also noticeable in stratum corneum HE X 400.



BOOK REVIEW **BOEKRESENSIE**

LACTATION

Edited by B. L. Larson

1st Edn. The Iowa State University Press, Ames, Iowa, 500100. 1985 pp xi and 276, photographs II, micrographs 13, graphs 18, diagrams 37 and tables 45, Price £29.50 (ISBN 0-8138-1063-9).

In 1938 D.W. Espe authored the first edition of *Secretion of Milk* which in its fifth edition in 1959 was published by V.R. Smith as *Physiology of Lactation*, thereafter replaced in 1971 by the completely new book on *Biology of Lactation* by G.H. Smith. At the time of its publication each of these books filled the need, at the college level, for an up-to-date textbook and general reference book on bovine lactation. The continuation of this series of practical and informative books is ensured by B.L. Larson with the new book on *Lactation*. This textbook essentially amounts to a revised, modern and concise successor of the books mentioned initially. Each of the seven authors is an experienced scientists and lecturer, and the seven main chapters they have contributed therefore cover their respective fields of specialized research and teaching. This book is thus a source of information on present concepts and summarized basic data, particularly valuable to the lecturer and student alike.

The seven chapters of the book provide insight into the heterogenous field of bovine lactation by covering a wide and diverse range of aspects such as: Development, morphology, physiology and endocrine and neural control of the mammary gland; nutritional, metabolic and environmental requirements of lactation; biosynthesis and cellular secretion of milk; biochemical and nutritional properties of milk and colostrum; requirements and process of milking; and immunologically specific and non-specific defence mechanisms, predisposing factors related to mastitis, the diagnosis, control and prevention of mastitis.

The text of the book is presented in readily distinguishable sub-chapters and sections augmented with interesting illustrations and tables. It is very readable, easily understandable and clearly designed to convey concise and up-to-date information to students on the more fundamental aspects of the bovine udder and lactation under modern intensive dairying conditions.

The black on white print of text, illustrations and graphs is of good quality. At the end of each main chapter a limited number of particularly important references have been listed. The contents should be of interest to all in South Africa involved in various aspects of normal and abnormal bovine lactation.

W.H. GIESECKE

BOOK REVIEW **BOEKRESENSIE**

BACTERIAL AND FUNGAL DISEASES OF PIGS

J.R. BUDDLE

Volume 6 of Animal Health in Australian Government Publishing Service, Canberra 1985. Pages 239.

This book describes 44 diseases of pigs caused by bacteria and fungi. It also has a section which covers principles of pen cleaning, control of enteric diseases, control of respiratory diseases and descriptions of drugs and vaccines available for pigs in Australia. Tables for the differential diagnosis of syndromes are supplied.

This book is written by Australians for Australia, but without doubt it is ideally suitable for application to our South African conditions. The text is clearly written, and a refreshingly practical approach has been taken. Possibly the best book of its kind I have come across and I strongly recommend it to any veterinarian or animal scientist who works with pigs.

H.W. AUCOCK

DOURINE IN SOUTHERN AFRICA 1981 – 1984: SEROLOGICAL FINDINGS FROM THE VETERINARY RESEARCH INSTITUTE, ONDERSTEPOORT

CATHERINE C. WILLIAMSON* and S. HERR*

ABSTRACT: Williamson C.C.; Herr, S. **Dourine in Southern Africa 1981 – 1984: Serological findings from the Veterinary Research Institute, Onderstepoort.** *Journal of the South African Veterinary Association* (1986) **57** No. 3, 163-165 (En) Veterinary Research Institute, 0110 Onderstepoort, Republic of South Africa.

The distribution of positive dourine cases found on the complement fixation test at the Veterinary Research Institute, Onderstepoort from 1981 to 1984, is recorded. Within the Republic of South Africa, foci of infection occurred in the Johannesburg, Pretoria, Potchefstroom, Rustenburg, Upington, Lichtenburg, Kroonstad, Louis Trichardt, Middelburg (Cape) and Mossel Bay state veterinary districts. In Bophuthatswana, Transkei, Lesotho, South West Africa and Swaziland, positive cases were also recorded.

Anti-complementary activity of horse sera does not present a problem. In donkey and mule sera, however, sera show anti-complementary activity in approximately 50% of cases. This can be reduced by diluting the sera ½ before inactivating at 63°C for 1h.

Key words: Dourine, occurrence, southern Africa, anti-complementary activity.

INTRODUCTION

Dourine (slapsiekte) is a non-arthropod-borne disease of solipeds caused by *Trypanosoma equiperdum*. Under natural conditions, transmission is venereal, with either stallion or mare transmitting the disease[6]. In the Republic of South Africa, dourine has been observed to occur usually as a sub-acute or chronic disease, often showing no clinical signs in affected animals[1,6,7].

Serum from equines is submitted to the Veterinary Research Institute, Onderstepoort, for dourine testing prior to breeding, for diagnostic purposes and for export. Any animal reacting positively to the test is either sterilized, castrated or destroyed.

As recent literature about dourine is scarce, due to the disease being eradicated from many parts of the world,

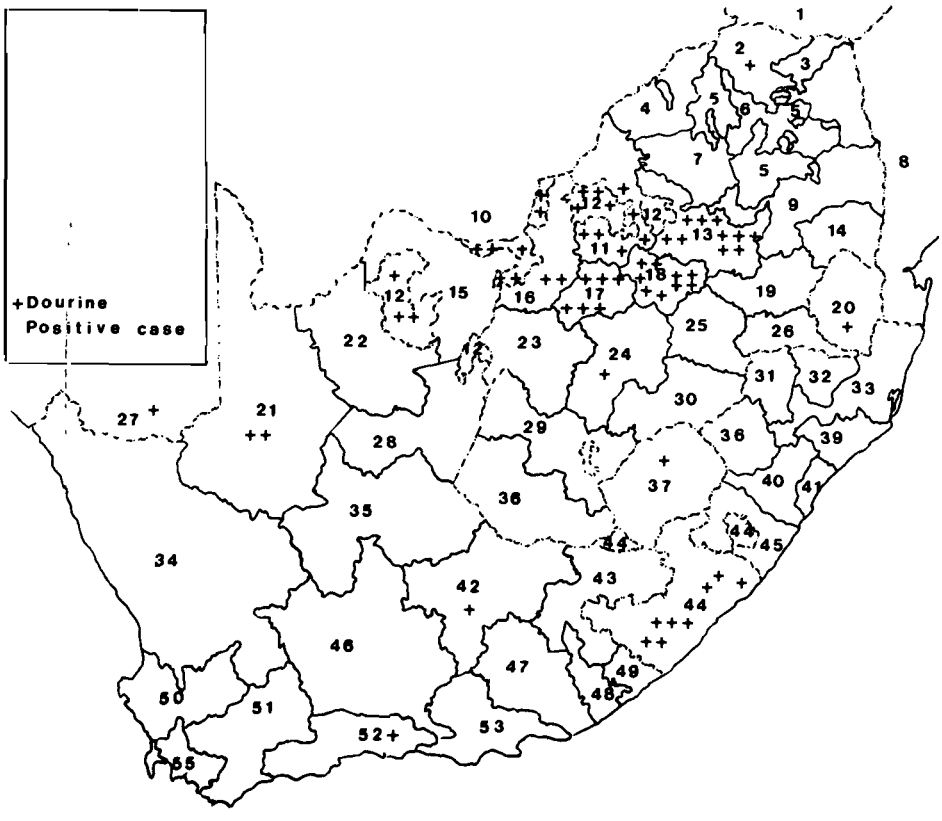


Fig. 1: Positive cases of dourine recorded at the Veterinary Research Institute, Onderstepoort 1981 – 1984

*Veterinary Research Institute, 0110 Onderstepoort, Republic of South Africa.

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it is relevant to collate data that gives an indication of where cases continue to be encountered. The data that follows is gleaned from routine diagnostic work and is not in the form of a planned survey.

MATERIALS AND METHODS

Sera were submitted to the Veterinary Research Institute, Onderstepoort, from 1981 – 1984 for dourine tests. They were subjected to the complement fixation test as described by Herr, Huchzermeyer, Te Brugge, Williamson, Roos & Schiele[4]. Horse sera were inactivated at 58°C for 60 minutes in a hot air oven. Mule and donkey sera were first dilute ½ with veronal buffer and inactivated at 63°C for 1 h in a waterbath. A positive control serum was always included and subjected to the same treatment. The results obtained on all sera were interpreted as either negative, suspicious or positive, according to established criteria[4].

RESULTS

The distribution in state veterinary districts of positive and positive or suspicious cases from within the Republic of South Africa, is given in Table 1 and in Fig.1, respectively. Those from the Independent National States and neighbouring countries are listed in Table 2. Map references to the districts are given in the tables.

Table 1: Distribution of suspicious and positive dourine cases within the Republic of South Africa recorded at the V.R.I., Onderstepoort from 1981 to 1984. Distribution is recorded in state veterinary districts (SV)

SV*	Map references	Suspicious	Positive	Total no of samples
Bethlehem	30			47
Bloemfontein	29			158
Cape Town	54			47
Dundee	31			8
Durban	41			5
East London	49	1		15
Ellisras	4			39
Ermelo	19	1		125
Eshowe	39			1
Estcourt	38			3
Fauresmith	36			8
Grahamstown	47			5
Hoopstad	23	3		245
Johannesburg	18	15	9	1 948
Kimberley	28	3		660
Kroonstad	24	1	1	169
Kuruman	22			22
Lichtenburg	16	4	2	449
Louis Trichardt	2		1	15
Lydenburg	9	1		62
Malmesbury	50	1		14
Middelburg (Cape)	42		1	36
Mossel Bay	52	1	1	65
Nelspruit	14			18
Port Elizabeth	53			8
Pietermaritzburg	40	1		2
Pietersburg	6			45
Piet Retief	26			14
Potchefstroom	17	3	7	406
Potgietersrus	7	3		41
Pretoria	13	9	10	760
Queenstown	43			17
Rustenburg	11	4	6	360
Standerton	25	1		125
Stellenbosch	55	1		25
Swellendam	51			160
Upington	21	3	2	92
Vryburg	15	2		165
Vryheid	32			11

*State Veterinary District

Table 2: Recorded cases of equine sera positive or suspicious on complement fixation test for dourine from TBVC States, National States in South Africa and neighbouring countries from 1981 to 1984

	Map reference	Suspicious	Positive	Total No. of samples
TBVC* States				
Bophuthatswana	12	17	14	245
Transkei	44	1	8	13
Venda	3	1		21
National States in South Africa				
Lebowa	5	2		125
Neighbouring countries				
Botswana	10			12
Lesotho	37		1	6
Mocambique	8			1
South West Africa	27		1	4
Swaziland	20	3	1	80
Zambia	—			2
Zimbabwe	1	1		135

*Transkei, Bophuthatswana, Venda, Ciskei

Within the northern areas of the Republic of South Africa, there were foci of infection in Johannesburg 9/1958 (0,459%), Pretoria 10/760 (1,31%), Potchefstroom 7/406 (1,7%), Rustenburg 6/360 (1,67%), Upington 2/92 (2,17%) and Lichtenburg 2/449 (0,4%) (Table 1).

Of the Independent National States, Transkei, Bophuthatswana, Venda and Ciskei (TBVC States), Bophuthatswana had 14/245 (5,7%) positive cases and Transkei 8/13 (61%) positive cases (Table 2).

Only a few sera were submitted from neighbouring countries: Lesotho 1/6 positive, South West Africa 1/4 positive and Swaziland 1/80 positive (Table 2).

DISCUSSION

In 1948, Robinson reported that 0,98% of horses tested for dourine, were positive[5]. For the period 1954 to 1975, 2% of horses tested from the Republic of South Africa, were positive[2]. From 1981 – 1984, 0,6% of horses tested were positive.

There is a high occurrence of dourine in Bophuthatswana and Transkei. The proximity of Rustenburg to the border of Bophuthatswana, and the movement of horses could account for the high number of cases recorded there.

In the complement fixation test for dourine, fewer than 2,2% anticomplementary reactions were seen. A non-specific factor that causes anticomplementary reactions in mule and donkey sera has been known since 1910. De Kock[3] in 1939 inactivated all sera at 62°C for ½ h to overcome this factor. He found that he could not completely eliminate anticomplementary reactions, and that temperatures above 62°C were liable to coagulate the serum[3]. We found that about 50% of mule and

donkey sera show anti-complementary reactions when inactivated at 58°C. To overcome the problem of coagulation, we diluted the serum prior to inactivation at 63°C. As De Kock previously found[3], we did not entirely overcome the problem.

The continued presence of *Trypanosoma equiperdum* in Southern Africa makes it essential to test breeding stock regularly.

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ABSTRACT

SAMEVATTING

A MORPHOLOGICAL STUDY OF THE LESIONS OF AFRICAN HORSESICKNESS

Gross, histological and ultrastructural findings are described in 6 natural cases and in 2 experimental cases of African horsesickness. From the gross lesions the cases were divisible into 2 groups which represented the previously described pulmonary and mixed forms of the disease. Histologically, abundance of fibrin and inflammatory cells in oedematous lung suggests that the pulmonary lesion is an exudative pneumonia. Lymphoid depletion and necrosis in germinal centres were consistently present. Electron microscopy failed to demonstrate virus particles or virus-associated structures in the tissues. Ultrastructural evidence of vascular injury was not apparent in oedematous tissues. Possible mechanisms in the development of the lung oedema are considered and a comparison is made with oedema induced by alpha-naphthyl-thiourea. Lack of structural evidence of vascular injury revealed by this study extends some hope for therapy in African horsesickness. (Newsholme, S.J., 1983. A morphological study of the lesions of African horsesickness. *Onderstepoort Journal of Veterinary Research,* 50, 7-24 (1983).)

ABSTRACT

SAMEVATTING

TUMOURS OCCURRING IN PIGS AND GOATS IN THE REPUBLIC OF SOUTH AFRICA

A survey was carried out on all the neoplasms in pigs and goats which are recorded in the registration files of the Section of Pathology of the Veterinary Research Institute at Onderstepoort over a period of 40 years, from 1935 to 1974. The tumours encountered in these 2 species were tabulated separately according to their type and site of origin.

In pigs, 24 tumours were recorded, and in goats, only 21. Of the porcine neoplasms 13 (54%) were lymphosarcomas, 5 (20,8%) were cutaneous squamous cell carcinomas and 2 (8,4%) were embryonal nephromas.

In goats, 8 (38%) of the tumours were squamous cell carcinomas, 50% of which occurred in the perineal region. Malignant melanomas and papillomas each made up 19% of the total, whilst lymphosarcomas accounted for 14% of the total caprine tumours. (Bastianello, Stella S., 1983. A survey of neoplasia in domestic species over a 40-year period from 1935 to 1974 in the Republic of South Africa. III. Tumours occurring in pigs and goats. *Onderstepoort Journal of Veterinary Research,* 50, 25-28 (1983).)

ABSTRACT

SAMEVATTING

INFECTIVITY VIRULENCE AND IMMUNOGENICITY OF *ANAPLASMA CENTRALE* LIVE BLOOD VACCINE

Cross-bred *Bos taurus* calves, aged between 6 and 8 months, were inoculated with the Onderstepoort *Anaplasma centrale* live blood vaccine. One group of 15 calves were inoculated once only, while a 2nd group of 15 were revaccinated 6 months later. All the animals were challenged with approximately 1×10^{10} *Anaplasma marginale* parasites of a known virulent strain 8 months after the first vaccination. The results of blood smear examination and the card agglutination test indicated that only 20 out of 30 animals vaccinated contracted *A. centrale* infections after the first attempt, and 3 out of 5 after the second. The vaccine conferred only partial immunity to challenge with a virulent *A. marginale* strain. (Potgieter, F.T. & Van Rensburg, L., 1983. Infectivity virulence and immunogenicity of *Anaplasma centrale* live blood vaccine. *Onderstepoort Journal of Veterinary Research,* 50, 29-31 (1983).)

CLINICAL NOTE **KLINIESE MEDEDELING**

OSTEOMALACIA IN YOUNG CAPTIVE CROCODILES (*CROCODYLUS NILOTICUS*)

F.W. HUCHZERMEYER*

ABSTRACT: Huchzermeyer F.W. **Osteomalacia in young captive crocodiles** *(Crocodylus niloticus)*. *Journal of the South African Veterinary Association* (1986) 57 No. 3, 167-168 (En) Section of Poultry and Fish Diseases, Veterinary Research Institude, 0110 Onderstepoort, Republic of South Africa.

The clinical signs of osteomalacia in year old crocodiles were kyphoscoliosis, "glassy teath", "rubber jaws" and extreme weakness. Treatment with high oral doses of calcium led to slow improvement. After six months the surviving animal could walk again, but the vertebral column remained deformed after two years.

Key words: Crocodile, osteomalacia, kyphoscoliosis.

With an increase in the establishment of crocodile farms in South Africa it is likely that more specimens will be submitted to diagnostic laboratories. Cowan[1] describes nutritional osteomalacia of crocodiles and alligators with kyphoscoliosis, deformed legs and easily fractured bones in animals fed meat exclusively.

Two one-year-old crocodiles (*Crocodylus niloticus*) from a recently established crocodile farm in the Eastern Transvaal were submitted with clinical signs of prominent kyphoscoliosis (Fig. 1), extreme weakness, inability to move on land and severely reduced ability to swim in shallow water. Their teeth were diaphanous like shards of glass ("Glassy teeth") and their upper jaws could be bent upwards ("rubber jaws") (Fig. 2), while on X-ray plates their bones had a very low density. These crocodiles had been fed exclusively on deboned chicken meat. Circumstantial evidence, clinical signs and radiographic findings were indicative of nutritional osteomalacia and it was decided to treat the animals with calcium.

For the first two days the crocodiles were dosed with 2 ml calcium borogluconate per day with the aid of a 1 ml tuberculin syringe. For 7 days thereafter they each received 2 ml of liquid egg yolk mixed with fine ground egg shell in the proportion of one egg yolk to 1 g egg shell on a daily basis. From then on they were force-fed once or twice per week with a piece of meat rolled in a mineral mix consisting of equal parts of fine ground egg shell, bone meal and a commercial mineral-vitamin mix for pets (Beefy Mix, Centaur Laboratories).

Within three months the animals' legs strengthened noticeably, although they still could not walk, and their teeth had lost their glassiness and became white. Within six months one of the crocodiles could walk, lifting its body off the ground, whereas the other drowned after having being transferred to a pen with deeper water, probably having been unable to swim properly due to its severe spinal deformities. The surviving animal has been growing well since, but the kyphoscoliosis still persists two years after the inception of the treatment (Fig. 3).

In most aspects the clinical signs seen in the described case are similar to those described by Cowan[1]. The fact, that a tendency of the bones to fracture easily was not observed but rather an extreme elasticity, was probably due to the very young age of the animals. The glassiness of the teeth has not been described previously.

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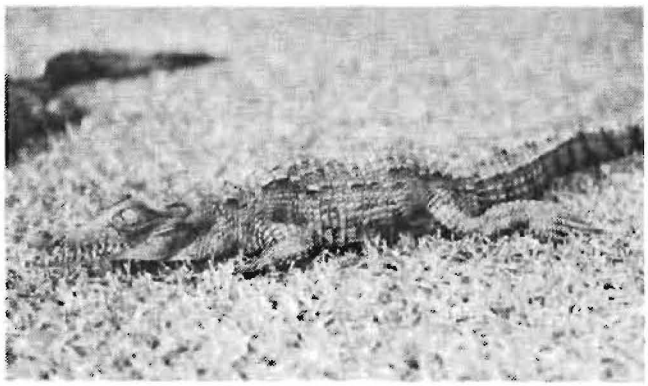

Fig. 1: Kyphoscoliosis caused by osteomalacia in a young crocodile.

Fig. 2: "Rubber jaws" – osteomalacia in a young crocodile.

Fig. 3: Persisting kyphoscoliosis one year after inception of treatment.

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The treatment applied was planned according to practical considerations. The apparent slow rate of absorption or calcification should be described not only to the generally slow metabolic rate, but also to the fact that the treatment was commenced at the end of summer. Although indoors, the animals were kept in near hibernation conditions, without artificial heating. It was, when the animals were moved to a larger outside pen with a deeper pond, that the one animal drowned. Probably if it had been kept in deep water all the time, it would have drowned earlier.

The surviving crocodile was observed for two years after the submission of the specimens. With a reasonable growth rate in the last year, when it was no longer necessary to force-feed the animal, it should have had time to outgrow the pronounced kyphoscoliosis. Since this did not happen, it appears as if the deformities of the vertebral column caused by nutritional osteomalacia in young crocodiles, are permanent.

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REVIEW OORSIG

VELABSORPSIE VAN CHEMIKALIEË

J. SCHRÖDER*

ABSTRACT: Schröder J. **Cutaneous absorption of chemicals.** *Journal of the South African Veterinary Association* (1986) 57 No. 3, 169-176 (Afrik) Roodeplaat Research Laboratories, P.O. Box 13873, 0129 Sinoville, Republic of South Africa.

Chemicals have become indispensible for the maintenance of health in animals and man. The route of administration of each medicament is decided by factors such as site of desired action, chemistry of the active ingredient, age and species of the patient, and frequency of administration (or desired duration of activity). In situations where the oral and hypodermic routes, which are used most frequently, are inadequate or unsatisfactory, dermal application can provide a valuable alternative method to achieve systemic activity.

Examples of formulations currently available for dermal application contain diverse chemicals and are intended for a variety of purposes, such as crufomate against cattle grubs, fenthion against cattle lice, levamisole against gastrointestinal nematodes, nitroglycerine for angina pectoris, and scopolamine for motion sickness.

The skin acts as a barrier to penetration by chemicals and micro-organisms by virtue of its morphology and chemical composition. Chemicals which do penetrate, do not necessarily pass through the appendages (hair follicles and gland ducts), but mostly penetrate through the interjacent epidermis, either through the cells, or via the intercellular spaces. These spaces have recently been shown by electron microscopy to be filled by an amorphous substance which exudes on the skin surface in convex ridges. This substance has a lipid nature, but is not hydrophobic as is often accepted. For a chemical to be able to penetrate the skin, it must be partially water and lipid soluble, polar, and weakly ionizing.

A variety of factors can possibly affect the permeability of skin for a chemical. These include species differences in morphology (skin thickness, tightness of intercellular junctions, density of hair follicles and other appendages), biochemistry, and physiology; seasonal and climatic variations; and differences between breeds and genders. Species differences in skin permeability are largely unpredictable and inconsistent. An observed difference between two species for one chemical cannot necessarily be extrapolated to another.

Chemicals such as DMSO, propylene glycol, corn oil, isopropanol, and cyclohexanol have been used to "carry" drugs through the skin. It is, however, important to remember that the chemistry (eg. polarity, partition coefficient, dissociation constant) of a substance determines its ability to penetrate the skin, and this ability cannot always be enhanced by solvents or carriers.

Techniques to determine the skin's permeability to a chemical are performed in vivo or in vitro. The former range from relatively uncomplicated (such as chemical assay of serum levels or observation of clinical signs after administration) to more sophisticated (as with the use of radioisotopes, serology, histology and histochemistry, and surgical implants). The greatest disadvantage of these methods is the inability to extrapolate from the test animal to other species such as man with any degree of confidence. Recently, elegant in vitro techniques have been described in which the skin of the target species is used as a membrane between donor and recipient cells. The results of such tests are then used to predict the behaviour of a formulation in vivo.

Key words: Review, cutaneous absorption, chemicals.

INLEIDING

Chemikalieë speel 'n toenemend belangrike rol in die gesondheid van mens en dier. Benewens stowwe ter behandeling of voorkoming van siektes, word ons ook blootgestel aan stowwe wat die omgewing besoedel. Hierdie besoedeling word ingesluk of ingeasem, maar daar is besorgdheid oor die mate waartoe gevaarhoudende stowwe in die omgewing die huid kan deurdring[31]. Daar is 'n baie nouer verwantskap tussen dermale LD_{50} waardes en die voorkoms van beroepsvergiftiging, as in die geval van orale LD_{50}. Daar het al baie ernstiger gevalle van vergiftiging voorgekom met dieldrin en paration, wat meer vergelykbare orale en dermale LD_{50}'s het, as met bv. DDT, lindaan en metielparation, waarvan die orale en dermale LD_{50}'s groot verskille toon[11].

Geneesmiddels word op verskeie wyses toegedien. Formulerings soos tablette, kapsules, bolusse, vloeistowwe (oplossings, emulsies, suspensies) en voervoormengsels word oraal ingeneem. Die inspuitingsnaald word gebruik om middels bv. binnespiers, binneaars, onderhuids en minder dikwels, intraperitoneaal of intra-artikulêr toe te dien.

Die keuse van 'n geneesmiddel se formulering en toedieningsroete hang af van die plek waar die werking verlang word, die chemie van die aktiewe bestanddeel, die verlangde werkingsduur en die gemak van toediening wat vereis word. In gevalle waar orale toediening teenaangewese is en die inspuitingsnaald 'n onaanvaarbare alternatief, is die moontlikheid om 'n middel buiteop die vel toe te dien om 'n sistemiese werking te verky baie aantreklik. Daar is baie struikelblokke om te oorbrug, maar 'n aantal perkutane formulerings is reeds beskikbaar.

'n Kort bespreking van terme wat algemeen in hierdie verband gebruik word, is miskien nie onvanpas nie. Die woord "deurlaatbaarheid" is misleidend in die sin dat dit 'n mens aan die vel laat dink as 'n passiewe filter waarvan die lewendigheid betrekking het op die handhawing van elektriese eienskappe, tussenselruimtes, en die toestand van die selwand, maar nie op selle se afskeidingsvermoë, waardeur stowwe moontlik opgeneem, gekonsentreer, en na binne "gestoot" sou kon word nie. Die woord "absorpsie" word dikwels (moontlik onnadenkend) gebruik wanneer die wetenskaplike bloot die proses van imbibisie (soos water bv. deur filtreerpapier of keratien opgeneem word) in gedagte het. In teenstelling hiermee plaas "deurdringing" ("penetrasie") die klem op die stof en die eienskappe wat dit in staat stel om die huid te oorkruis[6].

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Geneesmiddels wat kutaan aangewend word het een van twee bestemmings, nl. plaaslik op of in die vel, of sistemies. Eersgenoemde bestemming vereis dat die geneesmiddel nie die vel binnedring nie, of hoogstens indring tot in die dermis. Laasgenoemde bestemming vereis egter dat die stof in die dermis vrygelaat en deur die bloedstroom verder gevoer word. Dit is veral hierdie (sistemiese) bestemming wat aandag geniet in hierdie oorsig.

Dit is nodig om die volgorde van gebeure tydens velabsorpsie in gedagte te hou, nl. absorpsie op die horinglaag se oppervlak, diffusie daardeur, loslating by die lewendige epidermis, diffusie hierdeur en deur die dermis tot by die haarvatnetwerk[43].

In hierdie oorsig word verwys na voorbeelde van reeds beskikbare geneesmiddels wat kutaan aangewend word, die mate waartoe en die wyse waarop die huid as skans optree teen die binnedring van chemikalieë, en faktore wat huiddeurdringing beïnvloed, soos bv. spesiesverskille, seisoen en klimaat, voeding en hormoonpeile. Aandag word geskenk aan die gebruik van oplosmiddels wat huiddeurdringing bevorder en eksperimentele metodes wat gebruik word om die deurdringingsvermoë van 'n formulering te beoordeel. Die doel van die oorsig was om beskikbare inligting te versamel ten einde te bepaal of voorspellings gemaak kan word t.o.v. 'n stof se potensiaal in 'n perkutane formulering (o.g.v. die beskikbare kennis oor die betrokke stof se chemiese eienskappe) en die geskikste draerstowwe om vir 'n spesifieke geneesmiddel te gebruik.

DIE HUID AS TOEDIENINGSROETE VIR MEDISYNE

Daar is etlike voordelige toepassings van die kutane toediening van 'n wye reeks middels:

- minder arbeidsintensief
- vereis nie duur toerusting soos dompel- of spuitdippe nie
- meng nie in met spysvertering soos wat orale formulerings moontlik kan doen nie[35]
- vermyding van chemiese afbreking in die dermkanaal[33]
- noukeuriger berekening van dosisse as by toediening deur voer of in lekke
- minder gevaar van besering van mens en dier[38], veral van belang waar inspuitings weefselskade veroorsaak[35]
- waar 'n stadige maar sekere styging in die bloedpeil van 'n stof verlang word, wat dan met daaglikse aanwendings konstant gehou kan word[40].

Moontlike nadele is dat hierdie metode duurder kan wees as bv. bespuiting of indompeling waar groot getalle beeste teen ektoparasiete behandel word en dat die operateur aan 'n groter gevaar van vergiftiging blootgestel is[35].

Voorbeelde van veemiddels wat kutaan aangewend word met die spesifieke doel om 'n sistemiese uitwerking uit te oefen, sluit in levamisool teen rondewurms in beeste[5 41], fention [20 35], famfur, chloorpirifos en metidation[33] teen luise op beeste, ronnel en krufomaat teen *Hypoderma* sp. en fosmet teen bloubosluise op beeste, en chloormadinoon teen lewerslakwurm in skape[35]. By mense kan bv. skopolamien teen reissiekte, nitrogliserien vir *angina pectoris* (C Ackerman 1985 Dept Farmaseutika, P U vir CHO, Potchefstroom Persoonlike mededeling), en indometasien vir inflammasie kutaan toegedien word.

Pitman & Rostas[35] tref onderskeid tussen opdrup- en opgietformulerings ("spot-on" en "pour-on") op grond van hul konsentrasies en dus dosisvolumes. Hulle herinner ook dat dit moontlik is om die formulering so te ontwerp dat absorpsie stadig sal plaasvind waar langdurige werking verlang word. Rothman[40] het in 1943 al gesê dat die insluiting van cholesterol in 'n formulering die deurdringing van wateroplosbare stowwe sal vertraag.

DIE FISIOLOGIE VAN VELABSORPSIE

Die epidermis dien as 'n homogene skans teen indringerstowwe en -organismes en beskerm die organisme teen uitdroging[6]. Die lewende epidermis word beskerm deur die horinglaag, die haarkleed of vag en die sebumafskeiding[21 22 34 39]. Die langkettingvetsure en hulle sepe in hierdie afskeiding is sterk bakteriedodend[6] en eiwitte soos IgA, IgM, IgG, albumien en transferrien (lg. verhinder die indring van dermatofiete) is al serologies aangetoon[16]. Veertig tot 50% van die epidermis bestaan uit die *stratum compactum*, wat by soogdiere hialien van aard is, met esterases en eiwitgebonde SH-groepe[14]. By die mens word die horinglaag ongeveer elke 14d vervang teen ongeveer een sellaag per dag. Dit beteken dat enige stof wat plaaslik aangewend is en nie binne 'n dag verby die eerste sellaag gediffundeer het nie, verlore is[10].

Die oorgangslaag van die epidermis bestaan uit die *stratum granulosum* en die *stratum lucidum* in dikker dele van die huid. Dit lê tussen die suur horinglaag en die effens alkaliese *stratum spinosum*, het 'n pH naby die isoelektriese punt van eiwit en word beskou as die setel van ondeurlaatbaarheid van die huid vir baie stowwe[6]. Hierdie ondeurlaatbaarheid (veral vir water) is deels te danke aan die feit dat die oorgangslaag 'n gepolariseerde membraan vorm[40] en deels aan die intersellulêre aansameling van 'n stof wat waarskynlik 'n hoë lipiedinhoud het, want na voorafbehandeling met vetoplosmiddels en oppervlakspanningsbrekers ('surfactants'), dring wateropgeloste spoorstowwe dieper in die epidermis in[9 40].

Die vetterige aard van hierdie stof, wat tussen die horingselle uitpeul op die huidoppervlakte en duidelik onder die aftaselektronmikroskoop (SEM) sigbaar is, is ook deur ander werkers beskryf[18 21 22]. Hulle het tot die slotsom gekom dat die stof waarskynlik 'n emulsie van sweet en sebum is en dat dit deur middel van kapillêre werking die dieper lae van die epidermis bereik, waar dit die tussenselruimtes vul[21 22] en serologies aangedui kan word[16].

Wat egter waarskynlik gebeur, is dat hierdie stof 'n mengsel is van sebum, sweet en die inhoud van die korrels van die *stratum granulosum*. Die inhoud van hierdie korrels vorm breë, aaneenlopende lae in die horinglaag. Dit is hidrofobies[9] en raak vermeng met die sebumsweetemulsie (by epitrigeale sweetkliere meng die sweet en sebum reeds voordat dit die veloppervlak bereik[15]) in die buitenste lae van die horinglaag. Die sebumafskeiding van die smeerkliere is in wisselende hoeveelhede teenwoordig, afhangende van die spesies[21 22 43] (die duimreël is dat diere met meer haar- of wolfollikels meer sebum afskei en 'n dunner horinglaag het[27 43]). In die lig van hierdie getuienis is dit moeilik om Scheuplein se aanspraak dat die horinglaag die hoofskans teen chemiese indringing is[42], te aanvaar.

Die deurlaatbaarheid van die vel vir chemikalieë en

mikro-organismes word verhoog deur langdurige benatting wat lei tot uitloog van die sebum en verbrokkeling van die horinglaag[10 39 43]. Hierdie verskynsel is waarskynlik die gevolg van die feit dat die cholesterolbevattende sebum-sweet-emulsie hidrofiel is en nie hidrofobies soos algemeen aanvaar nie[6 40]. Weer eens verskil Scheuplein van die ander werkers en sê dat langdurige benatting die skansfunksie van die horinglaag slegs in 'n geringe mate beïnvloed deur sogenaamde "porieë" te veroorsaak en dat dit oënskynlik nie die invloed van vetoplosbaarheid op deurdringing verminder nie[42].

Vir sommige stowwe is die huid die helfte so deurlaatbaar as die spysverteringskanaal[1]. Plaagdoders is gewoonlik giftiger na orale as na kutane toediening, maar daar is tog uitsonderings. Fenitrotion en mevinfos is byvoorbeeld giftiger na velaanwending[12].

Aangesien haarfollikel- en sweetklierbuisepiteel teoreties 10 tot 100 maal so deurlaatbaar is as die tussenliggende, aaneenlopende horinglaag, is dit 'n algemene opvatting dat velabsorpsie van alle stowwe hoofsaaklik langs hierdie roetes geskied[43]. Hierdie opvatting word verder onderskraag deur eksperimentele bevindings dat daar ioonherabsorpsie in die sweetklierbuisepiteel van die aap plaasvind[29], dat metileen blou onder invloed van 'n elektriese stroom haarfollikels en smeerklierbuise deurdring[6], en dat beesvel, wat 15 maal soveel haarfollikels, sweet- en smeerkliere per eenheidsoppervlak bevat as mensvel, 400 maal so deurlaatbaar is vir levamisool[36].

By mense is daar wel aanvanklik vinnige diffusie langs hierdie roetes, maar wanneer 'n bestendige peil bereik word, is die belangrikste absorpsie transsellulêr deur die horinglaag[42 43]. By beeste en skape dring die meeste neutrale molekules met klein tot medium massas egter deur die haarfollikels en klierbuise[35].

In die praktyk is dit ook so dat die klierbuise en haarfollikels gevul is met sebum, dooie selle en lug, wat almal dien as hindernis vir die beweging van'n stof en eers verwyder moet word met iets soos 'n organiese oplosmiddel of water[6 40].

Absorpsie van 'n stof deur hierdie roetes kan verder verhaas word deur een van die volgende moontlike stappe:

a. gebruik 'n relatiewe "swak" oplosmiddel (dit wil sê 'n middel waarin die stof minder oplosbaar is as in die sebum-sweet-lipied-emulsie van die horinglaag) en verhoog dus die verdelingskoëffisiënt (*vide infra*), of
b. verhoog die konsentrasie van die stof, of
c. verhoog die temperatuur[33].

Laasgenoemde vind byvoorbeeld plaas wanneer skape te vêr of te vinnig aangejaag word nadat gedip is[35]. Let egter op dat 'n temperatuurverhoging veldeurdringing kan versnel, maar nie die vel meer deurdringbaar maak nie[40].

Neutrale molekules is in die huid omtrent so oplosbaar as in water, wat aandui dat die huid relatief polêr is[37]. Dit wil dus blyk dat 'n stof gedeeltelik water- en vetoplosbaar, polêr en swak ioniserend moet wees om deur die huid te kan dring[6 40]. Salisielsuur en boorsuur is vetoplosbaar, effens gedissosieer en dring maklik deur die vel. Daarenteen is natriumsalisilaat onoplosbaar in vet, vryelik ioniseerbaar en dring baie traag deur die vel[6]. In waterige oplossing dring (niegeïoniseerde) levamisool 8 keer so vinnig deur die vel as levamisool hidrochloried, wat geïoniseer is[38].

Die hoeveelheid van 'n stof wat die huid in 'n tydeenheid kan oorkruis, kan bereken word deur:

$$J = \frac{D.K.S.C}{T} = k.C,$$

waar J = hoeveelheid stof wat die huid oorkruis per tydeenheid, D = diffusie-konstante van die stof in die huid, K = verdelingskoëffisiënt van die stof oor die huid, S = oppervlakte van die huid, C = konsentrasie van die aangewende stof, T = dikte van die huid en k = deurlaatbaarheidskonstante van die stof deur die huid[33 44].

Uit die formule is dit duidelik watter stappe teoreties geneem kan word om die hoeveelheid van 'n stof wat die huid deurdring te verhoog. Die diffusie-konstante kan verhoog word deur 'n stof met 'n molmassa van minder as 300 te gebruik (D is indirek eweredig aan die derdemagswortel van die molmassa), of deur die horinglaag se waterinhoud te verhoog (deur byvoorbeeld 'n paraffien as draer te gebruik, of deur die vel met 'n verband dig af te sluit) en sodoende die digtheid daarvan te verlaag. Die horinglaag se digtheid kan ook verlaag word deur stowwe soos dimetielsulfoksied (DMSO), dimetielasetamied, en dimetielformamied. Om die verdelingskoëffisiënt te verhoog, word 'n nie-polêre oplosser (byvoorbeeld propileenglikol of olie) gebruik vir polêre stowwe en 'n polêre oplosmiddel vir niepolêre stowwe. Die vel se dikte kan byvoorbeeld verminder word deur die stof aan te vryf[33] (Op diè manier word 'n paar van die oppervlakkige sellae van die horinglaag meganies verwyder, wat die vel dus dunner maak).

VERBINDINGS WAT DIE HUID DEURDRING

a. Gasse

In die geval van gasse en baie vlugtige stowwe lyk dit asof die vel as 'n onaktiewe membraan ageer en dat eenvoudige diffusie plaasvind. Hierdie diffusie word beïnvloed deur onder meer die konsentrasie weerskante van die membraan, temperatuur en water- en vetoplosbaarheid. In die geval van CO_2 is die konsentrasie-ewewigspunt in die omgewing van 8,7%. HCN by 'n konsentrasie van 5,5-15 mg/ℓ in lug kan 490 vk mm huid deurdring en die dood van marmotte en honde veroorsaak in minder as 60 minute. Die inligting oor velabsorpsie van H_2S is teenstrydig, maar N_2, He, Rn en NH_3 kan wel die vel deurdring[6]. Dit blyk dat H_2S in irriterende konsentrasies swakker deur die vel dring as in lae konsentrasies[40].

b. Vette

Verskeie pogings is al aangewend om aan te toon dat vette soos waterige lanolien, harde vet en petrolatum die huid kan deurdring[6]. Indien hierdie stowwe in die vel ingevryf word, kan daar nie aanvaar word dat hulle deurgedring het omdat hulle nou nie meer sigbaar is nie. Tensy dit aangetoon kan word dat die stof die bloedstroom of onderhuidse weefsel betree het, moet aanvaar word dat dit vir alle praktiese doeleindes nog in die horinglaag (dit wil sê "buite die liggaam") is.

c. Swaarmetale

Etlike swaarmetale dring ook deur die huid. Die deurdringing van Hg is chemies bepaal en dit is histologies bewys dat die roete hoofsaaklik deur die smeerkliere en haarfollikels is. Pb dring minder maklik deur, waarskynlik omdat dit meer geredelik met weefseleiwitte

reageer en onoplosbare kombinasies vorm. Cu, As en Bi dring ook deur die vel[6].

d. Vitamines

Die vetoplosbare vitamines A, D en K kan die huid in fisiologies betekenisvolle hoeveelhede deurdring. Die hoeveelhede wat vir perkutane terapie benodig word, is egter veel meer as vir ander roetes van aanwending[6].

e. Hormone

Testosteroon in 'n salf word in hoeveelhede opgeneem om die normale reproduktiewe fisiologie van die bykomstige geslagskliere van gekastreerde manlike diere te handhaaf[6]. In die algemeen dring die asetaat-soute van kortikosteroïede soos kortisol, prednisoloon en metielprednisoloon beter deur die huid as die alkohole, terwyl die fosfate swakker deurdring. So is deksametasoon-alkohol 100 maal beter as die fosfaat, maar triamsinoloon-asetonied is 1 000 maal beter as die alkohol wat veldeurdringing betref[25].

VERSKILLE IN DIE HUID

1. Tussen spesies

a. Morfologies

Diere verskil aansienlik ten opsigte van digtheid en lengte van haarkleed. Varke het 20 – 30 primêre haarfollikels per vk cm, honde 100 – 600, katte 800 – 1 000, perde 800, beeste 900 – 1 300 (of ongeveer 2 000 volgens Pitman & Rostas[35]), bokke 1 200 – 1 800, en skape 6 000 – 8 000[28] of 300 – 400 primêre en 6 000 – 10 000 sekondêre[34] follikels per vk cm.

Sweetkliere is slegs in die vel van homeotermiese soogdiere aanwesig (knaagdiere, seekoeie en die walvisfamilie beskik nie oor sweetkliere nie, want hulle skep op verskeie wyses hul eie "mikroklimaat" en ontwyk sodoende temperatuuruiterstes). Hul digtheid wissel van ongeveer 20 – 30 per vk cm by varke tot meer as 2 000 per vk cm by Zebu-beeste[15]. In die lig van die rol wat haarfollikels en sweetkliere by velabsorpsie speel (*vide supra*), kan hierdie verskille in struktuur wesenlike verskille in absorpsie tot gevolg hê.

Ook wat die vel se dikte betref is daar aansienlike verskille. Die epidermis van die kat en hond is 10 – 45 μm dik. By verskillende skaaprasse varieer dit van 25 – 40 μm en haardraende vel is dikker as woldraende vel. By die bees en bok is die epidermis 40 – 60 μm dik, by die perd 30 – 90 en by die vark 70 – 140 μm (in vergelyking met 50 – 120 μm by die mens)[28]. Die werklike invloed van veldikte is nie klinkklaar uit die literatuur nie. Nadat 'n bestendige peil ("steady state") van diffusie bereik is, het die vel se dikte waarskynlik min uitwerking op die tempo en hoeveelheid van absorpsie (C Ackerman 1985 Dept Farmaseutika, P U vir CHO, Potchefstroom, Persoonlike mededeling).

Die ultrastruktuurverskille is minder opvallend, maar ewe wesenlik. In teenstelling met soogdiere, bevat die epidermis van voëls geen oorgangslaag (*stratum granulosum* en *stratum lucidum*) nie[14]. Hierdie oorgangslaag word beskou as die deel van die epidermis wat bepaal of 'n stof deur die huid kan dring al dan nie. 'n Padda se vel, waar die *stratum spinosum* en *stratum granulosum* ook ontbreek, is vryelik deurlaatbaar vir water[6 40]. By honde is die *stratum granulosum* nie aaneenlopend nie en 'n *stratum lucidum* kon nie aangetoon word nie[45].

In gevriesdroogde velsnitte onder die SEM is daar aansienlik meer van die amorfe stof (waarskynlik lipied) wat in konvekse riwwe tussen die horingselle uitpeul (*vide supra*) op die vel van skape as beeste[18]. By die bok strek die horinglaag dieper in die sweetklierbuis af as by die bees en skaap. By die skaap en bok voeg die mikrovilli van aangrensende lumenepiteelselle in die sweetklierbuis inmekaar, terwyl by die bees hierdie swaelsterteffek afwesig is in die buis[29], maar wel aanwesig en selfs meer uitgesproke in die klier self is[17]. In die sweetklierfundus van die perd is hierdie swaelstertvoeë nog beter ontwikkel as by die skaap, bok, of bees[30]. Die verskille in absorpsie wat tussen diersoorte waargeneem word, mag toe te skryf wees aan sulke ultrastruktuurverskille, maar geen bewyse hiervoor kon gevind word nie.

b. Fisiologies

Die doeltreffendheid van sweetkliere as temperatuurbeheerders verskil merkbaar tussen spesies. Hierdie funksie is slegs by primate en sommige hoefdiere van groot belang. By skape en rooi takbokke speel die sweetkliere 'n baie onbelangrike rol in temperatuurbeheer. Die stelling word selfs gemaak dat sweetkliere verskillende rolle vervul by verskillende spesies[15].

Die wyse waarop sweet uitgeskei word verskil ook tussen spesies. By sommige diersoorte speel mioepiteelselle 'n groot rol, terwyl by ander die werk slegs deur die uitskeidingselle verrig word[15]. Sweetbevattende vesikels in die sweetklierepiteel van skape, bokke en perde is duidelik die produk van die Golgi-apparaat, terwyl daar by beeste twyfel bestaan omdat dit lyk asof die mitochondria 'n bydrae kan lewer in hul ontstaan[17 30]. Sweetkliere van beeste, wat in staat is om vir 10 uur lank onophoudelik sweet te vorm, toon tekens van uitskeidingseldegenerasie en versnelde mitose na 'n groot intradermale dosis adrenalien. By skape en bokke degenereer slegs 'n paar selle en die meeste hou op om te fungeer voordat hierdie uiterste toestand bereik word[17].

Sweet word op verskillende maniere beheer. By die mens is daar simpatiese senubeheer, terwyl die hipotalamus betrokke is by die bees en hond. Die sweetkliere van alle soogdiere reageer in 'n sekere mate op 'n inspuiting van adrenalien, maar slegs sommiges op noradrenalien. Die sweetkliere van die hond, Equidae, mens en sommige ander primate reageer op asetielcholien, maar die van die bees, skaap, bok, vark en kameel nie[15].

Oplosbare eiwitte op die veloppervlak is by skape hoofsaaklk afkomstig van die sweetklier, terwyl die smeerklier by beeste ook 'n bydrae lewer[16]. In teenstelling met die sweet van die mens, is 'n perd se sweet hipertonies, terwyl beeste se sweet 'n veel laer Na^+/K^+ verhouding het as die van die mens[30].

Weereens kon geen verbintenis in die literatuur gevind word tussen die bewese fisiologiese verskille en die verskille in velabsorpsie tussen die verskillende diersoorte nie. Indien 'n stof wat aangewend word om die vel te deurdring in die sebum-sweet-lipiedemulsie moet kan oplos (*vide supra*), volg dit egter seker dat verskille in die samestelling en hoeveelheid van sweet, ook verskille in oplosvermoë kan meebring.

c. Chemies

Anders as soogdiere besit voëls 'n beta-tipe keratien wat geen hialien bevat nie[14]. Die feit dat beesvel meer deurlaatbaar is vir 'n bepaalde formulering van leva-

misool as skaapvel of mensvel[34 35], kan dui op 'n chemiese, eerder as 'n struktuurverskil tussen hierdie spesies.

Op histochemiese vlak bestaan daar sterk ooreenkomste ten opsigte van energielewerende oksidaktiewe ensieme tussen soogdiere met yl en digte haarklede. Daarenteen word 'n hoë asetielcholinesterase(AChE)-aktiwiteit slegs by die huisvark, wat 'n yl haarkleed het, aangetref. Varke toon ook alkaliese fosfatase-aktiwiteit in die basale gedeeltes van die epidermisvoeë. Die teenwoordigheid van albei hierdie ensieme kan dui op 'n hoër deurdringbaarheid van die epidermis, omdat hulle benewens hul ander funksies, ook gemoeid is met membraanvervoer en deurlaatbaarheid[27].

Ongeag bogenoemde verskille, stem die ensiembeeld van die vark se epidermis die naaste ooreen met die van die mens en kan dus as 'n fisiologiese model daarvoor beskou word. By beide varke en mense bestaan die huidoppervlaklipiede oorwegend uit vrye vetsure en trigliseriede, terwyl dit by diere met 'n digte haarkleed (soos byvoorbeeld die kat) hoofsaaklik uit diesterwasse bestaan[27].

2. Tussen rasse

Pitman en sy medewerkers[37] kon nie daarin slaag om enige verskil in die deurlaatbaarheid van die huid van 5 beesrasse aan te toon nie. Ponting & Pitman[38] maak die stelling dat rasverskille kan bestaan, maar staaf dit nie. Wat veldikte betref is duidelike rasverskille in beeste[28 35], skape[35] en honde[45] wel waargeneem.

3. Tussen geslagte

Vroulike rotte is oor die algemeen vatbaarder vir vergiftiging met organofosfore, maar schradan is na plaaslike aanwending giftiger in manlike as in vroulike rotte[11].

4. Tussen seisoene

Op grond van die waarneming van 'n hoë voorkoms van *Dermatophilus* besmetting in reëntye met hoë humiditeit, is daar aanvaar dat die vel beskadig word deur die aanhoudende benatting[23 38] en verhoogde bosluis- en vliegaktiwiteit[38]. Amakiri[2] het probeer bepaal of die veldikte van beeste in Nigerië varieer tussen droë en nat seisoene. Na aanleiding van sy negatiewe bevindinge het hy besluit dat seisoensverskille in veldikte wat elders waargeneem is, die gevolg was van groot temperatuurverskille en nie van verskille in humiditeit nie.

Die onomwonde stelling is gemaak dat middels die huid van beeste en skape makliker oorkruis in die somer as in die winter en dat 'n verhoging in temperatuur die huid se deurlaatbaarheid verhoog[33 37].

ANDER FAKTORE WAT VELABSORPSIE BEÏNVLOED

1. Besering

a. Fisies

Geen inligting kon opgespoor word oor die uitwerking van kneusing op die deurdringing van chemikalieë deur die vel nie. Trauma wat lei tot versteuring of vernietiging van die fisiese integriteit van die huid (soos skaafplekke en snye) sal beteken dat enige stof wat aangewend word tot 'n meerdere of mindere mate hierdie skans omseil en in direkte kontak kom met die onderliggende weefsel. Dan is daar dus nie meer sprake van perkutane absorpsie nie.

b. Chemies

Die onderskeid tussen besering en gewysigde funksie, of tussen fisiologiese prikkeling en ligte irritasie kan baie vaag wees. Dit is moontlik dat ligte vorms van 'besering', of tydelike fisiologiese of morfologiese veranderinge die huid se deurlaatbaarheid vir 'n aantal stowwe kan wysig. Voorbeelde hiervan is ligte keratolise, hiperemie, verwydering van velbestanddele soos vette of cholesterol en ligte irritasie of prikkeling van epidermisselle[6]. Dit word as 'n algemene reël voorgehou dat enige stof wat in 'n konsentrasie aangewend word wat hoog genoeg is om bytend te wees, swakker deur die huid sal dring as wanneer dieselfde stof teen laer, nieskadelike, konsentrasies aangewend sou word[40].

Stowwe soos salisielsuur, pirogallol, resorsinol en beta-naftol veroorsaak 'n ligte keratolise, wat die deurdringing van kleurstowwe soos tripaanblou bevoordeel. Sommige skrywers betwyfel hierdie bevinding en redeneer dat verdunning van die dooie horinglaag nie die deurlaatbaarheid van die onderliggende lewende selle kan wysig nie[6].

Aangesien die skans teen deurdringing, naamlik die epidermis, bokant die haarvatnetwerk lê, word daar geredeneer dat hiperemie nie absorpsie of deurdringing kan bevorder nie. Sommige werkers het egter 'n 4 – 5 voudige toename in CO_2 absorpsie deur hiperemiese vel waargeneem. Dit is natuurlik so dat die oorsaak van die hiperemie ook die deurlaatbaarheid van die epidermis kan beïnvloed[6].

Prikkeling of irritasie van die epidermis met stowwe soos kaliumjodied, kapsikum, dennenaaldekstrak en krotonolie bevorder die deurdringing van byvoorbeeld salisielsuur en tripaanblou. Voorafbehandeling van 'n konyn se vel met chloroform verhoog sy vatbaarheid vir strignien wat kutaan aangewend word en voorafbehandeling met petroleumeter maak die vel so deurlaatbaar vir insulien dat daar 'n merkbare verlaging in die bloedsuikerpeil volg[6].

2. Inflammasie

Ontsteking wat deur uiteenlopende faktore soos warmtebesering, vasoaktiewe amiene, en chemikalieë (oppervlakkig of intradermaal toegedien) veroorsaak is, lei tot verhoogde deurlaatbaarheid van huidbloedvate wat met kolloïedale koolstof aangedui kan word[3 4]. Hierdie verhoogde deurlaatbaarheid veroorsaak edeem en emigrasie van leukosiete, maar 'n verhoogde absorpsievermoë is nie deur hierdie werkers beskryf nie.

3. Spanning ("stress")

Dit is uit die beskikbare literatuur nie duidelik of stremming 'n invloed het op velabsorpsie nie. Wat wel aangetoon is, is dat hoë bloedpeile van glukokortikoïede inmeng met wolgroei, waarskynlik omdat dit kernsuurstofwisseling onderdruk[32].

4. Voedingspeil

Dit is onduidelik of die "breek in die wol" wat by skape opgelet word na 'n koorsreaksie en wat ook al gesien is na 'n akute *Haemonchus contortus*-besmetting (Swan GE & Schröder J 1979 MSD Navorsingsentrum, Hennopsrivier, Pretoria Ongepubliseerde inligting), die gevolg is van 'n tydelike aptytverlies of van stremming en dus moontlik hoë bloedpeile van kortikosteroïede. Dit is onbekend of so 'n breek in die wol gepaard gaan met enige ander veranderinge in die huid, soos verhoogde deurlaatbaarheid.

5. Elektrisiteit

Onder die invloed van 'n gelykstroom (ca. 1mA/vk cm vir ½uur) kan die deurlaatbaarheid van die vel vir 'n aantal stowwe verhoog word. Die huid tree op as 'n negatief-gelaaide membraan[6 40] en indien die anode op die vel geplaas word, sal katione (soos metileen blou + en atropien +) makliker deur die vel migreer. Dieselfde gebeur nie met anione indien die katode op die vel geplaas word nie[6].

DIE ROL VAN DRAERSTOWWE EN OPLOSMIDDELS

Daar is chemiese stowwe wat die huid maklik deurdring en so die reputasie verwerf het dat hulle as draers vir ander stowwe kan dien. Die bekendste voorbeeld van 'n draer is seker DMSO, wat onder andere die velabsorpsie van hidrokortisoon by mense verbeter[10]. Die proefondervindelike bewys dat dit nie so is vir alle stowwe nie[24], (daar is trouens stowwe wat so goed oplos in DMSO dat hul velabsorpsie in hierdie vorm benadeel word[33], terwyl in ander gevalle die DMSO geen versnellende effek het nie en slegs dien as oplosmiddel[38]) het baie wetenskaplikes ontnugter en sodanig teleurgestel dat hulle verdere werk in hierdie rigting gestaak het. Die waarheid is natuurlik dat deurdringing al dan nie meesal van die aktiewe bestanddeel afhang. Die oplosmiddel laat die formulering in 'n geskikte vorm bestaan, verminder oppervlakspanning, verlaag vlugtigheid, of los oppervlaklae op en beïnvloed sodoende die sukses van deurdringing[6 24 40]. Indien follikel- en klierbuisabsorpsie die belangrikste is by skape en beeste, teenoor transsellulêre deurdringing by mensvel, volg dit dat stappe wat velabsorpsie by mense bevorder, nie noodwendig suksesvol sal wees by skape en beeste nie[35].

'n Draer in die vorm van 'n salf help om die aktiewe stof in noue kontak met die veloppervlak te bring, kan lug wat in haarfollikels en klierbuise vasgevang is verplaas (veral as dit tydens aanwending ingevryf word) en kan inmeng met die normale uitskeiding van water. Hierdie water word geabsorbeer (deur imbibisie) deur die horingselle[6] en dit kan die deurlaatbaarheid van die epidermis vir wateroplosbare stowwe verhoog[10]. Dieselfde uitwerking is ook al verkry deur die huid met 'n lagie plastiek af te sluit na die aanwending van verskillende kortikosteroïede[25]. Benewens sy vermoë om die aktiewe stof in kontak met die vel te bring, moet die draer ook in staat wees om die stof 'los te laat', anders word absorpsie benadeel. Soms vind chemiese reaksies plaas tussen die draer en die aktiewe stof wat die deurdringing wysig, soos in die geval van salisielsuur, wat 'n ester vorm met cholesterol[6].

Mits 'n vlugtige oplosmiddel as draer gebruik word, is die uitwerking van perkutane en subkutane toedienings van geslagshormone soos estrogeen en testosteroon ongeveer dieselfde. Alhoewel die geslagshormone vetoplosbaar is, lyk dit asof vermenging in olierige en vetterige draers hul absorpsie vertraag[6 40].

In 'n vergelyking van die kutane giftigheid van 'n reeks stowwe in rotte, is die stowwe opgelos in xileen en aangewend nadat die vel eers 'skoongemaak' is met 'n 1:1 mengsel van asetoon en 95% etanol[18], wat natuurlik 'n vraagteken plaas oor hoe 'normaal' die vel was waarop die oplossings aangewend is (*vide supra*). In ander studies is propileenglikol, mielie-olie en etanol as oplosmiddels/draers gebruik[14] en ook sikloheksanol[15], amiel alkohol, isopropanol en ligte aptekersparaffien[35].

EKSPERIMENTELE METODES

Daar is nog baie vrae wat beantwoord moet word i.v.m. die velabsorpsie van medisyne. Watter middels hou genoeg belofte in om as velpreparate geformuleer te word? Watter oplosmiddel is die geskikste vir 'n betrokke middel? Watter verband is daar tussen die orale en veldosis van 'n geneesmiddel? Hoe vergelyk die plasma-halflewe na orale en kutane toediening? Vind daar sekwestrering in die huid of onderhuidse vet plaas? Dit is in elk geval nou reeds seker dat selfs indien al bogenoemde vrae ten opsigte van een, of selfs 'n paar middels beantwoord sou kon word, daar nie gevolgtrekkings na alle ander middels deurgetrek sal kan word nie[24]. Daar is geen konsekwente verhouding tussen die giftigheid van stowwe na orale en plaaslike toediening nie[8].

Op voorwaarde dat die data eers logaritmiese transformasie ondergaan, is goeie korrelasies gevind tussen die perkutane giftigheid op rotte na 4 uur en konyne na 24 uur. Netso was daar goeie korrelasie tussen 4 en 24 uur op rotte en tussen 4 en 24 uur op konyne. Hierdie korrelasies was beter as tussen perkutane en orale giftigheid in dieselfde diersoort en is vir 'n hele reeks stowwe bepaal[46].

Die sukses van perkutane aanwending kan op verskeie wyses gemeet word:

a. Chemiese ontledings op weefsel, urien, ander liggaamsvloeistowwe, of uitgeasemde lug.

Hierdie benadering berus op die veronderstelling dat 'n gevoelige ykingsmetode beskikbaar is. Sommige stowwe dring so stadig deur die huid, dat 'n 24 h urienmonster te veel verdun word vir suksesvolle ontleding. In die geval van 'n stof soos kwik wat in die nier gekonsentreer word, kan die huiddeurdringing van kwikhoudende salwe suksesvol bepaal word deur die nier se kwikinhoud te meet[6].

b. Ontleding van die verskil

Indien dit moeilik is om die stof na toediening chemies in die organisme op te spoor, kan die metode van ''ontleding van die verskil'' gebruik word. 'n Bekende hoeveelheid word aangewend en na die blootstellingstydperk word die oorblywende hoeveelheid gemeet[6]. In gevalle waar die stowwe aangewend, maar nie ingevryf word nie en die oorblywende hoeveelheid na 'n ruk teruggeweeg word, kan dit gebeur dat die stof water uit die vel absorbeer. Dit sal dus 'n kompensatoriese massatoename veroorsaak, sodat 'n negatiewe resultaat versigtig beoordeel moet word[6].

c. Radioaktiewe isotope

Die beskikbaarheid van radioaktiewe isotope het baie van die probleme met in vivo proewe opgelos. Na plaaslike aanwending van 'n bekende hoeveelheid radioisotoop-gemerkte stof, kan die totale hoeveelheid vir 5d versamel en ontleed word vir radioaktiwiteit. Aangesien die niere nie die enigste roete van uitskeiding is nie, moet 'n parallelle proef met binne-aarse toediening uitgevoer word[10].

d. Kliniese tekens

Plaaslike[7 8 25 26] en sistemiese [6 8] kliniese tekens is ook al

gebruik om die deurdring van 'n stof deur die huid te demonstreer. 'n Bepaalde minimum bloedpeil is 'n voorvereiste vir die meeste sistemiese reaksies en daar is stowwe wat na kutane toediening nie hieraan kan voldoen nie, of omdat die stof te stadig deur dring, of omdat dit te vinnig afgebreek word[6]. Die vaatvernouingsreaksie word gebruik in 'n essaïeringstoets vir plaaslike steroïede[7 25 26]. Blootstelling duur 18 h en die verbleking word 1 en 2 h na verwydering van die steroïede beoordeel[7].

e. Histologie en histochemie

Histologiese en histochemiese metodes kan die deurdringende stof in die epidermis opspoor en moontlik 'n aanduiding gee van die roete wat die stof volg op pad na die basismembraan. Indien die stof met 'n kleurstof gemeng word voor aanwending, volg dit noodwendig dat die twee ewe vinnig moet deurbeweeg indien 'n gevolgtrekking oor die stof gebaseer gaan word op 'n waarneming van die kleurstof[6].

d. Serologie

Deurdringing van eiwitte deur die vel kan serologies bevestig word. 'n Depper geweek in perdeserum en op die vel vasgedruk, kan 'n marmot sodanig sensitiseer, dat 'n perdeseruminspuiting 14d later dodelike anafilakse veroorsaak. Eieralbumien in petrolatum is al op konynvel ingevryf en teenliggame 7 – 10d later in die bloedstroom opgespoor. In sulke proewe moet natuurlik sorg gedra word dat die vel geen letsels bevat nie[6].

g. Sjirurgie

Hoey & Kopkins[13] beskryf 'n interessante in vivo metode wat vir ons doeleindes in die teenoorgestelde rigting toegepas kan word. Hulle het naamlik kanules in die oppervlakkige vertakkings van bv die diep boogvormige heupslagaar van skape geplaas, middels toegedien en die uitwerking op die betrokke velstreek bestudeer. Indien die kanule in die aar geplaas sou word, kan die verskyning van 'n stof wat plaaslik toegedien is, in die bloed waargeneem word voordat dit blootgestel word aan metabolisme en biotransformasie.

'n Interessante variasie op hierdie tema is die beskrywing van 'n proef waar die ore van beeste en perde gebruik word[19]. Die ore word deurspoel met Krebs-oplossing. Die uitwerking van adrenergiese middels op die verdeling van die sirkulasie tussen haarvate en arterio-veneuse anastomoses word dan deur middel van radio-aktiewe merkers bestudeer. Dit is 'n metode wat hom moontlik sou kon leen tot die bestudering van velabsorpsie van stowwe.

h. In vitro

In vivo proewe met proefdiere hou voordele in, maar spesiesverskille is 'n groot struikelblok. Daar is bv nie 'n metode om velabsorpsie in diere te toets wat resultate sal oplewer wat direk op die mens van toepassing is nie[31].

Elegante in vitro metodes, waarin die huid van die doelwitspesies gebruik word, is in die afgelope jare beskryf. In die een metode word 'n stukkie vel tussen 2 helftes van 'n glassel vasgedruk. Die helfte aan die dermiskant word gevul met gebufferde fisiologiese soutoplossing vanwaar monsters dan op vasgestelde tye na aanwending op die epidermis geneem word vir ontleding[10 37 38]. Blootstelling duur gewoonlik vir 2 dae. Alhoewel daar in hierdie stelsel geen afskilfering van die horinglaag plaasvind soos in vivo nie, is daar 'n baie goeie kwalitatiewe korrelasie met inligting wat in vivo verkry word[10]. Daar kan groot verkille tussen bepalings wees, maar die metode is nogtans nuttig om groot verskille in deurdringingsvermoë van formulerings aan te toon[38]. In Scheuplein se beskrywing van hierdie metode word die epidermiskant ook aan die waterige oplossing blootgestel en vir solank as 10 dae[42]. Dit laat ernstige bedenkinge ontstaan oor die integriteit van die toetsmembraan aan die einde van die toets en die skrywer se gevoel is dat Franz[10] se wysiging, met die epidermis oop, die werklikheid getrouer naboots.

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VETERINARY EDUCATION AND RESEARCH IN SOUTH AFRICA.[1]

Address by Sir ARNOLD THEILER, K.C.M.G., Director of Veterinary Education and Research, on Degree Day, Pretoria, 9th April, 1920.

It affords me great pleasure to have this opportunity of speaking for the first time in public on behalf of the newly founded Veterinary Faculty, to explain its objects, its organization, and its ideals. Veterinary science is, if not the last, at least one of the last sciences, the application of which has been recognized to be an important factor in the development of the stock-breeding resources of South Africa. The rough and ready methods used in the past to deal with plagues and diseases in stock have gradually given way to treatment based on scientific principles. As a result of this, the serious epizootics have been brought under control, and stock farming, which in earlier times was threatened by many perils, has finally become a safe undertaking. Everybody now realizes that the future of South Africa lies in the development of agriculture, particularly in stock raising for the production of food and cloth to relieve the shortage of these commodities throughout the whole world. Improvement in the breed of cattle and sheep will come as a consequence of the increased demand, and of necessity the higher value of such stock will call for better care and attention as regards both the prevention and cure of disease. For some time past, farmers have recognized this and have drawn the attention of the Government to the necessity of establishing a School of Veterinary Science in South Africa itself. They have realised that as far as stock diseases are concerned this sub-continent has its own peculiar conditions, which are not met with in other parts of the world, and occur least of all in the older countries where the veterinary sciences are taught. They rightly conclude that no school in Europe can afford South African students all the facilities required to make them thoroughly acquainted with their future work in South Africa.

In consequence of representations made by the Transvaal University College, the Minister of Education took up the question, and convened a meeting of persons interested in veterinary science, pure science, agriculture, and education, for the purpose of discussing the need for such a school, the advisability or otherwise of providing a course of training in South Africa, the extent to which university institutions generally could participate in such provision, and the centre at which the final professional stages of the course should be completed. This Commission realized that there was a shortage of veterinarians not only in South Africa but throughout the world, and that the urgent and genuine necessity for meeting veterinary demands in South Africa was not likely to diminish in the future but on the contrary was likely to increase with the inevitable expansion of the stock industry, and the more general application of intensive farming methods. The Commission therefore recommended the establishment of teaching facilities in this country, and set forth the advantages to be derived from such a course in the following words:

(1) The training received in this country would naturally be specially adapted to the needs of the stock-raising community and would embrace a consideration of important diseases peculiar to South Africa, which are not dealt with elsewhere with the emphasis that South African conditions require.
(2) It would afford facilities for South Africans desiring to enter the Veterinary profession but who are at present debarred from doing so for financial or other reasons.
(3) The knowledge of South African conditions, both social and economic, possessed by those living in this country, is a valuable asset to the professional man trained in South Africa, which is not shared by men coming from other countries.
(4) The due appreciation of the value of scientific research, and work of this character, is likely to develop more freely in the presence of a South African Veterinary College equipped with adequate facilities for education and Research.
(5) It is held that the establishment of a South African Veterinary School would fulfil the national and international aspirations and obligations of this country to take an adequate share in the study and investigation of stock diseases peculier thereto, and contribute its quota to the solution of scientific problems in connection with tropical diseases generally. Such an institution would in process of time come to take a permanent place as an international centre for the study of diseases of this character.
(6) The training received by South African graduates would specially fit them for veterinary appointments throughout the African continent in places where a demand for such services may arise, as in British East Africa, Nyasaland, and Egypt, and probably also in India and the West Indies.

The Commission further recommended that the existing university institutions should participate in the education of veterinary students. A five years course was finally considered to be necessary for complete training, two years of which could be undertaken by any University or University College that provided the adequate staff and facilities for the teaching of the pure science subjects, and of Veterinary Anatomy and Physiology. It also advocated the establishment of a Degree of Bachelor of Science in Veterinary subjects, which could be taken at a University or University College before entering upon the final three years' vocational training. It recommended that the final three years of more specialized professional training, following upon the two years Science curriculum or the three years Bachelorate in Veterinary Biology, should lead to the Degree of "Bachelor of Veterinary Science" in the University of South Africa, a professional degree enabl-

ing the graduate to follow the vocation of veterinarian in this country. The Commission furthermore recommended that provision be made for a Doctorate of Veterinary Science in the University.

With regard to the teaching of the professional subjects the majority of the members of the Commission came to the conclusion that the most suitable establishment for this purpose was the Research Institute at Onderstepoort, and the "Majority Report" advocated that this Institute be converted into a "Faculty of Veterinary Science in the University of South Africa," the teaching staff to be so selected that the members would at the same time be actually engaged in the research work of the Institute.

In November last, the Government definitely decided to establish a Veterinary Faculty and it accepted the "Majority Report" of the Commission. It decided that the faculty should form an integral part of the Transvaal University College, and as such of the University of South Africa; and that the third, fourth, and fifth years of the course be undertaken at Onderstepoort in conjunction with Veterinary Research. The Institute was to remain under the administration of the Department of Agriculture, which would make financial provision both for the Research Institute and for the Faculty. In terms of the "Majority Report" the Cabinet decided that all the activities at Onderstepoort were to be under the ultimate control of one head.

The Premier, General Smuts, then asked me to undertake this control, and although at that time I had already made arrangements definitely to leave the service of the Government, I could not refuse to accept the task of organizing the new undertaking, and thus show my sympathy with the South African student, and the educational ideals of the country.

This is a short outline of the history of the foundation and organisation of the new Faculty. In proposing the Faculty the Commission appointed by the Minister aimed at a high standard of training. As already stated, a five years' course is contemplated, since even within the ranks of the profession itself it is felt that the period of training given in the past in the overseas schools is insufficient, particularly in view of special South African requirements. The Commission clearly realized that the veterinarian required in South Africa, and indeed in the whole sub-tropical world, would generally not be the private practitioner who attended the individual animal, but rather an officer in Government employ, who would apply the laws for the prevention of plague, and utilize his scientific training for the study of disease and of methods for eradication and control. In other words, although the practitioner training would be included, the South African students would have to be primarily equipped for research, and it is this view which determined the Commission to recommend provision for a more extensive instruction in the general sciences, the establishment of a science degree, the subsequent special training in connection with the Research Institute, and the creation of a Doctorate of Veterinary Science.

This new departure involved in combining research and teaching must be considered an excellent one, and South African farmers will in due time reap the full benefit of the extension of the activities of the Research Institute. The allotment of the subjects for research will be so arranged that they will fit in with the teaching function of the corresponding officer. On the one hand the research officer will, by teaching, remain in constant touch with the literature of his subject as a whole, while on the other hand the student will receive instruction from a teacher who masters his subject from the research point of view as well. Indeed the combination of the two functions will be of the greatest benefit to research itself, and I venture to predict a period of constant progress in the near future, and the solution of problems which have hitherto proved refractory.

You will realize that under this arrangement the new school does not depend upon a large number of students to justify its existence, but will do useful work even if it should happen that there are very few students. The combination of research and education has a still further advantage, and one which will appeal to the people handling the purse strings. That is the saving of expense both in the construction of the new establishment and in subsequent current expenditure. The Research Institute as it now stands no longer fulfils the requirements for routine and research in the Union. Both have taken tremendous strides during the past few years, and for some time past an extension of the establishment has been contemplated. This extension can now be so arranged that provision is made at the same time for the educational side. For many years the research staff has been inadequate and its augmentation is necessary. A small increase over the estimated number of research officers, and a skilful distribution of the work, will now provide an adequate teaching staff. The professorial staff can be large without being expensive owing to the fact that each teacher is not paid exclusively for teaching, but is primarly paid as a research officer. From the point of view of the State the new organization thus affords every guarantee for effective research and education at a moderate expense. From the point of view of the student it is the most ideal one to be found. The young South African veterinarian will be a member of the University, and as such will derive all the advantages that the University life can offer. Students of the different faculties will meet on common ground, and will rub shoulders with men whom in the future they will help to shape the destiny of the country. Furthermore, the student in the Research Institute will, from the very beginning of his studies, live in a scientific atmosphere. He will participate in the investigations of the professors. He will be able to follow their research, and to sharpen his critical mind during the progress of the work itself. It is the training of the critical mind, so necessary for the interpretation of facts obtained by observation and experiment, that makes a successful scientist.

Hence the new institute will afford opportunities superior to those of any other veterinary institute in the world.

At the same time, however, I wish to point out that not all and sundry will be welcome into our realm of science. Indeed, from the very beginning, I wish to utter a grave word of warning to those who consider the study of Veterinary Science only as a lucrative investment. I appeal to the young South African as the future veterinarian who above everything else has the welfare of the country at heart; to the young man who has the altruistic desire to be useful to his fellow citizens; and to the man who loves science for science's sake, who will be satisfied with a decent living, and will labour to elucidate the problems which are as yet unsolved. In doing so he not only serves the interests of his particular

branch of science, but of science in general. It must be made clear to our student that veterinary medicine is a biological science, that the laws applying to the wider "science in general" are again to be found in the more limited regions of veterinary science, and that in approaching his subject from this wider point of view, he will be in a position to promote both. Whilst our science does not lend itself to the accumulation of wealth, it offers all prospects for distinction not only in our own country but in the scientific world at large. For the gifted few there are place on the Roll of Honour of Science, but every honest veterinarian can become a great benefactor to the farming community of his country. It is to the student with big ideals that I appeal, and I feel sure that he is to be found in the young South African.

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SPLIT PALATE IN A LITTER OF PUPS

by G.J. LOUW* and SELMA J.E.M. VAN SCHOUWENBURG**

Fig. 1: The heads of all 5 pups with their mandibles removed, showing the split palates.

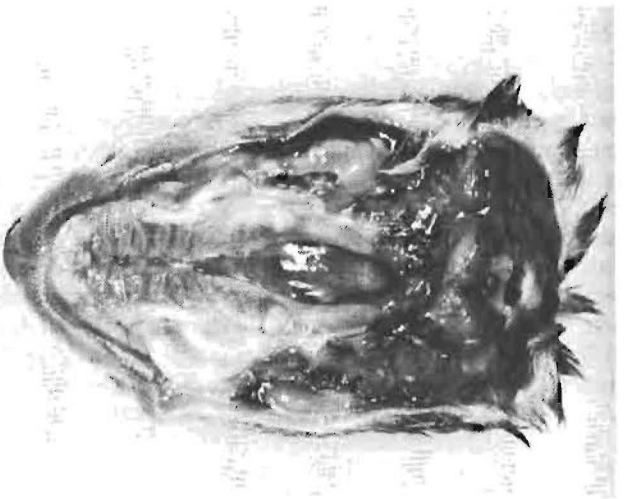

Fig. 2: A closer view of the palate of a pup.

A Toy pom-cross bitch of 11 months old was presented for treatment. She was approximately 20 days advanced with her first pregnancy. She was run over by a motor car and suffered severe lacerations to her left hindleg, with severe skin and muscle loss, exposing most of the bones of the crus. The leg was treated intensively using Lotagen (Byk-Gulden) and bandages. The dog was given Dexatomanol (Byk-Gulden), Betsolan soluble (Glaxovet), penicillin/streptomycin, and later Synulox (Beecham) parenterally, repeatedly. Her treatment was continued for 4 weeks.

A month after the initial treatment with steroids, the bitch whelped, and produced 5 pups, which rapidly became moribund and one of them died. The remaining pups were euthanased. An examination of all 5 cadavers revealed a split palate in each animal (Fig. 1 & 2). In many domestic animals and in man, the fusion of the palate occurs approximately 1/4 – 1/2 of the way through the gestation period. If this were to be extrapolated in this case, it may be assumed that fusion occurs at approximately 32 – 34 days of gestation in the dog.

Speculations made about the cause of this teratological condition are:

1. The trauma and stress to the bitch, causing an increased oxygen-consumption by her tissues with oxygen-deprivation of the pups, or else causing raised steroid levels in her bloodstream;
2. The administration of steroids;
3. The administration of antibiotics; most drugs carry specific warnings concerning their use in pregnant animals.
4. A genetic origin, which is difficult to assess at present since she has produced only one litter of pups.

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Proceedings of a colloquium on the use/abuse of strychnine, organized by the Wildlife Group of the South African Veterinary Association.

Handelinge van 'n colloquium oor die gebruik/misbruik, van strignien, georganiseer deur die Wildsgroep van die Suid-Afrikaanse Veterinêre Vereniging.

THE LEGAL CONTROL OF STRYCHNINE

T W NAUDE – Professor and Head, Department of Pharmacology and Toxicology, Faculty of Veterinary Science, P/Bag X04, University of Pretoria, 0110 Onderstepoort.

Strychnine is included in Schedule 4 of the Medicines and Related Substance Control Act (Act 101 of 1965). If a veterinarian is convinced of the need for using strychnine, he may issue a prescription, which is dispensed by a pharmacist. The veterinarian stays responsible for his actions and may only prescribe strychnine after careful risk-benefit evaluation and after informing the client fully about the exact technique to be used and the precautionary matters which are applicable. Provincial ordinances have to be considered.

Game may not be poisoned in the Transvaal unless a permit is obtained. Problem animals and non-game animals may be poisoned, provided it is not done in an area controlled by a problem-animal dog hunting club.

In Natal poison may be laid out for the preservation of livestock, crops or produce against depravation by vermin or marauding dogs, provided that reasonable precautions were taken against game being destroyed.

In the Orange Free State poison may only be put out on permit, unless for rodents and insects. Permits are issued on occasion for poisoning marauding dogs but not for jackals, as these are effectively controlled with dogs by Oranjejag.

In the Cape Province strychnine may be used against black-backed jackal, caracal and marauding dogs. The local Divisional Council must be notified and notice boards must be posted.

In SWA/Namibia certain approved poisons may be used (strychnine, warfarin, carbon monoxide and cyanide).

STRYCHNINE PHARMACODYNAMICS

T W NAUDE – Professor and Head, Department of Pharmacology and Toxicology, Faculty of Veterinary Science, P/Bag X04, University of Pretoria, 0110 Onderstepoort

Strychnine is an alkaloid with two tertiary amine nitrogen atoms: $pK^1 = 6,0$ and $pK^2 = 11,7$. It is rapidly absorbed from the alkaline duodenum, but not from the stomach, and distributed throughout the body. About 80% of absorbed strychnine is oxidized and detoxified by hepatic microsomes and the remainder is excreted unchanged via the kidneys. No accumulation takes place. Strychnine blocks the spinal depressant effects of glycine at the receptor sites; this demodulates spinal motor impulses and leads to overstimulation. Reported oral LD_{50}'s range from 0,7 mg/kg for man and dogs, 2,0 mg/kg for horses, 3–6 mg/kg for raptors, 10 mg/kg for pigs to 15 mg/kg for cattle. If the gastric contents, liver and kidneys are excluded, the chances of secondary intoxication through consumption of the carcass of an animal dying from strychnine poisoning are remote.

ETHICAL ASPECT OF STRYCHNINE POISONING

J VAN HEERDEN – Professor & Head, Department of Medicine, Faculty of Veterinary Science, Medical University of Southern Africa.

Objections to the use of strychnine are that it is both inhumane and indiscriminate. Strychnine acts on inhibitory interneurones in the spinal cord resulting in the loss of spinal cord reflex inhibition thus causing supra-facilitated contraction of striated muscle. The animal remains fully conscious. External stimuli cause tonic and eventually tetanic muscle contractions. Tetanic contraction of the diaphragm, intercostal and laryngeal muscles results in progressive asphyxia. Convulsive tetanic seizures become progressively more frequent and intense and the victim eventually dies in a state of exhaustion, anoxia and cyanosis. The anxiety and muscular pain experienced by the victim probably lead to massive endogenous catecholamine and cortisol release, which could result in neurogenic lung edema and ventricular fibrillation. Strychnine is usually put out in meat in the veld and left to be picked up by the intended victim, usually jackals. They are usually not the only carnivores in the area and a whole range of non-target species could theoretically be poisoned.

DIE VOORKOMS VAN STRIGNIENVERGIFTIGING IN SUID-AFRIKA

P W NEL – Navorser, Seksie Toksikologie, Navorsingsinstituut vir Veeartsenykunde, Onderstepoort.

Die Seksie Toksikologie, Navorsingsinstituut vir Veeartsenykunde, Onderstepoort ontvang gewoonlik monsters van huisdiere wat akuut gevrek het. Gedurende 1 Maart 1983 tot 28 Februarie 1984 is 196 uitbrake van strignienvergiftiging gediagnoseer waarby 389 diere betrokke was, oa. 22 honde, 113 kransaasvoëls, 40 konyne en 13 katte. In Transvaal, veral van Pretoria, noordwaarts, is daar 110 uitbrake aangemeld waarin 225 diere dood is. In Kaapland is 36 uitbrake bevestig (82 vrektes), in Natal 11 uitbrake (26 vrektes) en in die OVS 17 uitbrake (20 vrektes). Die stede waar strignienvergiftiging die meeste gediagnoseer is, is Pretoria (30), Bloemfontein (8) en Johannesburg (6). Die hoogste insidens is gewoonlik in April-Mei en Augustus-Oktober, wanneer tewe op hitte is.

STRYCHNINE POISONING AND THE EFFECT ON WILDLIFE

JOAN C DOBBS & PATRICK C BENSON – Zoology Department, University of the Witwatersrand.

Poisoning by strychnine in non-target wildlife animals has been shown to be a problem. Vast quantities of strychnine have been used around the world to reduce or eliminate pest species. In many cases, these predatory animals are surviving as well or better than in the pre-poisoning era. The populations of many non-pest scavenging mammals and birds, on the other hand, have been declining. Although many nations have regulations on the restrictive use of strychnine, many non-target animals are still being affected. In order to preserve South Africa's wildlife resource, there is a need for individual landowners and regulatory agencies to be selective in choosing ways to eliminate problem animals. It should be kept in mind that indiscriminate poisoning has the potential to alter the ecological balance of the country.

STRIGNIEN EN ALTERNATIEWE METODES IN DIE BEHEER VAN PROBLEEMDIERE

M J DE WET – Eerste Natuurbewaarder, Probleemdierbeheer-seksie, Afdeling Natuurbewaring, Transvaalse Provinsiale Administrasie, P/Sak X209, 0001 Pretoria.

Probleemdiere vervul 'n nuttige rol in die natuur en uitroeiing van 'n spesie is dus ongewens. Die maatstaf van suksesvolle beheer is nie hoeveel diere gedood is nie, maar of die skade beheer word. Wettige beheermetodes vir probleemdiere:

Dodelike metodes
- Vergiftigde aas
- Gifskieter
- Jag met honde
- Skiet.
- Slagysters
- Uitgrawe en vergassing van teelgate
- Gifnekbande

Afweermetodes
- Bestuurspraktyke, bv. kraal van skape snags
- Omheinings
- Skaapwagter
- Chemiese afweer
- Anti-vrugbaarheidsmiddels
- Vanghokke en -kampe

Verlaging van bevolkingsdigtheid stimuleer die groeitempo van bevolkings. Waar beheer met een metode vir 'n lang tydperk volgehou word, leer diere om dit te vermy. Enige beheermetodes is net so effektief en selektief soos die operateur wat dit gebruik. Opleiding van operateurs is dus noodsaaklik.

EVALUASIE VAN BEHEERMAATREËLS

G K BRÜCKNER – Assistent Direkteur, Afdeling Dieresiektes, Departement Landbou en Veeartsenydiens.

Hondsdolheid in jakkalse is in 1973 vir die eerste keer in die distrik Messina gediagnoseer. Teen die middel van 1975 is gemiddeld een geval elke tweede dag in beeste aangemeld. Strigniengifaas is op 2 agtereenvolgende nagte op 24 plase uitgeplaas. Die insidens van die siekte in beide jakkalse en beeste het toe geleidelik afgeneem. In 1980/81 was hondsdolheid weer op 'n hoogtepunt en is die prosedure herhaal. Op een plaas is na een nag se gifstrooiery 12 dooie jakkalse gevind, terwyl die getal op verskeie plase van 15 tot 25 jakkalse per nag gewissel het. Ander diere wat aangemeld is, was 6 ratels, 4 muskeljaatkatte, 3 bakoorjakkalse en 1 hiëna. Strignien word slegs vir die beheer van hondsdolheidvektore gebruik wanneer:

- die gebruik daarvan deel vorm van 'n georganiseerde veldtog
- die effek so prakties moontlik gemonitor kan word
- die uitplasing van gif selektief en verantwoordelik toegepas word
- die verhoogde jakkalspopulasie direk verband hou met die verhoogde voorkoms van hondsdolheid in beeste.

DIE BOER EN STRIGNIEN

H P ELOFF – Boer, Posbus 1, 0800 Bandolierkop.

'n Verlies van 19 uit 40 kalwers op een plaas en 'n verlies van 'n derde van die kalwers op 'n ander plaas gedurende een jaar illustreer die skade wat deur luiperds in die Noord-Transvaalse bosveld aangerig kan word. Die verlies van 82 bokke in een jaar as gevolg van predasie deur jagluiperds, die verlies van 9 uit 30 osse as gevolg van predasie deur hiënas en die feit dat rooijakkalse soms aan koeie vreet wat sukkel om te kalf dien as verdere voorbeelde van skade deur roofdiere.

Beesboerdery het 'n uiters lae renteverdienste; van 2 – 3% per jaar en boere kan dus nie verlies aan roofdiere bekostig nie. Die beheer van jakkalse word gewoonlik gesamentlik deur Veeartsenydienste en Georganiseerde Landbou aangepak. Boere werk ook saam met natuurbewaringsinstansies, mits bewaring by ekonomiese boerdery kan inpas.

ABSTRACT

SAMEVATTING

CHEMOTHERAPY OF *THEILERIA PARVA LAWRENCEI* INFECTIONS IN CATTLE WITH HALOFUGINONE

Halofuginone lactate, given once orally at a dosage rate of 1,2 mg/kg body mass on the 1st, 3rd or 5th days of fever, resulted in the recovery of only 1 out of 5 splenectomized cattle. Three splenectomized animals treated on the 1st as well as the 4th day of fever, recovered and were then carriers. Six untreated controls all died. The potential value of a chemotherapeutic agent for *Theileria parva lawrencei* infections in South Africa is discussed. (De Vos, A.J. & Roos, J.A., 1983. Chemotherapy of *Theileria parva lawrencei* infections in cattle with halofuginone. *Onderstepoort Journal of Veterinary Research,* 50, 33-35 (1983).)

ABSTRACT

SAMEVATTING

PHOTO-SENSITIVITY CAUSED BY THE PLANT *ATHANASIA TRIFURCATA* L. (ASTERACEAE)

Hepatogenous photosensitivity was experimentally induced in 1 out of 4 sheep dosed with milled *Athanasia trifurcata.* This is an unpalatable aromatic shrub commonly found along the south-western and south-eastern Cape coast on overgrazed, recently burnt or disturbed veld, up to an altitude of 1 300m. The liver lesions ranged from a few small multifocal areas of necrosis in 1 animal to various zonal patterns of necrosis (centrizonal, midzonal and peripheral) in each of the other 3. Botanical, toxicological and clinical data are given. (Kellerman, T.S., Coetzer, J.A.W., Schneider, D.J. & Welman, Wilhelmina F., (1983). Photosensitivity in South Africa. III. Ovine hepatogenous photosensitivity caused by the plant *Athanasia trifurcata* L. (Asteraceae). *Onderstepoort of Veterinary Research,* 50, 45-53 (1983).)

ABSTRACT

SAMEVATTING

OVINE PHOTOSENSITIVITY CAUSED BY THE PLANT *ASAEMIA AXILLARIS*

Hepatic lesions in 4 field cases of ovine hepatogenous photosensitization caused by the plant, *Asaemia axillaris* (Thunb.) Harv. Ex Jackson, are described.

The liver was swollen, friable and yellowish-brown, with distinct lobulation. Microscopically, the lesions ranged from peripheral coagulative necrosis in 1 animal to others with scattered single cell or small foci of necrosis as well as hepatocellular degeneration and unrest, ductular proliferation, portal fibroplasia and cholestasis.

The liver lesions are compared with those of previously reported experimental cases of *A. axillaris* poisoning in sheep. The significance of zonal necrosis and factors that may have a bearing on their production in different hepatotoxic plant poisonings in sheep and cattle in South Africa are discussed. (Coetzer, J.A.W. & Bergh, T., 1983. Photosensitivity in South Africa. IV. Pathological changes in the liver in ovine photosensitivity caused by the plant *Asaemia axillaris* (Thunb.) Harv. Ex Jackson. *Onderstepoort Journal of Veterinary Research,* 50, 55-58 (1983).)