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JOURNAL OF THE SOUTH AFRICAN VETERINARY ASSOCIATION

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ARTICLE ARTIKEL

EQUINE BLOOD SERUM CALCIUM AND PHOSPHORUS CONCENTRATIONS IN PROGRESSIVE NUTRITIONAL HYPERPARATHYROIDISM

J.E.F.M. DENNY*

ABSTRACT: Denny J.E.F.M. **Equine blood serum calcium and phosphorus concentrations in progressive nutritional hyperparathyroidism.** *Journal of the South African Veterinary Association* (1985) **56** No. 3, 123-125 (En). Department of Animal Health and Production, Faculty of Veterinary Science, Medical University of Southern Africa, 0204 P.O. Medunsa, Republic of South Africa.

Weekly blood serum samples from 20 yearling horses, divided into equal groups, receiving diets with total calcium to inorganic phosphorus ratios of 1,5/1 and 0,2/1, were analysed for calcium and phosphorus concentrations. This was done over a continuous 23 week period, divided into 2 sub-periods of 16 and 7 weeks each. During the first period complete diets were provided ad lib but were restricted during the second period to accentuate any effects of calcium deficiency and phosphorus excess. Falling calcium levels and rising phosphorus levels during period 1 and a reverse trend during period 2 indicated that this method can be used to detect progressive nutritional hyperparathyroidism in individual horses when a series of profiles are analysed over a period of time.

Key words: Equine, serum calcium, phosphorus, progressive nutritional hyperparathyroidism.

INTRODUCTION

Mineral concentrations in blood plasma and serum have been used in the field as parameters to assess early dietary calcium and phosphorus imbalances.

However, as Traver et al.[7] have observed, in the numerous disease processes involving aberrant electrolytic and mineral metabolism, the evaluation via serum determinations are obscured because of the homeostatic responses in the body.

While serum calcium and inorganic phosphorus determination may be useful during the early stages of imbalanced nutrition of these minerals, it is of no use once the homeostatic mechanism comes into play. Should overcompensation occur, for example in the case of calcium deficiency, the serum calcium will rise to above normal levels, at which time it is exactly the opposite of the nutritional imbalance[4].

In cases where overcompensation does occur and where reference values have been obtained by monitoring a number of metabolic blood profiles from individual horses, serum calcium and phosphorus determinations could be useful in detecting early and late nutritional hyperparathyroidism.

This paper reports on metabolic blood profiles from 20 yearling horses which were monitored over a continuous 23 week period to establish whether differences in blood serum calcium and phosphorus could be detected when half the group received a diet with an imbalanced calcium to phosphorus ratio.

MATERIALS AND METHODS

Weekly blood samples were obtained from 20 yearlings of Thoroughbred origin with no access to feed other than complete pelleted diets. The diets were formulated to have calcium to phosphorus ratios of 1,5/1 (Diet T1) and 0,2/1 (Diet T2). Of the 20 yearlings, 10 received Diet T1 and 10, Diet T2. Both groups were fed the diets ab lib for a period of 16 weeks (Period 1) and were then switched for a further 7 week period (Period 2) to a total dietary intake of 1,5% of their bodymass in order to accentuate any dietary calcium deficiency or phosphorus excess. A representative feed sample was obtained from each 50 kg bag of each diet and analysed for total calcium and phosphorus using the Weende technique. At 08h00 each Monday morning horses were weighed and the daily feed intake calculated from data collected during the preceeding week. Venous blood from the jugular vein of each horse was extracted with an evacuated tube (Venoject, Terumo Corporation, Tokyo, Japan) using an 18 guage needle. Venoject tubes containing blood with no additive were placed in a water-bath at 30°C for two hours until the clots retracted. Tubes were then centrifuged for 20 minutes and serum removed with a Pasteur pipette. For autoanalysis and atomic absorption analysis 5 ml of serum was used.

Serum samples were subjected to analysis for total calcium concentration and total inorganic phosphorus concentration.

Calcium concentrations were determined by an atomic absorption spectrophotometer (Model Varian AA 275). Strontium chloride 3,8% was used as a dilutent and Merck Titrasol No 9976 was used as a standard. Wellcome normal and abnormal serums (Boehringer Mannheim GmbH) were used as controls. Concentrations were recorded in mmol/ℓ.

Serum inorganic phosphorus concentrations were determined by the Technicon Autoanalyser 11 System (Technicon Instruments Corporation, Tarrytown N.Y.). Boehringer Mannheim Preci Flo was used as a standard and Wellcome normal and abnormal serums as controls. Results were recorded in mg/dℓ and converted to mmol/ℓ by division of a factor 3,1.

Statistical analysis of variance was carried out using the general linear models procedure and least square means were calculated.

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RESULTS

Serum Calcium Concentrations

Least square means of serum calcium concentrations for the T1 group were 2,79 mmol/ℓ and 2,89 mmol/ℓ for Periods 1 and 2, respectively. For the T2 group the equivalent concentrations were 2,62 and 2,70 mmol/ℓ. Serum calcium concentrations were significantly higher in the T1 group during both periods (P = 0,0036, Period 1 and P = 0,0265, Period 2).

Serum Phosphorus Concentrations

Least square means for serum inorganic phosphorus concentrations for the T1 group were 1,79 and 1,73 mmol/ℓ for Period 1 and Period 2 respectively. For the T2 group the equivalent concentrations were 2,05 and 2,01 mmol/ℓ. Serum phosphorus concentrations were significantly higher in the T2 group for both periods (P = 0,001, Period 1 and P = 0,0003, Period 2).

Serum Calcium to Phosphorus Ratios

Least square means of serum calcium phosphorus ratios for the T1 group were 1,58/ℓ and 1,69/ℓ for Period 1 and Period 2, respectively. For the T2 group the equivalent ratios were 1,31/ℓ and 1,38/ℓ. Highly significant differences were found in the ratios of serum calcium to serum phosphorus, being wider in the T1 group for both periods (P = 0,0001, Period 1 and P = 0,0001, Period 2).

Serum ratios and levels for the two periods are graphically presented in Fig. 1 & 2.

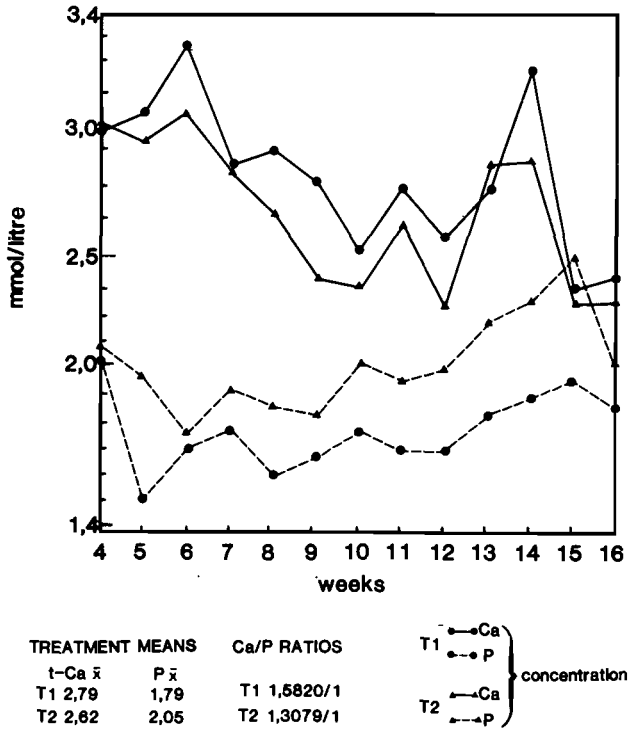

Fig. 1: Serum calcium phosphorus concentrations and ratios Period 1.

Fig. 1 & 2 illustrate a declining serum calcium level and a rising phosphorus level during Period 1 while during Period 2 the trend is reversed particularly in the T2 group during the final week of Period 2 where the serum calcium level shows a marked rise.

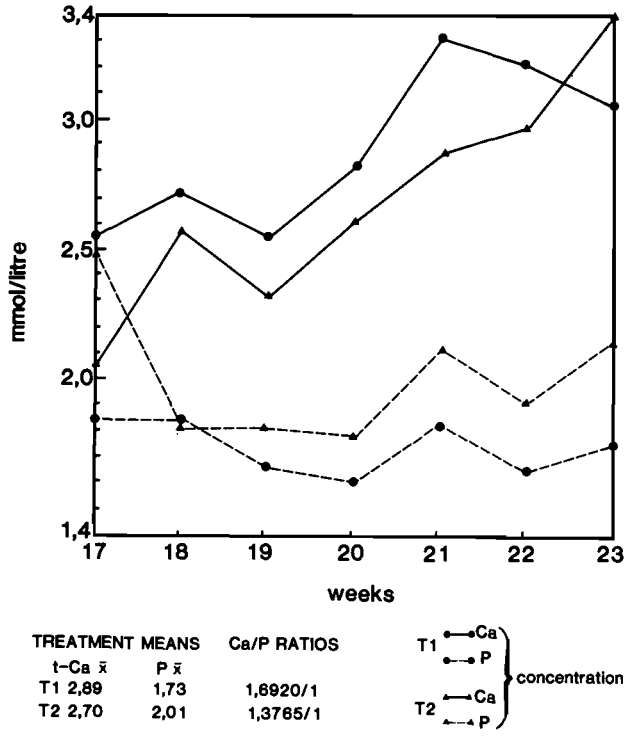

Fig. 2: Serum calcium phosphorus concentrations and ratios Period 2.

DISCUSSION

Literature norms for serum calcium and phosphorus concentrations vary considerably. For example Berrier[1] gives a calcium range 2,25 – 2,75 mmol/ℓ, Blood et al.[2], 2,8 – 3,45 mmol/ℓ and Mullen et al.[5], up to 3,77 mmol/ℓ for 2 year old Thoroughbreds in late training. Similarly reported phosphorus concentrations range widely. For example, Berrier[1], 1,29 – 2,58 mmol/ℓ and Blood et al.[2], 1,0 – 1,8 mmol/ℓ.

Serum calcium concentrations in this trial in both treatments fell within the range of normality as reported in the literature. Phosphorus levels, while also falling within the normal range, tended to be on the high side especially in the T2 group. This is understandable since Diet T2 had a much higher level of phosphorus. The lower concentrations of phosphorus in both groups during Period 2 could be ascribed to a lower dietary intake.

Lewis[4] has stated that when phosphorus absorption is excessive (T2 phosphorus levels were higher than T1 throughout the trial) and calcium absorption inadequate, initially the calcium concentration decreases and the phosphorus concentration increases (Period 1; Fig. 1).

The decreased serum calcium concentration stimulates parathyroid hormone secretion, thus causing an increase in intestinal absorption, renal tubular reabsorption of calcium, and calcium and phosphorus excretion. These effects return both calcium and phosphorus to normal levels where they may remain. Often there is over-compensation which increases serum concentrations above normal at which time the concentration in the serum is exactly the opposite of the nutritional imbalance (Period 2; Fig. 2).

During Period 2 serum calcium levels rose, which

could be ascribed to improved calcium absorption due to restricted feeding and deficient calcium intake particularly in the T2 group where the calcium reabsorption effect of the distal renal tubule could have been overriding. It would appear therefore, that the rise in serum concentrations, particularly of calcium during Period 2, indicates the presence of the first phase action of parathyroid hormone, as described by Simmons[6], prior to the oesteoblastic rebound response effect and resultant osteodystrophy. These effects are caused by the widening of the calcium to phosphorus ratio during the second period in both treatments.

As diets were in a complete pellet form, the rate of passage through the digestive tract could have been expected to be more rapid than if the horses were provided with a conventional diet of long roughage and concentrate. More faecal phosphorus excretion could therefore be expected since the major effective sites of phosphorus absorption are the dorsal and small colon and the rapid feed passage rate may have resulted in inadequate phosphorus absorption time. This in turn would have resulted in the parathyroid reflex action increasing bone phosphorus mobilisation and resultant high serum phosphorus concentrations. In addition, excess dietary phosphorus in relation to calcium in the T2 group may still have been expected to interfere with calcium absorption.

It would therefore be difficult to diagnose a mineral nutrient imbalance simply from one individual profile. However, if reference values are obtained for an individual horse, or group of horses, through analyses of several profiles over a period of time, dietary calcium and phosphorus imbalances may well be detected in progressive nutritional hyperparathyroidism. In this respect a change in ratios could provide a more sensitive indication than the actual concentrations. Thus supportive evidence may be provided to any further tests carried out to diagnose imbalances such as the renal clearance test of Traver el al.[7], faecal analysis tests reported by Denny[3] and chemical analysis tests of feed samples.

ACKNOWLEDGEMENTS

The technical assistance of Mr Charles Henderson and the laboratory staff of Epol Research Farm, Halfway House, who conducted the analyses, is gratefully acknowledged.

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BOOK REVIEW BOEKRESENSIE

VETERINARY DENTISTRY

C.E. HARVEY

1st Edn. W.B. Saunders Company, Philadelphia 1985 pp. IX + 322 numerous figures (ISBN 0-7216-1111-7) price not stated

This book is written by the well-known Prof C E Harvey of the University of Philadelphia, in cooperation with 16 other contributors including five dentists. This book differs from two recently published books on veterinary dentistry on two aspects. Firstly the author has interpreted dentistry in its wider sense and has included chapters on oral medicine, oropharyngeal neoplasms, oral surgery, conditions of the salivary glands and diseases of the pharynx. Secondly this book is not limited to small animals only, but includes chapters on oral diseases of the horse, the ruminants, the pig, laboratory animals and captive wild animals.

The author states in the introduction, that the book is written to serve as a textbook for veterinary students and a reference text for practicing veterinarians and dentists. Some chapters in the small animal section are in my opinion too concise to accomplish this goal. The chapter on periodontal disease and on "disorders of teeth" are lacking depth. In the latter chapter the authors tried to cover congenital anomalies, dental trauma, caries, endodontics, conservative dentistry and exodontics in a mere 26 pages, with the result that, for example, the pathogenesis of caries is dealt with in one single sentence. In the same chapter some most irritating inaccuracies are present such as carnassial abscess being described as the most common form of chronic osteomyelitis of the maxilla. Furthermore the pathogenesis of this particular condition is poorly described; the authors fail to distinguish sinuses from fistulae; and Eisenmenger & Zetner's classic on veterinary dentistry where the pathogenesis and conservative treatment of this condition was for the first time elegantly described and illustrated, is not even mentioned in the references of this particular chapter. This is all most regrettable because these two abovementioned chapters cover the topics that are by far most important in small animal dentistry.

The chapters on equine dentistry give an excellent blend of academic background knowledge and sound practical information. In the chapters dealing with oral diseases in ruminants, excessive attention is given to tooth eruption times in the different cattle breeds. On the other hand periodontitis in sheep, the so-called "broken mouth", which is extremely important in certain parts of the world and also very interesting from a comparative point of view, is only briefly discussed. The chapter on oral diseases in laboratory animals gives a review on animal models of human dental disease, with major emphasis on caries models. This chapter cannot be fully appreciated by the average reader, in view of the fact that the general pattern of conditions such as periodontitis and caries has not been comprehensively described in the previous chapters.

In summary, the merit of this book lies in the fact that species other than dogs and cats, and conditions other than the traditional dental problems have been included in the text. However, sound scientific background knowledge is lacking in many chapters of this book and, most disturbingly, in chapters that deal with primary dental problems. If this book is also intended to be read by the dental profession, inaccuracies and incompleteness are not permissible. In my opinion, this book cannot be recommened without reservation.

F.J.M. VERSTRATE

BOOK REVIEW BOEKRESENSIE

ATLAS OF CANINE SURGICAL TECHNIQUES

P.G.C. BEDFORD (EDITOR)

1st Edn. Blackwell Scientific Publications, Osrey Mead, Oxford 0x20EL 1984 pp 186, photos 37, illustrations 233 Price (ISBN 0-632-01154-8)

This book describes various surgical techniques which can be carried out successfully in the average veterinary practice without the use of specialized instrumentation.

Section I deals with instrumentation, anaesthesia, fluid therapy and radiography. Section II contains chapters on surgery of the skin, head and neck, thoracic cavity, abdominal-alimentary tract, uro-genital tract and nervous system. There are also sections on ocular and orthopaedic surgery.

Each chapter is concisely presented in the following format: Indications, equipment, technique, post operative care and possible complications. Illustrations are clear and apposite. The section authors are all renowned in their fields which accounts for the high standard of the techniques described. The different techniques are not all original but will provide the practitioner with an easily understandable exposition of the techniques. The book is not intended as a compendium of surgical techniques, but is aimed at the practitioner who would like to attempt more than just routine surgical procedures.

This book is recommended for the practitioner with an interest in canine surgery.

R. GOTTSCHALK

ARTICLE ARTIKEL

CHARACTERISTICS AND INDICES OF REPRODUCTION IN DORPER SHEEP

E. ELIAS*, D. COHEN* and P. DAYENOFF*

ABSTRACT: Elias E.; Cohen, D.; Dayenoff, P. **Characteristics and indices of reproduction in Dorper sheep.** *Journal of the South African Veterinary Association* (1985) **56** No. 3, 127-130 (En). Isan Center for Comparative Medicine, Ben-Gurion University of the Negev, P.O. Box 653, Beer-Sheva 84105, Israel.

In seventeen adult Dorper ewes imported from South Africa into Israel and nine of their primiparous, first-generation daughters born in Israel, characteristics and indices of reproduction were determined during the period of April 1982 to April 1984. This study showed that, during the period from April 1982 to January 1984, three lambings occurred in the adult ewes; the lengths of the oestrous cycles for adult and primiparous ewes were 17.6 ± 1.1 and 16.6 ± 1.2 days, respectively; the number of services per ewe in oestrus were 3 ± 1 services; the average length of pregnancy was 146 – 147 days; the lambing intervals were 6.2 ± 0.46 and 7.7 ± 0.62 months from the first to second lambing and the second to third lambing, respectively; of 17 ewes, 3 had twins in all 3 lambings (17.6%) and 4 had twins in only the first 2 lambings (23.5%). The sex ratio recorded in 70 lambs of adult ewes (in three lambings) was 41 males to 29 females (41:29). A high percentage of fecundity (137.2%) and prolificity (149%), an unrestricted breeding seasons, a short lambing interval and a short postweaning anoestrus period, recommend this breed of sheep as commercially advantageous for arid zones.

Key words: Dorper sheep, oestrous cycle, length of pregnancy, lambing interval, prolificity, fecundity, sex ratio.

INTRODUCTION

The Dorper sheep has been a recognized breed since 1950 and has been described as a true South African success[8]. This new breed was developed by crossing a Dorset Horn with a black-headed fat-tailed Persian. By strict selection of the desired type, the new breed was established[2]. The breed was developed primarily for arid zones[1,2], where it demonstrated that it could very effectively utilize available grazing[4]. Dorper sheep were first imported into the arid Negev area of Israel in April 1982. The objective of the present study was to determine breeding characteristics and indices of reproduction in these first Dorper sheep imported into Israel.

MATERIALS AND METHODS

Sheep in experiment:

Seventeen adult Dorper ewes (2 years old), two rams (2½ years old), and nine primiparous ewes (13 – 14 months) were observed for the period of April 1982 to April 1984 at the Isan Center for Comparative Medicine, Ben-Gurion University, Beer-Sheva. During the quarantine period (April to September 1982) and later on, in the paddocks, the rams were separated from the ewes during the experiment.

Feeding program:

During the quarantine period the sheep received per head per d 3 kg alfalfa hay and 250 g concentrates. According to the analysis these concentrates contained: protein min. 16%, fat min. 2%, fibre max. 7.5% and ash 6.5%. Moisture was 13%. During the paddock period the sheep were fed differently according to the physiological condition. Non-pregnant ewes and rams were fed with 1.5 kg hay and 500 g concentrates; pregnant sheep in the last 50 – 60 d of pregnancy received 1.5 kg hay and 750 g concentrates; nursing ewes were fed with 2.5 kg hay and 1 kg concentrates and young lambs (2.5 – 12 months) received 1 kg hay and 300 g concentrates. In the premating period (50 d prior to mating) rams received as supplement 400 g oats per head per d. All the sheep were fed twice daily (morning and afternoon).

Reproductive management

The program of reproductive management is based on three mating periods of 5 weeks each, in April-May 1982, November-December 1982 and July-August 1983 for the adult ewes and one mating period of eight weeks for the primiparous ewes, in October-November 1983. The two rams were exposed for 30 min to the ewes twice daily, once in the morning (at 06h30) alternating with the other ram in the afternoon (at 17h30). The same procedure was used for dams ten d prior to weaning (55 d postpartum).

Factors studied were: the number of services per ewe in oestrus, the duration of oestrus, the length of the oestrous cycle, the mean gestation period, the lambing intervals, the weight of lambs at birth, the sex ratio, the repetition of twinning characteristic in the second and third lambings and the indices of reproduction. These followed the scheme described by Desvignes, 1968, as cited in Tafta[9] (Table 1). Prolificity is defined as the ability of ewes to reproduce live offspring and fecundity is their potential capacity to produce fertile ovules. The Index of Prolificity is defined as the number of lambs born (p in Table 1) per number of lambing ewes (g in Table 1) and the Index of Fecundity is defined as the number of lambs born (p in Table 1) per number of ewes designated for mating (a in Table 1), not all of whom conceived.

RESULTS

During the period of April 1982 to January 1984 three lambings of adult ewes were recorded. The first lambing occurred during the quarantine period, September-October 1982. One lambing of young ewes (primi-

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parous) was recorded in March-April 1984. The rams showed high libido during all three mating periods emphasized by mountings without coitus (4 ± 1 times in 30 min) and by the number of services per ewe in oestrus in 30 min. (3 ± 1 services).

Conception rates were lower for first mated ewes in the nursing period (8.8%) than in first mated ewes in the postweaning period (91.2%). The mating response of Dorper ewes during the mating periods are shown in Table 2. The values indicate that a high percentage of ewes remained pregnant in the first oestrous cycle in all three mating periods. On the other hand, a ewe's response in the July-August period was lower than in the first and second mating periods (April-May and November-December, Table 2). Three ewes returned to oestrus (second oestrous cycle). The length of the oestrous cycles were 17.6 ± 1.1 and 16.2 ± 1.2 d for adult and primiparous ewes, respectively (Table 3). In the postweaning period, the first oestrous cycle occurred 16.3 ± 8.4 d after the first lambing for 15 adult ewes and only for 12 ewes after the second lambing. The second oestrous cycle in the same period occurred 17.8 ± 2.4 d after the first cycle in the remaining non-pregnant ewes.

Table 1: CHARACTERISTICS OF REPRODUCTION OF EWES (DESVIGNES, 1968 CITED IN TAFTA[9])

Specific *characteristic*	Symbol	Formula	Indices
Ewes designated for mating	a		
Non-mated ewes	b		
Mated ewes	$c = a - b$		
Sterile ewes	d	d/a · 100	of Sterility
Pregnant ewes	$e = a - d$	e/a · 100	of Fertility
Ewes which aborted	f	f/e · 100	of Abortion
Lambing ewes	$g = a - d - f$	g/a · 100	of Apparent Fertility
Single lambing	h	h/g · 100	of Single lambing
Double lambing	i	i/g · 100	of Double lambing
Single lambs	h	h/p · 100	of % of single lambs
Twin lambs	2i	2i/p · 100	of % of twin lambs
Total of lambs born	$p = h + 2i$	p/g · 100	of Prolificity
		p/a · 100	of Fecundity
Stillborn births	q	q/p · 100	of Mortality
Live births	$r = p - q$		
Dead lambs post-partum	s	s/r · 100	of Perinatal mortality
0-5 days Living lambs at day 5 post-partum	$t = r - s$		of Mortality during growth period
Dead lambs, day 5 post-partum till weaning	u	U/t · 100	
Weaned lambs	$V = t - u$	v/a · 100	of Numerical productivity
Total dead lambs	$w = q + s + u$	w/p · 100	of Total mortality

Table 3). The onset of oestrus was abrupt, while the cessation was gradual. The average length of pregnancy in this breed was 146 – 147 d (Table 3). The lambing interval from the first to second lambing was 6.2 ± 0.46 months and from the second to third lambing 7.4 ± 0.62 months. The weight of the single lambs born were not significantly heavier ($P < 0.05$) than that of the twin lambs born (Table 4). At the day of weaning (65 d post partum) sixteen lambs weighed 20.5 ± 0.8 kg. For twins the number of males exceeded that of females (29 to 17) compared with variable results received for single lambs born (Table 5). Three ewes out of seventeen (17.6%) lambed twins during all three lambings and four out of the seventeen (23.5%) had twin lambings in only the first and second lambings.

Good values for prolificity (149%) and fecundity (137.2%) were found in all three lambings (Table 6). A high percentage of fertility (98.03%) was obtained in adult ewes per total lambings (Table 6).

The total of 47 lambing adult ewes produced 57 weaned lambs (121.3%) (Table 6). In all of the lambings, including primiparous ewes, no uterine inertia or dystocia was presented due to the feto-maternal disproportion. Three dams giving birth (to twins) rejected one lamb immediately after parturition during the second and third lambings. Vaginal prolapses were observed in four adult ewes pregnant with twins in the fourth month of their pregnancy.

DISCUSSION

It is generally agreed that breeding activity of ewes is stimulated by declining d length or a particular low number of h of light per d and is suppressed by increasing d length or a larger number of h of light per d.

The lambing rate, a high rate of prolificity and fecun-

Table 2: MATING RESPONSE OF DORPER EWES

Ewes in experiment	First mating period April-May 1982						Second mating period November-December 1982						Third mating period July-August 1983					
	Number and percentage of pregnant ewes post coitus in:																	
	F		S		T		F		S		T		F		S		T	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Adult (n = 17)	16	94.1	1	5.9	—	—	15	88.2	2	11.8	—	—	12	70.6	5	29.4	—	—
	October-November 1983																	
Primiparous (n = 9)	6	66.7	1	11.1	2**	22.2												

*F = First oestrous cycle; S = Second oestrous cycle; T = Third oestrous cycle
**One out of two ewes was not pregnant; n = number

Table 3: DURATION OF SEXUAL CYCLE AND PREGNANCY PERIOD IN DORPER SHEEP

Ewes in experiment	Duration of oestrous cycle		Duration of oestrus		Duration of pregnancy period (days)		
	The period Days	Mean ±SE Days	The period Hours	Mean ±Se Hours	Single born lambs		Twins born lambs
					Male	Female	
Adult (n = 17)	16-18	17.6±1.1	28-44	36±8	147.1±0.28	147.7±0.25	146.6±0.32
Primiparous (n = 9)	15-17	16.6±1.2	24-36	28±6	146.8±0.2	146.3±0.1	146.2±0.12

n = number

Table 4: LAMB BIRTH WEIGHT*

Ewes in experiment	Lambs born	Sex	n	Birth weight (kg) mean ± SE
Adult	Single	Males	4	3.1±0.2
		Females	4	2.9±0.08
	Twin	Males	5	2.6±0.8
		Females	5	2.5±0.1
Primiparous	Single	Males	2	2.9±0.3
		Females	3	2.9±0.15
	Twin	Males	2	2.6±0.1
		Females	4	2.3±0.14

*Lambs from first lambing
n = Number

dity observed in this study show that the photoperiodic mechanism is not applicable to Dorper sheep. Since there was no seasonal limitation to the breeding cycle of the Dorper sheep it can be presumed that the hypothalamo-hypophyseal axis was not influenced by d length in Dorper ewes and this then suggests that there are differences in the reproductive endocrine cycle in Dorper sheep destined to return to oestrus post-weaning as compared to other breeds[6,7,9].

This unrestricted breeding season in Dorper ewes is a key point in sheep production making it possible to call the breed a breeding factory. Our observed three lambings in a two year period, a short lambing interval and a high value of fecundity and prolificity, confirmed the high rate of reproduction reported for Dorper sheep[1-3] as compared with the local Awassi breed[5].

The high percentage of ewes which did not return to oestrus after mating represents a good rate of fertility. Also, in the majority of mated ewes ovulation occurred in the first oestrous cycle as estimated by the time of lambing. Each ewe was serviced more than once during oestrus, thus increasing their chances of becoming pregnant over the ewes serviced only once. The mean gestation period in Dorper ewes was shorter by 3±1 than in Awassi ewes in our area[5].

Birth weights of Awassi lambs have been recorded[5] as being heavier than birth weight in Dorper lambs found in this study. However, from our unpublished observations of Dorper lambs, the rate of growth is more rapid in the first three months of life than in Awassi lambs in the same period. In our opinion the Dorper lamb has greater growth potential.

In Bedouin and fellahin Awassi flocks, not more than 5% of the adult ewes have twins[5]. In this study in the three lambings of adult ewes, 49.2% of ewes had twins. The sex ratio recorded in 70 lambs of adult ewes (in three lambings) was 41 males and only 29 females. However, the fact that the number of males exceeded that of females coincides with those in a stationary flock purchased from Awassi nomads ewes[5].

A lambing interval of 6–7 months in this breed is considered very good and confirmed previous observations that the lambings interval in Dorper ewes does not exceed 8 months[1].

In the mating periods of spring and summer, more lambs resulted per lambing ewe (1,52 and 1,57, respectively) than in the mating of the end of autumn (1,37), but the difference was not significant.

In conclusion, the high reproductive rate of this breed is based on: high values of fecundity and prolificity, an unrestricted breeding season, a short lambing interval and the twinning characteristic. These characteristics recommend the Dorper sheep for consideration as a commercially advantageous animal for meat production in arid zones.

Table 5: SEX RATIO IN DORPER LAMBS

Ewe in experiment	Lambs born	First lambing				Second lambing				Third lambing				Total			
		Males	(%)	Females	(%)	Males	(%)	Females	(%)	Males	(%)	Females	(%)	Males	(%)	Females	(%)
Adult	Single lambs	4	(50)	4	(50)	8	(80)	2	(20)	0		6	(100)	12	(50)	12	(50)
	Twins	10	(55.6)	8	(44.4)	8	(66.6)	4	(34.4)	11	(68.7)	5	(31.3)	29	(63.6)	17	(36.7)
Primiparous	Single lambs	2	(40)	3	(60)												
	Twins	2	(33)	4	(67)												

Table 6: INDICES OF REPRODUCTION OF DORPER SHEEP

Specific characteristic	Indices	Date of lambing							
		Adult ewes (n = 17)						Primiparous (n = 9)*	
		Sept-Oct. 1982		April-May 1983		Dec. 1983-Jan 1984		March-April 1984	
		No	%	No	%	No	%	No	%
Ewes designated for mating		17		17		17		9	
Non-mated ewes		0		0		0		0	
Mated ewes		17	100	17	100	17	100	9	100
Sterile ewes	of Sterility	0		0		1	5.8	1	0.11
Pregnant ewes	of Fertility	17	100	17	100	16	94.1	8	88.8
Ewes which aborted	of Abortion	0		1	5.8	2	12.5	0	
Lambing ewes	of Apparent fertility	17	100	16	94.1	14	82.3	8	88.8
Single lambing	of Single lambing	8	47	10	62.5	6	42.8	5	62.5
Double lambing	of Double lambing	9	52.9	6	37.5	8	57.2	3	37.5
Single lambs	of % of Single lambs	8	30.8	10	45.4	6	27.2	5	45.4
Twin lambs	of % of Twin lambs	18	69.2	12	54.5	16	72.7	6	54.5
Total of lambs born	of Prolificity	26	152.9	22	137.5	22	157.1	11	137.5
	of Fecundity		152.9		129.4		129.4		122.2
Stillborn birth	of Mortality	0		0		0		0	
Live birth		26	100	22	100	22	100	11	100
Dead lambs-post partum 0-5 days	of Perinatal mortality	3	11.5	1	4.5	5	22.7	0	
Living lambs at day 5 post partum	of Mortality during growth period	23	88.5	21	95.5	17	77.3	11	
Dead lambs day 5 post partum till weaning		1	4.3	1	4.7	2	11.7	0	
Weaned lambs	of Numerical productivity	22	129.4	20	117.6	15	88.2	11	100
Total dead lambs	of Total mortality	4	15.3	2	9.0	7	31.8	0	

*First generation of females from first lambing (Sept-Oct. 1982)

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The authors are grateful to Mrs Martha Papo for her technical assistance.

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CASE REPORT GEVALVERSLAG

ANOMALOUS DEVELOPMENT OF THE UPPER THIRD PREMOLAR IN A DOG AND A CAT

F.J.M. VERSTRAETE*

ABSTRACT: Verstraete F.J.M. **Anomalous development of the upper third premolar in a dog and a cat.** *Journal of the South African Veterinary Association* (1985) **56** No. 3, 131-134 (En). Department of Surgery, Faculty of Veterinary Science, University of Pretoria, P.O. Box 12580, 0110 Onderstepoort, Republic of South Africa.

Two cases of anomalous development of the upper third premolar in a dog and a cat are described. The involved teeth have a bifid crown and 3 roots. The central root is abnormally wide and has 2 separate root canals. The anomalous tooth is the cause of malocclusion in the cat and of periodontitis in both cases. The difficulty in distinguishing gemination from fusion is discussed.

Key words: Tooth diseases, dentistry, gemination, fusion, dichotomy, dog, cat.

INTRODUCTION

Gemination, fusion and concrescence are developmental disturbances in the shape of teeth[9 18]. Gemination (or dichotomy) refers to an attempt at division of a single tooth bud. This results in the incomplete formation of two teeth. The clinical appearance is usually that of a tooth with a longitudinal coronal groove and a single root (Fig. 1). Fusion and concrescence of teeth denote a joining of 2 tooth buds to form a single structure. Fusion may be complete or incomplete but the dentine is always confluent. In concrescence, however, the teeth involved have completely separated dentine but the cementum of the roots is confluent. Fusion can affect 2 normally present teeth but can also occur between a normal tooth and a supernumerary tooth. It is therefore obvious that it may be very difficult or even impossible to differentiate between fused teeth and a dichotomous tooth[9 18]. Some authors avoid this problem by naming both conditions 'double teeth'[3 19]. Numerous case reports have been published in the dental literature[3]. In man the incisors are most often affected but isolated cases involving premolar and molar teeth have been described[3 5]. A prevalence varying from 0.1 to 1.0 % has been found[3]. Fusion and gemination occur more often in the deciduous dentition[3]. These anomalies are rare in animals and have received very little attention in veterinary literature. Colyer[4], in his monumental work on the dental disorders of wild and domestic animals, found cases of gemination in the dog as well as in 12 wild animal species. Becker[2] described cases in the horse and in cattle. Most epidemiological studies on the dental disorders of the dog[11 12 14] and the cat[10] do not mention fusion nor gemination of teeth. Ross[16 17] has drawn attention to the existence of gemination and fusion in small animals. Kuiper et al.[8] recently described 2 cases of incisor gemination and one case of suspected fusion in the dog, and discussed the ontogeny of these conditions. Arnall[1] briefly mentioned a case of incisor fusion in a dog. The cause of these anomalies is unknown. Gemination may be hereditary in humans[3 9] as well as in dogs[6 7]. A physical force with resultant contact between developing teeth may result in fusion[18-20]. There may also be a hereditary tendency[18 19]. Concrescence occurs after root formation has been completed[18]. Trauma and crowding of teeth have been implicated as possible causes for concrescence[18 19].

The documented cases of dichotomous teeth in the dog involve incisor teeth[4 6 7 8 16]. This appears to be the most common form and is occasionally seen. During the period 1983-84 3 cases of incisor gemination were diagnosed out of 212 small animals presented at the Dental Clinic of the Department of Surgery, Faculty of Veterinary Science, University of Pretoria (Fig. 1). This report deals with two cases of gemination or fusion involving the upper 3rd premolar (P3) in a dog and a cat.

CASE REPORTS

Case 1

In the course of an on-going research project on the dental pathology of cats, a large number of cat cadavers were obtained from the local Society for the Prevention of Cruelty to Animals. No history was available and no clinical data were recorded. The skulls were prepared using the enzyme-active detergent technique as described by Mooney et al.[13].

Skull No 024 shows a permanent dentition with complicated crown fractures of 3 canines, early signs of generalized periodontitis and an abnormally shaped upper left P3 (Fig. 2). This tooth has a crown measuring 9 mm in width, compared to the 6 mm of the corresponding right tooth. A fissure divides the crown into 2 cone-shaped parts, each similar to the crown of a normal upper P3. The groove ends at the base of the crown. The two crown parts each have a bicuspid structure and are the mirror image of each other (Fig. 4). A normal upper P3 has a tricuspid crown[15]. The major cusps contact each other and the 2 parts are convergent at an angle of 60° in the vertical plane. Radiography revealed the presence of 3 roots. The central root has nearly double the width of the other 2 and has 2 separate root canals. The distal part of this tooth is lingually displaced and its distal root is lingual to the palatal root of the 4th premolar (P4). The two parts form an angle of 120° in the horizontal plane. Adjacent to the central root a deep groove is formed on the lingual side, due to vertical bone resorption (Fig. 3). The interproximal alveolar bone between P3 and P4 has a rough surface and is also

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0038-2809/85/03/0131-0134

receded. The mesial root of P4 shows severe vertical bone resorption (Fig. 4). These are all indications that periodontitis was present involving these 2 teeth. The mesial part of the tooth is mesially displaced and comes abnormally close to the 2nd premolar (P2). The distal part shows an extensive wear facet exposing the dentine. This is caused by occlusal contact with the lower P4 (Fig. 2 & 4).

Case 2

A two-year old female Afghan Hound was referred to the Dental Clinic of the Department of Surgery, Faculty of Veterinary Science, University of Pretoria, for orthodontic correction of anterior crossbite.

On examination an abnormally shaped upper left P3 was found. The tooth was similar to the anomalous tooth of case 1, but did not cause an occlusal problem, as an upper P3 is not in occlusal contact in the dog. The 2 parts of the bifid crown have a bicuspid structure but are not the mirror image of each other. Gingivitis and periodontal pockets measuring 5 mm were present at the lingual and vestibular aspects of the tooth, adjacent to the groove that divided the crown (Fig. 5).

Radiological examination of the part of the jaw involved revealed the presence of 3 roots. The central root has nearly double the width of the other 2, and has 2 well divided root canals (Fig. 6).

Impressions of the rostral part of the dentition were taken and the dog was discharged in anticipation of the orthodontic braces being made and planning of further treatment. Shortly thereafter the dog died of suspected viral gastroenteritis and was lost for further follow-up investigation.

DISCUSSION

Most authors[3,7-9,18-20] point out the difficulty in distinguishing gemination from fusion. This also applies to the 2 cases presented here. In both cases, the number of teeth present in the the affected area is normal. According to Levitas[9], this is important in differentiating between gemination and fusion. In fusion it will appear that there is a congenitally missing tooth, unless the fusion occurred between a normal tooth and a supernumerary tooth. The latter condition is especially applicable to man, where a supernumerary incisor is quite

Fig. 1: Typical case of incisor gemination in a dog (arrow).

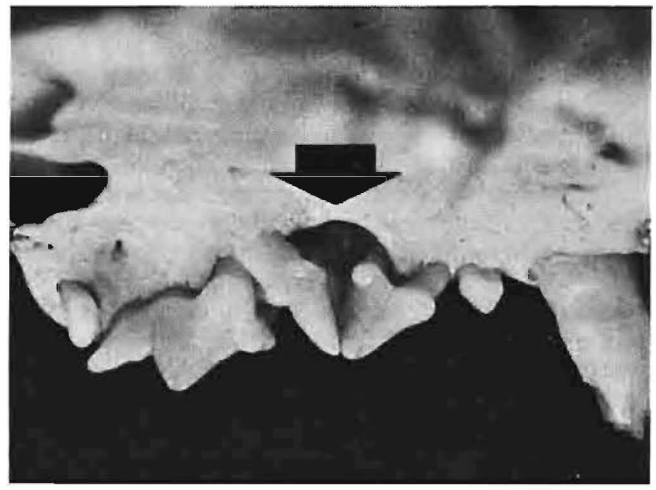

Fig. 3: Case 1 – lingual view of left maxilla. Note the extensive vertical bone resorption around the central root of the anomalous P3 (arrow).

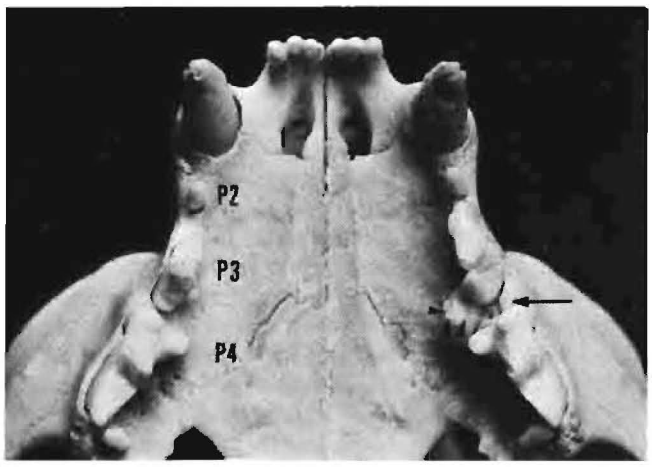

Fig. 2: Case 1 – occlusal view of maxillae, showing abnormally shaped left P3. Note the interproximal bone resorption at P3/P4 (arrow) and the wear facet on the distal part of the crown (arrowheads).

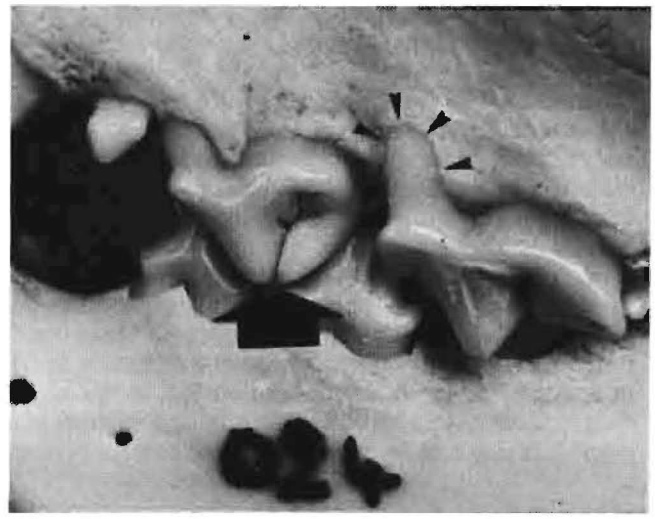

Fig. 4: Case 1 – vestibular view of left mandibula and maxilla. Note the fissure dividing the crown of upper P3 (arrow) and the vertical bone resorption at the mesial root of upper P4 (arrowheads).

Fig. 5: Case 2 – vestibular view of the anomalous upper left P3. Note the gingivitis and periodontal pocket (arrow).

Fig. 6: Case 2 – radiograph of upper left P2 – P4, showing the abnormally shaped P3. Note the 3 roots of P3 (1 – 3), with the central root being much wider (arrows) and having 2 separated root canals (arrowheads).

common and may fuse with a neighbouring incisor[18]. In the dog and cat, supernumerary teeth affecting the upper premolar area are extremely rare, except in the region of P1 in the dog[1,4,7,14] and P2 in the cat[10]. Colyer[4] described cases where there was a supernumerary tooth present lingual to the upper P3 in a cat and a jackal, and lingual to the upper P4 in a fox and also in a cat. It would therefore appear that, although extremely rare, a supernumerary tooth can occur in the vicinity of the upper P3 and P4 in Felidae and Canidae, and more specific lingual to these teeth. Levitas[9] further states that a geminated tooth is likely to have one root, and fused teeth, two roots or root canals. It should be emphasized, however, that he only considered cases affecting the incisors. Colyer[4] found cases of gemination affecting an upper P4 and P3 in 2 American opossums, and affecting an upper P2 in a coati. The P4 described shows 4 roots (including one abnormally wide one centrally), and P2 3 roots. Lüps[10] briefly mentions the case of a cat with an abnormal upper P3 having 3 roots. The illustration in Lüps' publication[10] suggests that this may have been a case similar to Case 1 described here. The radiographs of the 2 cases presented revealed the presence of 3 roots in the anomalous teeth. The central root is abnormally large and has 2 separate root canals. The number of roots is not an indication for differentiating gemination and fusion of teeth which normally have more than one root. The presence of completely separated root canals, however, is suggestive of fusion rather than gemination[9,18,20].

The fact that the 2 parts of the bifid crown of the affected tooth are each other's mirror image in Case 1 but not in Case 2, is difficult to interpret. Tannenbaum & Alling[20] suggest that gemination usually results in the formation of a mirror image. Other authors[3,9,18], however, do not consider this to be of any importance. In fact, dichotomous incisors in the dog very often do not consist of mirror image crown parts (Fig. 1)[4,16].

No definite diagnosis is possible in the 2 cases presented here. The fact that the number of teeth in the affected area is normal and the extreme rarity of supernumerary teeth there, would favour a diagnosis of gemination. The complete separation of the root canals in the anomalous teeth and the fact that the presence of a supernumerary tooth lingual to the upper P3 has been described in the cat and species related to the dog would suggest that fusion between a normal upper P3 and a supernumerary tooth could have taken place.

In animals geminated or fused teeth are usually of academic interest only, especially when affecting the incisors[16]. In the 2 cases presented here the anomalous tooth was the cause of malocclusion in Case 1, and of periodontitis in both cases. The periodontitis can be explained by the altered gingival anatomy[17,18] resulting in food impaction, and occlusal trauma[18]. Surgical removal of the anomalous tooth would therefore seem to be indicated in similar cases. Extraction of premolars and molars in the dog and cat does not seem to lead to overeruption of opposing teeth and drifting of adjacent teeth, as it does in man. Conservative treatment of incisor dichotomy has been described in man[19] but would be extremely difficult, if not impossible, in these cases.

The number of cases described in the literature and presented here, does not allow the drawing of conclusions as to the prevalence of this anomaly in the dog and cat. It can be expected, however, that with the increasing attention being paid to small animal dentistry, more similar cases will be diagnosed in the near future.

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CASE REPORT GEVALVERSLAG

NECROSIS AND ABSCESSATION OF PLACENTAL SITES IN A PEKINGESE BITCH

B.L. PENZHORN*

ABSTRACT: Penzhorn B.L. **Necrosis and abscessation of placental sites in a Pekingese bitch.** *Journal of the South African Veterinary Association* (1985) **56** No. 3, 135-136 (En). Department of Genesiology, Faculty of Veterinary Science, University of Pretoria, P.O. Box 12580, 0110 Onderstepoort, Republic of South Africa.

An 18-month-old Pekingese bitch aborted 7 foetuses at Day 55 of pregnancy. Necrosis and/or abscessation of all 7 placental sites were found following a panhysterectomy performed 4 days later. *Escherichia coli*, *Proteus mirabilis* and a β-haemolytic *Streptococcus* sp. were cultured from the vaginal discharge and from a uterine abscess.

Key words: Bitch, abortion, abscessation placental sites, *Escherichia coli*, *Proteus mirabilis*, β-haemolytic *Streptococcus*.

CASE REPORT AND DISCUSSION

An 18-month-old Pekingese bitch was admitted to the Genesiology Clinic, Faculty of Veterinary Science, University of Pretoria, a day after aborting 7 foetuses 55 days after mating. She was slightly depressed, anorexic and febrile (T = 39,7°C). Her mucous membranes showed a yellowish discoloration. A watery yellow-green vaginal discharge was present. The uterus could be palpated, but the bitch showed no signs of pain or discomfort on palpation. A blood smear was negative for babesias, a major cause of abortion in the area. A radiograph revealed that there were no retained foetuses. A vaginal swab was taken, from which *Escherichia coli*, *Proteus mirabilis* and a β-haemolytic *Streptococcus* sp. were cultured subsequently. The uterus was irrigated with 20 ml normal saline solution containing 300 mg amoxycillin (Clamoxyl, Beecham) and the bitch was also treated with 40 mg Clamoxyl per os twice daily. She was fed 10 ml milk every hour.

By the next day the bitch still wouldn't eat and was very depressed. Her rectal temperature remained high (39,5°C) and her mucous membranes were even yellower than the previous day. The vaginal discharge had become purulent and malodorous and a purulent ocular discharge had developed. Venous blood was collected for determining ALT (L-alanine amino transferase) levels as an indication of possible liver damage. The result (29 IU) was within normal limits. In addition to the Clamoxyl, the bitch received 150 ml intravenous fluid (Plasmalyte, Baxter Laboratories) with 1 ml of a combination of phospholipids and vitamins (Hepavet, Nattermann), as well as 0,1 mg $PGF_{2\alpha}$ (Lutalyse, Upjohn) intramuscularly twice daily. The uterus was irrigated as on the previous day.

On the third day the habitus improved somewhat, but the bitch was still anorexic and her temperature remained high (39,4°C). The vaginal discharge was yellow and purulent. The treatment of the previous day was repeated, but the uterus wasn't irrigated.

The following day the bitch's condition had deteriorated and her temperature was 39,6°C. As she now showed signs of pain on abdominal palpation, it was decided to perform an exploratory laparotomy. This revealed an enlarged uterus with what appeared to be various abscesses visible externally (Fig. 1 & 2). A panhysterectomy was performed. Necrosis and/or abscessation were found at all 7 placental sites in the uterus. Two of these abscesses, both in the left horn, had ruptured into the abdominal cavity, but there were no signs of peritonitis. Swabs were taken of the abscesses and the same bacteria as mentioned previously were cultured. Histological examination of some of the lesions showed necrosis and cellulitis, as well as bacterial proliferation.

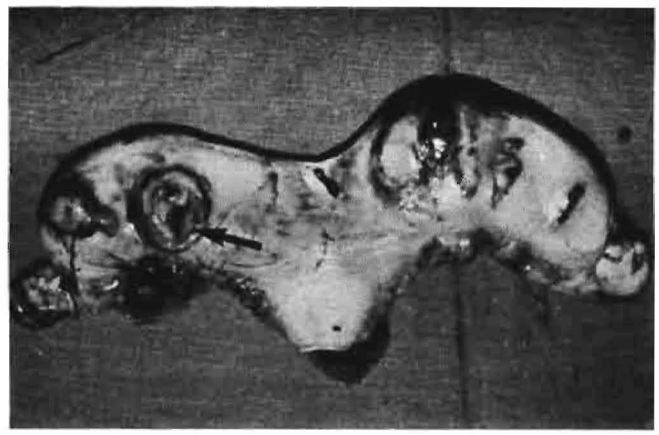

Fig. 1: Dorsal aspect of the uterus of a Pekingese bitch showing abscessation of some placental sites 4 days after abortion. One abscess in the left horn has ruptured into the abdominal cavity (arrow).

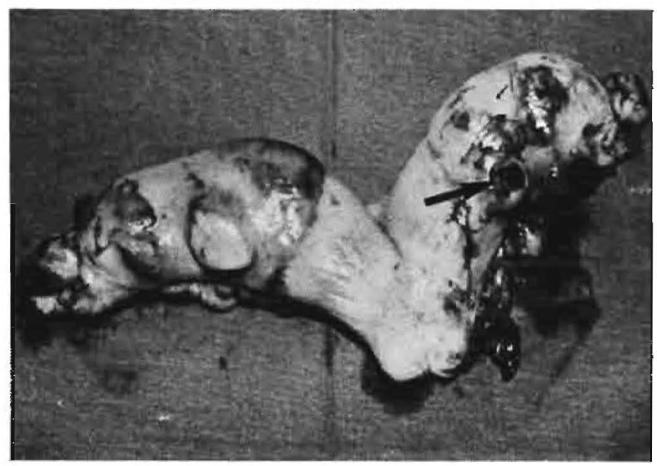

Fig. 2: Ventral aspect of the same uterus as in Fig. 1. One abscess in the left horn has ruptured into the abdominal cavity (arrow).

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By the morning after the operation the bitch's condition had improved markedly and she was eating well. She made an uneventful recovery and was discharged a week after being admitted to the Clinic.

The aetiology of the abortion remains speculative. The fact that pathogenic bacteria were cultured from vaginal swabs taken the day after the abortion suggests that one or more of these bacteria may have been involved as the primary cause of the abortion. This is mere conjecture, however, and the necrosis/abscessation of the placental sites may have resulted from bacterial infection after the abortion. Iatrogenic introduction of pathogens into the uterus after abortion cannot be ruled out. *E. coli* and other enteric bacteria are frequently cultured from the vaginal discharge or from foetal tissue after abortion, but they may be secondary pathogens[1]. β-haemolytic *Streptococcus* type L has been implicated as causing abortion in dogs[2].

ACKNOWLEDGEMENTS

I thank Prof I B J van Rensburg for the histological examination, Mrs B A Fabian for the bacterial cultures, Miss A van Heerden for the clinical pathology, Prof A J Bezuidenhout, Mrs H Smit and Miss D Pledger, the student handling the case.

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CASE REPORT GEVALVERSLAG

A PREGNANT HEIFER WITH A CONGENITAL IMCOMPLETELY DEVELOPED VULVA

E.E. OETTLÉ and R.I. COUBROUGH*

ABSTRACT: Oettlé E.E.; Coubrough R.I. **A pregnant heifer with a congenital incompletely developed vulva.** *Journal of the South African Veterinary Association* (1985) **56** No. 3, 137-138 (En). Department of Genesiology, Faculty of Veterinary Science, University of Pretoria, P.O. Box 12580, 0110 Onderstepoort, Republic of South Africa.

A 2 year old Friesland heifer was presented in an advanced stage of pregnancy with a vulva showing only 2 small openings of 1,5 and 0,5 cm in diameter in the dorsal and ventral vulvar commissures, respectively. Normal vulvar skin covered a thick band of fibrous tissue between the two openings. From the vestibulum forward, the rest of the genital tract was normal. At calving, the fibrous tissue was resected under epidural anaesthesia, and the calf delivered with ease. The vulva was reconstructed by stitching the vestibular mucosa to the vulvar skin using simple interrupted sutures.

Key words: Heifer, congenital vulvar abnormality.

CASE PRESENTATION AND DISCUSSION

A 2 year old Friesland heifer which had been running with a bull for the previous year, was presented in an advanced stage of pregnancy. On examination, it was noted that the vulva was incompletely developed, showing only 2 small openings 1,5 and 0,5 cm in diameter, at the position of the dorsal and ventral vulvar commissures, respectively (Fig. 1). Note the larger opening at the dorsal commissure, the conjoined lateral vulva lips, and the smaller ventral opening. When the vulvar lips were not opened manually, the external appearance of the vulva was essentially normal. A vaginoscope inserted through the opening at the dorsal commissure revealed a normal vestibulum, vagina and cervix. A small amount of urine was present on the ventral vaginal floor in the region of the fornix. The cervix, however, was tightly closed and not in contact with the pool of urine. Closer observation and palpation of the vulvar region revealed a thick band of fibrous tissue between the openings at the dorsal and ventral commissures. It was not possible to pass a probe from the one opening to the other, since their common connection within the vestibule was tortuous. On urination, however, urine was seen to discharge from both openings. The skin overlying the vulva was typically thin and loosely attached to the underlying structures, as is seen in normal animals.

Once parturition had advanced into the second stage, the interconnecting tissue closing the vulva was resected under light epidural anaesthesia (Fig. 2), and a stillborn heifer was delivered after an uncomplicated manual correction of bilateral shoulder flexion. The vulvar conformation of the calf was normal. After delivery, the vulva was reconstructed by suturing the vestibular mucosa over the underlying fibrous tissue to the resected vulvar skin, using simple interrupted sutures (Dexon) (Fig. 3). She was given 2000 mg oxytetracycline (Liquamacin, Pfizer) daily for 5 days, and 30 ml of a combination of anti-inflammatory compounds (Dexa-Tomanol, Byk-Gulden) daily for 3 days. The sutures were protected with daily applications of nitrofurazone ointment. The placenta was retained for 4 days, after which it came away on its own, and no intra-uterine treatment was administered.

The presented case suggests an incomplete opening of the cloacal membrane during the formation of the external genitalia. While the perineal body may have formed, only partial opening of the endodermal component of the cloacal membrane in the vulva region appears to have occurred.

The epidermis must have opened completely during this stage, reclosing over the retained underlying band of tissue with the formation of a distinct central union or raphé (Fig. 1) except in the region of the dorsal and

Fig. 1: Vulva of heifer preoperatively: arrows show openings of the vulva, dorsally and ventrally. Note the essentially normal visual appearance of the vulvar region.

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Fig. 2: During the operation: the vulva has been partially resected. Note submucosa (s) and muzzle of the calf (arrow).

ventral openings. On visual appraisal only, the vulva appeared surprisingly normal.

The primary congenital abnormality was easily resected along the line of the conjoined vulvar lips, which made reconstruction of the vulva a reasonably simple surgical procedure.

Fig. 3: Post operatively: the vulva has been reconstructed.

Despite the apparently normal outward appearance of the vulvar region of this heifer, the farmer had detected the lesion, but assumed that the heifer could not be served normally. Only when udder development started, however, did he suspect that she was pregnant. He presented the case, correctly assuming that normal parturition would not be possible. The breeding prognosis of the heifer is good, and should not be affected by the original lesion.

CASE REPORT GEVALVERSLAG

A PULMONARY GIANT CELL CARCINOMA IN A DOG

STELLA S. BASTIANELLO*, J.W. NESBIT* and P. BLAND-VAN DEN BERG**

ABSTRACT: Bastianello Stella S.; Nesbit J.W.; Bland-van den Berg P. **A pulmonary giant cell carcinoma in a dog.** *Journal of the South African Veterinary Association* (1985) **56** No. 3, 139-142 (En). Department of Pathology, Faculty of Veterinary Science, University of Pretoria, P.O. Box 12580, 0110 Onderstepoort, Republic of South Africa.

A case of a large cell anaplastic carcinoma of the giant cell type in the lungs of a 5 year-old crossbred male Labrador is discussed.

The dog was weak, depressed, febrile and markedly dyspnoeic. An intermittent moist cough and auscultable crackling rales were evident. Radiographic examination was indicative of pneumonia and pulmonic neoplasia. The dog died 36 hours after admission despite antibiotic and supportive therapy. At autopsy, the neoplasm appeared as numerous firm greyish-white nodules of varying size throughout all the lung lobes whilst in the right intermediate and diaphragmatic lobes the neoplasm was completely confluent. The microscopic features included: intra-alveolar composites of cells exhibiting considerable nuclear and cytoplasmic pleomorphism; the presence of numerous giant cells scattered throughout the tumour; the occurrence of tumour emboli within both venous and lymphatic vessels; and, metastatic foci in the bronchial and mediastinal lymph nodes. These features were considered to reflect a high degree of malignancy.

Comparative and aetiological aspects of bronchogenic carcinomas in man and the dog are discussed.

Key words: Dog, pulmonary carcinoma, giant cell carcinoma.

INTRODUCTION

Pulmonary tumours are relatively rare in the dog. The incidence of 0,85 % for pulmonary tumours in the Republic of South Africa (RSA) correlates reasonably well with an incidence of 1,24 % in Europe and the United States of America[2,4].

According to Stünzi et al.[5], the prevalence of the various pulmonary neoplasms in the dog include adenocarcinomas 83 %, anaplastic carcinomas 8 %, epidermoid carcinomas 6 % and other lung tumours 3 %. The latter comprise amongst others, combined epidermoid and adenocarcinomas, carcinoids and bronchial gland tumours[5]. In a local survey adenocarcinomas accounted for 72 %, epidermoid carcinomas 14 %, combined epidermoid and adenocarcinomas 7 % and bronchial gland tumours 7 % of pulmonary neoplasms. No anaplastic carcinomas were recorded[2].

The low world-wide incidence of pulmonary giant cell carcinomas, the paucity of recorded studies thereof and the absence of any recorded cases in the RSA prompted this report. The clinical and pathological features of a pulmonary large cell anaplastic carcinoma of the giant cell type (commonly referred to as a giant cell carcinoma) in a dog, form the basis of this case report.

CLINICAL FINDINGS

A black 5 year old male Labrador cross dog weighing 26 kg was presented with a week long history of inappetence, severe coughing and salivation. Physical examination revealed a depressed habitus, dull haircoat and extreme exercise intolerance. The rectal temperature was 39,2°C and the pulse was weak and rapid (188 beats/min). Severe dyspnoea and an intermittent moist cough were present and the respiratory rate was 42 breaths/min at rest. Respiratory sounds were harsh and clearly audible over the entire lung field. Bilateral crackling rales were heard especially ventrally. The heart sounds were muffled. Faeces were soft, black and malodorous. Blood and urine analysis as well as examination of a faecal flotation smear did not reveal anything of significance.

Thoracic radiographs indicated a diffuse ground glass density of the right cranial and middle lobes, cranial part of the right caudal lobe, and the entire left caudal lobe. Superimposed on these areas of increased density were a number of discrete, even more radio-dense, foci approximately 1 – 2 cm in diameter. Less dense areas of the lung had a faintly granular appearance. Air bronchograms were visible at the hilus and in the less dense lung areas. The terminal 4 – 5 cm of the trachea was displaced dorsally. The diaphragmatic line and cranial edge of the heart were still visible on the lateral view. The rest of the normal thoracic soft tissue anatomy was observed on both the lateral and dorso-ventral views. Radiographic changes were considered to be consistent with lung neoplasia and pneumonia.

Therapy with gentamycin, amoxicillin and aminophyllin together with saline nebulization was applied. After an initial improvement, sudden collapse with cardiac arrest occurred. Resuscitation attempts were unsuccessful and the dog died 36 hours after admission.

PATHOLOGY

Numerous firm greyish-white nodules varying in size from pinpoint to a few centimetres in diameter were disseminated throughout all the lobes of both lungs in both the hilar and subpleural localities. The nodules had coalesced to form a solid mass involving the entire right intermediate and diaphragmatic lobes (Fig. 1). On sectioning, the smaller nodules were firm and uniformly greyish-white whereas some of the larger nodules as well as the consolidated neoplastic mass showed areas of necrosis and associated haemorrhage. The non-neoplastic pulmonary tissue was either atelectatic in appearance or emphysematous.

The bronchial and mediastinal lymph nodes were approximately four times their normal size and on section-

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ing appeared similar in colour and consistency to the pulmonary neoplastic tissue.

A few small focal areas of villous proliferation occurred on the visceral and parietal pleura as well as on the pericardium.

Significant findings in other organs included an associated cor pulmonale manifested by moderate right atrial and ventricular dilatation together with mild ascites and cyanotic induration of the liver and moderately extensive renal infarction.

In spite of the above findings the carcass was in a remarkably good condition.

Specimens of affected and unaffected lung, bronchial and mediastinal lymph nodes, pericardium, heart, kidney and liver were taken in 10 % buffered formalin for histopathological examination. Sections of the above organs were routinely cut and stained with haematoxylin and eosin (HE). Selected sections of the lung and lymph nodes were stained with Periodic acid-Schiff (PAS) for mucin and Holczinger as well as Nile blue sulphate for free fatty acids and/or phospholipids[1].

The cells within the centre of the neoplasms formed a solid mass composed of sheets (Fig. 4) or intra-alveolar packets of cells (Fig. 2). Strands of connective tissue composed either of mature collagen or immature fibroblastic tissue encircled these packets of cells. The strands varied in thickness from a few fibres to thick bands (Fig. 2). Small to large foci of necrosis usually associated with haemorrhage and large numbers of neutrophils, were frequently encountered within the centre of these masses.

Towards the periphery of the neoplastic masses, the tumour cells were loosly arranged or tightly packed within the stromal remnants of the alveoli. Numerous large macrophages, many of which were vacuolated, together with several neutrophils, occurred in conjunction with these neoplastic cells. The majority of the macrophages contained material which stained positively with the PAS-stain. PAS-positive material was also seen in association with small foci of necrosis and aggregated neutrophils. The lumen of a few of the larger veins at the edges of the tumour masses were occluded by emboli of neoplastic cells (Fig. 3), many of which were necrotic. The odd neoplastic cell was also present within venules and capillaries in this region.

The neoplastic cells showed considerable variation with respect to both nuclear and cytoplasmic shape and size. The cells occurred individually or had coalesced to form aggregates of 3 to 5 cells. The cellular variation was exemplified by 3 neoplastic cell types namely small to medium mononuclear round cells, mononuclear megalocytes and multinucleated megalocytes (giant cells) (Fig. 6-8). The nuclei of the small mononuclear cells were round, but occasionally indented or elongated and vesicular (Fig. 6). An occasional hyperchromatic nucleus was present. The cytoplasm was relatively scant and eosinophilic. The mononuclear megalocytes were large cells with an extremely enlarged and hypochromatic nucleus and a small amount of eosinophilic, slightly granular cytoplasm. The giant cells were either binucleated or multinucleated (Fig. 6 – 8). The binucleate cells had large vesicular nuclei and relatively abundant eosinophilic or occasionally clear cytoplasm (Fig. 6). The nuclei of the multinucleated megalocytes varied in number from 3 – 20 and were either hyperchromatic or vesicular (Fig. 7 & 8). Some of the larger multinucleate cells appeared pedunculated with an arboreal arrangement of the nuclei. In general the nuclear cytoplasmic ratio favoured the nucleus. The mitotic index was high varying from 10 – 15 mitoses per field at X 40 magnification.

Examination of Holczinger- and Nile blue sulphate-stained sections revealed the presence of dark blue inclusions representing phospholipids within the cytoplasm of many mononuclear tumour cells as well as the alveolar pneumocyte type II and the bronchiolar Clara cells.

The relatively unaffected portions of the lungs revealed the following changes: isolated neoplastic cells within the majority of alveoli and terminal bronchioles; aggregates of neoplastic cells in close association with the terminal bronchioles; occasional neoplastic cells within the alveolar capillaries; interlobular septal widening due to oedema, lymphatic dilatation and a sparse infiltration of lymphocytes, macrophages and isolated neoplastic cells; fibrin thrombi in a few venules; mild congestion and leukostasis, predominantly neutrophils, in the alveolar capillaries; mild anthracosis; and, desquamation of the bronchial and bronchiolar mucosa.

The tissue of the bronchial and mediastinal lymph nodes was almost completely replaced by sheets of neoplastic cells with only a few remnants of lymphoid tissue, much of which was necrotic. The neoplastic cells had invaded the capsule and the perinodal areolar tissue and also occurred as emboli within the lymphatics.

Single neoplastic cells or packets thereof occurred within the congested venules or lymphatics or within the stroma of the affected pleura and pericardium. A subacute to chronic inflammatory reaction, characterised by the infiltration of predominantly plasma cells, together with macrophages, lymphocytes and an occasional neutrophil, was evident. Presumably this reaction was in response to the presence of the neoplastic cells.

Microscopic examination of the liver and kidneys confirmed the presence of cyanotic induration in the former and renal infarction together with a moderately diffuse, global, mesangio-proliferative glomerulonephritis in the latter.

Fig. 1: Neoplastic nodules of varying size in diaphragmatic lobe (D) and consolidation of intermediate lobe (I)

Fig. 2: Intra-alveolar arrangement of tumour cells. Note the fibrous stroma present as fine perialveolar connective tissue (arrow) or thick bands of collagen (C). HE X 80.

Fig. 3: A tumour embolus within a pulmonary vein (arrow). HE X 80.

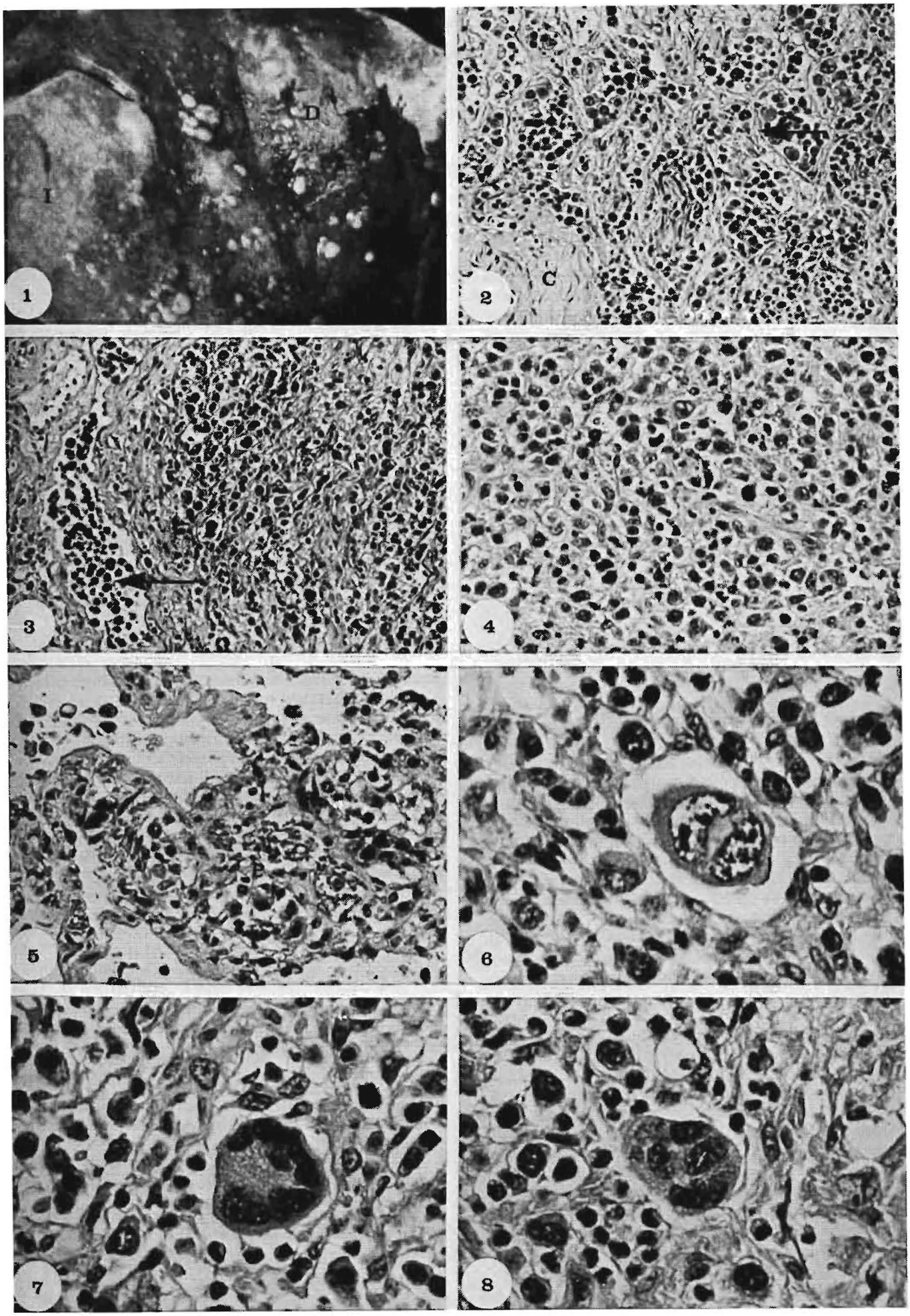
Fig. 4: An area of the neoplasm demonstrating the arrangement of the cells in sheets. HE X 160.

Fig. 5: A parabronchiolar neoplastic focus (P). Note the desquamation of the bronchiolar epithelium. HE X 160.

Fig. 6: A binucleated neoplastic cell. Note also the variation in size and shape of the mononuclear tumour cells. HE X 320.

Fig. 7: A multinucleated neoplastic cell (giant cell) with peripheral nuclear arrangement. HE X 320.

Fig. 8: A multinucleated neoplastic cell (giant cell) with 4 clearly visible nuclei. HE X 320.



DISCUSSION

By definition, bronchogenic carcinomas are malignant neoplasms that arise from the epithelium of the tracheobronchial tree. A recognised classification of bronchogenic carcinomas in man includes squamous cell carcinomas which arise from the basal cells of the mucosa of the major bronchi, small cell carcinomas which apparently originate from the epithelium of the major bronchi, adenocarcinomas (including bronchioloalveolar adenocarcinomas) which arise from the epithelium of the smaller bronchi and bronchioles, and large cell carcinomas for which the cellular derivation is presently unclear. In this classification, the large cell carcinoma is regarded as a miscellaneous tumour, because, under the light microscope, the differentiating features of a squamous cell carcinoma (individual cell keratinzation, pearl formation and/or the presence of extensive intercellular bridges) or adenocarcinoma (mucin production) are lacking. Ultrastructurally, however, large cell carcinomas reveal features of either squamous cell carcinomas, adenocarcinomas or both[3].

In man, squamous cell carcinomas and small cell carcinomas occur centrally in the hilar region around the larger bronchi and generally involve these structures, whilst adenocarcinomas involve the subpleural regions. Large cell carcinomas may occur both centrally and/or subpleurally. The larger bronchi are, however, not directly involved[3]. In the case described in this report the tumour nodules exhibited both a hilar and subpleural distribution which conforms to the findings in man. Neoplastic foci were present throughout all the lung lobes with a preponderance in the right intermediate and diaphragmatic lobes. These findings are consistent with those reported by Moulton[4]. Furthermore, the occurrence of the tumour as numerous small discrete nodules suggests a terminal bronchiolar and possibly also alveolar origin. Moulton[4] is of the opinion that anaplastic carcinomas in animals develop from both the terminal bronchiolar and alveolar epithelium. This supposition is supported to some extent by our finding of intracytoplasmic phospholipids, probably surfactant within both the tumour cells as well as the type II pneumocytes and Clara cells in the unaffected portions of the lung.

According to the reports reviewed, giant cell carcinomas present as sheets or cords of anaplastic cells having a scant connective tissue stroma[3–5]. In the case under discussion, the cells appeared to form sheets at low power magnification, but under high power, many of these cells were seen as intra-alveolar packets of cells surrounded by a fine connective tissue stroma which represents the pre-existing alveolar stroma. In some areas, the connective tissue appeared as thick collagenous bands which probably arose as a result of alveolar collapse and subsequent fibrosis.

Nuclear and cytoplasmic pleomorphism as evidenced in this case has been reported to be a diagnostic feature of large cell carcinomas (including the giant cell variant thereof) of the dog. Giant cell carcinomas in man also reveal cellular pleomorphism, some cells having a spindle or strap shape[3]. Similar cells were not encountered in this case. The majority of neoplastic cells had scant, homogenous or finely granular, eosinophilic cytoplasm, but, in the case of the giant cells, the cytoplasm was abundant and usually eosinophilic but clear on occasion. Clear cells have been reported to occur in bronchogenic squamous cell carcinomas, giant cell carcinomas and adenocarcinomas in man[3]. No mention is made of these cells in giant cell carcinomas in the dog[4 5].

In general, the neoplastic cells were not coherent which agrees with the findings for giant cell carcinomas in man[3]. Here and there, 3 or 4 cells were adherent which could indicate agglutination or a prelude to the formation of multinucleated giant cells. Wang et al. as cited by Carter & Eggleston[3], however, demonstrated that the giant cells of giant cell carcinomas are true giant cells having multiple pairs of centrioles and arising due to defective fission rather than as a result of fusion.

Necrotic foci as encountered in this case are reported to be a consistent feature of giant cell carcinoma in man[3]. The peripheral infiltration of polymorphonuclear leukocytes and macrophages may represent an immunogenic reaction to the neoplastic cells. Similar cells are seen at the edges of bronchiolo-alveolar adenocarcinoma nodules in sheep[6]. No mention is made of such findings in giant cell carcinomas of either man or the dog[3–5].

Bronchogenic giant cell carcinomas are considered to be highly malignant neoplasms of man metastasizing readily via both the lymphatic and vascular channels[3]. In animals, the behaviour of giant cell carcinomas is unknown[4 5]. In general, invasive lung carcinomas in the dog have a short clinical course varying from 1 week to 7 months[4]. The relatively good condition of the subject in this report supports this finding.

Several features of the giant cell carcinoma described in this report indicate that it is a highly malignant tumour of the dog. These features include a high mitotic index, considerable cellular anaplasia and pleomorphism, the presence of tumour emboli within blood and lymphatic vessels as well as isolated neoplastic cells in the interlobular stroma of relatively unaffected portions of the lungs, parabronchiolar microscopic neoplastic foci, extensive pulmonary involvement and focal pleural and pericardial invasion. The last two features indicate that the tumour is highly invasive thus spreading along the tracheobronchial tree throughout the lungs to the adjacent pleura and pericardium. In addition, the extensive metastatic involvement of the regional lymph nodes is also indicative of the high degree of malignancy.

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CASE REPORT **GEVALVERSLAG**

SUBKUTANE FIBROSARKOOM IN 'N LEEU (*PANTHERA LEO*)

J.S.J. ODENDAAL*, S.J. VAN DER MERWE**, F.P. COETZEE*** en W.S. BOTHA****

ABSTRACT: Odendaal J.S.J.; Van der Merwe S.J.; Coetzee F.P.; Botha W.S. **Subcutaneous fibrosarcoma in a lion (*Panthera leo*).** *Journal of the South African Veterinary Association* (1985) **56** No. 3, 143-144 (Afrik). 152 Benade Drive, Fichardt Park, 9322 Bloemfontein, Republic of South Africa.

A subcutaneous growth developed on the left side of a zoo lion. The growth enlarged over a period of 3 months. A diagnosis of fibrosarcoma was made on account of the history, clinical and histological examinations. The lion was killed 3 weeks after surgical removal of the tumour. The autopsy showed no evidence of metastases. A foreign body (wire) was discovered in the abdominal cavity but no association was found between the lesion caused by the wire and the malignancy.

Key words: Fibrosarcoma, lion, post mortem, foreign body.

INLEIDING

Fibrosarkoom is 'n minder algemene onderhuidse gewas van katte en dit is in slegs 4,1 % van gevalle uit 'n reeks velgewasse gediagnoseer[3]. In ouer katte kom die groeisel gewoonlik enkel voor en is dit meesal in die subkutis teenwoordig[3]. Fibrosarkome is gewoonlik infiltrerend en geneig tot hergroei na chirurgiese verwydering[2]. Metastase vind in minder as 25 % van gevalle plaas; die gewas versprei eerstens na die long[1]. Daar is geen ras- of geslagsvoorkeure nie[1].

GESKIEDENIS, KLINIESE ONDERSOEK EN DIAGNOSE

'n Mannetjie dieretuinleeu, met 'n geskatte ouderdom van 18 jaar, het 'n knop aan sy linkersy, regoor die laaste rib, oor 'n periode van 12 weke, ontwikkel. Die leeu het nie graag op sy linkersy gelê nie. Hy het mettertyd al hoe meer lusteloos geword en 'n aptytverlies met gepaardgaande gewigsverlies getoon. Sy massa is net voor die kliniese ondersoek op 200 kg geskat.

Om 'n kliniese ondersoek uit te voer, is die leeu onder algemene verdowing geplaas met ketamienhidrokloried (Ketalar, Parke-Davis) teen 'n dosis van 10 mg/kg. 'n Pylgeweer is gebruik om die verdowing binnespiers toe te dien. Die knop was ferm, feitlik onbeweeglik, nie warm nie en was 200 by 120 mm groot. 'n Naaldsteek het bloed tevoorskyn gebring. Daar is besluit om die massa chirurgies te verwyder.

Na roetine voorbereiding vir chirurgie, is die groeisel sover as moontlik verwyder. Volledige verwydering, as gevolg van diep infiltrasie in die omringende weefsel, was nie moontlik nie. Die binneste deel van die groeisel het bestaan uit nekrotiese weefsel en gestolde bloed. Die omringende weefsel was geweldig bloedryk. Die velwond is met nylon steke geheg.

'n Monster van die gewas is in 10 % gebufferde formalien versamel en versend vir histologiese ondersoek. 'n Relatief hoë mitotiese indeks en anaplasie is waargeneem (Fig. 1). Verskeie foki van nekrose was teenwoordig. 'n Finale diagnose van fibrosarkoom met infiltrasie en 'n swak prognose is gemaak.

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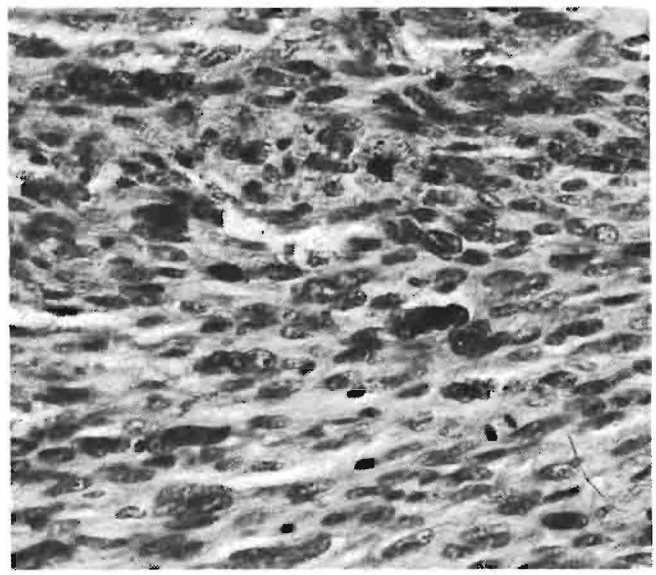

Fig. 1: Histopatologiese voorkoms van die fibrosarkoom. Etlike mitotiese figure is sigbaar.

BEHANDELING, RESULTATE EN NADOODSE ONDERSOEK

Aangesien die operasie in 'n onsteriele omgewing uitgevoer is, is die operasiewond sistemies met 'n langwerkende penisillien (Duplocillin, Wellcome) behandel. Die leeu het aanvanklik baie goed gereageer. Enkele dae na die operasie was die leeu lewendiger en het weer snags gebrul, iets wat hy voor die operasie nie meer gedoen het nie. Sy eetlus het baie verbeter en hy het weer sy gewone 15 kg vleis per maaltyd geëet.

Die leeu het egter 'n week na die operasie begin hoes en op grond van die patologiese verslag en die diep infiltrasie, is besluit om die leeu 'n genadedood toe te dien. Ander oorwegings wat in die besluit 'n rol gespeel het, was die leeu se ouderdom en die logistieke probleme om hom verder prakties te behandel. Genadedood is 3 weke na die operasie toegepas.

'n Nadoodse ondersoek is uitgevoer en die volgende bevindings van belang is aangeteken. Geen makroskopiese getuienis van metastase is gevind nie. Die operasie-

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wond het bevredigend genees en geen infeksie was sigbaar nie. Die makroskopiese voorkoms van die gewas was nog dieselfde as tydens die operasie. Monsters is van die longe, hart, niere, milt, lewer, limfknope en dermkanaal versamel in 10% gebufferde formalien en versend vir histologiese ondersoek. Geen tekens van kwaadaardigheid is in hierdie organe gevind nie.

'n Verdere bevinding tydens die nadoodse ondersoek was 'n opening van ongeveer 3 mm in deursnee in die lewerkapsel wat verbind was met 'n holte in die lewer van 80 by 80 mm. Die holte in die lewer was gevul met gestolde bloed. Teenaan hierdie letsel was 'n stukkie draad van 40 mm lank wat met omentum omhul was. Geen sigbare infeksie was in die lewer teenwoordig nie.

BESPREKING

Die erns van hierdie gewas blyk uit die geskiedenis (ouderdom, vinnige groei), kliniese tekens (onbeweeglikheid, infiltrasie, nekrose, geweldig bloedryke weefsels) en die histologiese ondersoek (hoë mitotiese indeks, anaplastiese fibroblaste, nekrose, infiltrasie).

Daar is op die oomblik ook geen beproefde behandeling van fibrosarkoom in katte nie[2].

Alhoewel geen metastase in die nadoodse ondersoek bevestig kon word nie, is bogenoemde feite ook in ag geneem by die besluit om die leeu 'n genadedood toe te dien. Die hoes-simptome is waarskynlik veroorsaak deur 'n allergiese of irriterende reaksie in die longe as gevolg van die stowwerige hooi wat as beddegoed in die tydelike slaaphok gebruik is. Die verbetering ná chirurgie was moontlik die gevolg van 'n verligting in druk.

Die vreemde voorwerp in die buik was 'n onverwagse bevinding. Die draad wat met omentum omhul was, het weens sy posisie teenaan die lewer, waarskynlik die trauma in die lewer veroorsaak. 'n Mens kan slegs spekuleer oor hoe die draad in die buikholte beland het. Daar was geen teken dat dit deur die buikwand gepenetreer het nie. 'n Ander moontlikheid is dat dit deur die maagwand in die buikholte beweeg het en dat die letsel in die maagwand reeds volledig genees was, want daar was geen makroskopiese teken van so 'n letsel nie. Die katspesies is selektiewe eters en 'n mens verwag nie dat 'n leeu geredelik so 'n voorwerp sou inkry nie. Die vermoede bestaan dat die draad saam met beesingewande, wat aan die leeu gevoer gewees het, in die maag beland het.

Die afwesigheid van infeksie rondom die draad, kan dalk toegeskryf word aan die antibiotiese behandeling wat tydens die operasie toegedien is.

Daar kon geen verband gevind word tussen die teenwoordigheid van die vreemde voorwerp en die gewas nie.

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SHORT COMMUNICATION KORT BERIG

BLOOD CHEMICAL PARAMETERS IN SHOT CAPE MOUNTAIN ZEBRA *EQUUS ZEBRA ZEBRA*

J. VAN HEERDEN*, J. DAUTH**, V. DE VOS° and J.E.F.M. DENNY°°

ABSTRACT: Van Heerden J.; Dauth J.; De Vos V.; Denny J.E.F.M. **Blood chemical parameters in shot Cape Mountain Zebra *Equus zebra zebra*.** *Journal of the South African Veterinary Association* (1985) **56** No. 3, 145-146 (En). Department of Medicine, Faculty of Veterinary Science, Medical University of Southern Africa, 0204 P.O. Medunsa, Republic of South Africa.

Serum levels of cortisol, sodium, potassium, chloride, urea, creatinine, total protein, albumin, phosphorus, aspartate transaminase, creatine kinase, lactate dehydrogenase, iron, total magnesium, total calcium, alkaline phosphatase, alanine transaminase and gamma-glutamyltranspeptidase were determined in 11 shot Cape Mountain Zebra *Equus zebra zebra*.

Key words: Serum biochemistry, cortisol, *Equus zebra zebra*.

INTRODUCTION

Blood chemical parameters are commonly employed in the diagnosis of clinical and subclinical conditions as well as in the evaluation of the state of nutrition of animals. When the male portion of the population of Cape Mountain Zebra *Equus zebra zebra* in the Mountain Zebra National Park, Cradock, exceeded an optimal number, it was decided to correct the imbalance and cull (translocate) the surplus males. A small number of these animals were shot in order to determine baseline pathological, parasitological, reproductive, anatomical and physiological values for the species. This is a report on the blood chemical parameters as well as cortisol concentrations which were established.

MATERIALS AND METHODS

The zebra to be shot for the survey were chosen from a photographic register which is kept on every animal in the park. The animals were approached in a vehicle, and it was attempted to shoot them in the early morning between 08h00 and 10h00. Spinal neck shots with a .308 calibre rifle, loaded with soft-nosed bullets, were attempted. Instantaneous death resulted in most cases. Wounding was, however, inevitable and in a few cases resulted in body shots and a more protracted death (Table 1). In one case a female was killed by mistake. Eleven animals were culled over four periods during the year (Table 1). Blood was collected in evacuated tubes (Vacu-test, Radem Laboratory Equipment Wijnberg) as soon as possible after the animals were shot (Table 1).

Blood was allowed to clot and the serum harvested after centrifugation within one hour of collection. The serum was subsequently stored at −4°C from 72−96 h until analyzed in the laboratory.

Serum specimens were analyzed for sodium (Na), potassium (K), Cloride (Cl), urea, creatinine, total protein (TP), albumin (Alb), phosphorus, iron, magnesium (t-Mg), total calcium (t-Ca), alkaline phosphatase (ALP), aspartate transaminase (ATP), creatine kinase (CK), lactate dehydrogenase (LDH), alanine transaminase and gamma-glutamyltranspeptidase according to methods previously described[2].

Serum cortisol levels were quantitated using a Clinical Assays Gamma Coat$_{TM}$ (^{125}I) Cortisol Radioimmunoassay kit (Division of Travenol Laboratories, Inc., Cambridge, Massachusetts).

Paired sample analyses were carried out, regressions performed and correlations calculated for serum cortisol concentrations and (a) time lapse between first seen and shot, (b) time lapse to the collection of blood specimens and (c) the sum of the two time lapses (a & b).

RESULTS

The sex, age of the animal, time lapse between first seen and shot, time lapse between shot and collection of blood specimens, actual time shot and serum cortisol concentrations are given in Table 1.

In three instances when zebra were seen, shot and killed within 10 min (excluding animals 1 and 9) serum cortisol concentrations were below 100 nmol/ℓ (Table 1). In three instances where animals were wounded or where death occurred associated with violent struggling, cortisol concentrations ranged from 133-283 nmol/ℓ.

Serum cortisol concentrations were not significantly correlated to the time lapses and were only weakly positively correlated to the time lapse between first seen and shot (r = 0,148), the time lapse between shot and collection of blood specimens (r = 0,055) as well as the sum of the two mentioned time lapses (r = 0,229).

The results of blood chemical analyses are given in Table 2. Tremendous variation was recorded in the serum concentrations of enzymes, ALP, AST, LDH and CK.

DISCUSSION

The presented values of blood chemical constituents are generally in agreement with those of the domesticated horse with the exception of the potassium concentrations which are slightly higher than the range of 3,1 − 4,7 mmol/ℓ accepted as the norm for horses in our laboratory.

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Table 1: TIME LAPSE BETWEEN FIRST SEEN AND SHOT, TIME SHOT, TIME LAPSE BEFORE COLLECTION OF BLOOD SPECIMENS AND SERUM CORTISOL CONCENTRATIONS IN SHOT MOUNTAIN ZEBRA

No. of animal	Sex	Age (years)	Date shot	Time lapse between first seen and shot (min)	Actual time shot	Time lapse before collection of blood specimens (min)	Cortisol (nmol/ℓ)	Remarks
1	♂	18	May 83	5	07h15	17	174	Shot twice. Wounded first time
2	♂	7	May 83	1	09h45	4	91	
3	♂	3	May 83	10	08h18	3	108	
4	♂	3,8	Oct 83	4	08h49	3	56	
5	♂	0,9	Oct 83	16	10h30	4	134	
6	♀	17	Oct 83	17	14h31	5	138	
7	♂	15	March 84	10	07h35	20	133	Ran 200 metres after having been shot
8	♂	4	March 84	33	10h03	4	283	Shot through spine which resulted in voilent struggling
9	♂	14	Sept 84	—	—	—	93	
10	♂	2	Sept 84	9	11h21	3	96	
11	♂	4,5	Sept 84	39	10h24	6	79	

Table 2: SERUM ELECTROLYTE AND CERTAIN BLOOD CHEMICAL CONSTITUENT CONCENTRATIONS IN THE MOUNTAIN ZEBRA

Blood parameters	n	$\bar{x}$	SD
Na mmol/ℓ	11	140,55	4,03
K mmol/ℓ	10	5,64	0,72
Cℓ mmol/ℓ	11	102,45	2,80
Urea nmol/ℓ	11	5,70	1,35
Creatinine μmol/ℓ	11	137,55	16,46
TP g/ℓ	11	69,45	10,06
Alb g/ℓ	11	31,54	3,36
Phosphorus mmol/ℓ	9	1,39	0,17
Iron μmol/ℓ	7	29,28	12,50
t-Mg mmol/ℓ	10	0,85	0,16
t-Ca mmol/ℓ	8	2,91	0,16
Alkaline phosphatase U/ℓ	11	247,27	65,89
Aspartate transaminase U/ℓ	11	236,64	201,69
Lactate dehydrogenase U/ℓ	8	709,00	327,81
Creatine kinase U/ℓ	11	735,81	1 269,93
Alkaline transaminase U/ℓ	11	8,54	15,45
Gamma-glutamyltranspeptidase U/ℓ	11	9,00	3,71

It was impossible to establish baseline cortisol concentrations or to relate serum cortisol concentrations to the method of culling due to the fact that the animals were shot at different times of the day and the fact that very few animals were seen and shot within 10 min. If data collected on dogs can be extrapolated to other species, we believe this to be a critical period[1] as any increase beyond 10 minutes could result in stress-induced rise in serum cortisol concentrations. Field conditions made it impossible to track and shoot animals all within the predetermined period.

The great variation in the recorded values for ALP, AST, LDH and CK can to some extent be attributed to muscular exertion which preceded death in some animals. Animal No. 1 for example was shot twice before it died, 22 minutes after it was first observed and a serum CK concentration of 3 300 U/ℓ was recorded.

ACKNOWLEDGEMENTS

The assistance of Messrs B van Wyk, M J Dreyer, F F Kuhn and Professor N J P Kriek is greatfully acknowledged.

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VITREKTOMIE BY DIERE

S.W. PETRICK*

ABSTRACT: Petrick S.W. **Vitrectomy in animals.** *Journal of the South African Veterinary Association* (1985) **56** No. 3, 147-148 (Afrik). Department of Surgery, Faculty of Veterinary Science, University of Pretoria, P.O. Box 12580, 0110 Onderstepoort, Republic of South Africa.

The use of a Vitrector in 51 lentectomies is discussed.

Key words: Vitrectomy, dog, horse, lentectomy.

INLEIDING EN TEGNIEK

Wanneer die glasliggaam deur die pupil stoot en in die voorste oogkamer beland, is 'n vitrektomie nodig om dit te verwyder. Die noodsaaklikheid vir hierdie prosedure is lank reeds bekend[1]. Sedert Oktober 1983 is 'n Vitrektor in 51 lentektomies gebruik.

Concept Inc se Kaufman Vitrector II is gebruik om die vitrektomies uit te voer. Fig. 1 toon die onderdele van die apparaat wat bestaan uit (a) die krageenheid met battery, (b) die snykop en (c) die suigapparaat. Verskeie en meer gesofistikeerde tipes Vitrektors is beskikbaar.

Twee-en-twintig honde het bilaterale katarakte gehad, 2 honde unilaterale verplaasde lense, 1 hond unilaterale troumatiese lenskapsel ruptuur en 2 perde bilaterale katarakte.

Alhoewel daar steeds gepoog word om ekstrakapsulêre lentektomies in diere te doen, gebeur dit tog dikwels dat die agterste lenskapsel skeur of heeltemal loskom terwyl die voorste kapsel verwyder word, of tydens die verwydering van die lensinhoud. Die gevolg is dat die glasliggaam dan deur die pupil stoot en in die voorste kamer beland. Dit gebeur in elk geval met 'n verplaasde lens of trouma van die lens as gevolg van vreemde voorwerpe wat die oog binnedring.

Om van die glasliggaam in die voorste kamer ontslae te raak, was klein sellulose sponsies gebruik om dit op te tel en 'n skêrtjie om dit dan af te sny sodat die res terugval agter die pupil. Die suig- en snyaksie in die punt van die naald van die Vitrektor maak dit 'n eenvoudige prosedure.

Die chirurg hanteer die krageenheid en plaas die punt van die naald van die snykop in die middel van en net agter die pupil (Fig. 2) terwyl die assistent die suigapparaat hanteer. Die suig en sny van die glasliggaam moet terselfdertyd plaasvind.

BESPREKING

Die Vitrektor voorkom onnodige kontak met die horingvliesendoteel wat makliker plaasvind met die gebruik van sponsies. Alle glasliggaam kan tot op die regte vlak verwyder word sodat geen kontak daarvan met ho-

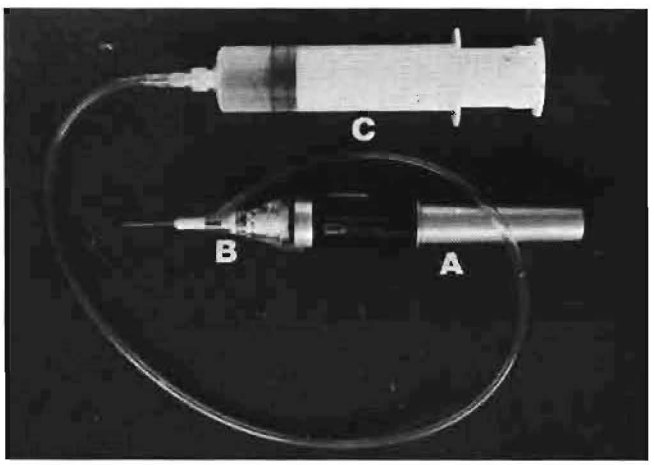

Fig. 1: Kaufman Vitrector (A) Krageenheid met battery; (B) Snykop; (C) Suigapparaat.

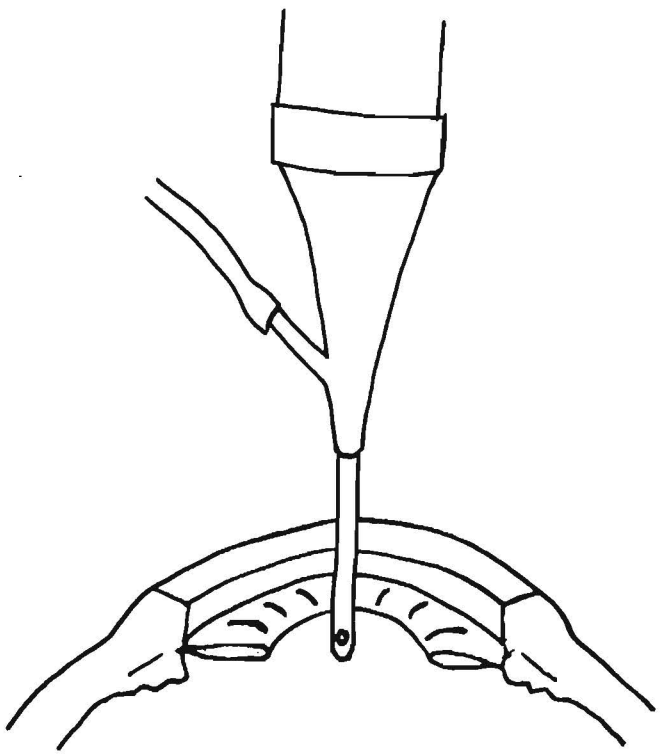

Fig. 2: Die Vitrector in posisie.

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ringvliesendoteel voorkom of dat daarvan in die horingvlieswond agterbly tydens hegting nie.

Daar dien op gelet te word dat nie te veel van die glasliggaam verwyder word om trekking op die retina en loslating te vermy. Verder moet die sny van die iris en bloeding vermy word.

Die nadeel van hierdie Vitrektor is dat die wegdoenbare dele naamlik snykop en suigapparaat duur is om te vervang.

BRONNELYS

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INTRAOCULAR IMPLANTS IN THE DOG AND CAT

S.W. PETRICK*

ABSTRACT: Petrick S.W. **Intraocular implants in the dog and cat.** *Journal of the South African Veterinary Association* (1985) **56** No. 3, 149-150 (En). Department of Surgery, Faculty of Veterinary Science, University of Pretoria, P.O. Box 12580, 0110 Onderstepoort, Republic of South Africa.

The use of 20 intraocular implants in 18 dogs and one cat is discussed.

Key words: Intraocular implants.

INTRODUCTION

To save an eye from enucleation because of functional loss due to trauma or disease, an intraocular prosthesis can be used with good results. For this purpose use of a silicone implant in the dog[1] and cat[2] has been described for the glaucomatous eye. Many owners will prefer the implant in a pet's eye because of aesthetical reasons.

Since 1980, twenty implants have been used in this department: fourteen dogs and one cat suffered of unilateral glaucoma, one dog of bilateral glaucoma, 2 dogs of traumatised eyes and loss of contents and one dog of intraocular melanomata.

MATERIALS AND TECHNIQUES

In the first 2 dogs black silicone implants (Fig. 1) were used and in the following 17 cases transparent acrylic implants (Fig. 2).

The implant should have a diameter similar to that of the horizontal diameter of the cornea of the normal eye or just less than that.

General anaesthesia is necessary. A lateral canthotomy is followed by a scleral incision in the eyeball either vertical (Fig. 3) from the limbus at a 12 o'clock position, or a scleral limbal incision in the upper half of the eyeball both just longer than the diameter of the implant.

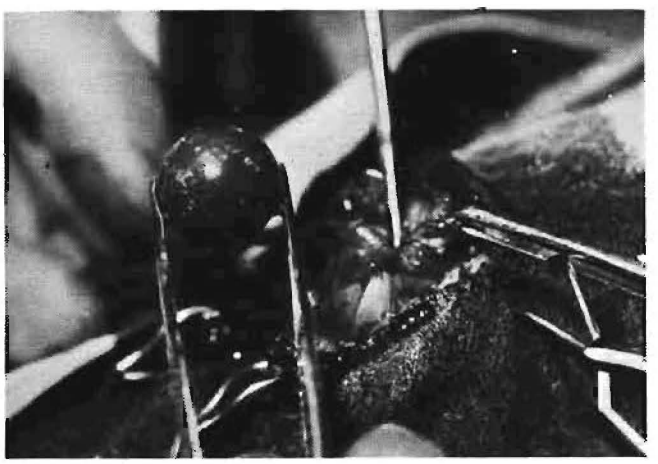

Fig. 1: Black silicone implant.

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Fig. 2: Transparent acrylic implant.

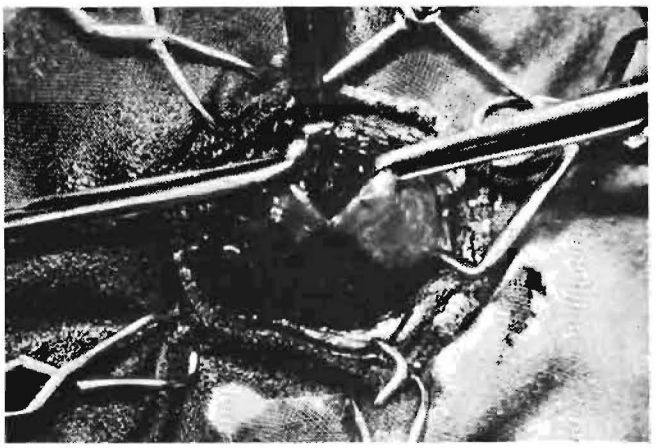

Fig. 3: Vertical scleral incision.

Fig. 4: Implant between eyelids.

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Evisceration is then performed; suction is used for the haemorrhage and the prosthesis is placed.

The sclera and the Tenon's capsule and/or conjunctiva, are closed separately with a continuous suture. For the canthotomy a simple interrupted suture is used.

A systemic antibiotic is used for 6 days and an antibiotic-steroid ointment for 2–3 weeks except where corneal ulceration is present.

RESULTS AND DISCUSSION

Three eyes developed corneal ulceration but responded well to treatment. In one a membrana nictitans flap was necessary.

In the cat the prosthesis was noticed between the eyelids (Fig. 4) seven months after surgery and what was left of the eye was enucleated at that time. It seemed that a traumatic rupture of the cornea was responsible for expulsion of the implant.

The owner of the dog with bilateral implants requested euthanasia shortly after surgery.

A Weimaraner with glaucoma of the left eye was the first patient to receive an implant in February, 1980 and is still doing fine.

The implant is useful not only in the glaucomatous eye but may be used in any condition where the cornea and sclera are still intact or can be saved.

Acrylic implants were used because the silicone implants are imported.

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CLINICAL NOTE KLINIESE MEDEDELING

VAGAL BRADYCARDIA IN A DOG

P.J. KELLY*

ABSTRACT: Kelly P.J. **Vagal bradycardia in a dog.** *Journal of the South African Veterinary Association* (1985) **56** No. 3, 151 (En). Faculty of Veterinary Science, University of Zimbabwe, P.O. Box MP 167, Harare, Zimbabwe.

A dog with vagally induced bradycardia was successfully treated and maintained with isoprenaline HCl.

Key words: Bradycardia, isoprenaline HCl, dog.

CASE REPORT

A 14 year old male Pomeranian was presented with a history of weakness, lethargy, exercise intolerance and an intermittent cough. These clinical signs had developed gradually during the week prior to presentation. Clinically the dog was normal except for a marked bradycardia (pulse rate 55 beats per minute), pulses alternans and prolonged capillary refill time.

An electrocardiogram was performed which confirmed the diagnosis of bradycardia and also revealed sinus arrest, ventricular escape beats, wandering pacemaker and junctional escape rhythms (Fig. 1).

The most common causes of bradycardia in the dog are vagal dysrhythmias, serum potassium abnormalities, advanced atrioventricular heart block and sick sinus syndrome[1].

The electrocardiogram was not suggestive of serum potassium abnormalities and ruled out the possibility of advanced atrioventricular heart block. To differentiate between a vagal dysrhythmia and sick sinus syndrome, 0,044 mg/kg atropine was injected intravenously and the heart rate monitored. There was a resultant 80 % increase in the heart rate shortly after injection suggesting the cause was vagal in origin[1].

Previously the dog had undergone surgery for a perineal hernia but the operation site had become septic and surgery had to be repeated. Since then the dog had suffered from constipation and tenesmus which seemed a likely underlying cause of the vagal hyperreflexia.

Since all attempts to alleviate the constipation and tenesmus had failed the dog was placed on 3 mg isoprenaline HCl q.i.d. The only commercially available isoprenaline HCl was 30 mg Saventrine tablets (Pharmax Ltd) which were powdered and diluted with maize starch to make up capsules containing 3 mg active ingredient.

Clinical improvement was noted in the dog 12 hours after the treatment began. An electrocardiogram then showed that the heart rate had been increased to 100 beats per minute with the elimination of the sinus arrest, ventricular escape beats, wandering pacemaker and junctional escape rhythms (Fig. 2).

Since withdrawal of the isoprenaline HCl treatment resulted in a gradual relapse of the clinical signs the treatment regime has been maintained for life. No adverse side effects of prolonged usage of the drug have been reported by the owner.

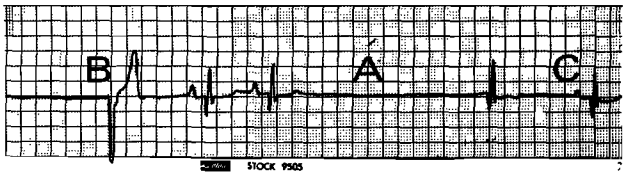

Fig. 1: A lead II electrocardiogram taken before treatment. Note the bradycardia, sinus arrest (A) premature ventricular beats (B), and wandering pacemaker (C). Paper speed = 50 mm/sec, 1 cm = 1 mv.

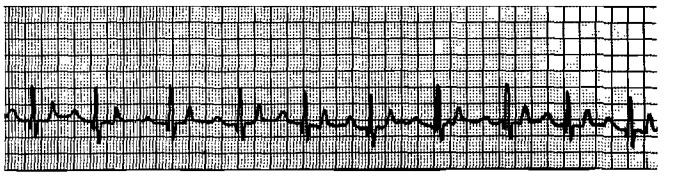

Fig. 2: A lead II electrocardiogram recorded after treatment with isoprenaline HCl. Note the increased heart rate and absence of abnormalities seen in Fig. 1. Paper speed = 50 mm/sec, 1 cm = 1 mv.

ACKNOWLEDGEMENTS

The author would like to thank Dr D Morton for preparing the capsules.

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BOOK REVIEW BOEKRESENSIE

WILDBOERDERY EN NATUURRESERVAATBESTUUR

E. YOUNG

Eddie Young Uitgewers, Swartklip 1984 pp 144 (ISBN 0 620 07870 7)

Die inhoud van die boek is gebaseer op 'n reeks artikels wat oorspronklik in "Die Landbouweekblad" verskyn het. Dié reeks is volgens die skrywer verder aangepas en aangevul met ses bykomende hoofstukke.

Die eerste twee hoofstukke skets opsommenderwys die filosofie van wildboerdery asook die hedendaagse probleme waarmee die voornemende wildboer te make het. Sommige van die standpunte van die skrywer, soos die betoog teen die beperkings op die vestiging van wild in gebiede waar hulle nie voorheen voorgekom het nie, is kontroversieel van aard, dog eerlik gestel en verdien die aandag van beleidmakers.

Die boek is primêr 'n praktiese handleiding en was die plasing van 'n hoofstuk oor die finansiële implikasies van wildboerdery heel vroeg in die boek, 'n baie goeie keuse. Die waarskuwing dat 'n wildheining om 'n stuk grond nie die grond in 'n wildplaas verander nie, is een wat nie genoeg beklemtoon kan word nie. Die daaropvolgende hoofstukke verstrek praktiese inligting oor aspekte soos die keuse van 'n geskikte wildplaas, wildsoorte vir wildboerdery, voorbeelde van tipiese wildsoorte in die bosveld en grasveld, voedselvoorkeure van wildsoorte, sosiale gedrag van en reproduksie in wildsoorte, wildvangtegnieke, hantering en behandeling van wild, voeding en versorging van wild in gevangeneskap, vervoer en vestiging van wild, wildheinings, weiveldbeheer, watervoorsiening, wildsiektes en oesmetodes.

Aangesien dié publikasie primêr gerig is tot die voornemende boer, is sommige inligting vervat in die hoofstukke oor chemiese immobilisasie en die effekte daarvan, na my mening, onvanpas. So word byvoorbeeld verwys na die effek van fensiklidienhidrochloried (terwyl hierdie middel slegs by hoë uitsondering aan sekere persone en/of instansies beskikbaar gestel word) en na die dosisse en gebruik van etorfienhidrochloried en fentaniel (terwyl daar duidelik in die teks vermeld word dat sommige middels alleenlik deur 'n veearts of onder sy direkte toesig gebruik mag word). Die verwysing na die gebruik van sekere etiese produkte soos heptaminol en glukuronsuur is ook verouderd en kon liefs weggelaat gewees het.

Die boek word aangebied in 'n besonder netjiese en aantreklike formaat en is ryklik geïllustreer met foto's en tekeninge. Dit word afgesluit met 'n uitgebreide bronnelys van ongeveer 1 000 verwysings.

Dr Young verdien 'n pluimpie met die uitgawe van hierdie boek wat as 'n baanbreker op die gebied van wildboerdery in Suid-Afrika beskou kan word. Alhoewel die boek primêr vir boere bedoel is, beveel ek dit sterk aan vir voorgraadse studente en alle veeartse wat belangstel in wild en wildboerdery.

J. VAN HEERDEN

BOOK REVIEW BOEKRESENSIE

OPERATIONEN AN HUND UND KATZE

H. SCHEBITZ and W. BRASS

1st Edn. Paul Pary, Berlin & Hamburg. 1985 pp 292, illustrations 606, 1 colour plate, tables 2, Price DM 136-

In this book subjects like surgical conditions, pathophysiology or complications of surgery are not dealt with. These should be known to the reader. Much time is spent on orthopaedic surgery thus once again pointing out the importance of this field. Basically the book is subdivided into 2 parts.

The first part which deals with general concepts, summarises the important components for successful surgery including subjects like instrumentation, preparation of instruments, surgeon and patient, suture material and sutures, osteosynthesis, pain and anaesthesiology. Only the basics are described and where necessary more detail is given with each technique described in the second part.

The second part describes a variation of surgical techniques concerning the head and neck, thorax, abdomen and orthopaedic surgery. It is presented in a very systematic manner on which the authors are to be congratulated. Subsections for each technique are: indications, additional instruments and anaesthesia, preparation of the patient and positioning, technique, suturation other than normal; post operative treatment where necessary, and suture and drain removal.

Little knowledge of the German language is necessary to follow the text because of known terminology and excellent illustrations. The book is recommended for students and small animal practitioners.

S.W. PETRICK

BEPLANDE MELKKUDDEGESONDHEID I. ALGEMENE FILOSOFIE

D.C. LOURENS* en R.I. COUBROUGH*

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A dairy herd health programme may be defined as a planned and co-ordinated approach which aims at achieving and maintaining optimal herd health, production and reproduction, the implementation of which is governed by sound economic principles.

The object of this article is to present and discuss some facets of the background philosophy of the concept of herd health, and look at some of the pitfalls and shortcomings of their application in practice.

In terms of production levels achieved in other developed countries, South Africa lags behind. While factors such as climate, environment, feed quality, and basic livestock potential may play a role in this difference, the single most important factor is undoubtedly the managemental approach. Modern livestock production requires a shift in emphasis of veterinary involvement towards a herd approach which promotes increased cost-effective production. The veterinarian forms part of a production team which, apart from himself, includes the farmer, farm labour and the animal scientist.

The veterinarian has a key role in this endeavour. Through his basic training he is well equipped to serve as a co-ordinator of the massive flow of information being generated. To do this effectively he must be able to work with, advise and communicate with people at various levels of management as well as with the labour force. While optimal co-operation of each team member is cardinal to the success of such a programme, no progress will be made unless the farmer is convinced of the viability of the undertaking, and indeed has the managerial skills to implement any directive or recommendation.

Veterinarians are traditionally regarded as the primary providers of clinical services to individual animals. Farmers also do not expect veterinarians to give advice on nutritional or managemental problems. In fact, most farmers are unaware of how an integrated herd health programme can be of benefit to his farming enterprise, or of the role the veterinarian can play in such a programme. Because of this the farmer tends to seek help elsewhere, often turning to lay personnel for advice. To change this situation will take time, patience and a great deal of hard work. Veterinary courses will have to be remodelled to provide the necessary basis for the new graduate to operate competently in the field of herd health. Those in practice will have to move with the times, and accept that a shift in practice emphasis is required to fulfil the demands of modern farming, and be bold enough to implement changes in this direction. The practitioner will have to equip himself to undertake a new and challenging role.

The modern, economically viable dairy requires an integrated approach to herd management which not only includes the maintenance of the general health of the animals, but also their optimal production and reproduction potential taking cognisance of strict business principles. The practitioner must thus become a professional, broad based consultant able to advise on a wide range of topics, and know who (and when) to consult in other fields of professional expertise. While health and fertility management are at the fulcrum of a herd health programme it must be closely linked to overall production management. The practitioner must be accepted as part of the policy making team, and ensure that he is competent to fulfil this role. He must become problem orientated, and he must set objectives and outline priorities which are economically attainable. He must implement the institution of an appropriate record system, for without accurate records that can be fully analysed to measure set objectives, any herd health programme is doomed to failure. Herd health programmes provide an exciting and rewarding challenge to the rural practitioner. The farmer should be able to turn to the veterinary profession for help in the broad spectrum of his production management with the fullest confidence that he will obtain professional guidance and assistance. The challenge to play a leading and positive role in this production team is one that the rural practitioner cannot allow to pass by.

Key words: Philosophy, team approach, dairy herd health.

INLEIDING

Beplande kuddegesondheid kan kortliks gedefinieer word as 'n beplande en gekoördineerde benadering tot 'n kudde om optimale gesondheid, produksie en reproduksie teweeg te bring en te handhaaf. Daar is tans 'n klemverskuiwing in praktykvoering vanaf die bekamping van siekte met duidelike kliniese tekens na die opklaring van sub-kliniese toestande soos verlaagde vrugbaarheid en mastitis, wat hulself manifesteer as verminderde melkproduksie[1].

Weens die ekonomiese druk van hoë produksiekostes is veterinêre betrokkenheid by voedseldiere tans toegespits op kuddegesondheidsprogramme met 'n verhoogde ekonomiese produksie as ideaal[4]. In moderne boerdery is daar dus 'n groeiende behoefte aan konsultante wat in staat moet wees om advies ten opsigte van veterinêre, landboukundige en bestuursaspekte aan te bied. Die veearts se belangstelling moet dus meer toegespits word op die gesonde dier en die voorkoming van potensiële siektetoestande[1,10].

Die primêre doel van beplande melkkuddegesondheidsprogramme is om die ekonomiese doeltreffendheid van melkproduksie te verhoog deur sorg te dra dat die gesondheidstoestand van elke koei bydra tot optimale funksionering van die kudde as 'n eenheid.

Verbetering in melkproduksie in die RSA toon, in vergelyking met ander ontwikkelde lande, 'n groot agterstand. Vanuit analises van die suiwelindustrie in die RSA is dit duidelik dat dit deur 'n relatiewe lae produksie gekenmerk word. Die gemiddelde produksie per laktasie (300 dae) vir varsmelk en vir industriële melk is respektiewelik 3 210 kg en 1 410 kg; 'n gemiddeld dus van 6.2 kg per koei per dag. Die ooreenstemmende syfers vir Israel, V.S.A. en Australië is onderskeidelik 20, 14.5 en 9.8 kg (Luitingh H C, Rudert C P 1981 Lesing, nagraadse opknappingskursus Onderstepoort). Omge-

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wings-, ekonomiese-, voedings-, en bestuursfaktore speel seersekerlik in hierdie wesenlike verskil, 'n baie belangrike rol. Die aanwending en doelgerigte toepassing van effektiewe bestuurspraktyke kan egter tot 'n groot mate die negatiewe faktore van ons klimaatsomstandighede beperk.

Die melkaantekeningskema word as 'n baie belangrike hulpmiddel in toonaangewende produksie-eenhede beskou. Produksie tendense word hierdeur gemonitor. Hierdie inligting reflekteer die doeltreffendheid van voeding, algemene bestuur, teling asook die beheer van siektes soos mastitis, en is noodsaaklik om bestuurspraktyke te verbeter. In Suid-Afrikaanse kuddes waar melkaantekening toegepas word, is die produksie per laktasie heelwat hoër en word die volgende produksiegegewens vir verskillende rasse aangegee[11] (Tabel 1).

Die departement Geslagskunde van die Fakulteit Veeartsenykunde, Onderstepoort is reeds 'n aantal jare aktief betrokke by 12 melkkuddes wat met gereelde tussenposes besoek word vir hoofsaaklik ginekologiese ondersoeke. Die afgelope 2 jaar het die ondersoeke egter uitgebrei tot 'n meer geïntegreerde benadering, waar nou meer aandag gegee word aan die bestuur, voeding, behuising en gesondheid van die droë koei, die koei tydens die peripartale periode, die pasgeborene, die koei in melk en die kalf en vervangingsvers. Tans word gebruik gemaak van 'n handrekordstelsel waaruit analises gedoen word en maandverslae aan die boer verskaf word. 'n Maandelikse kuddekontrolelys word ook gebruik om kuddes tydens besoeke ten opsigte van verskeie aspekte te monitor. Toepassing van bogenoemde aspekte word later behandel.

Die senior outeur (D.C.L.) het verder ondersoek ingestel na die kudde benadering soos tans in die praktyk beoefen word, beide plaaslik en in die buiteland. In die RSA is 9 gevestigde grootdierpraktisyns in verskillende streke besoek, en op 'n buitelandse studiereis is 7 veterinêre fakulteite en 2 privaatpraktisyns met funksionele kuddegesondheidsprogramme besoek. In totaal is 25 melkplase plaaslik en 26 melkplase in die buiteland besoek.

Aspekte wat spesifieke aandag geniet het tydens elkeen van bogenoemde besoeke was algemene bestuur, behuising, voeding, produksie, algemene gesondheid, ginekologie, mastitis, evaluasie van melkmasjiene, voeranalise en rantsoensamestelling, kalf en vervangingsverse en rekordhouding.

'n Deeglike oorsig van pertinente en toepaslike literatuur is gedoen om as basis te dien van die melkkuddegesondheidsprogramme.

Die doel van hierdie studie was om die metodiek en die praktiese uitvoerbaarheid van die basiese beginsels van beplande kuddegesondheid onder verskillende omstandighede te bestudeer. Dit het ons die geleentheid gegee om ons huidige benadering tot kuddegesondheid met ander te vergelyk en te evalueer en om sinvolle aanpassings in benadering te maak sodat dit tot verbeterde dienslewering kon lei.

BESPREKING VAN ALGEMENE BEGINSELS

Sukses ten opsigte van beplande kuddegesondheid is afhanklik van 'n spanpoging tussen die boer, bestuurder, landboukundiges, veearts asook die arbeiders. Optimale samewerking, vertroue, kommunikasie èn wedersydse opleiding op alle vlakke is noodsaaklik[3 6 10].

Die veearts kan 'n strategiese rol speel. Sy breë kennis en gereelde besoeke aan kuddes plaas hom in 'n ideale posisie om as koördineerder van die magdom van inligting wat ingewin word, op te tree. Bo-en-behalwe die omvang van sy veterinêre kennis moet 'n veearts oor 'n deeglike basiese begrip van verskeie landboukundige onderwerpe beskik om 'n sinvolle en volledige diagnose van produksie-probleme te kan maak. Aktiewe skakeling met landboukundiges in die praktyk asook in die opleidingsituasie is dus noodsaaklik. Dit kan en behoort dan tot wedersydse vertroue en samewerking te lei op 'n gebied waar wetenskaplike simbiose meer en meer noodsaaklik word. Die veearts is heel dikwels die enigste professionele persoon in 'n baie mededingende bestuurssituasie. Hy moet dus seker wees van sy feite en moet sorg dra dat hy in staat is om enige mening wat hy mag huldig op 'n professionele en wetenskaplike wyse te kan verdedig[6 7 10] (A. Brand 1983 Rijksuniversiteit Utrecht Vakgroep Bedrijfsdiergeneeskunde en Buitenpraktijk, persoonlike besoek en kommunikasie).

Die sleutel van sukses lê dus dikwels in die vermoë om met mense vanuit verskillende dissiplines te kan werk en te kommunikeer – dit is net so belangrik as die vermoë om diere met vertroue te kan hanteer[6]. Die VEERU (Veterinary Epidemiology and Economics Research Unit) het bewys dat so 'n spanpoging in praktyk verkry kan word (R.J. Esslemont 1983 Universiteit van Reading Engeland, persoonlike besoek en kommunikasie). DAISY (Dairy information system) is die eindproduk van samewerking tussen 'n interdissiplinêre groep bestaande uit veekundiges, veeartse, landbouekonome en programmeerders – almal mense wat met die boer moet saamwerk in 'n poging om optimale produksie te verkry. Hierdie groep het bewys dat interdissiplinêre spanwerk nie alleenlik moontlik is nie, maar dat dit ook uitdagend en bevredigend kan wees. 'n Beleid van oop, eerlike kommunikasie, samewerking en bereidwilligheid om risikos te neem is noodsaaklik[3].

Dit is uiters noodsaaklik dat 'n wetenskaplike benadering tot die verskaffing van voorligting gehandhaaf moet word. Versameling van data, programmering en prosessering van data moet die basis vorm waarop advies gegrond word. Die doeltreffendheid van enige kuddegesondheidsprogram lê ook veral in die sinvolle skakeling van mens met mens. Sonder samewerking tussen verskillende groepe mense kan frustrasies en teleurstellings aan die orde van die dag wees[5].

Met voorgenoemde spanpoging as ideaal gaan vervolgens gekyk word na die probleme wat dikwels die sukses van 'n spanpoging bemoeilik.

'n Voorvereiste tot sukses is 'n opregte behoefte by 'n boer om sy boerdery se winsgewendheid deur wetenskaplike metodes, in samewerking met deskundiges, te verhoog. As 'n boer nie inisiatief toon en die vermoë het om 'n kudde te bestuur nie is die kans op sukses baie skraal. Dit is dus dikwels nodig om kliënte te selekteer[1 6].

Baie boere het 'n wanindruk van veeartsenykundige betrokkenheid by die veebedryf en het nie tred gehou met die vooruitgang op hierdie gebied nie. Die boer se opvatting van veeartse is dikwels die van 'n voorsiener van kliniese dienste – iemand wat net daar is om die individuele siek dier te behandel – 'n tegnikus wat sekere dienste lewer. Boere besluit dikwels wanneer die veearts nodig is en dra nie kennis van beplande kuddegesondheidsdienste wat die veearts kan lewer nie. Die boer beskou dus nie die veearts as lid van 'n adviserende span nie, en skakel dikwels slegs met ander persone wat nie

noodwendig sy totale probleem kan hanteer nie[6].

Indien die veearts 'n eerlike selfondersoek doen is die redes vir bogenoemde beeld velerlei van aard en staan die professie nie onskuldig nie.

Beperkte dienslewering deur die veearts aan die boeregemeenskap is 'n belangrike oorsaak van bogenoemde foutiewe beeld by boere. Dikwels is die veearts slegs die voorsiener van nooddienste en is hy te gejaagd van geval tot geval (brandweerpraktyk). Hy het nie tyd om na die boer te luister nie en stel nie belang in totale beplande kuddegesondheid nie. Die suksesvolle bemarking van 'n program begin dikwels juis deur o.a. na die boer te luister wat terloops noem dat hy 'n probleem het met bv. mastitis, onvrugbaarheid, diarree by kalwers ens. Dit skep nou 'n geleentheid om die probleem en die benadering tot beheer in detail te bespreek[2 6].

Die voorsiening van nooddienste is en bly noodsaaklik, en die veearts sal altyd noodgevalle met vertroue moet kan hanteer. Dit kan dikwels dan ook 'n beginpunt van beplande kuddegesondheid wees. Die voorsiening van nooddienste is 'n integrale deel van 'n totale program, en 'n praktyk moet dus so bestuur en beman word dat daar genoegsame tyd is vir beplande kuddegesondheid asook genoegsame mannekrag om noodgevalle te kan hanteer[5 6].

Aktiewe inskakeling en betrokkenheid by boeredae en studiegroepe is 'n verdere belangrike manier om kuddegesondheidsprogramme te bemark[2 6].

Baie veeartse vind dit moeilik om, vanweë die aard van een- of tweeman plattelandse praktyke, die multispesie *Jack of all Trades* benadering, prys te gee. Om 'n spesifieke spesie benadering op 'n kuddebasis met vertroue aan te pak, moet 'n praktisyn die kans en tyd gebied word om die kennisontploffing op die gebied te bowe te kom. Kuddebenadering is dus makliker om toe te pas in 'n multimanpraktyk waar 'n praktisyn die geleentheid en tyd gebied kan word om die nodige kennis en praktiese kundigheid te bekom. Kuddegesondheidsprogramme noodsaak 'n geïntegreerde benadering tot bestuur, behuising, voeding, produksie, ekonomie, rekordhouding ensovoorts as gevolg van die komplekse interaksie tussen al hierdie faktore[2 4 9 10]. Programme moet met vertroue bemark word – die moderne boer verwag dan ook dat die veearts op hoogte moet wees met landboukundige en ekonomiese fasette van veeboerdery[4 9]. Tye en behoeftes verander gedurigdeur – aanpassings en herevaluasies moet dus gereeld gemaak word. Die veearts moet in staat wees om nuwe idees met vertroue voor te stel en te implementeer.

Die komplekse meervoudige komponente van geïntegreerde kuddegesondheid is 'n verdere faset wat aandag moet geniet. Tradisioneel is daar 'n sterk betrokkenheid t.o.v. vrugbaarheid wat dikwels slegs beperk is tot tegniese aktiwiteite soos rektale ondersoeke, terwyl die verwantskap met ander aspekte nie in oënskou geneem word nie. Dit is noodsaaklik dat vrugbaarheid in verband gebring moet word met faktore soos melkproduksie, voeding, kondisie, bestuur en voetprobleme[2 4 6 9 10]. Voetprobleme verlaag o.a. estrus aktiwiteit, en die voerinname kan ook daal met gevolglike verlaagde melkproduksie en verswakking in kondisie[9]. Die ondersoek van vrugbaarheidsprobleme is 'n belangrike toegangspoort tot 'n kudde, maar dit moet uitgebrei word tot groter betrokkenheid sodat die veearts die boer uiteindelik bewus kan maak van subkliniese toestande[4].

Dikwels word die verkeerde program op die verkeerde tydstip aangebied. Die ekonomiese verbetering as gevolg van die implementering van 'n fertiliteitsprogram is stadig, terwyl dramatiese resultate na 'n baie kort tydperk met 'n mastitis en/of voedingsprogram verkry kan word. Laasgenoemde kan by 'n boer vertroue inboesem en kan ander gesondheidsprogramme daarna makliker aangepak word. Dit is dus dikwels noodsaaklik om 'n behoeftebepaling te maak, primêre probleme te bepaal en dan 'n prioriteitslys op te stel. Die klem moet verskuif vanaf "gesondheid" na "produksie met gesondheid"[6].

Van al die aspekte van beplande kuddegesondheid kom betrokkenheid by voeding dikwels die moeilikste en laaste. Hoekom? Is dit moontlik dat die veearts se formele opleiding hom onvoldoende toegerus het t.o.v. voeding?

Veeartse verrig dikwels sekere aktiwiteite op 'n plaas sonder doelwitte, meting, analisering of advisering[3]. Die veearts behoort homself dus die volgende af te vra om sodoende te definieer wat sy betrokkenheid op die melkplaas behoort te wees[7 10]:

- Wat is die doelstellings t.o.v. die verskillende fasette van gesondheidsprogramme, en is dit gegrond op ekonomiese beginsels?
- Watter programme moet aangebied word en hoe moet die verskillende programme implementeer word (algemene gesondheid, mastitis, ginekologie, kalf, voeding ens.)?
- Watter aktiwiteite moet tydens plaasbesoeke gevolg word?
- Hoe moet evalueer en analiseer word?
- Hoe moet kontrole uitgeoefen word?
- Is die benadering geïntegreerd?

Die boer moet nie oorweldig word met té idealistiese mikpunte nie – pas mikpunte aan van plaas tot plaas.

Dit is duidelik dat dit absoluut noodsaaklik is dat die veearts vertroud moet wees met rekordstelsels. Deur betrokke te wees by rekordhouding bewys die veearts sy belangstelling in die boerdery en dit kan slegs tot wedersydse vertroue en samewerking lei. Effektiewe rekordhouding help om probleme vroegtydig te identifiseer, te diagnoseer, te vergelyk en te monitor. Verslaglewering, inligtingstukke en samesprekings met die boer is verder uiters noodsaaklik[1 3 8 9] (R. Eddy 1983 Privaatpraktisyn op DAISY program. Shepton Mallet, Somerset Engeland. Persoonlike besoek en kommunikasie).

Dit is onmoontlik om 'n gesondheidsprogram aan te bied sonder ondersteunende laboratoriumdienste. Praktisyns moet in staat wees om vinnige en akkurate diagnoses te lewer. Diagnostiese metodiek word meer en meer kompleks en gebruik van laboratorium diagnostiese prosedures en fasiliteite is gesonde praktyk. Staats- en privaat-laboratoria moet effektief gebruik word[12]. In baie gebiede is afstand 'n groot probleem. Die daarstelling van 'n praktyk-laboratorium vir die praktisyn kan van groot hulp wees, maar 'n deeglike opgeleide persoon sowel as kwaliteitskontrole is noodsaaklik. 'n Praktyk-laboratorium werk nie as die praktiserende veearts self die laboratoriumwerk moet doen nie[2 12].

Opleiding van veeartse in kuddebestuur is 'n baie belangrike aspek wat aandag sal moet geniet[4 5].

'n Breë opleidingsbasis is by meeste Fakulteite in die wêreld gelê maar in die verlede was die tendens om met die aanbieding van kursusse te veel klem op die enkel geval te plaas eerder as op die kudde. Alhoewel die kliniese benadering tot die enkel dier belangrik is behoort die samestelling van moderne kursusse meer klem op populasies te plaas sodat die student ook sy benade-

Tabel 1: MELKAANTEKENING IN SUID-AFRIKA. GEMIDDELDE PRODUKSIE PER LAKTASIE (240 – 300 DAE) GEDURENDE 1982[11]

	Geregistreerde koeie					Graadkoeie				
Ras	Aantal	Gem. produksie (kg)	BV %	Gem. VGM (kg)	Proteïene %	Aantal	Gem. produksie (kg)	BV %	Gem. VGM (kg)	Proteïene %
Fries	19 560	5 115	3,60	4 812	3,34	38 462	4 546	3,58	4 263	3,34
Jersey	5 819	3 763	4,69	4 150	3,90	6 465	3 455	4,56	3 747	3,83
Ayrshire	540	4 540	3,70	4 338	3,44	1 611	3 828	3,65	3 626	3,39
Guernsey	709	4 344	4,43	4 624	3,66	1 365	3 736	4,19	3 844	3,54

BV = Bottervet
VGM = Vet-gekorrigeerde melk

ring daarvolgens sal aanpas. Kursusse moet beter geïntegreer word en meer aandag moet aan fasette soos epidemiologie, voorligting, plaasbestuur, voeding, weiding, ekonomie, rekordhouding en data prosessering gegee word[4]. Voortgesette nagraadse opleiding en kort kursusse sal baie meer aandag moet kry. Is die tyd ook nie ryp om oorweging te skenk aan die skepping van nagraadse spesie-spesialisasie nie?

Die pasgekwalifiseerde veearts beskik oor 'n stewige basis van kennis waarop hy verder kan voortbou. Daar kan ook nooit verwag word dat die pasgekwalifiseerde onmiddellik as kundige moet kan optree nie. Ondervinding is 'n evolusionêre proses, en 'n lewendige belangstelling asook baie selfopleiding is noodsaaklik om die kundigheid te ontwikkel[5 6].

SAMEVATTING

– Moderne boerdery praktyke stel nuwe eise met gepaardgaande veranderings aan die benadering van die melkboer, veekundiges en veeartse. 'n Spanpoging moet aangewend word waardeur die kragte van elke groep saamgesnoer word om 'n groter bydrae tot ekonomiese boerdery te maak.
– As die veearts nie aanpas, verander of tred hou met hedendaagse ontwikkelinge nie, sal ons as professie agterbly. Die veeartsenykundige professie durf dus nie passief as toeskouers die veranderings gadeslaan nie. As veeartse se dienste en advies die basiese ekonomiese beginsels van veeboerdery ignoreer sal die dienste van veeartse binne die voedseldiermark nie ten volle benut word nie met gepaardgaande verlies aan inkomste, prestige en selfrespek[2 3 4 6] (Groenewald J A 1981 Lesing nagraadse opknappingskursus; Bevorderende dieregesondheid, Universiteit van Pretoria).
– Ons bevind ons in 'n dinamiese en opwindende tydperk. Veeartse met 'n belangstelling in die voedseldierbedryf moet die uitdaging aangryp en hulleself oriënteer tot produksie- en gesondheidsprogramme wat bestuursgeoriënteerd is.
– Die steunpilare van gesondheidsprogramme berus op bestuur, behuising, voeding, rekordhouding en totale gesondheid wat gegrond is op moderne beginsels van ekonomiese produksie[7 9]. Daar moet 'n geïntegreerde benadering tussen al hierdie faktore wees asook tussen die kundiges op elke spesifieke gebied. Veeartsenykundige aspekte vorm 'n integrale deel van totale bestuur. Die veearts se betrokkenheid met betrekking tot veeproduksie moet op 'n geskeduleerde gesondheidsdiens toegespits word en daar moet weggebreek word van tradisionele praktykvoering gemik op die genesing van die enkel dier.
– Om 'n bestendige mark vir die veearts te skep moet hy hom bekwaam om sy regmatige plek in veeboerdery in te neem. Daardeur sal hy die boer help tot die uitbouing van sy boerdery aktiwiteite.

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TO THE EDITOR — AAN DIE REAKSIE

STRESS-ASSOCIATED MORTALITY

We wish to report on the following unusual and complicated case involving deaths in sale cattle. We would like to bring this to the notice of practitioners as an example of an inconclusive diagnosis after both laboratory and some field investigation. Findings such as these are seldom "aired" but the information obtained may be useful to others. We hope this will encourage others to submit similar correspondence.

In January, during hot humid weather a herd of 70 Simmentaler cows in poor condition and calves at foot, were trekked 8 km to a sale yard near Melmoth, Zululand. At the yard 3 cows became ill and were returned to the farm of origin. One of these cows subsequently died. The following day the purchaser trekked the remainder of the group about 25 km between 10h00 and 15h00 to a sweetveld farm near the White Umfolozi River. One stop was made en-route for rest and watering. One cow and calf died en-route. Over the next 16 days a further 9 cows died.

On examination, cows and calves were generally in very poor condition. Several cows were extremely dehydrated yet voided copious quantities of pale clear urine. Some animals showed signs of diarrhoea and others straining and tenesmus. Fine muscle tremors were seen in more advanced cases and recumbent animals assumed a "milk fever" position. Some animals showed a nasal hyperaemia which progressed to a crusting and focal sloughing of the skin. No febrile reactors were noted.

Post mortem findings of some animals revealed only severe lung oedema. However, most showed severe oedema of the abomasum, small and large intestine and a haemorrhagic typhilitis. Severe nephrosis was a consistent finding and a mild cirrhosis was present in some cases. Degenerative lesions and haemorrhages were sometimes present in skeletal muscles.

Histopathology showed the presence of iron containing proteinaceous casts in kidney tubuli.

Laboratory tests on sick cattle showed proteinuria, mild anaemia and a more or less constant hypoproteinaemia and hypoalbuminaemia. Several of these animals had a moderate to severe hypocalcaemia. Some blood smears were positive for small piroplasms. Virological investigations on two animals were negative as was parasitology on faeces and ingesta.

The probable pathogenesis of this case involves the severe stress to poor conditioned animals of the trek to and from the sale yard, minimal feed intake over 72 hours and high ambient temperature and humidity. It appears that a myopathy developed during the second day which caused a severe nephrosis resulting in polyuria, proteinuria, hypoproteinaemia and associated physiological disturbances.

The administration of Calcium borogluconate and oral electrolyte solution produced a marked improvement in most of the sick cattle.

It is believed that either a viral infection (eg. IBR, BVD or Ephemeral fever) or ingestion of poisonous plants (eg. *Solanum*, *Senecio*, *Crotalaria*, *Lantana* or *Lippia* spp which were observed) played a role as complicating factors and which may explain the nasal hyperaemia and enteritis. These factors, however, were not confirmed.

In summary we feel this problem was essentially stress induced. Due regard should therefore be taken by stockowners of the general condition of animals before subjecting them to stressful situations.

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BOOK REVIEW — BOEKRESENSIE

IN PRACTICE: THE SMALL ANIMAL BOOK

BRITISH VETERINARY ASSOCIATION

British Veterinary Association, 1985 pp 140, numerous figures and tables

"In Practice: The small animal book" is a compendium of articles published on various aspects of small animal medicine and surgery. These articles appeared over a number of years in "In Practice" of which the primary aim is continuing education of veterinarians. As such this attractively presented publication, well illustrated with photographs (black and white and in full colour), sketches and diagrams, contains articles by 19 authors on 19 different topics. The subject material is widely divergent in nature and include for example chapters on "skin diseases of the cat", "autoimmune disease in the dog", "ocular disease in the cat", "urinary incontinence in the dog", "differential diagnosis of polyuria-polydypsia in dogs and cats" and "first aid for wild birds". South African readers should be alerted to the fact that little or no reference is made to conditions of local importance. This publication should be useful to practitioners in small animal practice and to students.

J. VAN HEERDEN

VALSIEKTE (FALLING DISEASE) IN LAMBS

I read with interest the article by F.H. v.d. Vyver et al. in the Journal of the South African Veterinary Association (1985) vol. 56, 65-68, on valsiekte in lambs.

In 1906, H. Keeling Roberts[1], Veterinary Bacteriologist and Assistant Veterinary Surgeon writing in the Report of The Chief Veterinary Surgeon of the Orange River Colony for the year July 1908 – June 1909 describes a very similar condition.

His report is headed "**A Form of Paralysis in Lambs, so-called Stiff Sickness**".

He writes: "From enquiries made it is believed that the first appearance of this disease was during the winter of 1906, then farmers lost many lambs in the Philippolis, Bethulie, Rouxville and Smithfield districts".

As far as he knew, no losses occurred in 1907 but "This disease caused a great loss in this colony during the winter of 1908".

Significantly, he states "Up to the present (30th June 1909), no reports have been received of outbreaks during May and June, and it is more than probable that the disease will not appear *because of the heavy late rains and the luxuriant veld*" (My italics). He also states that the condition never appears in the summer months when veld growth is good.

The veld type where the condition occurs he describes as, "Bushveld generally, e.g. Karroo bushes, bluebush, *bitter-bush*, yellow bush etc. It is also found on mixed veld, *but I have not seen in on grass veld*" (My italics).

The cause of the disease he says, "[is] unknown, but it is probable that the cause is unsuitable veld, either chronic vegetable poisoning or errors in diet".

He goes on to detail several experiments which lead him to conclude that the cause of the disease was not bacterial or "spread by contagion".

One experiment is interesting: "One lamb remained healthy after receiving two pints of an infusion of a suspected bush (bitter bush)". Even then they suspected bitter bush.

His description of the clinical signs is almost identical to that of V.d. Vyver and his co-workers:

"Symptoms – A lamb is usually at least 6 weeks old when the first symptoms appear. I have only seen one case in a lamb under that age (It therefore appears as if the cause were not in the milk of the mother). Sometimes the animal is about 3 months old before it shows any signs of disease. Generally the herd-boy notices the lamb is ill when the flock is being driven to the kraal in the evening: it will be seen to fall or stumble during progression or one or more of the limbs will fail occasionally. If the lamb is chased it becomes very excited and may fall over and when caught it struggles and trembles violently as if it were very frightened or excited. The temperature is usually about 105 to 106°F at this period: occasionally there is slight tympany: respirations are slightly accelerated and pulse is quickened (these two latter symptoms appear to be due to excitement). Next day the symptoms are more pronounced; there is less control of the limbs, the lamb falls over and has great difficulty in getting on its legs again. After many struggles and half rolls, it gets up and runs away. Later the symptoms are aggravated and about the third day the animal is unable to rise, but immediately it is picked up, it rushes off again, only to fall almost at once. If it is held on its legs for a short time until the struggles are less violent, then the lamb will go away more quietly and will start feeding, but after a time it probably gets on to some rough ground which causes the lamb to trip up and fall over on to its side; here it lies trying to eat if there is any vegetation about, until someone lifts it on to its legs again.

Sometimes the fore limbs are affected; sometimes the hind ones, and at others, all four legs. Occasionally a lamb will crawl on "all fours", or it may pull itself along with its fore legs, the hind ones being dragged behind".

He also states that ". . . the muscles of mastication are not affected".

His "Recommendations as preventive or ameliorative in a flock" include the kraaling of lambs during the day and feeding with greenfeed, moving flocks from one part of the farm to another and "of course trek, if possible".

In the report he publishes 5 photographs of affected lambs and two of the photographs are virtually identical to those accompanying v.d. Vyver et al.'s article.

"Post mortem examination reveals very little", he says. "The brain and cord appear normal to the naked eye (unfortunately I was unable to make sections for microscopical examination, because my specimens were destroyed in the fire)." From an historian's point of view how one wishes he had told more about the fire!

He goes on to give the duration of the disease as 3 days to 6 weeks with mortality of more than 70 per cent. He further distinguishes an acute, subacute and chronic form depending on the duration of the condition and the severity of the clinical signs.

It would seem that we are dealing with the same condition now as then. I was unable to follow up any further reports as the Orange River Colony ceased to exist at the time of Union in 1910 and no further reports appear in the Archives in Bloemfontein. Maybe somebody could search the reports of the Director of Veterinary Services of the Union of South Africa subsequent to 1910.

I submit this letter purely as an item of historical interest and wonder how many "new" conditions have not been seen and described in the dim and distant past and subsequently been lost sight of.

As the Preacher said ". . . there is no new thing under the sun" (Ecclesiastes 1 v. 9).

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1. Annexures to the Votes and Proceedings of the Legislative Assembly – Orange River Colony: No. 42, 1910.

GOUE MEDALJE VAN DIE SAVV VIR 1985

DANIEL WYNAND VERWOERD

Die Goue Medalje van die Suid-Afrikaanse Veterinêre Vereniging ter erkenning van voortreflike wetenskaplike prestasie en/of 'n betekenisvolle bydrae tot die vooruitgang van die veterinêre wetenskap, word vanjaar aan 'n besondere navorser, Dr. Daan Verwoerd, toegeken.

Daniel Wynand Verwoerd is op 19 November 1933 in Stellenbosch gebore. Hy matrikuleer in 1950 aan die Helpmekaar Hoërskool in Johannesburg.

Hy behaal die graad BVSc aan Onderstepoort in 1955 en besluit op 'n navorsingsloopbaan wat 'n gevolglike koersaanpassing ten gevolge het en hom 'n MSc in biochemie op die suiwering van die toksiene van *Clostridium perfringens* tipe D in 1958 laat behaal.

Op grond van sy besondere navorsingspotensiaal en akademiese kwalifikasies ontvang hy die Alexander von Hobolt-stigtingbeurs wat hom in staat stel om aan die Max Planck Instituut vir Biochemie in München te studeer waar hy basiese navorsing op die biochemie van DNA doen. Vir hierdie werk word die graad DSc (Biochemie) *cum laude* in 1963 aan hom toegeken.

Hy werk nog 2 jaar verder in Duitsland maar nou aan die Max Planck Instituut vir Virologie te Tübingen waar hy op die biochemiese interaksie van poliovirus en die gasheersel werk.

By sy terugkeer in 1963 word hy Hoof van die nuwe seksie Molekulêre Biologie wat deur hom geïnisieer is en begin hy met kenmerkende spanwerk met baanbrekerswerk wat hom uiteindelik die hoogste aansien op navorsingsgebied in Suid-Afrika en in die buiteland sou besorg.

Die aanvanklike oogmerk van sy navorsingspan was om die invloed wat 'n virus op 'n sel het, op molekulêre vlak te bestudeer. Hiervoor kies hy bloutongvirus as model. Suiwering van die virus was die eerste moeilike stap waarin geslaag was. Dit het die weg gebaan tot die biochemiese en morfologiese karakterisering daarvan. Hierop volg die unieke wêreldbelangrike ontdekking dat beide bloutong en perdesiektevirusse dubbeldraad RNA as genetiese materiaal bevat – iets wat tevore slegs in 'n nie-patogene reovirus gevind is.

Erkenning vir hierdie prestasie was die aanstelling van dr. Verwoerd op verskeie internasionale komitees en die redaksionele komitees van verskeie internasionale tydskrifte.

Verdere studie van die molekulêre samestelling van bloutongvirus lei tot die ontdekking dat die proteïndop uit 'n dubbellaag bestaan met 'n unieke samestelling wat geheel en al verskil van die bekende reovirusstruktuur.

Deur die gebruik van bloutongvirus-boodskapper-RNA in kruishibridisasies word 'n enkele virusproteïen as die serotipe en neutralisasiespesifieke-antigeen ontdek – 'n resultaat van groot praktiese belofte in entstofontwikkeling.

Hierdie werk lei dan ook tot sy tweede doktorsgraad – hierdie keer in DVSc.

Hy besluit op hierdie tydstip om 'n nuwe uitdaging aan te pak nl. die veld van kankernavorsing en bewys weer eens dat hy van wêreldformaat is. As onderwerp word die netelige probleem jaagsiekte, 'n longkanker van skape, gekies.

Die eerste deurbraak was om uit die neoplastiese weefsel 'n kankerlynsel te isoleer waarmee jaagsiekte oorgedra kon word – 'n resultaat wat wye belangstelling op veeartsenykundige gebied uitgelok het.

Hierna volg die bewys van 'n tweede tipe oordrag d.m.v. selvrye fraksies van die kankersellyn en word die moontlikheid van 'n kankervirus wat met die DNA van normale selle kan integreer, geopper.

Na die demonstrasie van omgekeerde transkriptase ensiem in die longvog van jaagsiekteskape en die bewys dat die konsentrasie daarvan gekorreleer is met infektiwiteit, word die ensiemdraende viruspartikels gesuiwer en die betrokke retrovirus elektronmikroskopies bestudeer.

Sy kennis in verband met omgekeerde transkriptaseensiemtoetse, lei daartoe dat talle mediese navorsers betrokke by die studie van die gevreesde imuungebreksindroomvirus van die mens, hom daaroor kom raadpleeg het. Die status van die veterinêre navorser in Suid-Afrika is weer eens daardeur verhoog.

Dr. Verwoerd speel 'n leidende rol in die implementering van 'n biotegnologiese navorsingsprogram en hoof-

saaklik deur sy toedoen is Onderstepoort geïdentifiseer as die mees geskikte sentrum in Suid-Afrika om die potensiaal van biotegnologie en entstofontwikkeling te evalueer.

Sover dit opleiding ter bevordering van veeartsenykundige navorsing in besonder en die biologiese wetenskap in die algemeen betref, het 5 studente onder sy direkte toesig hul D-grade en 5 hul M-grade verwerf in verskillende aspekte van fundamentele navorsing met 'n veeartsenykundige strekking.

Hierdie stil, teruggetrokke kollega is getroud met Rina Gilliland, 'n hoërskool onderwyseres en hul het 3 kinders.

Een van dr. Verwoerd se belangrikste bydraes tot veeartsenykunde is die indrukwekkende manier waarop hy die beeld van die veearts as navorser na buite dra. Ten spyte van sy intieme betrokkenheid by basiese, fundamentele navorsing het hy nooit die praktiese veeartsenykundige implikasies van sy navorsing uit die oog verloor nie.

Hy het dwarsdeur sy loopbaan hoogstaande wetenskaplike prestasies gelewer en het 41 publikasies tot sy krediet. Hierdie wêreldbekende navorser se loopbaan is van meet af gekenmerk deur inisiatief en oorspronklike denke. Hierdie onbetwisbare vermoë om nuwe en belangrike ontwikkelings in die biologiese wetenskap te identifiseer en te implementeer, het hom van die begin af uitgelig as navorser. Dit het die fondament gevorm van 'n navorsingsloopbaan waarin herhaaldelike voortreflike wetenskaplike prestasies behaal is en 'n heel besondere en blywende bydrae tot die vooruitgang van die veterinêre wetenskap gemaak is.

SILWER MEDALJE VAN DIE SAVV VIR 1985

ELIA MARIUS VAN TONDER

Die tweede Silwer Medalje van die Vereniging ter erkenning van uitstaande langtermyndiens aan en bevordering van die veterinêre beroep word toegeken aan dr. Marius van Tonder van Middelburg, Kaap.

Elia Marius van Tonder is op 26 September 1938 in die Vryburg distrik gebore en matrikuleer aan die landbouskool te Jan Kempdorp. Hy kwalifiseer as veearts te Onderstepoort in 1961.

Hy aanvaar diens as Staatsveearts te De Aar waar hy vir 5 jaar werk en waar hy vroeg vertroud raak met talle aspekte van die kleinveebedryf – die bedryf wat die grootste deel van hierdie besondere kollega se energie sou ontvang. In 1967 word hy oorgeplaas na Middelburg, Kaap, se Veterinêre Streekslaboratorium en hier word hy hoof in 1968 met die afsterwe van dr. K.M. van Heerden. Hy bou hierdie fasiliteit uit tot 'n organisasie wat alle verwagtings oortref het.

Hy het inderdaad bewys dat veterinêre navorsing nie net aan 'n navorsingsinstituut nie maar ook ter plaatse in die veldsituasie gedoen kan en behoort te word. Bewys hiervan is o.a. sy verkryging van die graad DVSc in 1977 op *Actinobacillus seminis*-besmetting van skape in Suid-Afrika wat o.a. die eerste diagnose van hierdie toestand ter plaatse asook die epidemiologie van die siekte behels.

Sy onuitputbare werksywer en entoesiasme is welbekend en sy grootste bydrae is waarskynlik te vind in die inspirasie wat hy was (en steeds is) vir kollegas, tegnici en ander medewerkers. Sy vermoë om span te bou word as voorbeeld voorgehou in die Afdeling Veeartsenydiens en dit is 'n groot rede vir die wyse waarop sy invloed uitkring. Hy het alles feil vir sy personeel en word daarvoor beloon deur uitstekende werkverrigting en absolute lojaliteit.

Sy aandeel in die vestiging van 'n gedesentraliseerde diagnostiese diens was baie belangrik. Uit die aard van die saak moet mense gelok word na 'n vaal dorpie in die middel van die Karoo. Die lokmiddel in hierdie geval is die goeie gees en positiewe instelling by die betrokke laboratorium. Professionele en tegniese poste kon hier nog altyd geredelik gevul word.

Die standaard van werkverrigting is besonder hoog en dit is beslis 'n laboratorium met prestige. Met die instelling van die beesbrucellose-skema was daar 'n dringende behoefte tot standaardisering van serologiese toetsmetodes – o.a. die komplimentbindingstoets. Die leidende rol wat Marius en sy tegnici hierin gespeel het, word deur almal erken.

Die volle spektrum van veterinêre probleme wat in die kleinveebedryf voorkom het sy span se aandag hier ontvang en enkele fasette wat dit illustreer is dan sy bydrae tot die volgende:

Die daarstelling van 'n praktiese handleiding oor die sertifisering van ramme vir geslagsgeskiktheid.

Die verwekking van geeldikkop met *Tribulus terrestris* en sy bydrae tot die oplossing van die probleem.

Die bewys dat ensoötiese ikterus niks met geeldikkop te doen het nie en kroniese kopervergiftiging is.

Sy bydrae tot fosfaatbyvoeding van skape, verwekking van urinêre kalkuli en beheer daarvan.

Diagnose van die oorsake van aborsie en perinatale verliese by kleinvee.

'n Volledige in-diepte studie van uitsaklammers.

Dr. Van Tonder is sonder twyfel dié man wat vir die professie 'n vastrapplek in die kleinveebedryf in al sy fasette en vertakkings losgewoel het. Tradisioneel het skaap- (en bok-) boere maar self opgesnork en slegs hulp kom soek wanneer vrektes epidemiese afmetings aanneem of wanneer 'n besondere ram siek was. Die opleiding van veeartse het hulle ook nie vir veel meer as hierdie aspekte van hulpverlening toegerus nie.

Hy was uit die staanspoor geïnteresseerd in skaapboerdery en die probleme van skaapboere en het, veral vanaf die ontstaan van die Veterinêre Streekslaboratorium noue skakeling met die georganiseerde Skaap- en Wolbedryf (en Sybokbedryf) geïnisieer en deurgaans behou. Dit het daartoe gelei dat die leiers in hierdie bedrywe gaandeweg al meer gebruik van veeartsenykundige advies begin maak het.

Die gevolge was o.a. die totstandkoming van 'n leerstoel in kleinveekunde aan die Fakulteit van Veeartsenykunde, Universiteit van Pretoria en 'n hele aantal privaatpraktyke wat baie skaapwerk – by 'n paar selfs oorwegend – doen. Die bedryf – in name die Wolraad

en die NWKV – het deesdae 'n deeglike begrip van en baie waardering vir die bydrae van die veearts en skakel op gereelde en formele basis met ons.

Marius se wye kennis van die kleinveebedryf en veral gesondheids- en produksieprobleme is algemeen bekend. Hy kan tereg as die professie se segsman in die verband beskou word – vir die afgelope 20 jaar al.

Bewys hiervoor is te vind in die programme van nasionale en streekskongresse van die SAVV, SA Vereniging vir Diereproduksie, SALU en boereverenigings oor die afgelope 20 jaar. Hy was (en is) 'n gewilde spreker wat sy onderwerp deeglik ken en goed kan oordra – of dit nou gaan oor algemene probleme van die bedryf, perinatale verliese, onvrugbaarheid, vagverkleuring, vergiftigings of wat ook al. Onder andere het hy oor die afgelope 14 jaar 25 keer wetenskaplike referate gelewer.

Marius se *curriculum vitae* getuig van 'n uitsonderlike werksvermoë en produktiwiteit. Uit die aard van die saak het meeste van sy kollegas in die Direktoraat Veeartsenydiens 'n aantal populêre publikasies tot hul krediet en enkeles mag ook 'n paar wetenskaplike artikels op hul naam hê. Om onder dieselfde omstandighede bykans 40 wetenskaplike publikasies en meer as 100 populêre of semi-wetenskaplikes te hê, spreek boekdele.

Dr. Van Tonder is 'n uitstaande veearts wie oor 'n wye front oor baie jare sy professie uitmuntend gedien het in die algemeen maar in die besonder in die veld van die kleinveebedryf en sy bydrae kan moeilik na regte geskat word.

Hy het op diens-, voorligting- en navorsingsvlak sy deel gebring en voldoen by uitstek aan die vereistes vir die Vereniging se Silwer Medalje.

TOEKENNING AWARD

JACK BOSWELL AWARD FOR 1985

ROYDEN CHARLES TUSTIN

This award is in acknowledgement of dedicated service to the veterinary profession through the SA Veterinary Association and this year it is awarded to Prof. Roy Tustin of the Veterinary Faculty, University of Pretoria.

Royden Charles Tustin was born on 4 June 1929. He matriculated in Pietermaritzburg and qualified as a veterinarian at Onderstepoort in 1953. In 1977 he also obtained the degree MMedVet(Path).

After qualifying as a veterinarian he spent the first 2 years in private practice and then joined the Veterinary Research Institute where he initially worked in the Section of Bacteriology for 3 years. At his request he was transferred to the Section of Pathology in 1958 and he became Head of this Section in 1968.

In 1970 he joined the National Research Institute for Nutritional Diseases of the South African Medical Research Council as pathologist and in 1973 accepted the position of Professor and Head of the Department of Pathology of the Veterinary Faculty, University of Pretoria, at Onderstepoort.

Roy Tustin has long had a keen interest in the SAVA and its affairs, having being a cadet member of the Association as a student and then becoming a full member on graduation. He was a founder member and first honorary secretary of the Northern Transvaal branch of the SAVA and a founder and committee member of the Veterinary Pathology Group of the SAVA.

He further served the profession through many years by sterling diagnostic work and through teaching. He was Senior Lecturer in Pathology from 1963 to 1970 and has been Professor in Pathology for the past 12 years.

It is, however, his association with South African Veterinary journals which highlights the outstanding service he has given the profession. He was a member of the editorial committee of the Onderstepoort Journal of Veterinary Research for many years and its convenor for 2 years. As far as our own Journal of the South African Veterinary Association is concerned, he was an active member of the editorial committee for 12 years and Editor for 5 years up to September 1984.

As an editorial committee member, he has always readily given assistance and encouragement to authors – specially first time authors and those in private practice. Over the past 17 years he has spent many long hours scrutinising, correcting and critisising manuscripts.

Thanks largely to Prof Tustin's editorship the Journal was brought out on time and the profession can be proud of the standard and excellence of this internationally read publication.

The production and printing of a scientific journal is a complex and time consuming task and with a relatively small readership it is an expensive venture. New material for publication must constantly be canvassed and there are inevitable deadlines to be met. As editor he coped admirably with these problems. To maintain the high quality and timely appearance of the Journal, he devoted an immense amount of time, far beyond the call of duty, over 5 years to the organisational aspects of running it. This, together with his meticulous, outstandingly professional approach to the scientific correctness and technical aspects of the Journal, has made it a worthy showpiece of the Association and it continues to flourish.

In addition to teaching he has always been most approachable regarding advice and the dissemination of knowledge to the profession. He has always done this in an openhearted way for those in all spheres of veterinary science including private practice, research and industry.

He is the author or co-author of 50 scientific articles and contributions to standard text books. The majority of papers and publications delivered by him have been via the platform of SAVA Congresses and our own Journal.

He is married to Gill Kok a physiotherapist and they have 4 children and 2 grand children.

This man has rendered outstanding service to the veterinary profession through his participation in the affairs of the Association, through teaching and his openhearted dissemination of knowledge through his scientific publications, through his long and active membership of the editorial committee and finally through his competent and distinguished term of office as Editor of our Journal.

It is with confidence and pride that the 1985 Boswell Award is bestowed on him.

RESEARCH AWARD OF THE SAVA FOR 1985

WERNER HEINZ GIESECKE

The fifth recipient of this award is Dr Werner Giesecke of the Veterinary Research Institute at Onderstepoort.

He obtained his veterinary degree in 1962 and the degree Doctor Med.Vet. (*magna cum laude*) in 1965 at the Veterinary Faculty of the Free University of Berlin.

He immigrated to South Africa in 1966 where he joined the Veterinary Research Institute as research worker in Food Hygiene. He also lectured in milk hygiene from 1969 to 1973. He was promoted to Head of the Section of Food Hygiene in 1975 and became Assistant Director in 1982.

Dr Giesecke is nationally and internationally renowned in the field of mastitis and has given new dimension to especially the physiopathology and dynamics of this most important erosion disease – he has in fact put South Africa on the map as far as mastitis is concerned. As a scientist he is highly conscientious, thorough and critical in a positive sense and has repeatedly demonstrated the ability of original thinking.

In addition to numerous popular and semi-popular articles in the field of mastitis, no less than 39 scientific articles of which he is author or co-author have been published and 6 are in print. Ten scientific articles on other topics in food hygiene have also appeared.

Over the 3 year period 1983-1985 alone, 12 articles on mastitis have been accepted for publication and the 7 which have already appeared, have been evaluated.

These articles include topics such as glucose levels in mastitic milk, electron microscopy of teat cup liners, plasminogen activators in milk and the physiopathology and dynamics of mastitis.

There is no doubt whatsoever that Dr Giesecke has made a meaningful contribution to knowledge in this field and that he is a most worthy recipient of this award for the best series of articles of South African origin on a veterinary topic which have recently appeared in scientific literature.

CLINICAL AWARD OF THE SAVA FOR 1985

PAUL BLAND-VAN DEN BERG

The fifth recipient of this prestigious award in acknowledgement of clinical excellence, is Prof. Paul Bland van den Berg, Head of the Department of Medicine of the Faculty of Veterinary Science of the University of Pretoria at Onderstepoort.

Paul qualified in 1968 and was the Theiler Medalist of his class. He spent 5 years in mixed general practice in Zimbabwe. He then returned to Onderstepoort as Senior Lecturer in Medicine and obtained his MMedVet (*cum laude*) in 1978. Then followed 3 years at the Texas A&M University where he obtained his PhD and where he also became a Diplomate of the American College of Veterinary Internal Medicine – the only South African veterinarian to have achieved this distinction. In 1982 he returned to Onderstepoort as Associate Professor and in 1984 he became Professor and Head of the Department of Medicine.

Paul is an outstanding and extremely popular teacher both at pre- and post-graduate levels but he excells in the field of continuing education. He was the driving force behind the implementation of the Problem Oriented Medical Record System and the establishment of an intensive care unit at the Faculty. For this a sum of R20 000 was raised by the National Clinician's Group (particularly the Witwatersrand branch) with the assistance of a private benefactor. This facility is now being utilised by all three Clinical Departments.

The medicine curriculum has undergoing major changes and rationalisation under his guidance and his applied knowledge has been assimilated making it now a dynamic, vibrant course.

He is particularly known for his outstanding knowledge of small animal veterinary medicine and he has given 25 addresses to the profession over the past 10 years virtually covering the entire field of Veterinary Medicine on topics ranging from dermatoses (on which he is an outstanding authority), gastro-intestinal disorders and neurological conditions, to the concept of shock in its broadest context.

In addition he has proved to be a most competent research worker and he has 9 scientific publications to his credit.

It is clear that for this award he is an outstanding candidate who has through study, research, implementation of new ideas and teaching, been an outstanding example to colleagues and students alike and who has most certainly enhanced the status of the veterinary profession.

HONORARY MEMBERSHIP OF THE SAVA

GEORGE COLIN BISHOP

George Colin Bishop was born on June 13 1943, the son of the late Gerhardus Petrus (Bolly) Bishop, a well-known veterinarian in government employment.

Having obtained his matriculation certificate in 1960 from Maritzburg College, Pietermaritzburg, he was originally employed as a technical assistant in the Department of Agriculture between January and December 1961, wherafter he completed his national service during 1962. Between 1963 and 1966 he obtained a BSc degree from the University of Natal. Between March 1967 and January 1968 he was employed as an analyst by Lever Brothers, Durban. In February 1968 he was appointed professional officer at the Allerton Veterinary Laboratory.

Apart from being released from duty between November 1970 and November 1971 in order to complete his thesis on the genus *Pseudomonas* for the MSc degree, he has been at Allerton ever since, being successively promoted to Senior Professional Officer (1971), Chief Professional Officer (1977), Veterinary Researcher (1980) and Chief Veterinary Researcher (1983).

During his career at Allerton laboratory spanning a period of 17 years, he has become deeply involved in a wide variety of veterinary activities. His unfailing enthusiasm for his work and the quality of his results have made his name a byword for excellence throughout Natal. Over the years he has made significant contributions toward the furthering of veterinary knowledge and the rendering of high quality diagnostic services to the veterinary profession. Foremost amongst these contributions has been his close involvement with the Brucellosis Eradication Scheme. These diagnostic procedures have been developed to be reliable, accurate and internationally recognised. A manual for diagnostic procedures has been published with Mr Bishop as a major contributor. His ability and willingness to help with the interpretation of test results have been of great value to veterinarians in Natal and elsewhere, and his careful monitoring of test result patterns has enabled the province to become a leader in the control of Brucellosis.

He is well-known in equine practitioner circles for the quality of his work in investigating and monitoring equine venereal and reproductive diseases. This has resulted in a number of modifications to the approach in controlling these diseases, in particular Contagious Equine Metritis. His abilities were recognised when he was nominated to be sent to Denmark at the expense of the Thoroughbred Breeders' Association to study the identification of *Klebsiella* isolates.

His extensive knowledge of bacteriology enabled him to identify the fastidious organism, *Haemophilus somnus*, the causative organism of thromboembolic meningoencephalitis, for the first time in South Africa. Similarly he was able to identify *Bacteroides nodosus*, the cause of ovine footrot, for the first time in South Africa. This extremely fastidious and sensitive organism had previously been sought unsuccessfully by many investigators.

These achievements are illustrative of the quality and importance of the contribution George Bishop has made to Veterinary Science in South Africa. His standing as a microbiologist is recognised in academic circles in that he has been appointed as external examiner in microbiology at the University of Natal. In 1980 the Natal branch conferred honorary life membership of the branch on Mr Bishop in recognition of his outstanding service to the profession.

George married Margaret Hobson in 1970 and they have two sons.

It is fitting that the South African Veterinary Association now recognises the contributions which George Bishop has made to our profession by making him an honorary life member of our Association.