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TYDSKRIF VAN DIE
 SUID-AFRIKAANSE
 VETERINÊRE VERENIGING

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TYDSKRIF VAN DIE SUID-AFRIKAANSE VETERINÊRE VERENIGING – SEPTEMBER 1983

THE FAMILIAL INCIDENCE OF "GREY" AFRIKANDER CALVES WITH AND WITHOUT GOITRE

K.C.A. SCHULZ* and J.W. GROENEWALD**

ABSTRACT: Schulz K.C.A.; Groenewald J.W. The familial incidence of "grey" Afrikaner calves with and without goitre. *Journal of the South African Veterinary Association* (1983) 54 No. 3, 147-154 (En). 15 Darlington Rd, Lynnwood Manor, 0081 Pretoria, Republic of South Africa.

Afrikaner cows rarely drop "grey" (very pale yellow) calves with or without goitre. These 2 defects have been recorded among calves in 2 herds. In one of these herds, all affected calves were the progeny of a particular bull when bred to its own daughters and closely related cows. The bull responsible on the other farm apparently inherited the pathogenic genes for goitre and grey colour also from his paternal and maternal ancestry respectively. Both sires are fairly closely related. Both bulls and the cows they sired must have been heterozygous for both abnormal genes to produce homozygous offspring. There is evidence that the factors concerned segregate according to Mendelian rules during the second generation.

These anomalies appear to be simple (autosomal) recessive genes and when combined in the same animal, are usually lethal.

Key words: Inherited goitre, Afrikaner cattle, abnormal skin pigmentation, grey calves.

INTRODUCTION

Goitre, or struma, is the most common cause of chronic enlargement of the thyroid gland. Clinically this defect may be: 1. palpable, 2. palpable and just visible, or 3.

large; the size and weight of the gland may thus vary considerably. In addition, goitres are divided into toxic and non-toxic types and are also designated as diffuse, uninodular or multinodular.

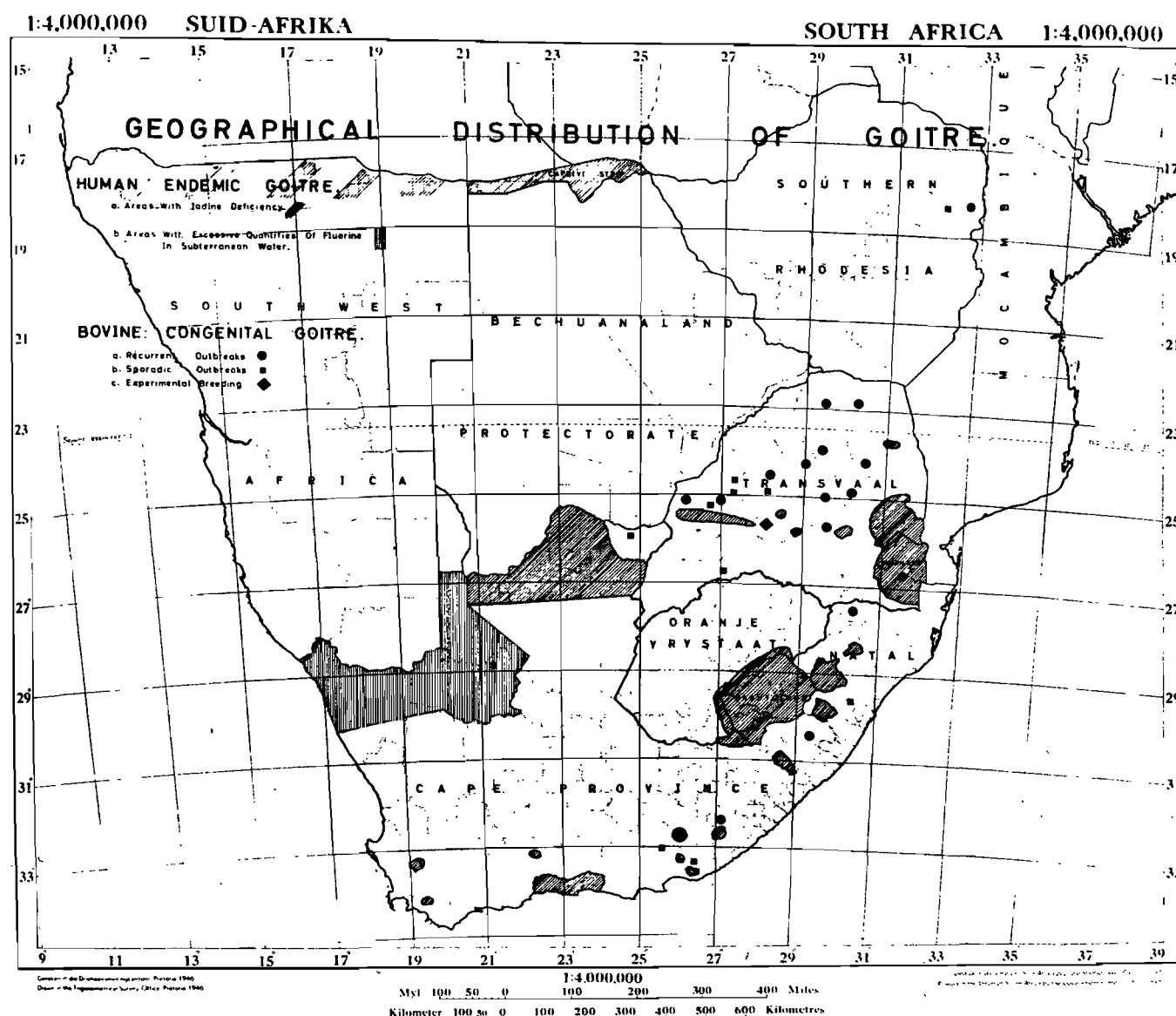


Fig. 1: Geographical distribution of goitre in Southern Africa

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Throughout the world, from ancient times to the present time, iodine deficiency has been accepted as the main cause of simple goitre in man and in livestock^{3 6 15 18 26 33 34 41 43} with genetic factors playing a lesser role^{12 14 16 17 25 27}. In most regions where endemic goitre is common in human beings, it is also prevalent among domestic animals, except in South Africa where this defect in livestock is rare or absent even in severe human endemic areas^{33 34}. It is significant that some grasses possess the ability of concentrating iodine in their leaves and stalks, although the soil and water may have very low iodine concentrations. It has been suggested that this is the reason for the rarity or absence of the condition in animals. It should be stressed, however, that a high iodine content in the feed, as such, need not necessarily prevent the occurrence of goitre in the individuals concerned as the iodine is not necessarily available to the animal.

During 1934 a form of congenital goitre which affected calves was encountered in an Afrikaner herd in the Eastern Province of the Cape. Its cause was ascribed principally to a genetic rather than to an environmental factor¹⁶. The anomaly occurred only in calves that were sired by 4 particular bulls that were related to each other to a variable extent. Unfortunately the breeder refused to disclose their names and origins.

Corroborative evidence that it was an inherited condition was obtained when a breeding experiment was carried out in a known non-goitrous area as has been previously described by Schulz²⁷. The condition was subsequently encountered in another 34 herds of Afrikaner cattle²⁷. The sires of all affected calves in these herds could be traced back to a common ancestor called "Makman". All these herds were dispersed throughout the Republic of South Africa, Swaziland and Zimbabwe. Only one of them is situated in a known iodine deficient area, while on another an excess of fluoride in the pasture and/or the water has been recorded (see Fig. 1); the occurrence of the condition in these areas is undoubtedly coincidental. The presence of goitrogenic edible plants on these farms as a possible cause, could be eliminated. The incidence of the goitre could be correlated with the degree of inbreeding adopted. In addition, iodine therapy did not have any beneficial effect whatsoever as has previously been recorded for simple goitre^{3 10 15 18 19 26 41}. In fact, when affected animals were treated by the administration of iodine, their condition deteriorated and evidence of chronic iodine poisoning became evident in some of them.

This form of inherited congenital goitre in Afrikaner cattle is confined to the progeny in first crosses of the du Plessis strain of this breed. It appears to be transmitted by an autosomal recessive trait due to a double dosage of an abnormal allele²⁷. It is possible, however, that one or more modifying factors may influence the severity of the condition and recently much work has been done in order to elucidate some of the responsible and/or contributing factors not only in humans^{12 29-32} but also in cattle^{20-24 35-39}. In the latter species these differ in some respects from those giving rise to any of the metabolic defects causing one or another form of inherited goitre in man³⁵. Similarly an autosomal recessive gene giving rise to dropsical calves in the Ayreshire breed of cattle has been recorded⁴².

It seems reasonable to assume, however, that the results obtained in one species are not necessarily

transferable to another and if one takes into consideration the environment, habits and feed of the various types of the affected individuals, this assumption seems quite feasible. Even in the same country, race and nutrition may influence the incidence of simple goitre!

We diagnosed the inherited condition in these Afrikaner cattle as being a parenchymatous goitre but a colloid goitre has also been encountered in aged, sterile Afrikaner cows in South Africa¹⁴. Hypothyroidism, possibly related to reproductive disorders in Friesian, Ayrshire and Guernsey cattle has also been recorded². Colloid goitre appears rarely in adult horses⁴⁰.

The colour in the majority of adult Afrikaner cattle in affected herds and their progeny ranged from light red to red to dark red, but in 2 herds, in addition, a few "grey" (very pale yellow) individuals were born with or without palpable and visibly enlarged thyroids²⁷. We will confine ourselves to these latter herds.



Fig. 2: Grey heifer with large goitre (C₄9: DOB1812)

HISTORY

This condition was recorded in new-born Afrikaner calves only among 2 herds out of the 34 affected herds in which inherited goitre had been encountered. The defects occurred on 2 widely separated farms in the Transvaal, namely on KA and on TR situated in the Pietersburg and Rustenburg districts respectively. The former outbreak was investigated by one of us (J.W.G.) in February 1954. To our knowledge "grey" or very pale yellow Afrikaner calves with and without goitre were observed in this breed for the first time. All these were the offspring of a particular bull, Bosveld Rooddag 11039/7, which was introduced into the herd at the age

of approximately 3½ years at the end of 1949 and remained as a stud bull for about 7 years.

It was significant that inbreeding had taken place: the sire of each grey calf was also the sire of the calf's dam. Four types of calves, however, occurred among the herd namely red or grey with goitre and red or grey without goitre (Fig. 3). Apparently this bull (C_6A_{gl}) inherited the gene for grey and that for goitre from his maternal (A_32 , see Fig. 4) and paternal (C_6A_{g2}) ancestors respectively. Thus Bosveld Rooidag was heterozygous for both recessive conditions. Before a recessive trait manifests itself, the individual must be homozygous for the abnormal gene⁹. Undoubtedly the cows dropping grey calves with and without goitre, must also have carried both affected genes.

Theoretically it can be demonstrated that these factors segregate according to the Mendelian rules. In one year in a total calf crop of 80 calves there were approximately 5 calves born with goitre, one of which was grey and the other 4 were red. In addition, another 3 calves were grey. The rest of the calves were red. The grey goitrous calves usually die within the first few months of life, as do some of the affected red calves, but some of the latter do grow to maturity (depending on the severity of the defect) but never develop into good animals; they remain stunted and are all culled. This observation is in accordance with the presence of a lethal factor. But this is not necessarily coupled to the gene for light colour as has been suggested⁵.

The age of the cows dropping goitrous calves varied from 3 to 8 years and over. Goitre may appear in the first, second or third calf. A fair number of cows abort but all tests for contagious abortion (brucellosis) proved negative.

During July 1961 a goitrous heifer, Witbok, was encountered in an unregistered grade yellow Afrikaner herd on the farm TR by Dr. J.A. Schutte. It was born during November 1960 and, at the age of 14 months, was presented gratis for experimental purposes to the Director of Veterinary Services, Onderstepoort where it was designated DOB 1812 and died in a coma 4 months later. Apparently it was the first and the only visible affected animal in this herd.

SYMPTOMS

Calves born "grey" retain this extraordinary pigmentation throughout their lives. In some, however, a reddish tinge may develop towards maturity. This pigmentation is so predominant at birth that even the hooves, gums, lips and eyelids appear grey. Owing to a weak constitution the majority of grey calves with enlarged thyroids usually die young but, exceptionally, a severely affected animal, e.g. Witbok (DOB 1812) and a heifer (A_4C_4), may reach the age of 18 months without showing any respiratory disturbance (Fig. 2). On the other hand, severe respiratory distress is sometimes observed in a red calf with a large goitre, e.g. a bull calf (C_625) which died when 10 days old. The goitre remains throughout life but its size apparently varies appreciably. Occasionally in an affected animal, owing to the conformation of its neck, the swelling may be masked to a variable extent. The actual size of the gland seen at autopsy in such animals is usually surprisingly large. The cordlike appearance of both jugular veins below the goitre and the distinct jugular pulse often noticed are significant clinical signs.

There is evidence that the respiratory disturbance and the distension of the jugular veins are not necessarily associated with excessive pressure on the trachea and blood vessels of the neck by a large goitre as is usually assumed. A patient with a relatively small goitre and an insignificant mechanical tracheal stenosis may suffer from marked respiratory and cardiac disturbances¹¹. The cordlike appearance of both jugular veins of our cases could not in all animals be attributed to excessive pressure on these blood vessels, but perithyroidal oedema in some calves at and shortly after birth may be associated with it. We are inclined to believe that the former condition is the result of functional thyroidal disturbances and the so called thyreopathic heart affections ("das Kropfher" and/or "Kropftod")¹¹. Although cattle on both farms have free access to a salt and bonemeal lick, often pica and occasionally alophagia were observed especially among juveniles on the farm KA. A tin causing partial obstruction of the pharynx was removed from a 2-year-old bull, whilst it was being examined for goitre. Fractures of the long bones and mandibles, associated with osteoporosis, were not uncommon, and the growth of teeth appeared to be retarded but they wore quicker than usual. There were, however, no evident signs of chronic fluoride poisoning.

LOCATION OF FARMS AND THEIR VELD CONDITIONS

TR is at the junction of the Matlabas and Limpopo Rivers. The pasture (bushveld) is sweet, whereas that of KA, although being of a good type of mixed grass, is very sour. Apparently the calcium-phosphorous metabolism in the animals is disturbed resulting in the above-mentioned defects. The latter property is situated about 22 miles south-west of Pietersburg at an altitude of approximately 1548 m. It is thus situated in a small highveld area. During the rainy season the grass coverage is lush, but the cattle still show pica. They are not inclined to eat the lick during the summer months.

THE BREEDING PROCEDURE ON THE FARMS TR AND KA

The breeding of the heifer Witbok (C_9A_4) on TR is of interest. Bismarck (C_7A_3), her grandsire, was a great grandson of Makman (C_1A_9) the common ancestor of all animals transmitting goitre. Incidentally Mooidraai (C_2A_2), its granddam, was also great granddam and grandmother of the sire Bosveld Rooidag (C_67). His grandsire Kromkuil Premier 1697/1 (C_6A_1) was the son and at the same time a half brother of his sire Pasop 624 (C_36) who sired his own mother, Mooidraai. The offspring of Bismarck and Mooidraai was Kromkuil Kleinbaas 2nd, 6584/6 (C_8A_6). When bred to a grade cow she dropped the grey heifer with a large goitre (C_9) (Fig. 2). Thus her parents must have been heterozygous for both pathogenic genes; Kromkuil Kleinbaas 2nd inherited the gene for goitre and that for grey from its paternal and maternal ancestors respectively (see Fig. 4: C_1A_9 to A_{12} and C_4A_3). As previously indicated²⁸ the bulls Bosveld Rooidag and Kromkuil Kleinbaas 2nd are relatively closely related. There is no history of contagious abortion in this herd.

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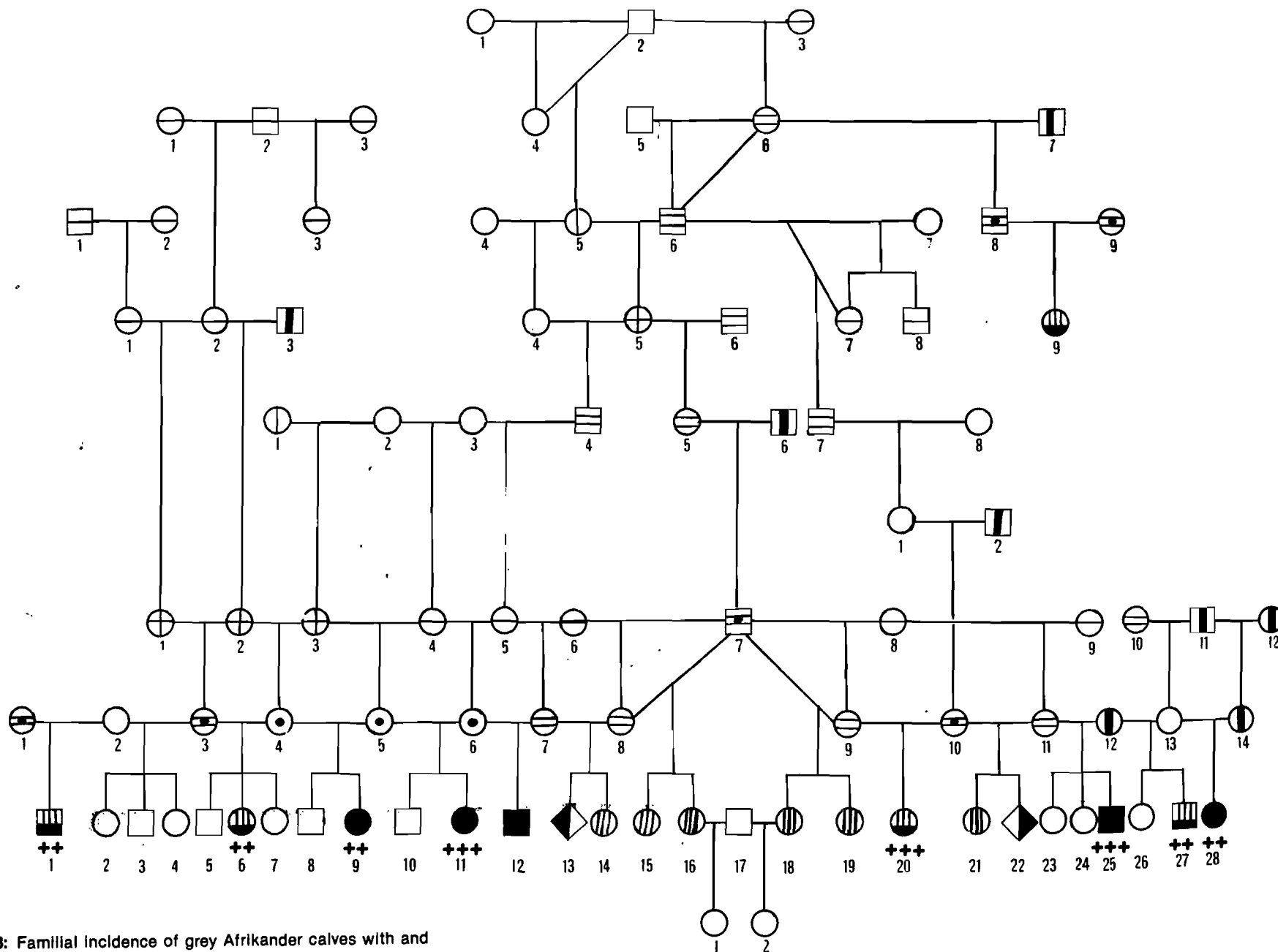


Fig. 3: Familial incidence of grey Afrikaner calves with and without goitre

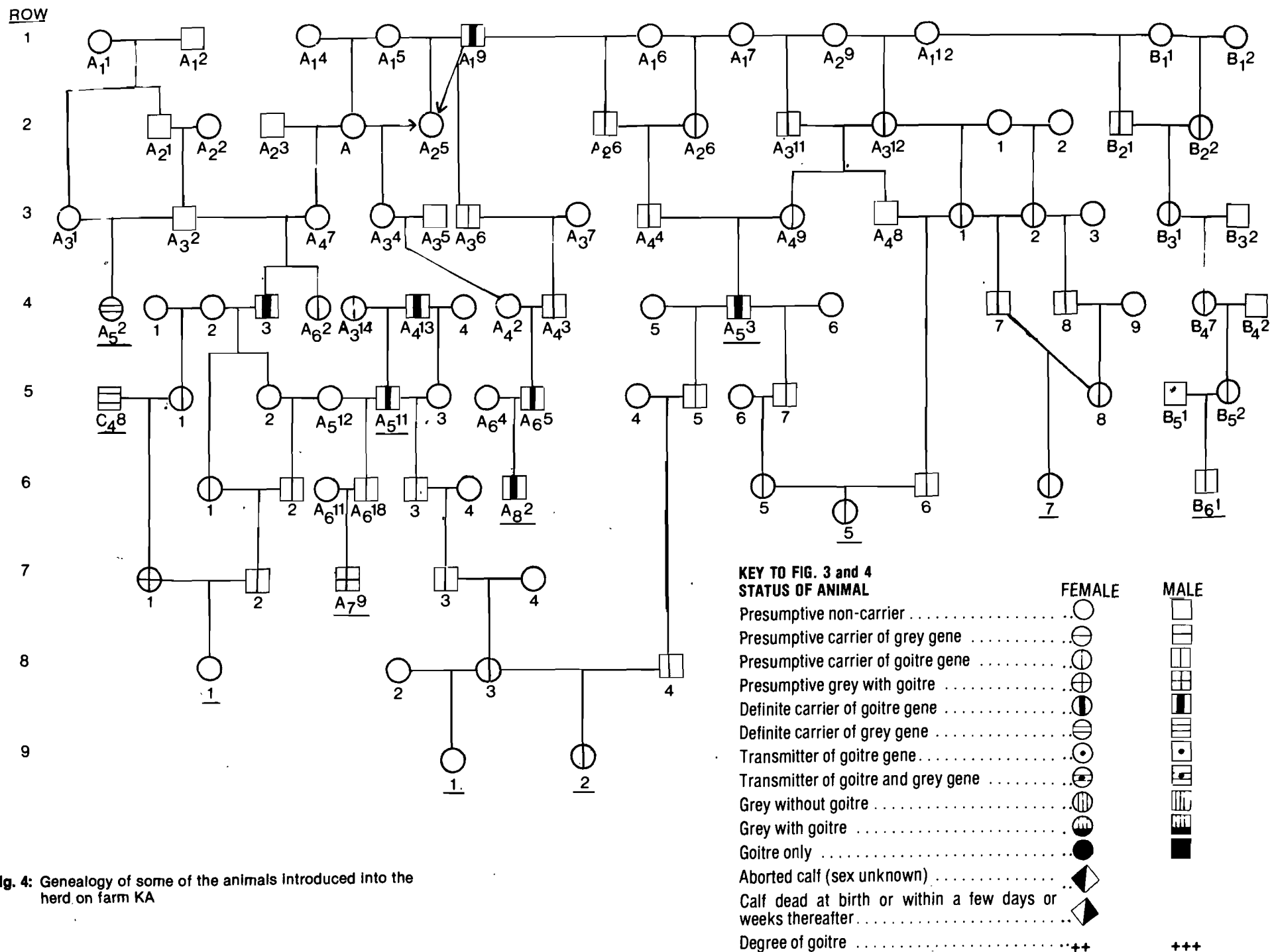


Fig. 4: Genealogy of some of the animals introduced into the herd on farm KA

On KA the breeding procedure is far more complicated and the results obtained differ appreciably from those on the farm TR. Better breeding records were kept on the farm KA.

Prior to 1938 the foundation stock, to our knowledge, did not carry the gene for goitre but presumably that for the grey colour. When these cows were bred to various bulls, Elandskraal Galakweef, Ludlow 81,440 (C₇A₉), Vredehof Seeman (C₆B₉) and Bosveld Rooidag, (C₆A₉1) indicated as A, B, C and D respectively in Table 1, grey and white hair colouring appeared in their offsprings to a variable extent at different anatomical sites, e.g. grey or brindled ("skilder") colour around the muzzle, grey or white hairs in the tail switch, which were occasionally totally grey or white, and a grey or white brisket and underline.

Similar anomalies have been recorded in descendants of other Afrikanders listed in the appendix of several Afrikander Stud Books, e.g. Bosveld Rosyntjie, 6728/4 (C₆2), where the muzzle appears greyish.

As there are no particulars on the breeding of the ancestry of the foundation cows, the origin of the above-mentioned modifications remains obscure. In 19 of these animals the colour of the hair varied from light red (1) to red (13) and to dark red (5) (Table 1).

When Bull D was bred to these and to a number of cows obtained from several breeders during 1949 and 1950 and to his own daughters, their calves, as stated above were of 4 types, namely red or grey with goitre and red or grey without goitre. This is clearly indicated in Fig. 3 in which, for simplicity, the individuals involved are given in numerical order in all the rows. All the grey calves with and without goitre are the offspring of the Bull D. The genealogy of the cows introduced dur-

ing 1950 (Elandskraal and Zwaalfontein) is reflected in Fig. 4. Whether they were presumptive non-carriers or presumptive carriers of the goitre gene became only apparent after they were bred to Bull D, which has been shown to be homozygous for both pathogenic genes: grey and goitre. One of these (C₇5) or (C₇12) when bred to this bull, dropped 2 apparently normal calves (C₈23 & 24) but her third (25) was red, very small with a large goitre. It suffered from severe respiratory distress, dying at the age of 10 days.

In addition, when Bull D was bred for 2 consecutive breeding seasons to one of his and one of Ludlow 81,440 daughters (C₇7), calves (C₈15 & 16) and (C₈18 & 19) were born. On mating an ordinary red Afrikander bull C₈17 with C₈16 and C₈18, their offspring C₉1 and C₉2 were red and unaffected. Thus grey is evidently a recessive character.

Of interest is that the third calf of another unrelated cow (C₈2) was born with a perfect 15 cm long tail. A similar anomaly has been recorded in several cows registered in the appendix of various Afrikander Stud Books, e.g. B/23 Meyer 3.

Incidentally, the cows introduced during 1949 were mainly cousins of the Bull D. Thus partial intense inbreeding was applied, the results of which appear on the left half of Fig. 3 whereas those of moderate inbreeding appear on the right half of the diagram. The former group may be considered a closed community.

CONCLUSION

Our results are in accordance with those formerly recorded^{44,48}.

1. It appears that the activity of the determinants

Table 1: MARKING OF HAIRCOAT OF SOME FOUNDATION AFRIKANDER CATTLE ON FARM K.A.

Cows	Bred to Sires		Offspring		Markings	Bred to Sires		Offspring		Markings	
4 Dr	A	R	Meyer	45	Red	C	R	Hbg	13	Lr, White on brisket	
	B	R	Hbg	35	Red	D	R		3	R	
			56	R. wh hairs switch	C	R		150	??		
			89	R. grey switch	C			8	R		
5 Dr		B		30	R. gr hrs in switch	D			41	R, wh on sw & bris	
6 Dr		A	Mey	31	R	---		---		95	R, sitly smoky muzzle
7 Dr		C	Hbg	1	Lr wh hrs in switch	C		---		59	??
8 R		A	Mey	27	R. grey switch	---		---		---	---
		A		30	R	---		---		---	---
				48	R. gr. brisk & underl	D		58 & 63		---	??
		C	Hbg	55	R. wh hairs in switch	---		---		---	---
12 R		C		44	R. wh underline	D				65	??
		B		54	Lr. gr hrs in switch	D				164	??
17 Dr		C		38	R.	C				14	R. greyish muzzle
						D				119	R. white mark brisket
		B		51	R both grey hairs in	C				61	??
				93	R switch	C		19 & 96		Both R.	
						D				53	??
18 Lr		A	Mey	22	R. wh. underline	C				39	R.
			Hbg	39	see above	D				49	??
62 Dr		A	Mey	37	R. grey nostril	C				18	R.
						D				68	??
			Hbg	18	see above	C				33	R.
68 Dr		A	Mey	28	R.	B				34	R. gr hrs switch C91:R
						C				40	R
		B	Mey	87	R. white switch	C				2	R wh hairs switch
			Hbg	2	see above	C				10	R wh patch on brisket

Sires: A & B presumptive carriers of grey. C carrier of gene for goitre only. D transmitter of genes for grey and goitre.

Colour: Dr = dark red, R = red, Lr = light red. wh hrs = white hairs, gr hrs = grey hairs, bris = brisket, ?? = colour not recorded.

--- = Offspring not registered.

responsible for heterozygous modifications often are either confined to a spot/s or widely distributed and thus, for instance, determining the animal's primary colour.

2. A "carrier" sire of an undesirable factor/s often may, by the excellence of its parents or his success in the showing, be mated to a considerable number of "carrier" cows. This results in a variable number of young stock exhibiting the undesirable trait/s.* If these individuals are interbred, several combinations of factors may occur giving rise to several new variations.

The following points of interest may be mentioned: The bull Bosveld Rooidag (D) is a half-brother of Bosveld Kuruman, 11036/7 (A₂). Both had the same father (C₅A₂) but different dams. That of the latter definitely did not carry the gene for grey. Bosveld Kuruman when bred to a number of Bosveld cows was responsible for goitre among red new-born calves on the farm HD, Pietersburg District in 1951. It is situated about 36 km south west of KA. Bosveld Kuruman, is a transmitter of the goitre only, whereas Bosveld Rooidag, as has been shown, was a definite carrier of both grey and goitre genes.

Mara Diep Damascus, 10199/7 is a carrier and transmitter of the gene responsible for goitre among the herd on the farm M. His paternal and maternal grandparents are B. de la Rey 83/19 (C₅A₁₁):A₅10 and Bismarck 574/22 (C₄A₃):A₅5 respectively. Although both sires are homozygous for the goitre gene, it seems that he received the pathogenic gene from the latter pair, either from the sire, a known transmitter of the trait, or the cow being a presumptive carrier of the affected gene.

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REFERENCES

1. ABBOTT A C 1932 Simple goitre. Its racial incidence and relationship to nutrition: Part III. Canadian Medical Association Journal 27: 314-317
2. ALLCROFT R, SCARNELL J C, HIGNET L 1954 A preliminary report on hypothyroidism in cattle and its possible relationship with reproductive disorders. Veterinary Record 66: 367-371
3. ANDREWS F N, SHREWSBURY C L, HARPER C, VESTEL C M, DOYLE L P 1948 Iodine in sheep and swine. Journal of Animal Science 7:298-310
4. COLE L C, JOHANSON I 1948 Inheritance in crosses of Jersey and Holstein-Friesian with Aberdeen-Angus Cattle. II. Color and white spotting. American Naturalist 82: 202-233
5. DUNKER H 1924 Einige Beobachtungen über die Vererbung der weissen Farbe bei Kanarienvögeln.
6. DÜRST J U 1931 Die endokrinen Drüsen des Rindes a) Die Schilddrüse. Grundlagen der Rinderzucht: J. Springer, Berlin 204-222
7. FUHRMANN N, VOGEL F 1968 Genetische Familienberatung. Heidelberger Taschenbücher. Springer-Verlag, Heidelberg
8. GOLDSCHMIDT R 1928 Die Dominanzregel. Reine und unvollkommene Dominanz. usw. Siebente Vorlesung. Einführung in die Vererbungswissenschaft 5te Auflage, Springer-Verlag, Berlin: 149-179
9. HEREDITY AND DISEASE 1963 Therapeutic Notes. In: A medical journal published by Parke, Davis and Co. 70E: 36-41
10. KALKUS J W 1920 A study of goitre and associated conditions in domestic animals. Washington Agricultural Experimental Station Bulletin 156: 1-48
11. KITT T 1921 Funktionsstörungen der Schilddrüse, Epithelkörperchen und Thymus. Allgemeine Pathologie für Tierärzte. V. Aufl. Stuttgart. Verlag Ferdinand Enke
12. KLEIN E 1960 Über die Heredität von Schilddrüsenkrankheiten. Deutsche Med. Wochenschrift 85: 314-322
13. KRONACHER C 1927 Die Inzucht. Die Züchtung. Allgemeine Tierzucht IV Abt. Dritte Aufl. Verlag Paul Parey, Berlin: 74-135
14. LOUW G N, GREY J H 1926 The occurrence of colloid goitre among Afrikaner Cattle in the Potchefstroom District. Proceedings of the South African Society of Animal Production, Pretoria 1: 74-75
15. MADSON L L 1942 Keeping livestock healthy. Yearbook of Agriculture, U.S. Govt. Printing Office, Washington D.C.
16. MATHEWS A, THOMAS A D 1935 Goitre in Afrikaner calves. Journal of the South African Veterinary Medical Association 6: 128-132
17. MEYER H, WEGNER W Vererbung und Krankheit bei Haustieren. Verlag M.u.H. Schafer, Hannover
18. MITCHEL J A 1929 The cause and prevention of simple goitre. Report of the Secretary for Public Health, Chief Health Officer, Pretoria, 1 July 1929.
19. ORR J B, LEITCH I 1930 Iodine in practical agriculture. International Review of Agriculture Pt. I—Monthly Bulletin of Agricultural Science and Practice No 6
20. PAMMENTER M, ALBRECHT C, LIEBENBERG N v d W, VAN JAARSVELD P 1978. Afrikaner cattle congenital goiter: Characteristics of its morphology and iodoprotein pattern. Endocrinology 102: 954-965
21. PAMMENTER M, BESTER A, ALBRECHT C, VAN JAARSVELD P 1979 Afrikaner cattle congenital goiter: Characteristics of the defensive 19S thyroglobulin synthesis. Endocrinology 104: 1853-1861
22. RAC R, PAIN R W, VAN ZYL A, VAN DER WALT B J, PAMMENTER M, ALBRECHT C F, VAN JAARSVELD P P, VAN DYK J E, DE VYLDER J J M, VAN VOORTHUIZEN W F, BELSHAW B E, and TEGELAERS W H H. 1979 Congenital Goiter. In: Spontaneous Animal Models of Human Disease. Eds: EDWIN J. ANDREWS, B.C. WARD, N.A.H. ALTMAN. Academic Press, New York
23. REEVE E C R, GOWER J C When selection acts against homozygosity at one or more loci. Biochemical Genetics Pergamon Press, London: 24-34
24. ROBBINS J, VAN ZYL A, VAN DER WALT K 1966 Abnormal thyroglobulin in congenital goiter of cattle. Endocrinology 78: 1213-1223
25. SCHELDON C, SUMMER M D The thyroid gland, Ed J M B Bloodworth Endocrine Pathology Genetical and Surgical. 2nd Edn Williams and Williams, Baltimore
26. SCHLUMBERGER H G 1955 Spontaneous goitre and cancer of the thyroid in animals. The Ohio Journal of Science 55: 23-43
27. SCHULZ K C A 1962 The inheritance of the susceptibility of congenital goitre in Afrikaner cattle in South Africa. Verrigtinge van die Tweede Kongres van die Suid-Afrikaanse Genetiese Vereniging, 1-4 Oktober, Pretoria: 90-93
28. SCHULZ K C A 1982 Genetically Determined Goitre and "Grey" Colour in Afrikaner calves. 22nd Annual Congress of the South African Society of Pathologists: 74
29. STANBURY J B 1963 The metabolic errors in certain types of familial goitre. Recent Progress in Hormone Research 19: 547
30. STANBURY J B 1966 Familial goitre. In: Stanbury J B, Fredrikson D S (ed.) The Metabolic Basis of Inherited Diseases 2nd edn: 215-237
31. STANBURY J B 1967 Iodothyronine synthesis and the so-called "coupling defect" in familial goitre. In: S G Spickett Cambridge (ed.) Endocrine Genetics University Press, Cambridge: 107
32. STANBURY J B 1974 Inborn errors of the thyroid. Progress in Medical Genetics 10: 55
33. STEYN D G, SUNKEL W 1954 Goitre in animals in the Union of South Africa. Journal of the South African Medical Association 25: 9-18
34. STEYN D G 1955 Endemic goitre in the Union of South African, Department of Nutrition
35. VAN JAARSVELD P P, ALBRECHT C F, THERON C N, VAN ZYL A 1976 The biosynthesis of thyroid hormones. South African Journal of Medical Science Quarterly 41: 165-189
36. VAN JAARSVELD P P, SENA L, VAN DER WALT B, VAN ZYL A 1971 Abnormal Iodoproteins in a Congenital Bovine Goitre. Further Advances in Thyroid Research. Ed. Fellingner K & Hofner R Separatum. Verl. Wien. Med. Akad: 465-479
37. VAN ZYL A, SCHULZ K, WILSON B, PANSENGROUW D 1964 Genetically determined goitre in cattle. South African Medical Journal 38: 155

38. VAN ZYL A, SCHULZ K, WILSON B, PANSEGROUW D 1965 Thyroidal iodine and enzymatic defects in cattle with congenital goitre. *Endocrinology* 76: 353-361
39. VAN ZYL A, VAN DER WALT B, VAN DER WALT K, HOBINS J 1969 Thyroidal iodoproteins in congenital goitre. *South African Journal of Laboratory and Clinical Medicine* 15: 100-111
40. VENZKE W G, MANASMITH C H 1940 Colloid goitre and its incidence among adult horses. *Veterinary Student* 3: 23-24
41. WELCH H 1928 Goitre in farm animals. *Montana Agricultural Experimental Station Bulletin* 214: 1-29.
42. WIENER G 1953 Breed structure in the pedigree Ayrshire cattle population in Great Britain. *Journal of Agricultural Science* 43: 123-130
43. WIERTS G 1953 Schildklieronderzoek by nuchtere kalveren uit verschillende delen van Nederland. Proefschrift. H Veeman en Zonen-Wageningen
44. WIESMANN A 1933 Vorträge über Deszendenztheorie. Dritte Aufl. Verlag G Fischer, Jena

ABSTRACTS

ABSTRACT: Norval, R.A.I., Walker, Jane B. & Colborne, J., 1982. The ecology of *Rhipicephalus zambeziensis* and *Rhipicephalus appendiculatus* (Acarina, Ixodidae) with particular reference to Zimbabwe. *Onderstepoort Journal of Veterinary Research*, 49, 181-190 (1982)

R. zambeziensis, like *R. appendiculatus*, is primarily a parasite of domestic and wild herbivores, and sometimes carnivores. Both species occur in parts of east, central and southern Africa, but they are not as a rule sympatric. In general, *R. zambeziensis* occurs in hotter, drier areas than does *R. appendiculatus*, especially along some of the great river valleys. In Zimbabwe, *R. zambeziensis* is largely restricted to the northern, north-western and southern parts of the country, whereas *R. appendiculatus*, is widely distributed in the eastern and southern areas.

ABSTRACT: Clifford, C.M., Walker, Jane B. & Keirans, J.E., 1983. Clarification of the status of *Rhipicephalus kochi* Dönitz, 1905 (Ixodoidea, Ixodidae). *Onderstepoort Journal of Veterinary Research*, 50, 77-89 (1983).

Figures of the types of *Rhipicephalus kochi*, and of its synonym *Rhipicephalus neavei* Warburton, 1912, are presented. These are accompanied by complete descriptions of all stages of *R. kochi*, illustrated with scanning electron microscope photographs. The basic difference between this species, *Rhipicephalus pravus* Dönitz, 1910 and *Rhipicephalus punctatus* Warburton, 1912 are outlined.

R. kochi occurs south of the Equator in parts of eastern, central and southern Africa. Its adults feed most commonly on cattle, various antelopes and wild pigs, and on hares. Little is known about the hosts of the immature stages; nymphs have been recorded in a field collection once only, from *Petrodromus tetradactylus*, the 4-toed elephant shrew.

BOOK REVIEW

BOEKRESENSIE

ECONOMIC ASPECTS OF COMMUNICABLE DISEASES

EURO REPORTS AND STUDIES 68
Report on a WHO working group.

Regional Office for Europe, World Health Organization, Copenhagen, 1982 pp 35, Tabs 1, Annexures 2, Price Sw fr 4

This booklet contains the report of a Working Group on the Economic Aspects of Communicable Diseases held in Trier from 21 to 23 September 1981.

Health economics has emerged as a new discipline and is now widely recognized as having an essential part to play in the planning and delivery of health services. The assessment of disease costs and the evaluation of control procedures can act as a valuable stimulus to the selection of effective and economical health policies. Communicable diseases contribute suitable subjects for economic appraisal.

This report deals briefly with the economic aspects of viral hepatitis, salmonellosis, rabies and nosocomial infections. Although the text relates mainly to human health, it is interesting to note that 2 of the 4 conditions considered by the Working Group are zoonotic in nature. In relation to the economic aspects of communicable diseases, the study deals with economic costs, costs and benefits, evaluation of control programmes, training and education in economic methods and areas for future research. It is significant that the Working Group refers to the use of dynamic epidemiological models in disease control programmes. From the economic viewpoint a major

characteristic of an epidemiological model is that it indicates action or intervention points in the chain of infection, at which specific measures of prevention or treatment can be applied. As a result alternative strategies in intervention can be modelled and simulated in terms of their feasibility, effectiveness and cost. The Working Group emphasizes two main points. Firstly, with the development and application of increasingly complex scientific techniques, there is a growing need for a multidisciplinary approach at all levels in health service planning, delivery and research. Secondly, in most countries there is no established or routine means for health professionals and scientists to receive a basic training in economic methods. In some respects the gap between the disciplines of clinical medicine, epidemiology and economics is closing but is still too large.

Although this booklet does not deal with the economic aspects of communicable diseases in detail, the material presented makes the booklet suitable background reading for health professionals, and especially those interested in epidemiology and preventive medicine.

G.V. Turner

A REPORT ON THE CONSUMPTION, COMPOSITION AND NUTRITIONAL ADEQUACY OF A MIXTURE OF LUSH GREEN PERENNIAL RYEGRASS (*LOLIUM PERENNE*) AND COCKSFOOT (*DACTYLIS GLOMERATA*) FED AD LIBITUM TO THOROUGHBRED MARES

C.H.B. MARLOW*, E.M. VAN TONDER**, F.C. HAYWARD***, SOPHIA S. VAN DER MERWE*** and L.E.G. PRICE****

ABSTRACT: Marlow C.H.B.; Van Tonder E.M.; Hayward F.C.; Van der Merwe S.S.; Price L.E.G. A report on the consumption, composition and nutritional adequacy of a mixture of lush green perennial ryegrass (*Lolium perenne*) and cocksfoot (*Dactylis glomerata*) fed ad libitum to Thoroughbred mares. *Journal of the South African Veterinary Association* (1983) 54 No. 3, 155-157 (En). 21 Cypress Street, P.O. Box 138, 5880 Cradock, Republic of South Africa.

Non-pregnant Thoroughbred mares were stabled and subjected to 2 trials, each 24 h in duration, to establish their total consumption of a mixture of freshly cut, lush green perennial ryegrass (*Lolium perenne*) and cocksfoot (*Dactylis glomerata*) in approximately equal proportions; and to compare the total intake of crude protein, calcium, phosphorus and mass of the grass mixture on a dry matter basis with their daily nutritional requirements. The body mass of each mare was calculated at the commencement of each trial. In the first trial 2 lactating mares with foals at foot, 65 days and 8 days of age, and one mature non-lactating mare, consumed 75,5 kg, 61,0 kg and 39,5 kg of the grass mixture, cut in the early vegetative stage, respectively. The perennial ryegrass (*L. perenne*) contained 79,63 % moisture, 1,67 % crude protein, 0,75 % calcium, 0,057% phosphorus and 20,37 % dry matter. The cocksfoot (*D. glomerata*) contained 79,52 % moisture, 2,27 % crude protein, 0,051 % calcium, 0,061% phosphorus and 20,48 % dry matter. The younger foal did not eat the grass mixture. The mass of grass mixture consumed by the older foal was not determined. In the second trial conducted 3 weeks later, when oat straw (*Avena sativa*) was also fed ad libitum, the same lactating mares, but a different mature non-lactating mare, consumed 54,5 kg, 56,0 kg and 40,5 kg of the grass mixture, cut in the mid bloom stage, respectively. The perennial ryegrass (*L. perenne*) contained 70,03 % moisture, 2,37 % crude protein, 0,086 % calcium, 0,068% phosphorus and 29,97 % dry matter. The cocksfoot (*D. glomerata*) contained 71,18 % moisture, 2,51 % crude protein, 0,069 % calcium, 0,089% phosphorus and 28,82 % dry matter. Oat straw (*A. sativa*) was consumed by both the lactating mares but not by the non-lactating mare. Both foals consumed an undetermined mass of grass mixture and oat straw. In both trials the grass mixture consumed failed to meet the daily nutritional requirements of the lactating mares for maintenance and production in respect of crude protein and calcium. In both trials the grass mixture consumed by the non-lactating mares met their daily nutritional requirements for maintenance in respect of crude protein, calcium, phosphorus and total feed on a dry matter basis.

Key words: Lush green grass, composition, Thoroughbred mares, consumption, nutritional adequacy.

INTRODUCTION

In the Eastern Cape Province, Thoroughbred mares remain at pasture throughout the year and are only stabled immediately prior to, and for the first few nights after foaling. Extensive use is made of irrigated and dryland pastures which consist of oats (*Avena sativa*), lucerne (*Medicago sativa*), various grasses, either individually or mixed, and grass/lucerne combinations. Areas of natural vegetation, predominantly rooigras (*Themeda triandra*), are included in the majority of the paddocks. Daily dietary supplementation in the form of hay and/or concentrates may or may not take place.

The investigation was conducted because mares with young foals at foot, maintained on lush green grass pasture without dietary supplementation, had been observed to keep the natural vegetation very short and to avidly consume dry grass and lucerne hay whenever available. They often lost condition and generally failed to thrive. These observations did not pertain to non-lactating mares maintained under similar conditions.

MATERIALS AND METHODS

Experimental procedures

Experiment 1

Three non-pregnant Thoroughbred mares, Mare A with a foal 65 days of age at foot, Mare B with a foal 8 days

old and Mare C, mature and non-lactating, were selected. Prior to this trial, the lactating mares had been running on a very lush green mixed perennial ryegrass (*Lolium perenne*) and cocksfoot (*Dactylis glomerata*) pasture in the early vegetative stage³. After teasing each day for signs of oestrus, the mares were stabled for 2 h and received 4 kg commercial cube (East Cape Agricultural Co-operative Ltd, Queenstown) and oat straw ad lib. The non-lactating mare had been maintained on dryland oats and natural vegetation without dietary supplementation.

At 10h00 on the day of this trial, the mares with their foals, and the non-lactating mare, were stabled separately. The body mass of each mare was calculated² and recorded. Fresh water was supplied. During the following 24 h a mixture of freshly cut, very lush, non-grazed perennial ryegrass and cocksfoot in the early vegetative stage³ and in approximately equal proportions, to which the foals also had access, was offered ad lib. At regular intervals, not exceeding 3 h in duration, all uneaten material was removed and replaced with a freshly cut supply of the grass mixture. The mass of feed offered to each mare at the beginning of the trial and at each replenishment, the mass removed at each replenishment and remaining at the end of the trial, was recorded. Total consumption for each stable was calculated. At 16h00 on the day of this trial, samples of the perennial ryegrass and cocksfoot used in the experiment were cut, sealed separately in plastic bags, kept cool and submitted for analysis by 09h00 the following morning.

Experiment 2

The procedures followed in the first experiment were repeated 3 weeks later with the following adaptations:

Mare A's foal was 86 days old and Mare B's foal was

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29 days old. A different mature non-lactating mare, Mare D, was selected. The grass mixture, taken from the same paddock, was in the mid bloom stage³.

Oat straw was offered ad lib. The mass consumed in each stable was calculated and a sample submitted for analysis.

Analytical methods

1. Preparation of samples

Freshly cut grass samples were immediately sealed in plastic bags. The oat straw was sealed in paper bags. On arrival at the laboratory samples were weighed, placed in paper bags and dried in an electric oven at 60°C for approximately 60 h. The samples were then exposed to atmospheric conditions for 24 h and re-weighed to obtain the weight on an air dried basis. After milling in a stainless steel laboratory mill, the moisture content was determined by drying at 103°C to constant mass. At the same time samples were taken for determination of crude protein, calcium and phosphorus.

2. Chemical analysis

Crude protein (N x 6,25) was determined by the conventional Kjeldahl method.

Calcium was determined by means of atomic absorption spectro-photometry.

Phosphorus was determined according to the method of Hanson¹.

RESULTS

The body mass of each mare and the mass of feeds consumed during the experimental procedures are summarized in Table 1. During Experiment 1 Mare A's foal consumed an undetermined mass of the grass mixture. During Experiment 2 both foals consumed an undetermined mass of the grass mixture and oat straw. Expressed as a percentage of body mass, the non-lactating mares consumed less of the grass mixture than the lactating mares. During Experiment 2 the non-lactating mare did not consume oat straw. None of the mares showed any signs of restlessness during the trials.

The composition of the feeds, on a natural and a dry matter basis, offered during the trials, are summarized in Table 2. The moisture content of the grasses in the early vegetative stage and the mid bloom stage were approximately 80 % and approximately 70 % respectively. The crude protein content of the cocksfoot was higher than that of the perennial ryegrass. The calcium:phosphorus ratio of the perennial ryegrass was 1,3:1 whereas the ratio for cocksfoot was 0,8:1.

The total mass of dry matter, crude protein, calcium and phosphorus contained in the feeds consumed, are summarized in Table 3. For the ease of comparison, the daily requirements of these nutrients for maintenance and production, as given by The National Research Council², are presented in Table 4.

Table 1: THE MASS OF VERY LUSH GREEN GRASS AND OAT STRAW CONSUMED BY THOROUGHBRED MARES WHEN STABLED FOR 24 h AND FED AD LIB.

	Mare		Mixture of very lush perennial ryegrass and cocksfoot				Oats	
			Early vegetative stage		Mid bloom stage		Consumption	
	Identification	Body mass kg	Consumption		Consumption			
			kg	% of body mass	kg	% of body mass	kg	% of body mass
Experiment 1	A	619	75,5*	12,2*				
	B	522	61,0	11,7				
	C	540	39,5	7,3				
Experiment 2	A	648			54,5*	8,4*	1,0*	0,15*
	B	547			56,0*	10,2*	4,0*	0,73*
	D	527			40,5	7,7	0	0

*Includes feed consumed by foal

Table 2: THE COMPOSITION OF THE FEEDS CONSUMED ON A NATURAL AND A DRY MATTER BASIS

Name	Description	Composition				
		Moisture %	Crude protein %	Calcium %	Phosphorus %	Calcium: phosphorus ratio
Perennial ryegrass	Very lush, early vegetative stage	79,63	1,67	0,075	0,057	1,32 : 1
Cocksfoot	Very lush, early vegetative stage	79,52	2,27	0,051	0,061	0,83 : 1
Perennial ryegrass	Very lush, mid bloom stage	70,03	2,36	0,086	0,068	1,26 : 1
Cocksfoot	Very lush, mid bloom stage	71,18	2,51	0,069	0,089	0,77 : 1
Oats	Straw, mature	4,40	2,27	0,172	0,095	1,8 : 1
		0	2,38	0,18	0,10	

Table 3: TOTAL DRY MATTER, CRUDE PROTEIN, CALCIUM AND PHOSPHORUS INTAKE IN 24 h

	Mare		Feed intake							
	Identifica- tion	Body mass kg	Grass mixture kg	Oat straw kg	Total mass kg	Moisture kg	Dry matter kg	Crude protein kg	Calcium g	Phos- phorus g
Experiment 1	A	619	75,5*	Not fed	75,5*	60,1	15,4	1,48	48	45
	B	522	61,0	Not fed	61,0	48,5	12,5	1,26	39	36
	C	540	39,5	Not fed	39,5	31,4	8,1	0,78	25	23
Experiment 2	A	648	54,5*	1,0*	55,5*	38,5	16,0	1,33	43	43
						0,1	1,0	0,02	Trace	Trace
	B	547	56,0*	4,0*	60,0*	38,6	17,0	1,35	43	43
						39,5	16,5	1,36	44	44
	D	527	40,5	0	40,5	0,2	3,8	0,09	Trace	Trace
						39,7	20,3	1,45	44	44
						28,6	11,9	0,98	32	32
						—	—	—	—	—
						28,6	11,9	0,98	32	32

*Includes feed consumed by foal

Table 4: DAILY NUTRIENT REQUIREMENTS OF HORSES – DAILY FEED, CRUDE PROTEIN, CALCIUM AND PHOSPHORUS*

	Body mass kg	Daily gain kg	Daily feed* kg	Crude protein kg	Cal- cium g	Phos- phorus g
Mature horses, maintenance	500	0	7,45	0,63	23	14
Mature horses, maintenance	600	0	8,50	0,73	27	17
Lactating mare, first 3 months (15 kg milk per day)	500	0	10,10	1,36	50	34
Lactating mare, first 3 months (18 kg milk per day)	600	0	11,80	1,60	60	40

*The National Research Council. Nutrient Requirements of Domestic Animals No. 6 Nutrient Requirements of Horses 4th revised edn, 1978

*Dry matter basis.

DISCUSSION

Cursory perusal of Table 4 shows that for maintenance of body mass, the daily nutritional requirements of mares producing 15 kg and 18 kg milk per day during early lactation, markedly exceed those of non-lactating mares.

Although Mare B consumed 61,0 kg of the grass mixture, equivalent to 11,7 % of her body mass, during Experiment 1; the total crude protein and calcium contained in the feed failed to satisfy her daily nutritional requirements. In addition, the undetermined mass of feed consumed by Mare A's foal in both experiments aggravated both the crude protein and calcium deficiencies already present and could possibly have resulted in marginal to inadequate phosphorus intake. In the case of Mare B in Experiment 2, total crude protein adequacy was made possible by the consumption of 4,0 kg oat straw that only contained 2,38 % crude protein on a dry matter basis but 2,27 % crude protein on a natural basis. Here, the feed consumed by the foal would not only aggravate the calcium deficiency; but could also result in marginal to inadequate crude protein and phosphorus intake.

In Experiment 1, where the mass of grass mixture consumed by the non-lactating mare was equivalent to 7,3 % of her body mass, total dry matter and calcium intake only satisfied her daily nutritional requirements marginally. However, in Experiment 2, where the mass of grass mixture consumed by the non-lactating mare was equivalent to 7,7 % of her body mass, an increase of only 0,3 %, the total intake of dry matter, crude protein, calcium and phosphorus easily satisfied her daily requirements for maintenance, primarily due to a decrease of 10 % in the moisture content of the grass mixture.

The unexpected and unsatisfactory calcium: phosphorus ratio found in the cocksfoot renders this pasture unsuitable as a total diet for horses on this property and warrants further investigation.

The data obtained in these experiments indicate that, due to the high moisture content found in very lush green grass pastures, Thoroughbred mares with young foals at foot, grazing these pastures without dietary supplementation, may not be able to consume a sufficient mass of material to satisfy their nutritional requirements of maintenance and production, without even taking an increase in body mass into consideration. These findings not only indicate the necessity of dietary supplementation in the form of high quality hay and/or concentrates, but also explain why Thoroughbred mares with young foals at foot, maintained on lush green grass pastures only, keep the natural vegetation very short, avidly consume any dry grass or lucerne hay whenever available, often lose condition and generally fail to thrive. Furthermore, the fact that these observations do not pertain to non-lactating mares, is also explained.

ACKNOWLEDGEMENTS

The Director of Agriculture Research Institute of the Karoo Region is thanked for making facilities available for the analytical work.

REFERENCES

1. HANSON W C 1950 The photometric determination of phosphorus in fertilisers using the phospho-vanado-molybdate complex. *Journal of the Science of Food in Agriculture* 1: 172–173
2. LITTLEJOHN A 1972 Estimating the weight of horses. *Veterinary Clinician* No. 11:27
3. National Academy of Sciences 1978 In: *Nutrient Requirements of Domestic Animals No. 6 Nutrient Requirements of Horses* 4th revised edn, Washington, D.C.: 15–28

ABSTRACTS

ABSTRACT: Kellerman, T. S., Coetzer, J.A.W., Schneider, D.J. & Welman, Wilhelmina G., (1983). **Photosensitivity in South Africa. III. Ovine hepatogenous photosensitivity caused by the plant *Athanasia trifurcata* L. (Asteraceae).** *Onderstepoort Journal of Veterinary Research*, 50, 45-53 (1983)

Hepatogenous photosensitivity was experimentally induced in 1 out of 4 sheep dosed with milled *Athanasia trifurcata*. This is an unpalatable aromatic shrub commonly found along the south-western and south-eastern Cape coast on overgrazed, recently burnt or disturbed veld, up to an altitude of 1 300 m. The liver lesions ranged from a few small multifocal areas of necrosis in 1 animal to various zonal patterns of necrosis (centrizonal midzonal and peripheral) in each of the other 3. Botanical, toxicological and clinical data are given.

ABSTRACT: Coetzer, J.A.W. & Bergh, T., 1983. **Photosensitivity in South Africa. IV. Pathological changes in the liver in ovine photosensitivity caused by the plant *Asaemia axillaris* (Thunb.) Harv. Ex Jackson.** *Onderstepoort Journal of Veterinary Research*, 50, 55-58 (1983).

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

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

The liver lesions are compared with those of previously reported experimental cases of *A. axillaris* poisoning in sheep. The significance of zonal necrosis and factors that may have a bearing on their production in different hepatotoxic plant poisonings in sheep and cattle in South Africa are discussed.

ABSTRACT: Coetzer, J.A.W., Kellerman, T.S., Sadler, W. & Bath, F., 1983. **Photosensitivity in South Africa: V. A comparative study of the ovine hepatogenous photosensitivity diseases, facial eczema and geeldikkop (*Tribulosis ovis*), with special reference to their pathogenesis.** *Onderstepoort Journal of Veterinary Research*, 50, 59-71 (1983).

The subject of this study was the pathological and scanning electron microscopical changes in the biliary systems of sheep suffering from facial eczema or geeldikkop (*Tribulosis ovis*), or made photosensitive by ligation of the common bile duct. While an obliterative cholangitis is responsible for the retention of phyloerythrin in facial eczema, the occlusion of the bile ducts with crystalloid material (microliths) appear to perform a similar function in geeldikkop. The similarities and differences between the 2 diseases in the light of their pathogenetic mechanisms.

ABSTRACT: Bastianello, Stella S., 1982. **A survey on neoplasia in domestic species over a 40-year period from 1935 to 1974 in the Republic of South Africa. I. Tumours occurring in cattle.** *Onderstepoort Journal of Veterinary Research*, 49, 195-204 (1982).

A survey was carried out on all the bovine neoplasms recorded in the registration files of the Section of Pathology of the Veterinary Research Institute, Onderstepoort, Republic of South Africa, over a 40-year period from 1935 to 1974. The 606 neoplasms were divided and tabulated into 20 groups according to body systems or tissue types.

Skin, connective tissue, lymphoid tissue and ocular tumours in that order accounted for the majority of neoplasms. Squamous cell carcinoma was the most frequent neoplasm and the 2 main sites for it were the eye and the vulva. Fibromas and fibrosarcomas made up the majority of the connective tissue tumours. The lymphoid tissue tumours, composed almost entirely of lymphosarcomas, were the 3rd most common group of tumours. Penile fibropapillomas and cutaneous papillomas were commonly encountered, and there was also a noteworthy incidence of melanomas, mesotheliomas and neurofibromas. The male and female genital tracts were relatively frequently neoplastic, due principally to the occurrence of penile fibropapillomas, vulvar squamous cell carcinomas and uterine carcinomas. The incidence of respiratory, hepatic and vascular system tumours was moderate, whilst tumours of the endocrine, central nervous, skeletal and muscular systems were rarely encountered.

ABSTRACT: Bastianello, Stella S., 1982. **A survey on neoplasia in domestic species over a 40-year period from 1935 to 1974 in the Republic of South Africa. II. Tumours occurring in sheep.** *Onderstepoort Journal of Veterinary Research*, 49, 205-209 (1982).

A survey was carried out on all ovine neoplasms recorded in the registration files of the Section of Pathology of the Veterinary Research Institute at Onderstepoort over a 40-year period from 1935 to 1974. The neoplasms were divided and tabulated into 8 groups according to body systems or tissue types.

Out of a total of 673 neoplasms, 436 (64,8%) were cases of jaagsiekte (pulmonary adenomatosis). Of the remaining 237 neoplasms, 41,3% involved the skin. Eighty per cent of the cutaneous neoplasms were squamous cell carcinomas which varied from well-differentiated to anaplastic. The majority occurred on the head, in particular on the ears, frontal region and on the eyelids or nictitating membrane. Several factors have been suggested to explain the high incidence of squamous cell carcinomas on the head.

Lymphosarcomas were the 3rd most commonly encountered tumours, whilst a significant number of hepatocellular carcinomas also occurred. A variety of tumours of connective tissue origin were recorded, the most common of which arose from fibrous tissue and cartilage.

THE CONCEPT OF "PRODUCTIVE ADAPTABILITY" OF DOMESTIC ANIMALS IN TROPICAL AND SUBTROPICAL REGIONS**

P. HORST*

ABSTRACT: Horst P. The concept of "productive adaptability" of domestic animals in tropical and subtropical regions. *Journal of the South African Veterinary Association* (1983) 54 No. 3, 159-164 (En). Institute for Animal Production, Technical University of Berlin, Lentzeallee 75, D-1000 Berlin 33.

The complex trait "productive adaptability" is shown to be a useful parameter for selection work in tropical climates. Characters such as rectal temperature in poultry and hair colour and structure in cattle used as indicators of heat tolerance prove to be of little value. "Productive adaptability" is also genetically more suited for selection procedures.

Our results confirm that body size is a significant indicator of an animal's productive adaptability and that it is a suitable criterion for use in improving the genetic potential of livestock in warm climates.

The special use of major genes in breeding programmes to improve productive adaptability is demonstrated.

Key words: Productive adaptability, heat tolerance, auxiliary measurements, body size, use of major genes.

INTRODUCTION

Scientists working on the field of animal production are faced with a great variety of problems in connection with attempts to develop the use of animals as a source of food and raw materials, as providers of draught power and as exploiters of the world's vast available fodder resources. A further improvement of livestock development strategies in tropical and sub-tropical regions is closely related to successful research in the following areas: production systems and techniques together with their social and economic contexts; feed production and feeding and grazing systems; management procedures and biotechniques; breeding and selection programmes; processing and marketing of animal products.

In tropical animal production, the main constraints are the direct and indirect effects of climatic factors such as high temperature and high relative humidity. These may provoke a general reduction in food intake and thus an imbalance in individual energy, protein and mineral supply to the individual. The resulting decline in productivity cannot be fully compensated for by means of appropriate management, feeding and disease control techniques. This raises the question whether it might be possible to improve the adaptability and productivity of livestock under tropical and subtropical conditions by means of breeding and selection programmes. It has been demonstrated that distinct populations and genotypes differ in their adaptability to heat. A genetical basis for performance under such conditions may thus be assumed.

However, it is still not clear how the investigated traits are related to adaptability and productivity. Differences between breeds have been demonstrated for susceptibility to infestations by ticks and gastrointestinal worms^{22,26}, for rectal temperature²⁷, androgen status^{17,18} and for serum lysozyme activity¹¹. But their modes of inheritance and their relationship to the whole complex of adaptability is still uncertain.

SELECTION FOR PRODUCTIVE ADAPTABILITY

It is here that the concept of "productive adaptability"

may prove useful. This term refers to the ability of animals to maintain their normal bodily functions in stressful situations. As applied by Pirchner¹⁶ to tropical animal production, it means the degree to which individual performance is maintained under the given local conditions. As shown in Fig. 1, productive adaptability may be considered to be related to the components absolute performance potential, response to high temperature and susceptibility to disease. This does not in itself provide a basis for selection procedures, since criteria for these components and their relationship to productive adaptability have not yet been established.

The most important prerequisites for selection parameters are, beside the absence or low magnitude of contrary pleiotropic or linked gene effects, that individual differences in the parameter should be genetically determined i.e. should have high heritability values (h^2), that measurements of the parameter are repeatable (t) and that the traits should be economically significant (w). The extent to which certain traits fulfill these requirements is shown in Table 1.

Table 1: SUITABILITY OF TRAITS FOR SELECTION STRATEGIES

Trait \ Prerequisite	Heritability h^2	Repeatability of measurement t	Economic significance w
Performance in optimum conditions			
a) Reproduction	low	satisfactory	high
b) Production	medium to high	satisfactory	very high
Heat Tolerance*	unknown	low	unknown
Disease Susceptibility*	unknown	low	unknown

*Direct measurement not possible; estimated values are for auxiliary criteria, e.g. respiratory rate, rectal temperature and blood cell characteristics for heat tolerance.

As can be seen, the criteria measured in connection with heat tolerance lack high heritability values; their genetical relationship to parameters of productive adaptability is also uncertain. With regard to response to disease, it must be assumed that, with the possible exception of a few major gene effects such as leucosis in poultry or the halothane reaction in pigs, functional and physiological criteria of disease resistance or tolerance have just as low a degree of heritability as other fitness traits, too. Some of the resulting difficulties with respect

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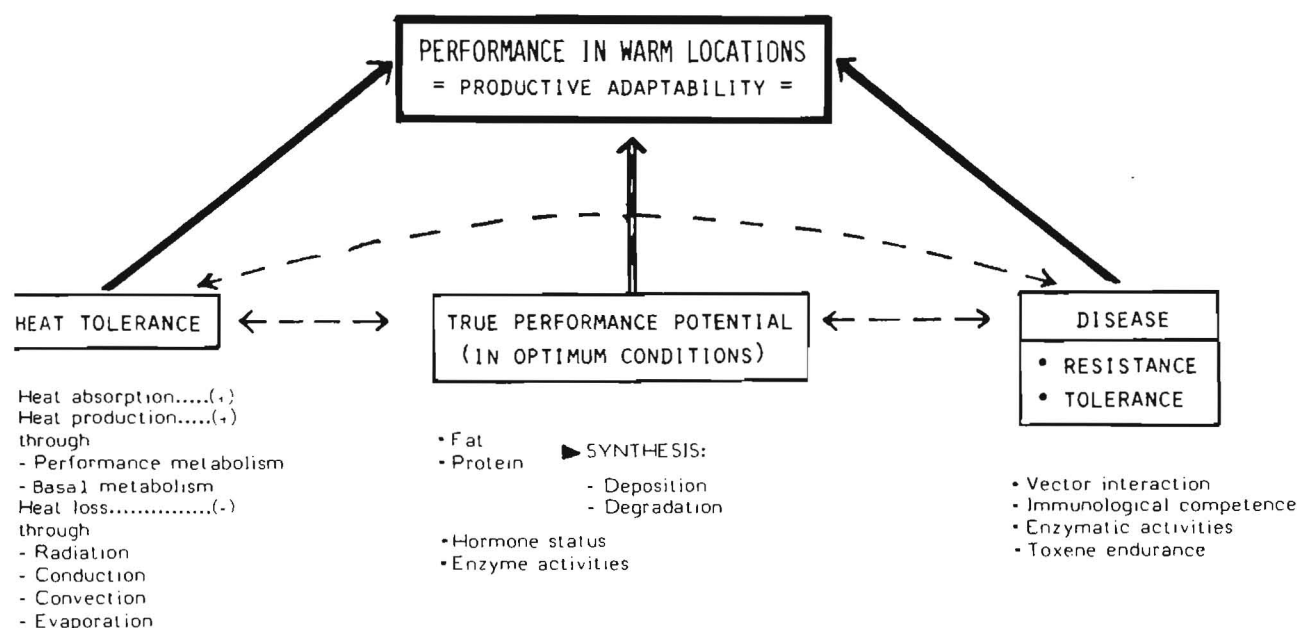


Fig. 1: Productive adaptability: relationships between performance in warm climates and absolute performance potential, response to heat and susceptibility to disease

to selection strategies may be illustrated by the following examples.

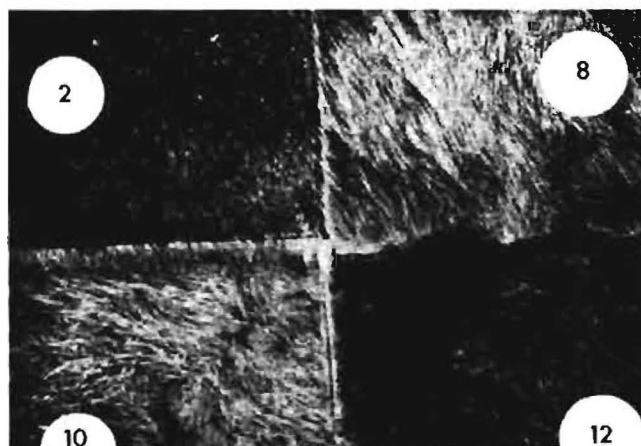
Petersen et al.¹⁴ describe an experiment with laying hens under long-term heat stress. Rectal temperature was recorded as a possible indicator of heat tolerance. Although rectal temperatures in the two experimental populations (lightweight and medium) were significantly different, combined variance analysis demonstrated an extremely low degree of genetic determination for this character. In contrast to this, under temperate conditions the production traits number of eggs laid and egg mass were associated with the high heritability values reported elsewhere; under hot conditions, the heritability values for these traits were also satisfactorily high (Table 2).

Table 2: HERITABILITY COEFFICIENTS AND VARIANCES FOR RECTAL TEMPERATURE, EGG NUMBER AND EGG WEIGHT (ADAPTED FROM PETERSEN ET AL., 1976)

Feature	Temperature conditions $h^2 + sh^2$	Warm conditions $h^2 + sh^2$	Associated trait
Rectal temperature	$0,04 \pm 0,10$	$-0,09 \pm 0,09$	Heat tolerance
Egg number	$0,30 \pm 0,16$	$0,38 \pm 0,19$	Productive adaptability
Egg weight	$0,65 \pm 0,20$	$0,34 \pm 0,17$	Productive adaptability

Coat colour and coat type have been considered to be significant for the ability of cattle to adapt to high ambient temperature and intense solar radiation. Bonsma¹, Riemenschmid & Elder¹⁹, Schleger²¹, Turner & Schleger²⁴, and Turner²⁵ agree in claiming that coat colour has an effect on the absorption of solar radiation and that the hair structure of cattle coats influences the rate of heat dissipation. These features are supposed to have an effect on heat tolerance; Peters et al.¹³ investigated whether the hypothesised adaptability actually

had an effect on productivity. The subjects were over 3 000 beef cows and their offspring on farms in different regions (sweetveld, mixed veld and sourveld) in South Africa. Afrikaner (Z), European dual-purpose (D) and British beef (M) breeds were used in a crossbreeding programme. Purebred (Z x Z) and crossbred (Z x D and Z x M) dams were mated with purebred sires (Z, D and M). Offspring were weighed at different ages, the dams at weaning and coat characteristics were recorded on each occasion. Coat colour was assigned to eight classes ranging from grey to black (2,4,6, . . . 16). Coat type was classified according to Turner & Schleger's scale²⁴ which also uses even-number classes ranging from 2 for a very sleek coat, to 14 for a very long and woolly coat (see Fig. 2)



2 = extremely short
8 = very long
10 = long
12 = woolly

Fig. 2: Coat scores for the evaluation of coat type (adapted from Turner & Schleger, 1960).

The relationships established in this experiment between coat colour and type of the dams on the one hand

and the body mass of the dams and their offspring at weaning on the other hand are illustrated in the following figures.

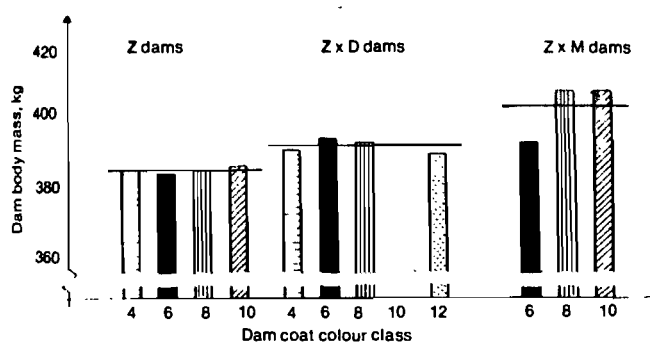


Fig. 3: Coat colour and body mass of dams at weaning time.

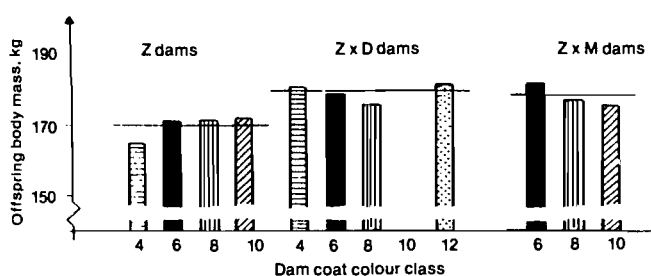


Fig. 4: Coat colour of dams and weaning mass of offspring.

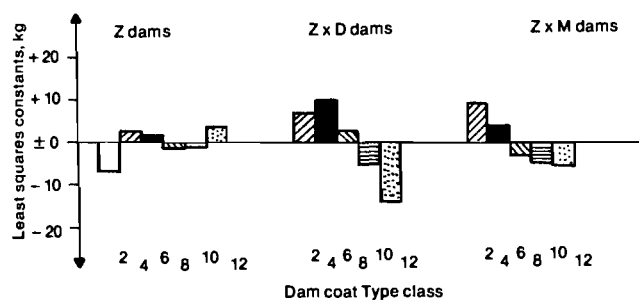


Fig. 5: Coat type and body mass of dams at weaning time.

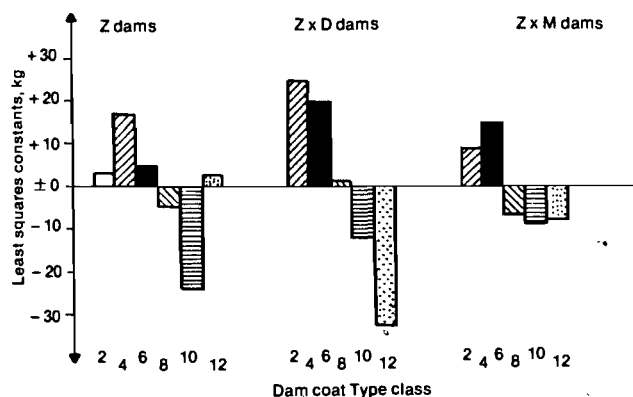


Fig. 6: Coat type of dams and weaning mass of offspring.

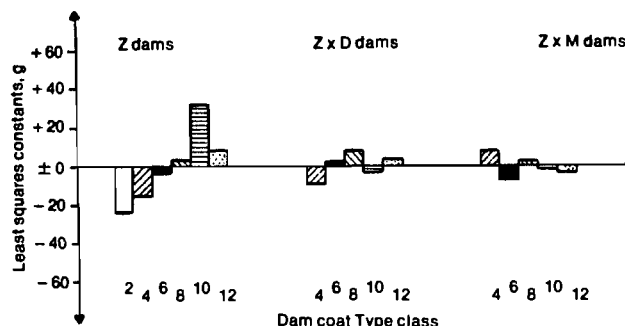


Fig. 7: Coat type of dams and weaning mass per unit cow weight.

These results corroborate our own observation that, as long as the skin is sufficiently pigmented to prevent possible sunburn, skin erythema or skin cancer, coat colour is of minor importance at least with regard to those features of maternal performance recorded here. With regard to coat type, although the three dam groups ($Z \times Z$, $Z \times D$ and $Z \times M$) differed in average coat type and in performance characteristics, differences between coat-type classes were slight. It is clear that the coat type of the dam has little effect on the body mass of dams and calves at weaning. This becomes even more evident when the effect of dam mass is corrected for and the productive adaptability parameter "calf mass produced per unit dam mass" is measured (Fig. 7). Moreover, it was established that coat-type effects in the post-weaning productive phase were also absent. Correlations between coat type and 18-month body mass of young stock did not differ significantly from zero. It must be concluded that such auxiliary heat tolerance criteria measurements do not at present provide a basis for selecting for productive adaptability.

BREEDING AND SELECTION STRATEGIES

Because of the present unsatisfactory situation concerning appropriate genetically determined criteria of heat tolerance and disease resistance, direct selection on the basis of the complex trait productive adaptability is to be preferred. This trait can be easily recognised in specific reproductive or productive performances which can then, in accordance with actual production aims, be directly altered or improved in a systematic selection process. Productive adaptability as directly expressed in production fulfills the prerequisites mentioned above for selection parameters. Repeatability of measurements is satisfactory, economic importance is considerable and the degree of genetic determination is considered to be high. Further research on the development of suitable strategies should be concentrated on establishing the degree of genetic determination of specific productive adaptability criteria in different populations under various environmental conditions and on clarifying where and whether limitations and possible antagonistic effects exist. Furthermore, a genetic basis for mass selection procedures requires that production traits be evaluated under field conditions and that, in the case of responses to heat and disease, useable auxiliary criteria be developed.

BODY SIZE AND PRODUCTIVE ADAPTABILITY

In order to facilitate breeding and selection for productive adaptability, research should at the same time be directed to finding genetically determined structural features which may be especially strongly associated with this trait. Body size is one feature that might be ex-

pected to be suitable. In the course of a large number of experiments with poultry and mice as models, we have established that body size strongly influences the animals' capacity to acclimatise and to survive stress^{3-7 9 12 15 23 28}. Among its direct effects are those on thermal capacity and rate of heat loss by radiation and convection. Body size also influences basal metabolic heat production and is involved in the effects on adaptability of internal heat production associated with high protein turnover¹⁰.

As far as size and heat loss are concerned, smaller animals are an advantage due to their larger surface area to mass ratio. On the other hand, with respect to basal metabolic heat production and cold storage capacity it is the larger animals that are favoured. However, for larger animals with a higher degree of leanness the ability to dissipate heat is probably of greater significance under warm conditions because of their bigger metabolic heat load. Unfavourable effects of the relatively poor ability of larger animals to lose heat include excess fatness and consequently reduced gonadal activity found in connexion with fattening programmes under ad lib. feeding systems. In poultry, poor heat loss leads to increased frequency of the fatty liver syndrome. In our research with mice as models for reproductive performance in pigs, we recorded an increase in body size in those lines which were selected for greater protein deposition. Such animals, however, also had more fat, a prolonged oestrus and a reduced fertility in the females. Selection on the basis of the animals' ability to survive stress also had an effect on body size: lines selected for longer survival under lethal stress (endurance +)

demonstrated genetically determined reductions in body size. These effects are illustrated in Fig. 8.

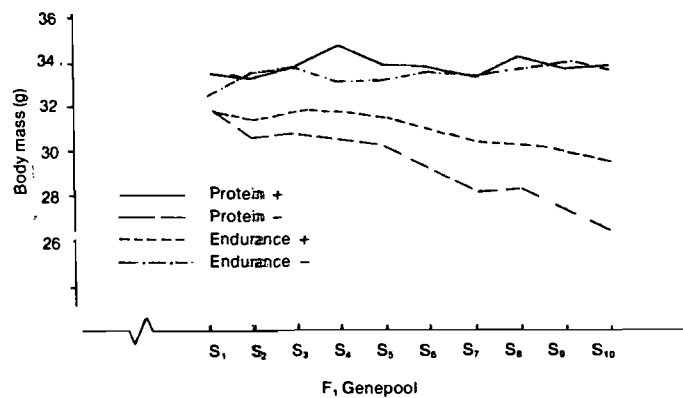


Fig. 8: 60-day body mass in dependence on orientation of selection (adapted from Horst et al., 1975).

Decreases in the genetically determined body size of laying hens was also observed to have an effect on productive adaptability. The results of regression analyses of the relationship between body size and productive performance in temperate and warm conditions (Fig 9) clearly demonstrate the importance of this phenomenon. Under warm conditions, larger hens also showed signs of reduced immune competence to Newcastle Disease, and frequent interruptions of laying were recorded.

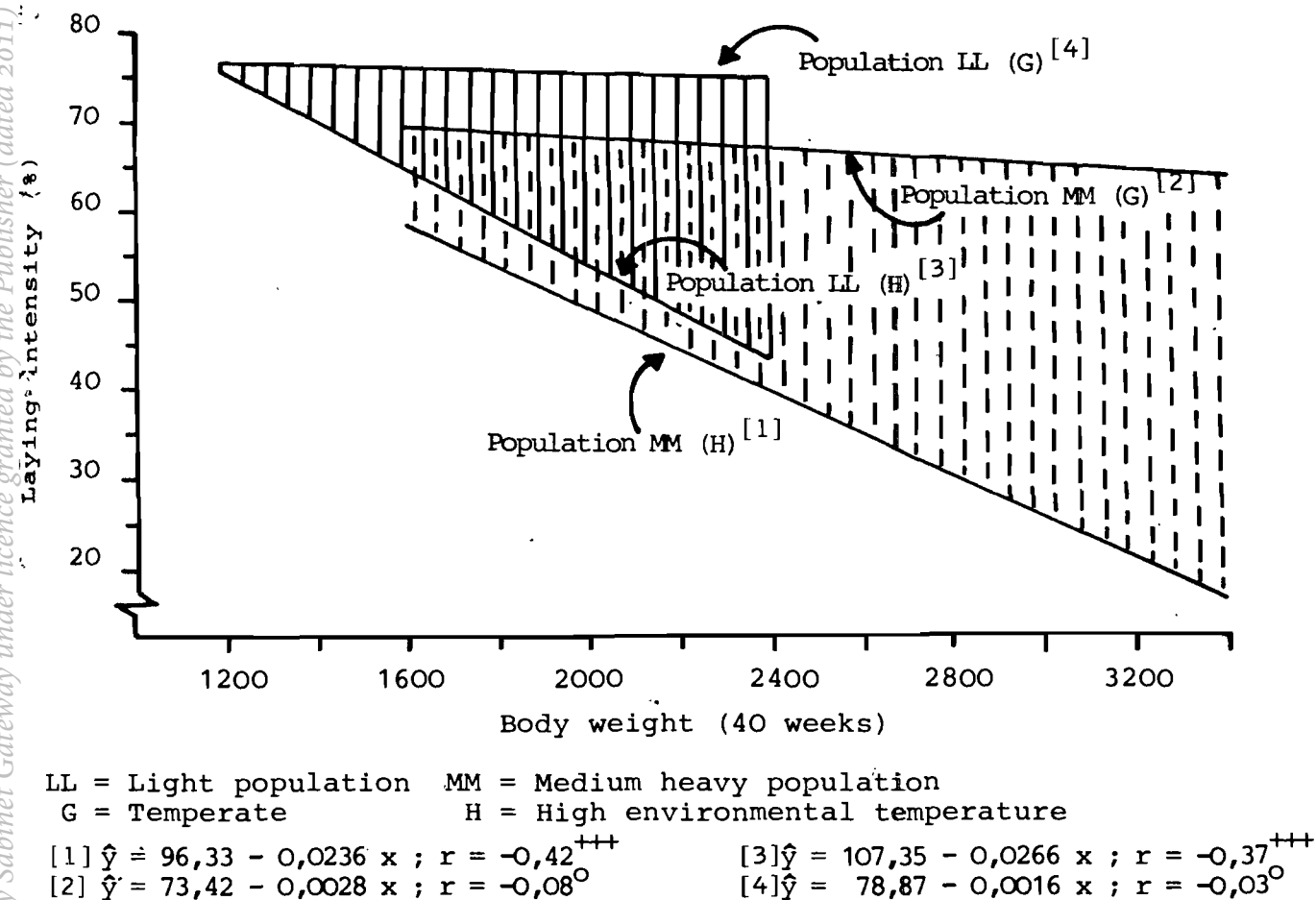


Fig. 9: Regression lines for the relation between body mass and laying intensity (adapted from Horst et al., 1975).

These results demonstrate that increasing body size progressively diminishes performances under warm conditions. But breeding programmes should not be based on a linear, but rather on a curvilinear relationship, as shown in an experiment in which the dwarf gene was transferred into a high-yielding lightweight strain of laying hens. This sex-linked gene (*dw*) reduced body mass by about 30 % and laying rate by about 20 % in the strain used, while feed conversion improved by about 6 %. In two groups of experiments using dwarf and normal hens in temperate and warm conditions the relationship between body size and productive performance proved to be clearly curvilinear (Fig. 10). In both cases it was established to almost the same extent that clear body size optima exist. Under temperate conditions medium normals and larger dwarf types performed best, while under warm conditions small normals and medium dwarf types were most favoured.

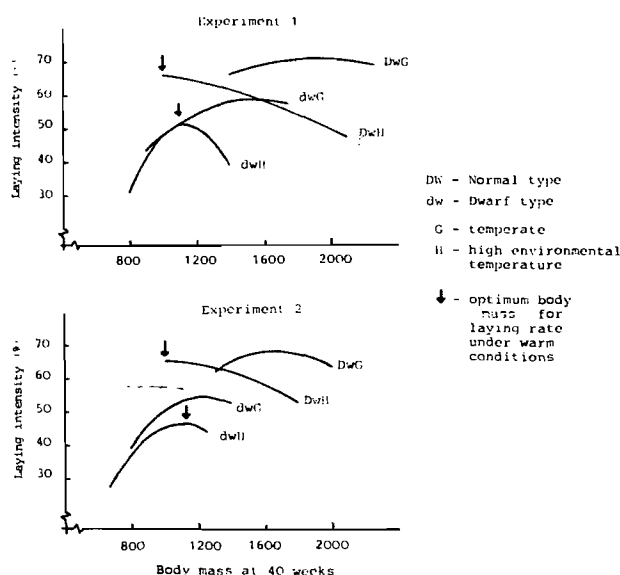


Fig. 10: Effect of environmental temperatures on the relation between body mass and laying intensity with normal and dwarf type of a light weight straincross (LL) (adapted from Horst et al., 1979).

Besides these specific results, the application of the *dw* gene to establish optimum body size indicates that appropriate major genes can be used to extend the scope and to broaden the genetical basis of selection and breeding programmes. There are already indications that major genes with tropical significance exist for poultry⁹ and for pigs⁸. The discovery of further such major genes could supplement present quantitative genetic procedures. Furthermore, their relatively easy breeding management guarantees their suitability for breeding programmes where infrastructure guarantees are less developed.

CONCLUSIONS

The genetic improvement of livestock used in warm climates depends on establishing clearly identifiable selection characters with a high degree of genetic determination and economic value. The complex trait "productive adaptability" seems to be most appropriate for this purpose.

Single component traits such as resistance or

tolerance to heat or disease are, however, unsuitable because reliable criteria for their identification do not exist and because their degree of genetic determination is uncertain and the nature of possible genetic correlations unknown.

The use of auxiliary measurements such as hair pigmentation or coat type as selection criteria cannot be recommended either, since correlations between these characters on the one hand and productive and reproductive performance on the other are very small and often not significantly different from zero.

As might be expected from its effect on thermal capacity and heat dynamics, body size proves to be a critical determinant of the productive adaptability of animals in warm environments. Correspondingly, the optimum selection strategy to be followed is that toward smaller body sizes.

Quantitative genetical procedures to improve productive adaptability may be supplemented by the use in breeding programmes of major genes with tropical significance such as the halothane gene in pigs and the dwarf gene and feather restriction genes in poultry.

REFERENCES

1. BONSMAN J C 1943 Influence of colour and coat cover on adaptability of cattle. *Farming in South Africa*: 1-20
2. HORST P & PETERSEN J 1975 Untersuchungen zur Auswirkung hoher Umwelttemperaturen auf die Leistungsreaktion von Legehennen unterschiedlichen Körpergewichtes. *Archiv für Geflügelkunde* 6: 225-231
3. HORST P & MAJOR F & TAWFIK E S & WOLF M & WEINIGER J H & STEINHAUF D 1975 Modellversuche zur Selektion auf Belastbarkeit in ihrer Beziehung zum Wachstum. II. Mitteilung: Selektionsergebnisse bis zur 10. Selektionsgeneration. *Zeitschrift für Tierzüchtung und Züchtungsbiologie* 92: 260-266
4. HORST P & PETERSEN J 1977 The importance of the dwarf gene (*dw*) on laying hen breeding. *Archiv für Geflügelkunde* 41: 246-252
5. HORST P & PETERSEN J 1979 Der Effekt des dwarf-Gens auf das Adaptationsvermögen von Legehennen an hohe Umwelttemperaturen. *Archiv für Geflügelkunde* 43: 242-245
6. HORST P & STEINHAUF D & WEINIGER J H & TAWFIK E S & MAJOR F 1979 Preliminary selection results for the combination of total protein deposition and endurance in mice. *Zeitschrift für Tierzüchtung und Züchtungsbiologie* 96: 221-234
7. HORST P 1980 Züchtungsversuche für tropentolerante Legehennen. *Deutsche Geflügelzüchtung und Schweinemast* 35: 848-854
8. HORST P 1980/81 Constraints on the genetic improvement of non-ruminants in the tropics. *Proceedings of the 1st Asian-Australian Animal Science Congress, Kuala Lumpur. Animal Research and Development* 14: 120-135
9. HORST P & PETERSEN J 1981 The effect of the dwarf gene on the adaptability of laying hens to high environmental temperatures. *Animal Research and Development* 13: 69-74
10. HORST P 1981 Breeding perspectives for fowls with improved adaptability to the tropics. *Proceedings of the SABRAO-Conference, Kuala Lumpur/Malaysia*
11. MORKRAMER G 1981 Biométrische Auswertung rasse-typischer Parameter von Serumlysozym und Komplement bei autochthonen und gekreuzten Rindern in Togo. *Dissertation of the University Göttingen/BRD*
12. MUKHERJEE T K & HORST P & FLOCK D K & PETERSEN J 1980 Sire x location interactions from progeny tests in different countries *British Poultry Science* 21: 123-129
13. PETERS K J & HORST P & KLEINHEISTERKAMP H H I 1982 The importance of coat colour and coat type as indicators of productive adaptability of beef cattle in a subtropical environment. *Tropical Animal Production*, printing
14. PETERSEN J & CHIMA M M & HORST P 1976 Bedeutung der Körpertemperatur als Akklimatisationsparameter beim Legehuhn. *Zeitschrift für Tierzüchtung und Züchtungsbiologie* 93: 237-251
15. PETERSEN J & HORST P 1978 Hohe Umwelttemperatur als auslösender Faktor von Genotyp-Umwelt-Interaktionen beim Legehuhn. *Archiv für Geflügelkunde* 42: 173-178

16. PIRCHNER F 1968 Probleme der Züchtung auf Wärmetoleranz. Feed and Agriculture Organisation AN: ABC 6:1-11
17. POST T B 1977 Possible guides for selecting bulls for fertility. 3rd International Congress of the Society for the Advancement of Breeding Researches in Asia and Oceania (SABRAO), Canberra
18. POST T B 1978 The value of measuring androgens in males and progesterone in females for assessing reproductive status of tropical beef cattle. Joint FAO/IAEA Coordinating Meeting on the Use of Radioimmunoassays in Reproduction, held at Bogor/Indonesia, 20-25th Feb.
19. RIEMERSCHMIDT G & ELDER J S 1945 The absorptivity for solar radiation of different coloured hairy coats of cattle. Onderstepoort Journal of Veterinary Science Animals Industry 20:2
20. SCHLEGER A V & TURNER H G 1960 Analysis of coat characters of cattle. Australian Journal of Agricultural Research 11: 875-885
21. SCHLEGER A V 1962 Physiological attributes of coat colour in beef cattle. Australian Journal of Agricultural Research 13: 943-959
22. SEIFERT G S 1971 Ecto and endo-parasitic effects on the growth rates of zebu crossbred and British cattle in the field. Australian Journal of Agricultural Research 22: 839
23. SHIRIN ALI HUSSAIN & MUKHERJEE T K & HORST P 1979 Heritability, genetic and phenotypic correlations of the growth and reproductive traits in the Lohmann Superbrown. Society for the Advancement of Breeding Researches in Asia and Oceania 11: 125-131
24. TURNER H G & SCHLEGER A V 1960 The significance of coat type in cattle. Australian Journal of Agricultural Research 11: 645-663
25. TURNER H G 1964 Coat characters of cattle in relation to adaptation. Proceedings of the Australian Society of Animal Production 5: 181-187
26. TURNER H G & SHORT A J H 1972 Effects of field infestations of gastrointestinal helminths and of the cattle tick (*B. microplus*) on growth of three breeds of cattle. Australian Journal of Agricultural Research 23: 177
27. TURNER H G 1979 Genetic correlation between heat tolerance and fertility in beef cows. Proceedings of the 1st Conference of the Australian Association of Animal Breeding & Genetics, New England
28. WENIGER J H & HORST P & STEINHAUF D & WOLF M & TAWFIK E S 1974 Modellversuche zur Selektion auf Belastbarkeit in ihrer Beziehung zum Wachstum. 1. Mitteilung: Fragestellung, Versuchsdurchführung und orientierende Untersuchungen an Ausgangsmaterial. Zeitschrift für Tierzüchtung und Züchtungsbiologie 91: 265-270

BOOK REVIEW

BOEKRESENSIE

VETERINARY PHARMACOLOGY AND THERAPEUTICS

NICHOLAS H. BOOTH and LESLIE E. McDONALD

5th Edn. The Iowa State University Press, Ames, Iowa 50010. 1982 pp XII and 1134, numerous figures and tables.
Price US \$61.95 (ISBN 0-8138-1740-4)

This text book was last published in 1977. The new edition is considerably less bulky than the old. This has been achieved by the use of smaller print and lighter paper without a reduction of the contents or scope.

Fifteen well-known writers, including William L. Jenkins, have contributed chapters to the book which is divided into 18 sections. The introductory section is followed by sections on pharmacodynamics; drugs acting on the autonomic nervous system and central nervous system; local anaesthetics; local hormones (autocoids); drugs acting on the cardiovascular system and on fluid and electrolyte balance; endocrine pharmacology; drugs acting on the digestive system; nutritional pharmacology; drugs acting on the surface of the body and gases of therapeutic value. The chemotherapy sections cover the therapy of bacterial, fungal and viral diseases; therapy of neoplastic disease and therapy of parasitic diseases. The final sections are on toxicology (excluding plant-related toxins) and on residues of chemicals and drugs in animal products.

This text is the most comprehensive and modern

available in the field of veterinary pharmacology. It is ideally suited for use by teachers and graduate students. It will also be a useful aid to large and small animal practitioners and to undergraduate veterinary students - however it is somewhat expensive for the latter group.

A major criticism is that the book is poorly indexed. For instance the drugs mibolerone, hexestrol and nandrolone are not listed in the index despite their being adequately discussed in the relevant chapter. Megestrol and diethylstilbestrol are indexed but the indexed pages refer to minor uses of these 2 drugs, leaving the sections dealing with their major uses unindexed.

Minor criticisms are that unnecessary detail has been given in places. A few major omissions were noted, e.g. trembolone.

Despite the above-criticism the book comes closest to fitting the bill of a "standard reference work" in veterinary pharmacology. For this reason it is highly recommended.

C. Button

#

planations have been found for this property. The most likely is the ability of trypanotolerant cattle to produce a higher level of anti-trypanosomal serum antibodies than normal cattle after a challenge, provided they have been challenged before as young calves. Recent observations from CRTA even contradict these earlier findings.

It also appears that trypanotolerant cattle possess a much lower susceptibility to streptothricosis (*Dermatophilus congolensis* infection) than non-trypanotolerant cattle. On the other hand, they are said to be more susceptible than zebu types to rinderpest and to the commonly used strains of pleuropneumonia vaccines and to tick-borne diseases.

The property of trypanotolerance is only partly transmitted to the progeny when cross breeding with trypanosusceptible types such as zebus or European *Bos taurus*. In areas of transition in West Africa, between the heavily infected zones of the south and the tse-tse fly free zones to the north, hybrid populations of cattle exist. The proportion of zebu blood increases as the tse-tse fly challenge decreases. Due to their larger size, zebus are preferred wherever they can be kept.

CATTLE TYPES AND DISTRIBUTION

Observers identified long ago 2 distinct types among the trypanotolerant *Bos taurus* cattle of West and Central Africa. In this part of the world zebu types predominate largely and account for more than 75 % of all cattle to be found. There are also other breeds of humpless *Bos taurus* native cattle (ie the Kuri of Lake Chad), but they are not trypanotolerant and they live in a very special environment where tse-tse flies are not recorded.

The best known trypanotolerant type is the N'Dama, a fairly homogeneous breed, originating from the Futa-Djallon mountains of Guinea. The N'Dama is a below medium size animal with long horns and a predominantly uniform fawn, dun or brown coat.

The second trypanotolerant type of cattle has been called by Stewart²⁰, the West African Shorthorn (WAS) and is very similar to the ancient celtic ox in that it is small, almost dwarf, with generally small curved horns and a multi-coloured coat which is most often black pied. WAS cattle can be found along the limits of the rain forest from Liberia to Cameroon. They exist in isolated populations which bear various names in the different countries (Baoule in Ivory-Coast, Somba in Togo, Muturu in Nigeria, Namchi in Cameroon, etc ...).

Throughout this wide distribution area with little or no connection between the different breeding zones, the WAS has retained common characteristics and appear as a homogeneous group. The only sub-type which can be identified is the "Lagoon" type, which as its name indicates lives along the coast from the Ivory-Coast to Nigeria. This is a real dwarf animal showing many features generally associated with degenerescence such as absent or small "floating" horns but which survives in the most hostile environment in an area of heavy rainfall where grass is scarce and the challenge by tse-tse flies high.



Fig. 2: Baoule cow, Ivory Coast (Photograph: J. Pagot.)



Fig. 1: N'Dama bull, Mali. (Photograph: J. Pagot.)



Fig. 3: Baoule village herd, Central African Republic.

ORIGIN OF TRYPANOTOLERANT CATTLE

There have been many theories on the origins of the small humpless cattle of West Africa, whether longhorned (N'Dama) or shorthorned (WAS). Some early observers considered that they might be the distant offspring of European cattle released on the African shores by early navigators.

The study of genetic markers has shown that these cattle share the same haemoglobins as those of European cattle and even possess one unique type of their own. The most satisfactory theory is that developed by Epstein¹² which takes into account what is known of the human and animal migrations into Africa and of the climatic changes on the North Western part of the continent.

It is thought that a longhorned type of humpless bovine was introduced into Egypt and further west later by Hamitic people some 3 500 years before Christ, hence its name of Hamitic Longhorn. Rock paintings in the Sahara depict this type of animal along with wild species which were roaming this area until 3 000 years ago when the area started to become drier. This is still a recent event since a Roman general, Cornelius Balbus, was able to reach the Niger River in 50 BC in horse carts which implies that they could find water frequently enough for horses.

The N'Dama is considered as the direct African representative of the Hamitic Longhorn. Its long presence in the African region would be one of the causes of its trypanotolerance. It is also known that in their region of origin, the Futa-Djallon highlands of Guinea, the N'Dama cattle are kept by Fulani people who settled there only 4 centuries ago. The Fulani are Hamitic people with a millenia old tradition in cattle rearing and whose society is based on herd management.

Other Fulani groups graze their herds from Senegal to Western Sudan and from the border of the Sahara to the southern limit of the Adamawa highlands in Cameroon, only a few degrees north of the Equator. The Fulanis have well known and well defined types of cattle of predominantly zebu types (White Fulani, Bororo, Gudali, Toronke). It is therefore not surprising that they developed the N'Dama as a homogeneous type with characteristics which they praise, notably long horns. The Fulani take great care of their cattle. They milk the cows, use oxen for pack in the drier regions where they lead a nomadic life and have quite manageable animals. The West African Shorthorn is admittedly the descendant of the short horned cattle introduced into Africa 2 000 years after the Hamitic Longhorn and which replaced it almost everywhere for ill-defined reasons. Its present distribution is a clue to a much wider one in the past. In contrast to the N'Dama the WAS are kept by dark skinned Sudanese people who were primarily grain and root crop farmers and game hunters.

These people, until recently, showed very limited interest in their cattle which they merely kept around their villages and slaughtered on festive occasions (marriages, burials, etc . . .). The animals were not really tended, milked or used for draught or pack. The WAS has had to fend for itself. Nowadays, particularly in the Ivory-Coast, WAS cattle owners have become market conscious and have realized the value of cattle as an

asset^{14,15}. Frequently, they combined small herds on a village scale and hire Fulani herdsmen to look after the common herd.

PERFORMANCE OF TRYPANOTOLERANT CATTLE

The WAS living in some of the most hostile environments available under conditions of primitive husbandry, have had few or no opportunities to express a high potential for production.

Since the very early days of West African animal husbandry, efforts were directed mostly to the geographical zones where large animal populations existed. As a result, trypanotolerant cattle have only recently been intensively studied and the data are still scarce and scattered. The first comprehensive attempt at gathering the available information was made in 1977⁹ by the French I.E.M.V.T.* and more recently (1980), the International Livestock Center for Africa (ILCA/CIPEA)¹⁶.

At the present time, the most extensive productivity studies are those carried out in the Ivory-Coast^{14,15} with the N'Dama and Baoule (WAS) breeds, under both research station and village conditions. The investigations on trypanotolerance are one of the areas of research of the Institute for the Study of Animal Trypanosomiasis in Bobo-Dioulasso (Upper-Volta).

The potential of the N'Dama for milk production, even though extensively exploited by the Fulani in the region of origin of the breed, namely in Guinea, remains very limited. The cows have a very strong maternal instinct and let down their milk only in the presence of the calf. Observations were made by Pagot¹⁸ at the Sotuba experimental farm (Mali) in the 'fifties and more recently by Coulomb^{7,8} in Bouake (Ivory-Coast). The production of N'Dama females ranges from less than 400 kg per lactation to seldom more than 700 kg. Lactation seldom lasts more than eight months even following an improvement in management and feeding.

The potential for milk production of WAS females remains largely unknown. Estimates of 300 to 660 kg in 6 to 8 months are the only available figures and will remain such until the data presently being collected in the Ivory-Coast are analysed and made public. The WAS cows show a dairy temperament (or absence of) similar to that of the N'Dama.

The potential for draught and pack of the trypanotolerant breeds has only been investigated recently. The first attempts at animal draught for cultivation were made 50 years ago in Southern Senegal and Guinea. The technique is now self extending and an integrated feature of mixed farming in the sub-humid areas of West Africa. The trypanotolerant cattle introduced in Central Africa (Zaire, Gabon, Congo, Central African Republic) have even more recently been put to use in animal draught extension programmes.

In the Central African Republic, the technique has recently been introduced in the cotton growing areas with satisfactory results. In these regions, the smaller and more manageable WAS are preferred by the farmers who, having never had any previous contact with cattle, are often frightened by the large N'Dama¹⁰ even though the difference in size is not very great. This

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Table 1: BREEDING PERFORMANCE AND MILK PRODUCTION OF TRYPANOTOLERANT CATTLE

	N'Dama		Baoule	Lagune	Jersey X N'Dama
Husbandry situation	Intensive	Extensive	Semi extensive	Extensive	Intensive
Age 1st calving	35 months 17 days ± 29 days	42 months 1/2	25 months 21 days ± 40 days	3,5 – 4 years	39 months 15 days ± 16 days
Calving interval	420,8 ± 9 days	15 months (450 days)	421 days	18 – 24 months (540 – 720 days)	354,8 ± 3,9 days
Length of lactation	206 ± 29 days	7 – 10 months (210 – 300 days)	4 – 6 months (120 – 180 days)	4 – 6 months (120 – 180 days)	256,9 ± 5,7 days
Milk yield	588 ± 158 kg	400 – 600 kg	308,9 kg	125 litres	1277,3 ± 51,8 kg

Source: Coulomb (1976), Tidori and Al. (1975)

Table 2: GROWTH PERFORMANCE OF TRYPANOTOLERANT CATTLE (WEIGHT IN kg)

Age Breed Sex	Birth	3 months	6 months	9 months	12 months	18 months	24 months	36 months	48 months
Baoule (WAS)									
Males	12,5 ± 0,3	36,5 ± 1,3	61,2 ± 2,2	81,6 ± 2,8	92,8 ± 3,2	127,2 ± 4,3	162,0 ± 5,3	212,8 ± 10,0	
Females	12,0 ± 0,2	36,7 ± 1,0	61,7 ± 1,9	84,7 ± 2,3	95,8 ± 2,7	123,6 ± 2,8	145,8 ± 3,4	166,0 ± 6,4	
N'Dama									
Males	17,7	55,1	89,8	114,8	129,7	176,6	227,4	311,2	328,6
Females	16,7	51,4	84,3	109,4	120,7	154,2	190,9	259,8	268,7
Jersey x N'Dama									
Males	19,3	61,0	105,3	131,8	145,3	185,8	231,7	312,6	392,2
Females	17,6	56,5	99,0	122,3	137,1	184,0	214,6	297,0	324,4

Source: Tidori and Al 1976, Coulomb 1976, Charray and Al 1977

may also have arisen from the fact that most N'Dama in Central Africa originated from ranches and were less accustomed to human contact than the WAS coming from village herds.

The most important potential of the trypanotolerant cattle rests in beef production. The N'Dama is a slightly below medium sized animal. That means that mature females weigh 250 to 300 kg and mature males 280 to 360 kg.

In the herds of N'Damas on Central African ranches (Zaire, Gabon, Congo, Central African Republic) where these animals were imported 40 to 75 years ago from West Africa, better husbandry, the mixing of different strains and selection for size have led to an increase in size and weight. The "Van Lancker" N'Dama are the best known of these improved types.

The West African Shorthorns (Baoule, Maturu, Somba) are a small type of cattle with mature weights ranging in West Africa from 150 to 220 kg for the females and 200 to 300 kg for the males.

The populations which were established in Central Africa (Zaire, Congo, Central African Republic) from parent stock imported from different locations in West Africa (Ivory-Coast, Upper-Volta, Mali), often exhibit marked improvement in size. This has been attributed both to outbreeding at least in the first generations and better husbandry and nutrition.

Both types are slow growing and late maturing. Under traditional conditions of husbandry they reach their maximum size at the age of 7 to 8 years and, under improved husbandry and nutrition, their daily weight

gains are limited by their small skeletal frame.

Experiments in intensive feeding have shown that the growth rates of these types per 100 kg of liveweight can be compared with those of larger breeds but, due to their small size, daily weight gains seldom exceed 400 g. In feed-lots, optimum growth cannot be maintained for as long as with other breeds. N'Dama and WAS adapt poorly to intensive feeding and high densities per pen. The best results overall have been observed with permanent grazing of improved pasture, particularly *Stylosanthes guyanensis*, a legume of the humid tropics.

There is certainly scope for improvement through selection of these traits in both types of trypanotolerant cattle but this will be a slow process with obvious limitations resulting from the small size of the breeds.

In contrast to the minimal attempts being made for the improvement of the WAS through cross breeding, at least by the authorities in charge (wherever possible, farmers tend to grade it to larger zebu types) the N'Dama have been subject of many experiments.

The most successful cross breeding programme at the present time is that carried out during the past 15 years at the Bouake research station in the Ivory-Coast. In this case, the improved breed chosen was the Jersey because of its well documented heat tolerance, its similarity in general appearance to the N'Dama and because the main emphasis of the programme was on milk production. This programme has resulted in a marked improvement in all productive traits both for milk and beef production⁸.

A crossbreeding programme involving N'Dama,

Lagune and German Gelbvieh cattle is currently being carried out at Avetonou Station in Togo by the German G.T.Z. cooperation agency¹⁷.

Trypanotolerant cattle, placed under the same conditions of environment and husbandry generally perform better than zebu with regard to reproductive traits. Their performances vary widely depending on the feed resources and level of tse-tse fly challenge, not to mention care by the owners but as a rule, even though the cows seldom calve before their 4th year of age, fertility is good.

The milking of N'Dama cows in Guinea, Mali and Upper-Volta by their Fulani keepers often results in longer calving intervals, slower calf growth and higher calf mortality¹⁵. Some of the improvement in performance observed in the countries of adoption in Central Africa are obviously linked to the fact that under ranching conditions, all the milk is left to the calves.

WHAT FUTURE CAN BE FORESEEN FOR THESE ORIGINAL CATTLE TYPES?

At the present time, trypanotolerant cattle represent approximately 7.5 million head while there are 130 million cattle as a whole on the continent of Africa. These cattle are the most suitable for development on the 10 million square kilometres of tse-tse fly infested grasslands where, at present, there is no practical prospect of otherwise establishing any large cattle enterprises.

This was soon realized by the colonial authorities of the former Belgian and French Congo who started importing WAS breeding stock from Ivory-Coast at the beginning of the century.

Recent statistics show that these cattle now number close to 400 000 head. The best documented story on importation of trypanotolerant African cattle is that of the Central African Republic¹⁰.

Prior to 1946 there were no cattle in this 600 000 km² country. Some Fulani herdsmen introduced their Bororo cattle from neighbouring Cameroon into the tse-tse fly-free highlands of Western Central African Republic but could not go further into the central low lands because of trypanosomiasis.

Between 1954 and 1970, 300 to 400 WAS were imported annually from the Northern Ivory-Coast, Upper-Volta and Southern Mali. The animals were tested for bovine tuberculosis, brucellosis and pleuropneumonia, drenched, dipped and vaccinated against rinderpest and anthrax. They were trucked to Bouake, the railway terminal, then carried by rail to Abidjan, by boat from there to Pointe-Noire (Congo), by train again to Brazzaville, by barge on the Congo and Ubangui rivers and finally, by truck to their ultimate destination, one of the 1 200 village herds thus established.

At the present time, in spite of all intercurrent events, there are 20 000 head in this previously cattle free area.

N'Dama cattle have more recently been imported into Cameroon and Nigeria but both these countries have large numbers of zebras in tse-tse fly free areas and the incentive to develop trypanotolerant cattle does not seem to be very strong even though the zebras have already reached the limits in the areas where they can be kept.

Ivory Coast is probably the country in West Africa which is currently contributing the greatest effort to the better study and the development of both its native Baoule, WAS and N'Dama.

The interest of national and international organizations is shown by the work carried out in the study of these breeds by the French I.E.M.V.T.⁹ and the International Livestock Centre for Africa¹⁶.

The gradual destruction of game species throughout the tse-tse fly belt has already resulted in shortages of meat. With some incentive from governments the trypanotolerant breeds of cattle can contribute to a great extent to the relief of the hunger for protein which is developing in these areas.

In the meantime more research is needed to better understand the threshold of trypanotolerance and possibly to breed this interesting characteristic into other breeds or species in order to accelerate the development of meat production in these areas for which an increase from 180 million to 300 million inhabitants by the end of this century is already forecast.

REFERENCES

1. AILLERIE R 1926 La race bovine baoulée de la Côte-d'Ivoire. Bulletin du Comité d'Etudes historique et scientifique de l'Afrique occidentale française 9:80
2. ARCHIBALD R G 1927 The tse-tse fly-belt area in the nuba mountains province of the Sudan. Annals of Tropical Medicine and Parasitology: 39-43
3. BALFOUR A 1913 Animal trypanosomiasis in the Lado (western Mongalla) and notes on tse-tse fly traps and on an alleged immune breed of cattle in southern Kordofan. Annals of Tropical Medicine and Parasitology 7:113-124
4. BROWN D H 1943 Ilorin stock farm. Farm and Forest 4:3-7
5. CAZALBOU L 1906 La Souma. Revue générale de Médecine vétérinaire 8:240
6. CHANDLER R L 1952 Comparative tolerance of west african N'Dama cattle to trypanosomiasis. Annals of Tropical Medicine and Parasitology 46:127-134
7. COULAMB J 1976 La race N'Dama. Quelques caractéristiques zootechniques. Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux 29:367-380
8. COULAMB J, RIVIÈRE R, PAGOT J, CADOT R. Métissage jerisais-N'Dama. Résultats obtenus au C.R.Z. de Minankro-Bouaké. 1ère note
9. COULAMB J, GRUVEL J, MOREL P, PERREAU P, QUEVAL R, TYBAYRENC R 1977 La trypanotolérance. Institut d'Elevage et de Médecine vétérinaire des Pays tropicaux 10, rue Pierre Curie 94700 Maisons-Alfort
10. DESROTOUT J et collab 1967 Les bovins trypanotolérants. Leur élevage en République Centrafricaine. Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux 20:589-594
11. DESOWITZ R S 1959 Studies on immunity and host parasite relationships. 1. The immunological response of resistant and susceptible breeds of cattle to trypanosomal challenge. Annals of Tropical Medicine and Parasitology 53:293-313
12. EPSTEIN H 1971 The origin of the domestic animals of Africa. African publishing Corp. New-York vol 1, 573 p vol II, 719 p
13. FIENNES R N T 1947 immunity and premunity in cattle trypanosomiasis I & II. Veterinary Record 59: 291-292
14. GODET G, LANDAIS E, POIVEY J P, AGABRIEL J, MAWUDO W 1981 La traite et la production laitière dans les troupeaux sédentaires au Nord de la Côte-d'Ivoire. Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux 34:63-71
15. HOSTE C, CLOÉ L, DESLANDES P, POIVEY J P MARS 1982 Note technique. Etude de la production laitière et de la croissance des veaux de vaches allaitantes N'Dama et Baoulé. Institut d'Elevage et de Médecine vétérinaire des Pays tropicaux
16. ILCA/CIPEA 1979 Le bétail trypanotolérant d'Afrique occidentale et centrale. Tome I. Situation générale 153 p Tome II. Situations nationales 300 p. Publié par CIPEA/ILCA BP 5689 Addis-Abeba, Ethiopie
17. KARBÉ E, FREITAS E K éditeurs. Trypanotolerance and animal production German-Togolese project. Publication n°1 1980. Publication n°2 1981. Centre de Recherches et d'Elevage Avetonou B.P. 27 Agou Gare, Togo
18. PAGOT J 1956 Température corporelle des zébus et métis zébu

taurins sous les tropiques. Revue d'Elevage et de Médecine vétérinaire des Pays tropicaux 9:21-41

19. PIERRE C 1906 L'élevage dans l'Afrique occidentale française. Paris Gouvernement général de l'Afrique occidentale française

(Inspection de l'Agriculture) 280 p

20. STEWART J L 1951 The west African shorthorn cattle. Their value to Africa as trypanosomiasis resistant animals. Veterinary Record 63: 454-457

ABSTRACTS

ABSTRACT: Scialdo-Kreck, Rosina C., 1983. Scanning electron microscopy of the tegumental surface of *Heterobilharzia americana* (Trematoda; Schistosomatidae). *Onderstepoort Journal of Veterinary Research*, 50, 37-43 (1983).

An attempt is made in this paper to define more clearly the tegumental microstructure of the schistosome, *Heterobilharzia americana*. The adult parasites were examined with scanning electron microscopy at 75-10 000 magnifications. The morphology of the oral and ventral suckers, the tegument, and the gynecophoral canal with the *in copula* female were closely scrutinized. The tegument of the female is simple and uniform in structure, an adaptation which may allow for a more efficient mode of penetration through the smaller mesenteric venules. The male tegument, however, is characterized by papilla-like elevations of irregular size, shape, and distribution. These papillae may represent different kinds of sensory endings.

ABSTRACT: Belonje, P.C. & Van den Berg, A., 1983. Failure of bone phosphorus levels to indicate dietary intake of phosphorus by sheep. *Onderstepoort Journal of Veterinary Research*, 50, 1-2 (1983).

Fifteen actively growing lambs were divided into 3 groups and fed diets similar in all respects except for their calcium (Ca) and phosphorus (P) levels. The diets (Group 1: 1.47% Ca, 0.36% P; Group 2: 0.85% Ca, 0.47% P; Group 3: 0.37% Ca, 0.64% P) were fed to the animals for 98 days, when rib biopsy specimens were removed and analysed for Ca and P (Group 1: 21.20% Ca, 10.49% P; Group 2: 19.54% Ca, 9.42% P; Group 3: 19.10% Ca, 9.24% P). Although there were no differences ($P > 0.01$) in the bone analyses between the groups, there was a tendency for bone calcium levels to follow dietary calcium levels. Bone phosphorus levels, again, followed bone calcium levels and were opposite to dietary phosphorus levels. This work re-emphasizes the dominance of calcium over phosphorus in bone formation. Implications of these findings are discussed in the light of the use of bone phosphorus analyses to estimate the phosphorus intake and status of grazing sheep.

ABSTRACT: Swanepoel, P., Smithers, R.H.N. & Rautenbach, I.L., 1980. A checklist and numbering system of the extant mammals of the Southern African Subregion. *Annals of the Transvaal Museum*, 32(7), 155-196.

Common names, in English and Afrikaans, are given for each of the animals listed. According to the authors: "Each species is assigned a number in order to facilitate handling of data in computer Systems."

BOOK REVIEW

BOEKRESENSIE

ATLAS OF HEMATOLOGY OF THE DOG AND CAT

PETER KELLER and ULRICH FREUDIGER

First Edition. Verlag Paul Parey, Berlin and Hamburg, Germany 1983. pp 159, with 284 plates comprising 665 single illustrations, of which 381 in colour, a chart and two tables. Price DM 218 (ISBN 3-489-65516-8)

Presentation

This atlas is presented along the lines of the successful human haematology atlas "Sandoz Atlas of Haematology". However, the decision to use 5 languages simultaneously in the text section and especially in the legends opposite each plate has two negative effects. First, the atlas becomes unnecessarily voluminous which probably increases the cost of publication. Second, it is very difficult to find the relevant text in the language of one's choice, unless it happens to be German which is always the first insertion. The photographic plates are on the whole of a very high standard and the accompanying line-drawings greatly facilitate interpretation.

Content

The information contained in this publication is instructive,

though not exhaustive, which is correct for an atlas. There are minor inaccuracies such as the magnification of plates 37 and 228 (approx. 600x instead of the stated 1250x). Based on the information in the authoritative "Schalm's Veterinary Haematology" and L.J. Rich's "The Morphology of Canine and Feline Blood Cells", I would tend to disagree with the interpretation and plates of canine and feline basophils on pp 96 and 97 as well as toxic granulation on p 98.

Conclusion

This is an essentially good atlas, which will be useful to the undergraduate veterinary student and the small animal practitioner. Veterinary reference libraries should have a copy available. The multilingual approach, however, detracts from its readability.

F. Reyers

SUPRAKONDILÊRE EN DISTALE EPIFISEALE FEMURFRAKTURE BY DIE HOND EN KAT

G.L. COETZEE*

ABSTRACT: Coetzee G.L. *Supracondylar and distal epiphyseal femur fractures in the dog and cat. Journal of the South African Veterinary Association* (1983) 54 No. 3, 171-179 (Afrik), Department of Surgery, Faculty of Veterinary Science, University of Pretoria, P.O. Box 12580, 0110 Onderstepoort, Republic of South Africa.

Various surgical methods for the treatment of supracondylar femoral fractures involving the epiphyseal growth plates in young growing dogs and cats were studied. Some of the open reduction and fixation techniques are briefly reviewed with emphasis on some of the complications that may develop in the stifle joint.

Good results were obtained with the single Steinmann pin method in cats and small breeds of dogs. The parallel Kirschner wire technique as well as the cross Rush pin method was easier to apply in medium and large dog breeds, and resulted in a rigid fixation of the distal femoral condyles.

Key words: Dogs, femur fracture, repair.

INLEIDING

Frakture van die distale derde van die femur kom meestal in jong groeiende honde en katte tussen die ouderdom van 4 en 9 maande voor. Ongeveer 30 % van femurfrakture is in hierdie distale gebied^{1,10}. Die inisiële trauma word hoofsaaklik deur motorongelukke veroorsaak, wanneer diere met 'n harde voorwerp op die agterbeen geslaan word en katte van geboue afval⁹. Troumatiese beserings wat by volwasse pasiënte skeuring van ligamente of ontwrigtings veroorsaak, sal by jong groeiende diere meer geredelik skeiding van die groeiplaat tot gevolg hê¹⁷. Alhoewel die kniegewrig (femoro-tibiale gewrig) as 'n skarniergewrig geklassifiseer word is dit egter nie 'n gewone skarniergewrig nie. Glybewegings van die patella in die troglea veroorsaak dat die normale beweging en stabilisering van die kniegewrig meer kompleks is as in ander diartroidale gewrigte.

OORSIG

Die epifises van langbene word gewoonlik met 'n groeiplaat geassosieer¹⁷. Die distale femurepifise is 'n tipiese voorbeeld van 'n drukepifise omdat die kondilêre gewrigsooppervlaktes gewig dra en dus kompressie-spanning ondervind wanneer die dier hardloop of spring.

Die normale groeiplaat bestaan uit vyf histologiese onderskeibare lae of sones^{8,17} (Fig. 1):

1. Sone van rustende kraakbeenselle (kiemlaag teen die epifiseale beenplaat).
2. Sone van prolifererende kraakbeenselle met mitotiese aktiwiteit.
3. Sone waar volwasse kraakbeenselle in rye begin rangskik. (Sone 2 en 3 is sone van lengtegroei.)
4. Sone van hipertrofiese kraakbeenselle met piknotiese kernveranderinge, vakuoolvorming in die sitoplasma, opswelling en afsterwing.
5. Sone waar afgestorwe kraakbeenselle en matriks gekalsifiseer word (gekalsifiseerde kraakbeenlaag).

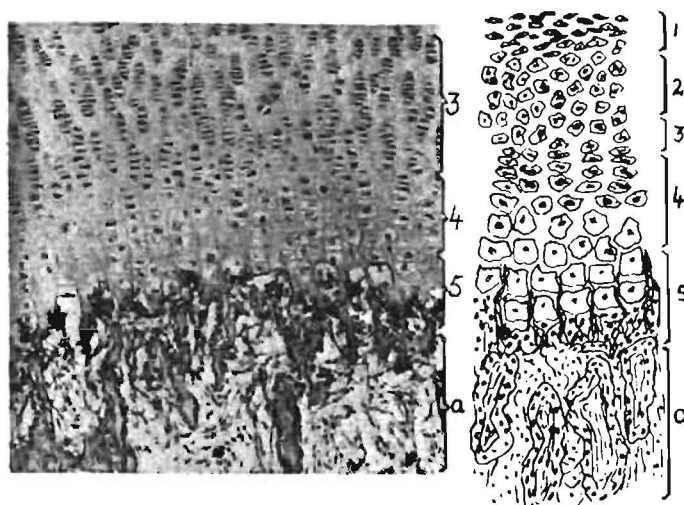


Fig. 1: Epifiseale groeiplaat. H.E. X125

- Sone waar volwasse chondrosiete in rye begin rangskik (3)
- Sone van hipertrofiese chondrosiete met piknotiese kernveranderinge, vakuoolvorming in die sitoplasma, opswelling en afsterwing (4)
- Sone waar afgestorwe chondrosie en matriks gekalsifiseer word (gekalsifiseerde kraakbeenlaag) (5)
- Metafiseale osteosiete en trabeculae (a).

Die vierde sone is die swakste area in die groeiplaat, omdat hierdie laag baie min matriksmateriaal tussen die gehipertrofeerde kraakbeenselle bevat en dus 'n natuurlike potensiële klowingslyn is¹⁷.

Die kraakbeenmatriks is alreeds gekalsifiseer in die vyfde sone en die lengteverlopende gekalsifiseerde septae is stabiel genoeg om weerstand aan die groeiplaat te verskaf om te kan voorkom dat die groeiplaat deur hierdie area kan breek. Wanneer die groeiplaat a.g.v. trauma deur die sone van gehipertrofeerde chondrosiete skeur, bevat die distale epifise nou nog steeds die rustende en prolifererende chondrosietlae wat later by die groeiplaat moet aansluit om normale lengtegroei van die femur te kan bewerkstellig¹⁷.

Troumatiese en isgemiese veranderinge in die sellulêre verdelingsvlak veroorsaak vertraagde lengtegroei en vroeë sluiting van die groeiplaat. Transfiseale benige bruë ontwikkel oor die groeiplaat en kan lei tot hoekige veranderinge in die lengte-as van die femur^{5,17}.

Alcantara & Steed¹ het gevind dat die distale

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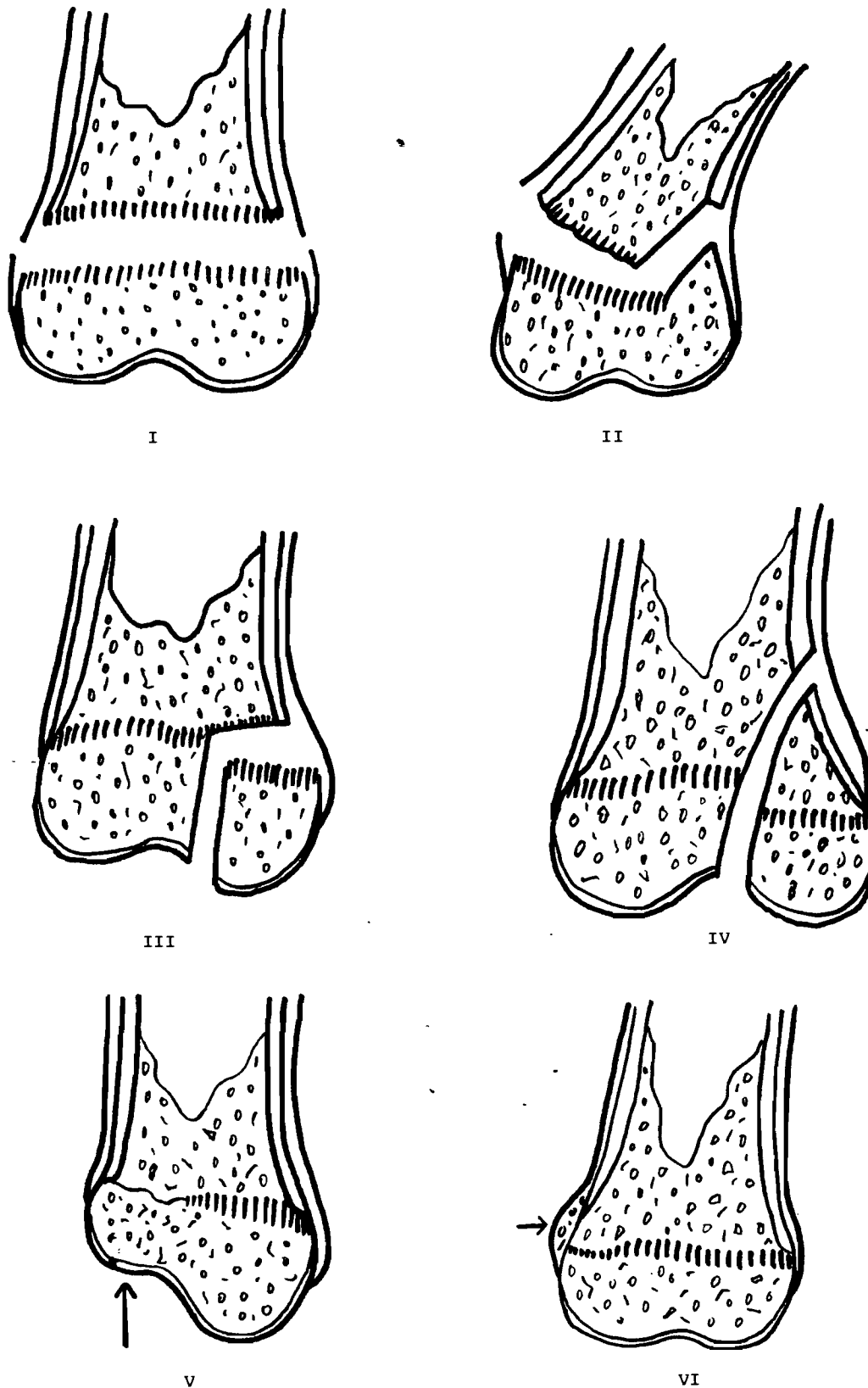


Fig. 2: Epifiseale groeiplaatfrakture: Salter-Härristipe I tot VI

- Tipe I: Skeiding van die groeiplaat (I)
- Tipe II: 'n Fragment van die metafise bly aangeheg aan die epifise (II)
- Tipe III: Intra-artikulêre, interkondilêre fraktuur (III)
- Tipe IV: Interkondilêre fraktuur strek op tot in die metafise (IV)
- Tipe V: Epifiseale groeiplaat word saamgepers (V)
- Tipe VI: Benige brug (pyltjie) ontwikkel oor die groeiplaat (VI)

epifiseale groeiplaat in 66 % van gevalle van suprakondilêre femurfrakture by honde en in 75 % van gevalle by katte nog nie gesluit was nie. Die algemene reël is dat die groeiplaat vroeër sluit by die kleiner honderasse¹⁹.

Sluiting van die distale epifiseale groeiplaat van die femur vind plaas by die hond tussen die ouderdomme van 7 en 9 maande⁴.

Faktore wat suksesvolle herstel beïnvloed

1. *Ouderdom van die pasiënt*: Vertraagde lengtegroei van die femur word veral waargeneem in jong diere wat tussen die ouderdom van 3 en 5 maande groeiplaatfrakture ontwikkel. Volwasse diere ontwikkel meer frakture van die femurskag¹¹.
2. *Gewrigsoppervlaktes*: Suprakondilêre femurfrakture word ook as 'n sogenaamde "gewrigsfraktuur" beskou. Ongewenste abnormaliteite wat kan ontwikkel indien die fraktuur nie anatomies korrek gereduseer en fikseer word nie, is:
 - (a) Oormatige kallusvorming op die femurmetafise net proksimaal van die patella²⁶.
 - (b) Verdikking van die kniegewrigskapsel⁶.
 - (c) Patella-ontwrigting¹.
 - (d) Bewegingsversteurings indien die kniegewrig na operasie immobiliseer word⁹.
 - (e) Sekondêre osteo-artrose met pyn en ongebruiksatrofie van die been^{9 10}.
3. *Rotasie van die femurfragmente*: Die patella sal uit die troglea ontwrig (gewoonlik mediale patellêre ontwrigting). Die tibia ontwikkel gevolglik 'n mediale aksiale rotasie wat weer die spanning op die kraniale kruisband en die mediale kollaterale ligament verhoog. Die mediale kollaterale ligament kan selfs verdik, verhard en later kalsifiseer, met ankilose van die kniegewrig⁶.
4. *Tydverloop tussen beserings en chirurgiese herstel*: By frakture ouer as 5 dae ontwikkel bindweefsel om die fragmente en bemoeilik soms korrekte apposisie. Omdat dit in die meeste gevalle jong pasiënte is, is dit noodsaaklik dat die tipe femurfraktuur sodanig herstel moet word dat die kniegewrig weer anatomies korrek en normale funksionele kinesiologie gehandhaaf kan word.

Epifiseale groeiplaatfrakture word in ses Salter-Harristipes geklassifiseer^{17 25} (Fig. 2).

Suprakondilêre femurfrakture word in vier groepe geklassifiseer¹⁹ wat klinies moeilik onderskeibaar is. Radiologiese ondersoek is belangrik om dit te diagnoseer en te evalueer. Die *M. gastrocnemius* is koudaal aan die laterale en mediale femurkondiele aangeheg (met fabella ingebed) en verleen koudale ondersteuning aan die kniegewrig. Die distale fragment word gewoonlik deur die sterk sametrekingskrag van die *M. gastrocnemius* koudaalwaarts verplaas. Die patella druk ook terselfdertyd op die troglea wanneer die dier sy kniegewrig wil strek en die femurkondiele word sodoende ook koudaalwaarts gedruk. Dit wil sê die distale fragment roteer 90°-koudaalwaarts met die lengte-as van die femur in die sagitale vlak.

Suprakondilêre en distale epifiseale femurfrakture (Salter-Harristipe I en II) word bespreek en nie interkondilêre (Salter-Harristipe III en IV) frakture nie:

Groep I: Groeiplaatskeiding (Salter-Harristipe I)

By katte dring die proksimale femurfragment dikwels

deur die *M. quadriceps femoris* en kan subkutaan palpeer word. Soms kan dit selfs die vel penetreer!



Fig. 3: Groep I: Die distale femurfragment word koudaal verplaas.

Insommige gevalle kan die distale femurfragment ook kraniaal verplaas wees.



Fig. 4: Groep I: Die distale femurfragment kan soms kraniaal verplaas word.

Groep II: Fiseale-Metafiseale skeur saam met 'n gedeelte van die epifiseale groeiplaat af.

'n Gedeelte van die metafise skeur saam met 'n gedeelte van die epifiseale groeiplaat af.



Fig. 5: Groep II: Fiseale-metafiseale femurfraktuur.

Groep III: Metafiseale femurfraktuur (Suprakondilêr)

Die pasiënt toon pynsimptome slegs wanneer die kniegewrig in volledige buiging en strekking gemanipuleer, of die patella palpeer word.



Fig. 6: Groep III: Metafiseale femurfraktuur.

Groep IV: Distale diafisefraktuur (Distale skagfraktuur)

Meer gevind by volwasse honde en katte. Die pasiënt toon vierde graad mankheid en die agterpoot swaai slap heen en weer



Fig. 7: Groep IV: Distale diafisefraktuur van die femur.

CHIRURGIESE TEGNIEKE VIR OOP REDUSERING EN FIKSERING VAN SUPRAKONDILÊRE EN DISTALE EPIFISEALE FEMURFRAKTURE

Radiologiese ondersoek is essensiël om die aard en omvang van die fraktuur te evalueer. In die praktyk word Steinmannpenne^{23 15 16 21 23}, Kirschnerdrade^{3 22 24} en Rushpenne^{14 18 21} gebruik. Trekskroewe^{12 26} en drie-gat beenplate¹³ word ook beskryf om hierdie tipe femurfraktuur te fikseer.

Gedurende die afgelope 14 maande (Januarie 1982 tot Februarie 1983) is 63 gevalle van distale femurfraktuur by honde en katte in ons departement behandel. Meeste fraktuur was deur die distale epifiseale groeiplaat (Tabel 1).

Tabel I: DISTALE FEMURFRAKTURE

	Honde	Katte
Groep I (Groeiplaatskeiding)	19	10
Groep II (fiseale-metafisealefraktuur)	14	3
Groep III (metafiseale femurfraktuur)	9	1
Groep IV (distale diafisefraktuur)	5	2
Totaal	47	16

Na my mening kan die volgende vier tegnieke aanbeveel word:

Tegniek I: Intramedullêre penmetode²¹⁵

Hierdie tegniek is in drie kleinrashonde toegepas (6 % van gevalle by honde).

Die femoro-tibiale gewrig word kranio-lateraal geopen en die snit proksimaal en distaal verleng sodat die gewrig en fragmentpunte manipuleer kan word. Die patella word mediaalwaarts ontwig en albei femurkondieles word met 'n beentang kraniaalwaarts verplaas sodat die kondieles nader aan die oppervlak kan kom.

Die distale fragment word nou in posisie gemanipuleer en 'n *dun* Steinmannpen, *langer* as die totale femurlengte, word net proksimaal van die interkondilêre fossa ingestoot sodat dit deur die distale fragment dring tot in die femurskag. Die skerp punt penetreer proksimaal by die *Trochanter major* se fossa en die vel, waar dit later kort gesny word. Die Steinmannpen word sub-chondraal begrawe sodat dit nie die kruisbande of gewrig kan beseer nie.

Na 4 tot 6 weke word die pen weer proksimaal deur die vel uitgetrek.

Tegniek II: Kort intramedullêre wigpenmetode²²³

Die tegniek is in 36 honde (80 % van gevalle) en in 13 katte (85 % van gevalle) gebruik.

Dieselfde prosedure word gevolg soos by Tegniek I, behalwe dat die *dun* Steinmannpen (S-pen) se lengte ongeveer een derde van die totale femur se lengte is (of minstens 3 maal die lengte van die distale femurfragment).

Die *dun* S-pen se deursnee moet net minder wees as die helfte van die femurmurgholte se deursnee. Oor-reducering van die distale fragment sal dan minder uitgesproke wees as wanneer 'n dikker pen gebruik word wat amper die hele murgholte vul.

Indien die fraktuur deur die epifiseale groeiplaat strek, is die fragmentpunte anatomies oneweredig a.g.v. die vorm van die groeiplaat. Rotasie van die distale fragment is selde 'n komplikasie.

Die kort lengte Steinmannpen word distaal twee derdes deurgesaag met 'n ystersagie. Daarna word die S-pen dieper in die femurmurgholte ingestoot totdat die saagmerk net onder die trogla se kraakbeen verdwyn en afgeknak. Die kort S-pen word dus subchondraal begrawe en permanent in die murgholte van die femur gelaat (Fig. 8).

Voordele van Tegniek I & II

- Min chirurgiese trauma word veroorsaak.
- 'n Eenvoudige en vinnige metode van reduksie en fiksasie.
- Die fraktuur kan visueel anatomies korrek en funksioneel herstel word.
- Geen na-operatiewe immobilisasie of stabilisasie is nodig nie. Die kniegewrig bly beweeglik en die pasiënt kan die been gebruik.

Chirurgiese komplikasies wat mag intree:

- Migrasie van die Steinmannpen deur die interkondilêre fossa kan plaasvind, met beskadiging van die kruisbande, patellêre ligament of gewrigskapsel.
- Die trogla se gewrigskraakbeen kan beskadig word wanneer die pen begrawe word.



Fig. 8: Die *dun* Steinmannpen word in die interkondilêre fossa begrawe en bly permanent in die femurskag.

- Rotasie van die distale fragment met patella-ontwrigting (Fig. 9).
- Oor-reducering van die distale fragment (Fig. 10).
- Steinmannpen buite die femurskag (Fig. 11).
- Steinmannpen dring deur die femurkorteks (Fig. 12).
- Versteuring van die femoro-kondilêre belyning (Fig. 13).

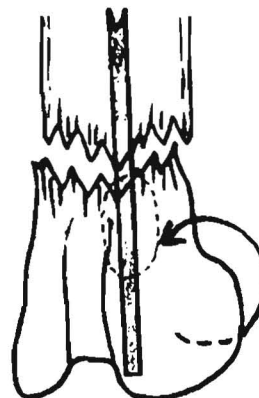


Fig. 9: Rotasie van die distale femurfragment en ontwrigting van die patella.

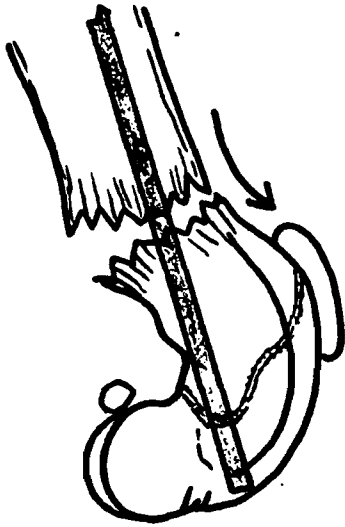


Fig. 10: Oor-redusering van die distale femurkondiele.

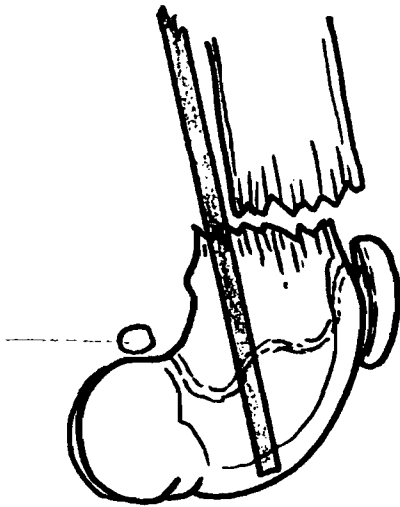


Fig. 11: Steinmannpen beland buitekant femurskag en beskadig die sagteweefsels koudaal van die femur.



Fig. 12: Steinmannpen penetreer die femurkorteks kraniaal.

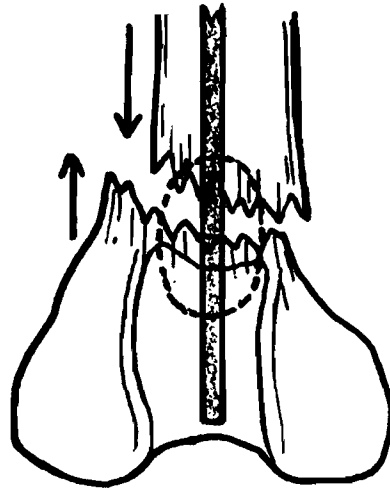


Fig. 13: Versteuring van die femoro-kondilêre belyning.

Tegniek III: Parallele Kirschnerdraadmetode³

Die tegniek is slegs in drie grootrassonde gebruik (6 % van gevalle). 'n Kranio-laterale artrotomie word weer gedoen soos by tegniek I en II.

Twee dun S-penne (groot honderasse) of Kirschnerdrade (K-drade) (klein pasiënte) word in die proksimale femurfragment se murgholte opgestoot tot deur die trochanteriese fossa en die vel. Die twee skerp punte van die S-punte/K-drade moet teenaan die koudale korteks van die proksimale fragment lê – een lateraal en een mediaal in die murgholte.

Trek die S-penne/K-drade totdat dië skerp punte gelyk is met die fraktuurlyn (Fig. 14).

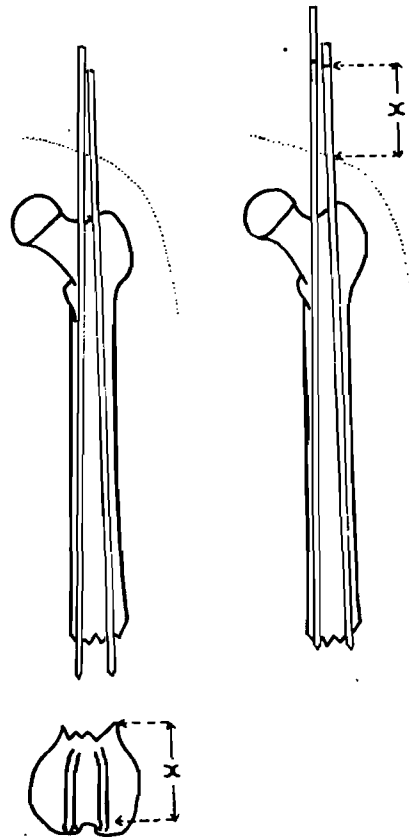


Fig. 14: Trek die dun Steinmannpenne/Kirschnerdrade proksimal uit totdat die skerp punte gelyk is met die fraktuurlyn. Die kondilêre lengte (x) word op elke S-pen/K-draad afgemerk (a).

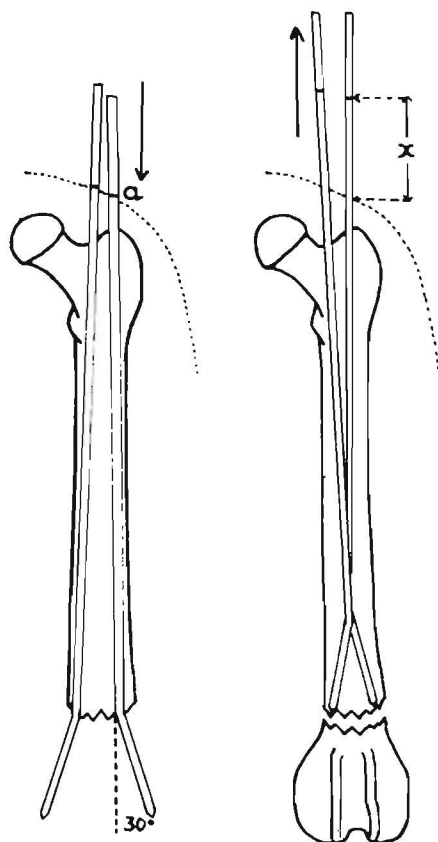


Fig. 15: Merkies (a) op die S-penne is gelyk met die veloppervlakte. Elke S-pen/K-draad word 30° mediaal- en lateraalwaarts gebuig en weer teruggetrek.

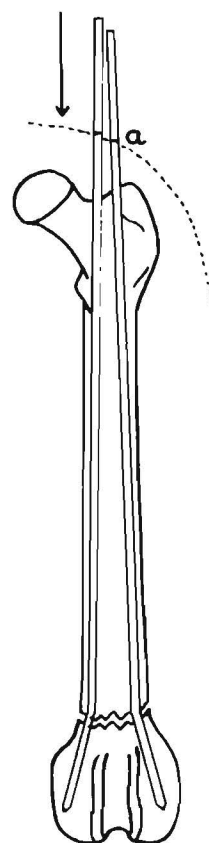


Fig. 16a: Met die femurfragmente in apposisie word elke S-pen/K-draad in die kondiele ingestoot totdat die merkies (a) weer gelyk is met die veloppervlakte.

Die lengte van die laterale en mediale femurkondiel word nou gemeet en hierdie afstand word op die twee S-penne/K-drade afgemerk waar hulle proksimaal by die vel uitkom (Fig. 14).

Elke S-pen/K-draad word vervolgens weer ingestoot totdat die merkies gelyk is met die veloppervlakte – dieselfde lengte sal nou by die fraktuurlyn uitsteek.

Die mediale S-pen/K-draad se distale punt word met 'n hoek van ongeveer 30° mediaalwaarts gebuig en weer in die murgholte teruggetrek totdat die skerp punt weer gelyk is met die proksimale fraktuurlyn. Dieselfde word ook met die laterale S-pen/K-draad gedoen, maar dit word net in 'n laterale rigting gebuig en teruggetrek (Fig. 15). Bring die distale femurfragment in posisie en stoot elke S-pen/K-draad in elke kondiel in sonder om die distale kondilêre oppervlakte te penetreer! Knip die S-penne/K-drade proksimaal net onder die veloppervlakte af (Fig. 16).



Fig. 16b: Onder-rêdusering van die distale femurfragment – die dun Steinmannpenne het baie min sponsbeen om in te anker.

Die patella word weer in die trogla teruggeplaas en die fibreuse gewrigskapsel en vel geheg.

Voordele van Tegniek III

- (a) Die fragmente kan goed in apposisie geplaas word.
- (b) Geen rotasie van die distale fragment is moontlik nie.

Nadele

- (a) Meer chirurgiese trauma word veroorsaak.
- (b) Moeilik gedoen in pasiënte met 'n klein murgholte distaal. (Die S-penne/K-drade druk weer reguit sodra dit teruggetrek word in die murgholte).
- (c) Migrasie van die S-penne/K-drade tot in die kniegewrig is moontlik, indien dit nie distale kondilêre oppervlaktes penetreer.
- (d) Onder-reduisering van die distale fragment kan veroorsaak dat die S-penne/K-drade te min spons-been beskikbaar het om in te ander (Fig. 16b).

Tegniek IV: Kruis Rushpenmetode¹⁷⁹¹⁴¹⁸

Dit is ook 'n baie goeie fiksasiemetode vir suprakondilêre femurfrakture maar spesiale instrumente word benodig wat nie altyd maklik beskikbaar is nie. Hierdie tegniek is in vyf honde (8 % van gevalle) en in drie katte (15 % van gevalle) gebruik.

Die gebruik van Rushpenne in die murgholte word beskou as 'n dinamiese metode van osteosintese⁷ terwyl Steinmannpenne meer beskou kan word as 'n stabiele fiksasiemetode by langbeenfrakture. By klein honderasse en katte kan 1,57 mm deursnee Kirschnerdraad gebruik word wat net soos Rushpenne oorkruis in die femurkondiele ingedruk en distaal "U"-vormig omgebui word om soos Rushpennetjies te lyk⁹ (Fig. 17).

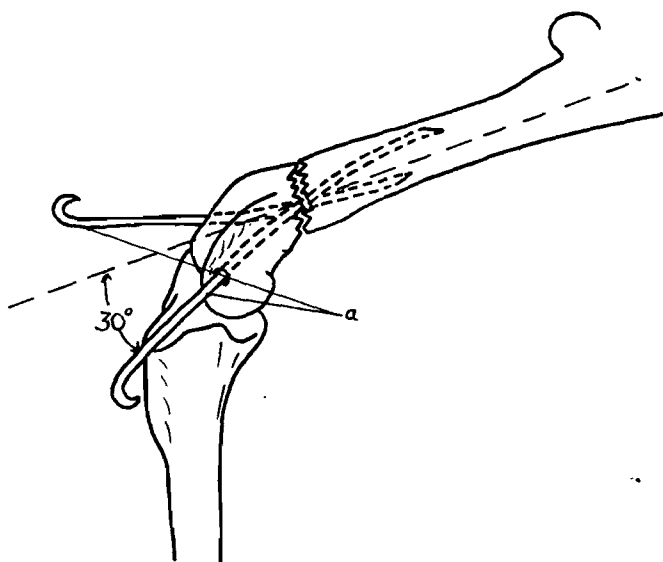


Fig. 17: Albei Rushpenne (a) word oorkruis in die femurmurgholte ingedruk met 'n hoek van 30° lateraal en mediaal met die lengte-as van die femur, terwyl die distale femurfragment in apposisie gehou word. Die Rushpenne se lengte moet 3,5X die lengte van die distale fragment wees.

Die Rushpenhak wat peri-artikulêr uitsteek, veroorsaak geen probleme in die kniegewrig nie. Die penne word weer na 4 tot 6 weke verwyder deur slegs 'n klein velwondjie oor die maklik palpeerbare hakke te maak en die penne met 'n tangetjie uit te trek.

Die kruis Kirschnerdraad kompressiemetode²²²⁴ het die voordeel dat dit primêre beengenesing in die distale epifiseale groeiplate bewerkstellig, sonder kallusvorming of aanhegtings aan die patella (Fig. 18). Hierdie tegniek is nie gebruik nie.

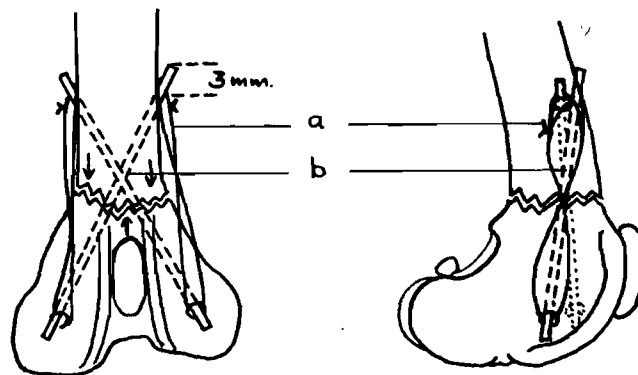


Fig. 18: Kruis Kirschnerdraad kompressiemetode: Kirschnerdrade (b) fikseer die fraktuur, terwyl die figuur agt drade (a) drukking op die fraktuurlyn veroorsaak.

Nadeel van hierdie tegniek is dat lengtegroei baie ingeperk word en die femurverkorting is opvallend indien die kruis Kirschnerdrade nie weer na 3 tot 4 weke verwyder word nie.

Dieselfde probleem word ook ondervind wanneer die trekskroefmetode¹²²⁶ en die drie-gat plaatmetode¹³ gebruik word (Fig. 19 en 20).

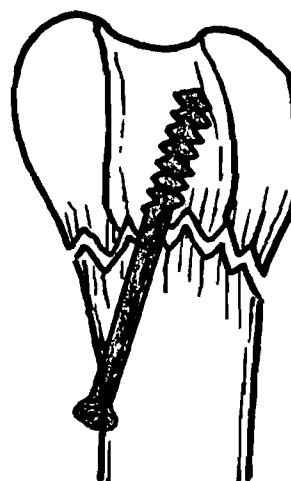


Fig. 19: Trekskroef kompressiemetode.

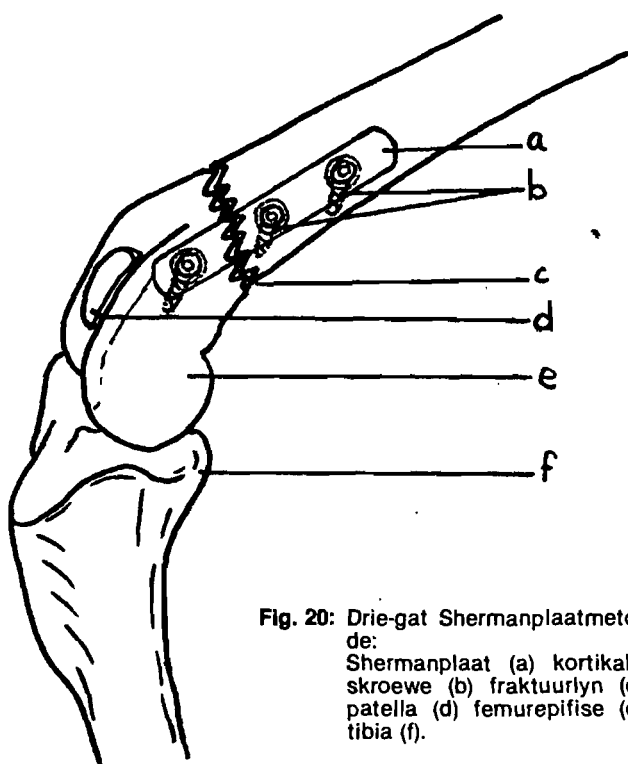


Fig. 20: Drie-gat Shermanplaatmetode:
Shermanplaat (a) kortikale skroewe (b) fraktuurlyn (c) patella (d) femurepifise (e) tibia (f).

Die kompressie-aksie van die trekstroef en beenplaat benadeel die epifiseale lengtegroei geweldig, en moet so spoedig moontlik na primêre beengenesing weer verwyder word (na 3 tot 4 weke by jong groeiende pasiënte).

BESPREKING

Vroeë sluiting van die epifiseale groeiplaat lei tot verkorting in femurlengte en word vererger wanneer van kompressiemetodes gebruik gemaak word bv. trekstroewe, kruis Kirschnerdrade en beenplate^{12 13 22 24 26}. Hinko¹² het vasgestel dat die femurverkorting by 'n 8½ maande oud hond 9 mm was, ongeveer 2½ maande nadat dit chirurgies herstel is. Die tibia se lengtegroei kompenseer egter, veral wanneer suprakondilêre femurfrakture plaasvind in honde onder 4 maande ouderdom¹.

Dit moet egter in gedagte gehou word dat die hond en kat, anders as die mens, redelik goed kan kompenseer indien minimale veranderinge in beenlengte ontwikkel het.

Indien die patella toegelaat word om vry te kan beweeg gedurende die herstelperiode, sal dit die motiliteit van die kniegewrig ook verbeter en minder aanhegtings of spieratrofie tot gevolg hê. Die gebruik van uitwendige immobilisasiemetodes soos 'n gipsverband, is dus 'n kontra-indikasie.

Daar is maar min inligting beskikbaar wat betrekking het op die langtermyn resultate van diere wat herstel het maar na my mening is die kort intramedullêre wigpenmetode²³ baie suksesvol by die herstel van meeste van die Salter-Harristipe I en II groeiplaatskeidings by klein- en gemiddelde grootte honderasse en katte. By die groter honderasse (massa groter as 16 kg) verleen die parallelle Kirschnerdraadmetode³ en die kruis Rushpenmetode¹⁴ egter 'n stewiger fiksasie van die distale femurkondiele sonder die moontlikheid dat die distale femurfragment kan roteer. Die prognose is goed indien die pasiënt die betrokke agterbeen 3 tot 4 dae na

chirurgiese fiksasie begin gebruik. Herstel word ook bevorder wanneer pasiënte vir 5 tot 7 dae in 'n hok kan rus, en ligte oefening vir 4 weke daarna kan kry.

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VERWYSINGS

1. ALCANTARA P J, STEAD A C 1975 Fractures of the distal femur in the dog and cat. *Journal Small Animal Practice* 16: 649-659
2. ARMISTEAD W W, LUMB W V 1952 Management of distal epiphyseal fractures of the femur. *North American Veterinarian* 33: 481-483
3. BRINKER W O 1981 Orthopaedic congress: Association for the Study of Internal Fixation. Johannesburg, Republic of South Africa
4. CHAPMAN W L 1965 Appearance of ossification centres and epiphyseal closures as determined by radiographic techniques. *Journal of the American Veterinary Medical Association* 147: 138-141
5. CULVENOR J A, HULSE J A, PATON C S 1978 Closure after injury of the distal femoral growth plate in the dog. *Journal Small Animal Practice* 19: 549-560
6. CAMPBELL J R 1977 Femorotibial surgery in the dog. *The Veterinary Record* 101: 318-320
7. DIETZ O, ERIKA Li 1975 Rush Pinning beim Kleintier. *Humboldt-Universität zu Berlin*: 99-101
8. DI FIORE M S H (ed.) 1967 *Atlas of Human Histology* 3rd edn Lea & Febiger, Philadelphia
9. EISENMENGER E 1969 Die distale Epiphysen losreissung und suprakondyläre Fraktur der femur bei Hund und Katze. *Weiner Tierärztliche Monatsschrift* 56: 356-369
10. FRITSCH R, ZEDLER W 1963 Die suprakondyläre Femurfraktur bei Hund und Katze. *Berliner Münchener Tierärztliche Wochenschrift* 76: 41-45
11. GRONO L R 1964 Treatment of femoral fractures in the dog. *Australian Veterinary Journal* 40: 172-176
12. HINKO P J 1974 Lag screw fixation of distal femoral epiphyseal fractures. *Journal of the American Hospital Association* 10(1): 61-63
13. HICKMAN J, WALKER R G (ed.) 1980 *An Atlas of Veterinary Surgery* 2nd edn John Wright & Sons Ltd, Bristol
14. LAWSON D D 1959 The technic of Rush Pinning in fracture repair. *Modern Veterinary Practice* 40: 32-36
15. LEONARD E P 1961 *Orthopaedic surgery of the dog and cat*. W B Saunders Company, Philadelphia & London
16. LEIGHTON R L 1952 Permanent intramedullary pinning of the femur in dogs and cats. *Journal of the American Veterinary Medical Association* 121: 347-350
17. LLEWELLYN H R 1976 Growth plate injuries - diagnosis, prognosis and treatment. *Journal of the American Animal Hospital Association* 12(1): 77-82
18. NIEMEYER K H, HOFFER R E 1971 Rush Pin repair of distal fractures of long bones in the dog. *Journal of the American Veterinary Medical Association* 59: 1433-1434
19. ROBINSON G W 1975 In: Bojrab M J (ed.) *Current techniques in small animal surgery*. Lea & Febiger, Philadelphia: 563-566
20. RUDY R L 1973 Intramedullary pins in fixation of fractures of long bones. *Archives III*: 23-27
21. RUDY R L 1975 Principles of Intramedullary pinning. *Veterinary Clinics of North America* 5(2): 209-228
22. SUMNER-SMITH G, DINGWALL J S 1973 a Technique for repair of fracture of the distal femoral epiphysis in the dog and cat. *Journal of the American Animal Hospital Association* 95: 171-173
23. SINGLETON W B 1966 Fractures of the hind limb in the dog and cat. *Journal Small Animal Practice* 7: 163-168
24. SAERS K J, PRIEUR W D 1974 Kreuzspickung mit Zuggurtung bei distalen Femurfrakturen. *Berliner Münchener Tierärztliche Wochenschrift* 87: 450-453
25. SALTER R B, HARRIS W R 1963 Injuries involving the epiphyseal plate. *Journal of Bone and Joint Surgery* 45-A: 587-622
26. WESTHUES M 1955 Die druckosteosynthese bei Fortsatzbrüchen der Kleintiere. *Berliner Münchener Tierärztliche Wochenschrift* 68: 125-128

ABSTRACTS

ABSTRACT: Bastianello, Stella S., 1983. A survey of neoplasia in domestic species over a 40-year period from 1935 to 1974 in the Republic of South Africa. III. Tumours occurring in pigs and goats. *Onderstepoort Journal of Veterinary Research*, 50, 25-28 (1983).

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

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

In goats, 8 (38%) of the tumours were squamous cell carcinomas, 50% of which occurred in the perineal region. Malignant melanomas and papillomas each made up 19% of the total, whilst lymphosarcomas accounted for 14% of the total caprine tumours.

ABSTRACT: Snyman, L.D. Van der Walt, J.J. & Pretorius, P.J., 1982. A study on the function of some subcellular systems of the sheep myocardium during gousiekte. I. The energy production system. *Onderstepoort Journal of Veterinary Research*, 49, 215-220 (1982).

In order to determine the status of the energy production system of the heart during cardiac failure of sheep with gousiekte, observations were made of the heart tissue levels of adenosine triphosphate (ATP), creatine phosphate (CrP), inorganic phosphate, reduced nicotinic adenine dinucleotide (NADH) and lactate. Some measurements on oxidative phosphorylation were also made. A significant decrease in ATP and CrP levels coincided with a simultaneous rise in the ATP:CrP ratio and lactate levels in gousiekte hearts. No significant deviations in inorganic phosphate and NADH levels could be demonstrated. These abnormalities were accompanied by a decreased uptake of oxygen by isolated mitochondria of gousiekte hearts. There was a marked increase in the anaerobic state of the hearts of dying gousiekte sheep, while the values of NADH and the ATP:CrP ratio at a presymptomatic stage indicated a possible early derangement in the energy metabolism of sheep fed the toxic material. No hypertrophy could be detected for the failing ventricles of gousiekte sheep after being corrected for a significant amount of oedema found in the heart tissue of these animals.

It was concluded that the depressed ATP and CrP levels in the heart of gousiekte sheep during cardiac failure could at least in part, be attributed to a depressed aerobic energy production. It is not possible, however, to state whether this is a primary or a secondary response due to intoxication and also whether it could be seen as a cause or effect of cardiac failure.

ABSTRACT: Snyman, L.D., Van der Walt, J.J. & Pretorius, P.J., 1982. A study on the function of some subcellular systems of the sheep myocardium during gousiekte. II. The contractile protein system. *Onderstepoort Journal of Veterinary Research*, 49, 221-226 (1982).

Two groups of Merino sheep were intoxicated separately and at different times with "gousiektebossie" (*Pachystigma pygmaeum*) until definite symptoms of heart failure were auscultated. Cardiectomy was carried out and some ventricular muscle from 1 group was stored in 50% glycerol at -20 °C for about 4 months. Natural actomyosin (n-actomyosin) was subsequently extracted and tested for magnesium, calcium and adenosine triphosphate (ATP)-dependent adenosine triphosphatase (ATP-ase) activity as well as for superprecipitation characteristics. Muscle strips were taken from the other group and stored for 2 weeks in 50% glycerol at -20 °C, whereafter it was analysed for an isometric tension-calcium response.

The data showed no difference between gousiekte and control sheep in the sensitivity of the contractile system to the activating effect of calcium ions with respect to isometric tension development. A significant reduction of the magnesium dependant ATP-ase was found for gousiekte n-actomyosin in either the presence or absence of calcium ions. A depressed sensitivity for this enzyme to increasing concentrations of ATP in comparison to controls was also found ($[ATP] < 1 \text{ mM}$, $[MgCl_2] = 1 \text{ mM}$). No significant difference could be detected in the sensitivity of the n-actomyosin: ATP-ase system to magnesium. n-Actomyosin: ATP-ase of gousiekte hearts revealed a depressed sensitivity to calcium ions. Gousiekte n-actomyosin also showed a significant depression in the rate of superprecipitation with a concomitant increase in the duration of the clearing phase.

We conclude from these observations that a definite biochemical lesion is induced in the contractile proteins of heart muscle obtained from sheep intoxicated with "gousiektebossie" at the stage of cardiac failure. This condition is characterized by abnormal superprecipitation characteristics and a depressed n-actomyosin: ATP-ase activity, showing a reduced sensitivity to the activating effect of calcium ions.

ABSTRACT: Scultz, R. Anitra, Coetzer, J.A.W., Kellerman, T.S. & Naudé, T.W., 1982. Observations on the clinical, cardiac and histopathological effects of fluoroacetate in sheep. *Onderstepoort Journal of Veterinary Research*, 49, 237-245 (1982).

Fluoroacetate was dosed per stomach tube to 17 Merino sheep at the rate of 0,05-1,0 mg/kg/day. The clinical signs, haemodynamic changes, chemical pathology and pathology of acute, subacute and chronically intoxicated cases are described.

Tetanic convulsions were seen in acutely intoxicated animals and in them respiratory failure, occurring concomitantly with cardiac failure, may have been the cause of death. Subacute intoxication resulted in less conspicuous clinical signs when the sheep were at rest, but they developed apparent nervous signs on being handled, and later tended to lie down. Chronically intoxicated animals were only mildly affected.

At all levels of intoxication changes in the chemical pathological parameters were either absent or were mild and transient.

The microscopic lesions in the heart of acutely intoxicated sheep included degeneration as well as necrosis of individual or small groups of myocardial fibres. In the subacutely and chronically intoxicated animals the multifocal myocardial lesions were more widespread and in various stages of development or resolution.

THE COMPOSITION OF PLASMA AND INTERSTITIAL FLUID OF GOATS WITH SWELLING DISEASE

G. MITCHELL*, J. HATTINGH** and M.F. GANHAO**

ABSTRACT: Mitchell, G.; Hattingh, J.; Ganhao, M.F.³ The composition of plasma and interstitial fluid of goats with swelling disease. *Journal of the South African Veterinary Association* (1983) 54 No. 3, 181-183 (En). MRC/University Circulation Research Unit, Department of Physiology, University of the Witwatersrand, 2001 Johannesburg, Republic of South Africa.

Angora goats may develop a characteristic ventral oedema of the subcutaneous tissue which is not unlike the 'wet-carcass syndrome' of sheep. The plasma of oedematous goats shows a lower total protein concentration, a lower colloid osmotic pressure and a lower albumin: globulin ratio than that of normal goats. Similarly, interstitial fluid of oedematous goats has a lower protein concentration, osmolality and colloid osmotic pressure than the fluid from normal but a similar albumin:globulin ratio. These results suggest that, unlike the 'wet-carcass syndrome' of sheep, the most likely explanation for the oedema is hypoproteinaemia which leads to filtration of fluid and an increased capillary permeability.

INTRODUCTION

We have recently reported that sheep with the 'wet carcass syndrome' have a subclinical oedema probably caused by the action of a vasodilator agent on the microcirculation³. Angora goats may develop a transient clinical oedema especially of the subcutaneous tissue of the ventral abdomen, a syndrome known as swelling disease ('swelsiekte'). Although the condition in goats seems to be more localized and is of greater intensity and shorter duration, the similarity of the observations in goats and sheep suggested that the goats developed a comparable but more severe vasodilatation and increase in capillary permeability to that occurring in sheep with the 'wet carcass syndrome'.

We have tested the hypothesis that the clinical oedema of goats is similar to the 'wet carcass syndrome' of sheep by comparing plasma and interstitial fluid from normal goats with fluids obtained from Angora goats showing a clinical ventral oedema.

MATERIALS AND METHODS

Animals and Fluids

For the analysis of clinical oedema, blood samples and oedema fluid were obtained from 8 Angora goats showing the oedema. Blood was taken by venipuncture and the subcutaneous fluid aspirated from the ventral surface in live animals.

For the collection of normal fluid samples, goats (Boerbokke) were kept under standard husbandry conditions at the Animal and Dairy Science Research Institute, Irene. Blood samples were obtained by venipuncture from these goats. Interstitial fluid samples were obtained from polythene capsules inserted subcutaneously in the scapular region under local anaesthesia. Fluid obtained from these capsules by aspiration 6 to 8 weeks after implantation has been shown to be representative of interstitial fluid^{1,6}.

Analytical techniques

Blood plasma was obtained from heparinised (500 U/ml final concentration) blood samples of all of the animals by centrifugation. Sodium and potassium in plasma and interstitial fluid were analysed using a Radiometer FLM

3 flame photometer, chloride concentrations using a Radiometer CMT 10 chloride titrator and osmolalities using a Wescor 5120 B vapor pressure osmometer. Albumin: globulin ratios were obtained after cellulose acetate electrophoresis using Beckman Microzone equipment and a Digiscreen scanner equipped with an integrator. The total protein content was determined by Lowry's method⁴ using bovine serum albumin as standard. Colloid osmotic pressure measurements were made using an electronic colloid osmometer as described by Prather et al.⁵, using Amicon PM-10 semipermeable membranes. This instrument was calibrated using bovine albumin solutions of known concentrations and a variable mercury column.

RESULTS

The fluid obtained from capsules in normal goats and from subcutaneous tissue in oedematous goats, was clear, watery and free of cells. The results of the analyses of plasma and interstitial fluid samples are shown in Table 1.

Significant differences in the constituents of body fluids between normal and abnormal animals could be shown. The composition of plasma of normal and oedematous goats differed significantly with respect to protein, colloid osmotic pressure and albumin: globulin ratio. All of these variables were significantly lower in oedematous goats than in normal goats. Interstitial fluid of normal goats and oedema fluid of abnormal goats differed significantly with respect to osmolality, protein and colloid osmotic pressure. Osmolality was significantly higher in interstitial fluid of abnormal goats while protein and colloid osmotic pressure were significantly lower. When the plasma of normal goats is compared to interstitial fluid of normal goats (Table 2) the expected lower total protein concentration and colloid osmotic pressure in interstitial fluid is revealed ($p < 0.01$). In addition Table 2 shows that in normal animals interstitial fluid osmolality is lower than plasma osmolality ($p < 0.01$), and interstitial albumin: globulin ratios are higher than plasma ratios ($p < 0.01$). In oedematous goats interstitial osmolality is the same as that of plasma. The high interstitial osmolality of oedematous animals relative to normal animals can be attributed to the significantly higher chloride concentration (compared to plasma) in the interstitial space of abnormal animals ($p < 0.01$). Colloid osmotic pressure and

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Table 1: FLUIDS OF NORMAL AND OEDEMATOUS GOATS

	Test	Normal goats n = 12	Oedema goats n = 8	P
Plasma	Chloride mmol/l	105,4 ± 6,7	105,0 ± 1,6	NS
	Sodium mmol/l	138,6 ± 11,0	143,0 ± 4,5	NS
	Potassium mmol/l	4,5 ± 0,6	4,6 ± 0,4	NS
	Osmolality mmol/l	276,9 ± 5,6	276,0 ± 4,8	NS
	Protein g/l	62,9 ± 12	53,0 ± 5,1	<0,01
	Colloid osmotic pressure mm Hg	29,1 ± 6,1	24,0 ± 2,8	<0,01
	Albumin: Globulin ratio	0,71 ± 0,1	0,5 ± 0,1	<0,01
Interstitial	Chloride mmol/l	109,8 ± 8,8	114,0 ± 1,1	NS
	Sodium mmol/l	137,3 ± 9,8	147,0 ± 3,5	NS
	Potassium mmol/l	4,0 ± 0,3	4,6 ± 0,6	NS
	Osmolality mmol/l	264,7 ± 5,1	278,8 ± 5,2	<0,01
	Protein g/l	39,7 ± 6,1	2,4 ± 1,5	<0,01
	Colloid osmotic pressure mm Hg	10,2 ± 1,9	0	<0,01
	Albumin: Globulin ratio	0,9 ± 0,1	0,9 ± 0,3	NS

Data are presented as mean ± standard deviation. Significance was tested using Student's 't' test.

Table 2: FLUIDS OF NORMAL AND OEDEMATOUS GOATS

	Test	Plasma	Interstitial Fluid	P
Normal goats	Chloride mmol/l	105,4 ± 6,7	109,8 ± 8,8	NS
	Sodium mmol/l	138,6 ± 11,0	137,3 ± 9,8	NS
	Potassium mmol/l	4,5 ± 0,6	4,0 ± 0,3	NS
	Osmolality mmol/l	276,9 ± 5,6	264,7 ± 5,1	<0,01
	Protein g/l	62,9 ± 12	39,7 ± 6,1	<0,01
	Colloid osmotic pressure mm Hg	29,1 ± 6,1	10,2 ± 1,9	<0,01
	Albumin: Globulin ratio	0,71 ± 0,1	0,9 ± 0,1	<0,01
	n	13	5	
Oedematous goats	Chloride mmol/l	105,0 ± 1,6	114,0 ± 1,1	<0,01
	Sodium mmol/l	143,0 ± 4,5	147,0 ± 3,5	NS
	Potassium mmol/l	4,6 ± 0,4	4,6 ± 0,6	NS
	Osmolality mmol/l	276,0 ± 4,8	278,8 ± 5,2	NS
	Protein g/l	53,0 ± 5,1	2,4 ± 1,5	<0,01
	Colloid osmotic pressure mm Hg	24,0 ± 2,8	0	<0,01
	Albumin: Globulin ratio	0,5 ± 0,1	0,9 ± 0,3	<0,01
	n	8	8	

Data are presented as mean ± standard deviation. Significance was tested using Student's 't' test.

protein concentrations are lower in interstitial fluid and the albumin : globulin ratio higher ($p < 0.01$) than in plasma.

It is now well established that changes in the volume of water in the interstitial space occur as a result of changes in the free fluid volume of the space². Thus oedema is characterised by an increase in free fluid volume in the absence of a change in saturation of the gel phase of the interstitial space³.

Normally most fluid is trapped in the gel phase and the small volume of free fluid is removed from the interstitial space as rapidly as it enters from capillaries. This equilibrium of the free fluid across the capillary membrane is described by Starling's equation:

$$P_c - P_{if} = \pi_c - \pi_{if}$$

where P_c is capillary hydrostatic pressure, P_{if} interstitial hydrostatic pressure, π_c capillary colloid osmotic pressure and π_{if} interstitial colloid osmotic pressure. Fluid will collect in the interstitial space if the equilibrium dependent on these pressures is altered. Oedema will also develop, however, in the absence of an altered equilibrium, if the volume of gel decreases.

In our experiment it seems unlikely that the gel volume decreased. The synthesis of gel requires an adequate level of nutrition, particularly of proteins and vitamins A and C. In these circumstances resolution of an oedema will be slow once the nutritional status has improved. In the swelling disease goats, the oedema is characteristically short-lived and, therefore, unlikely to be solely dependent on a decreased gel volume. It also seems unlikely that either P_c or P_{if} changed significantly to produce a transient oedema. On the other hand our data indicate that the abnormal goats had a hypoalbuminaemia. The evidence for this is that both plasma protein concentration and the plasma albumin : globulin ratio were significantly lower in abnormal goats than normal goats (Table 1). While decreased plasma albumin concentrations imply malnutrition and consequently the possibility of a decreased synthesis of glycoprotein in the interstitial space, it is also clear that hypoalbuminaemia will facilitate filtration of fluid into the interstitial space, by lowering π_c .

Our results support the idea that filtration of fluid has occurred and further indicate that capillary permeability to albumin has increased. The evidence for increased fluid filtration is dilution of interstitial fluid proteins in oedematous goats. The evidence for increased capillary permeability to albumin in oedematous goats is a normal interstitial albumin : globulin ratio despite a low plasma albumin : globulin ratio. If there had been no change in capillary permeability then the albumin : globulin ratio in interstitial fluid of oedematous goats

would have been lower than that of interstitial fluid of normal goats.

The low protein concentrations of interstitial fluid of oedematous goats can occur either because proteins are diluted in the interstitial space or because movement of proteins into the interstitial space has decreased. The low colloid osmotic pressure in the plasma of the abnormal goats would strongly favour the former. It would thus seem that large volumes of fluid have filtered into the interstitial space (localized) diluting the proteins. In addition albumin movement into the space would initially decrease because of the lower concentration gradient (low plasma albumin concentration) but would later increase again as interstitial albumin is diluted. The net effect is that a very low protein concentration develops in the interstitial fluid. This results in a redistribution of ions, especially chloride ions, to the extent total interstitial osmolality increases despite the dilution and the concentrations of proteins and ions shown in the tables become established in the oedematous goats.

In summary, our data suggest that the most likely explanation for the transient swelling disease of goats is a hypoproteinaemia and a disturbance in the balance of forces across, and a change in permeability of, capillary membranes. Further support for this idea is that swelling disease seems to occur more often during winter and in goats grazing green pastures (personal communication; Dr. S.O. Vermeulen) both of which may predispose to low protein intake.

ACKNOWLEDGEMENTS

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REFERENCES

1. COETZEE J H, HATting J, MITCHELL G 1982 American Journal of Physiology 72A: 173-178
2. GUYTON A C 1981. Textbook of Medical Physiology. 6th edn Saunders, London
3. HATting J, MITCHELL G, GANHAO M F 1983 The composition of plasma and interstitial fluid of sheep with the 'wet carcass syndrome'. Journal of the South African Veterinary Association 54 (in press)
4. LOWRY O H, ROSEBROUGH H J, FARR A L, RANDALL R J 1951 Protein measurement with the Folin phenol reagent. Journal of Biological Chemistry 193: 265-275
5. PRATHER J W, GAAR K A, GUYTON A C 1968 Direct continuous recording of plasma colloid osmotic pressure of whole blood. Journal of Applied Physiology 24: 602-605
6. SENAY L C, MITCHELL G, MCCLAIN E, MITCHELL D, CONNORS N 1982 A subcutaneous capsule for long term studies. American Journal of Physiology 6: 241: F687-F691

ABSTRACTS

ABSTRACT: Van Dijk, A.A. & Huismans, H., 1982. The effect of temperature on the *in vitro* transcriptase reaction of bluetongue virus, epizootic haemorrhagic disease virus and African horsesickness virus. *Onderstepoort Journal of Veterinary Research*, 49, 227-232 (1982).

Virions of bluetongue virus (BTV), epizootic haemorrhagic disease virus (EHDV) and African horsesickness virus (AHSV) can be concerted to core particles by treatment with chymotrypsin and magnesium. The conversion is characterized by the removal of the 2 outer capsid polypeptides of the virion. The loss of these 2 proteins results in an increase in density from 1,36 g/ml to 1,40 g/ml on CsCl gradients. The BTV, EHDV and AHSV core particles have an associated double-stranded RNA dependant RNA transcriptase that appears to transcribe mRNA optimally at 28 °C. It was found, at least in the case of BTV, that this low temperature preference is not an intrinsic characteristic of the transcriptase, but is due to a temperature-dependent inhibition of transcription at high core concentrations.

ABSTRACT: Barnard, B.J.H., Hassel, R.H., Geyer, H.J. & De Koker, W.C., 1982. Non-bite transmission of rabies in kudu (*Tragelaphus strepsiceros*). *Onderstepoort Journal of Veterinary Research*, 49, 191-192 (1982).

The titres of rabies virus in the saliva of kudu are higher than those of the salivary glands. The high titres are an indication of active excretion and multiplication in tissues other than the salivary glands. Two out of 4 kudu died of rabies after experimental infection by the instillation of infected saliva onto their buccal and nasal mucosae. Mice and 2 cattle resisted a similar exposure. Kudu also developed antibodies against rabies after instillation of HEP Flury virus onto their nasal and buccal mucosae. Cattle did not react when they were treated in the same way. These results suggest a high subceptibility of kudu to rabies when the virus is applied to their mucous membranes.

ABSTRACT: Barnard, B.J.H. & Voges, S.F., 1982. A simple technique for the rapid diagnosis of rabies in formalin-preserved brain. *Onderstepoort Journal of Veterinary Research*, 49, 193-194 (1982).

A simple technique is described for the rapid diagnosis in formalin-preserved brain. Brain tissue was emulsified, washed with phosphate-buffered saline and digested with trypsin. The digested material was stained according to conventional immunofluorescent procedures. Digestion with trypsin markedly enhanced the staining of rabies inclusions and eliminated non-specific staining of formalin-preserved brain. The method seems to be more accurate than histological examination.

ABSTRACT: Newsholme, S.J., 1983 A morphological study of the lesions of African horsesickness. *Onderstepoort Journal of Veterinary Research*, 50, 7-24 (1983).

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

ABSTRACT: De Vos, A.J. & Potgieter, F.T., 1983. The effect of tick control on the epidemiology of bovine babesiosis. *Onderstepoort Journal of Veterinary Research*, 50, 3-5 (1983).

The effect of tick control on the infection rates of *Babesia bovis* and *Babesia bigemina* are reported for 6 geographical regions in South Africa. Under conditions of poor tick control the situation for *B. bovis* was one of apparent enzootic instability in the 2 regions where its presence was recorded. Under similar conditions the situation for *B. bovis* was generally stable.

With good tick control *B. bovis* infection rates were reduced to very low levels, with minimal losses being recorded. In the case of *B. bigemina*, good tick control reduced the infection rates in cattle but increased the risk of outbreaks.

We concluded that, unless regular dipping is necessary to limit damage done by ticks *per se*, control of ticks is not justified economically as a means of minimizing the risks of babesiosis outbreaks in South Africa.

ABSTRACT: De Vos, A.J. & Roos, J.A., 1983. Chemotherapy of *Theileria parva lawrencei* infections in cattle with halofuginone. *Onderstepoort Journal of Veterinary Research*, 50, 33-35 (1983).

Halofuginone lactate, given once orally at a dosage rate of 1,2 mg/kg body mass on the 1st, 3rd or 5th days of fever, resulted in the recovery of only 1 out of 5 splenectomized cattle. Three splenectomized animals, treated on the 1st as well as the 4th day of fever, recovered and were then carriers. Six untreated controls all died. The potential value of a chemotherapeutic agent for *Theileria parva lawrencei* infections in South Africa is discussed.

ABSTRACT: Potgieter F.T. & Van Rensburg, L., 1983. Infectivity, virulence and immunogenicity of *Anaplasma centrale* live blood vaccine. *Onderstepoort Journal of Veterinary Research*, 50, 29-31 (1983).

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

STROBILIOESTRUS SP. LARVAE IN MERINO SHEEP

VIRGINIA BRAIN*, H. ELIZE VAN DER MERWE* and I.G. HORAK**

ABSTRACT: Brain V.; Van Der Merwe H.; Horak I.G., *Strobiloestrus* sp. larvae in Merino sheep. *Journal of the South African Veterinary Association* (1983) 54 No. 3, 185-186 (En) Veterinary Laboratory, P.O. Box 502, 9300 Bloemfontein, Republic of South Africa.

Seventeen Merino sheep in the Springbokfontein region of the Orange Free State were found to harbour *Strobiloestrus* sp. larvae in cutaneous nodules in the flank and rump regions of their bodies. The life cycle, however, could apparently not be completed in the sheep as the larvae left the nodules without developing further.

Mountain reedbuck, running with the sheep, were also infested and were a probable source of infestation for the sheep.

INTRODUCTION

The definitive hosts of larvae of warble flies belonging to the genus *Strobiloestrus* are klipspringers, mountain reedbuck, steenbok and vaal ribbok². They have been recovered from kudu and a domestic goat² and more recently also from cattle¹. Although cattle may be considered abnormal hosts the larvae are able to develop to the third stage in these animals¹.

The present paper describes the recovery of *Strobiloestrus* sp. larvae from Merino sheep in the Orange Free State.

HISTORY

The farm "Rheeboksfontein" situated in the Springfontein region of the Orange Free State, consists of rocky mountainous ridges and koppies interspersed with lower lying flatter terrain. Mountain reedbuck occur in fairly large numbers and roam freely over the farm. Other game found on the farm are blesbok, springbok and steenbok.

During September 1982, the owner of the farm noticed that some of his Merino sheep were plucking at the wool in their flank regions. At closer inspection, raised nodules were noticed in the skins of these sheep. On pressure each nodule yielded a single fly larvae and these larvae on microscopic examination proved to be second instar larvae of a *Strobiloestrus* species (Fig. 1).



Fig. 1: Second stage larvae of *Strobiloestrus* sp. expressed from the skin of a sheep. Actual length of larva 10,5 mm.

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Sheep on "Rheeboksfontein" are shorn at 8-monthly intervals and the affected sheep had been shorn but not dipped approximately 2 weeks prior to the infestation being noticed. From April to July the sheep are belly-bathed in an acaricide containing gamma BHC for the control of the Karoo paralysis tick, *Ixodes rubicundus*. During December they are plunge dipped in an acaricide containing diazinon or triazophos for the control of scab mite, *Psoroptes ovis*.

INVESTIGATION

On visiting the farm it was found that the sheep harbouring the *Strobiloestrus* sp. larvae ran in 2 adjoining camps. One of the camps was situated mainly on a mountainous ridge and, in addition to 507 sheep, contained approximately 150 mountain reedbuck. The other camp was flatter but enclosed isolated rocky koppies. This camp contained approximately 40 mountain reedbuck and 290 sheep. Five sheep in the former camp and 12 in the latter camp were infested with *Strobiloestrus* sp. larvae and some sheep had as many as 5 nodules containing larvae.

During October 1982, 2 of the affected sheep were transported to the Regional Veterinary Laboratory at Bloemfontein for further observation. The remaining infested sheep were treated with a pour-on formulation of famphur.

The sheep kept for study purposes were regularly examined and the parasitized nodules inspected. The size of the nodules did not enlarge appreciably and towards the end of November 1982 a purulent exudate was noted at the sites of the nodules and the larvae had disappeared.

The farm was visited again during early December 1982 and 2 mountain reedbuck were shot. One of these harboured 2 second stage *Strobiloestrus* sp. larvae in nodules in the region of the last rib and flank.

The sheep in the affected camps were also examined but no parasitized nodules were found. Dead, desiccated larvae were, however, found caught up in the wool of a number of the treated and some untreated sheep. These larvae on rehydration were found to be *Strobiloestrus* sp. larvae.

The sites on the sheep of the now empty nodules were also noted. These were laterally in the region of the last rib and on the flank, in the upper pelvic region and dorsally on the rump.

DISCUSSION

The definitive hosts of the *Strobiloestrus* infestation recorded in cattle in the Middelburg district of the Transvaal were klipspringers¹. In the present infestation, mountain reedbuck were the most probable definitive hosts, although steenbok could also have played a role. As in the case of the infestation in cattle, no specific identification of the *Strobiloestrus* sp. larvae infesting the sheep could be made.

Larvae infesting cattle reach the third larval stage and may even leave the host as mature third stage larvae and pupate¹. This did not appear to be the case with the infestation in Merino sheep. In these animals the larvae left the nodules and died in the second larval stage.

Infestation probably occurred some time after the December 1981 plunge dipping had taken place as this

would probably have killed any larvae present at that time. It is likely that the belly dipping which was applied after April 1982 would not have affected infestation as the acaricide, which also has insecticidal properties, would not have covered the nodules. Had the sheep been plunge dipped in an acaricide with an insecticidal effect shortly after shearing in August 1982 the infestation would probably have been eliminated then.

REFERENCES

1. HORAK I G, BOOMKER J 1981. *Strobiloestrus* sp. larvae in cattle. Journal of the South African Veterinary Association 52: 211-212
2. ZUMPT F 1965. Mysiasis of man and animals in the Old World. Butterworths, London

BOOK REVIEW

BOEKRESENSIE

HELMINTHS, ARTHROPODS AND PROTOZOA OF DOMESTICATED ANIMALS

E.J.L. SOULSBY

7th Edition. Baillière Tindall London (Publishers) 1982 pp 809 Figs 375 and 10 Tables Price R65 ISBN 0702008206

This edition of an already well-known textbook has been extensively revised and extended to include accounts of parasites of fish and laboratory animals as well as some information on wild animals and exotic pets. This has involved the addition of many new descriptions as well as increasing the number of figures (65 figures and 7 tables have been added to this addition as compared to the previous edition). Following a brief introduction the book is divided into sections dealing with Helminths (348 pages), Arthropods (145 pages), Protozoa and some Rickettsia (252 pages) and Techniques (15 pages). The latter include pictures of the worm eggs of the domesticated animals, and extensive host parasite lists. The more important reference citations are given, should greater detail be required.

Throughout, the text is concise and clear and well illustrated with photographs and drawings. In the introduction it states that this edition takes a global view of parasitic diseases of domesticated animals however the details of parasites occurring in Africa and particularly Southern Africa are less extensive than for those of temperate climates. For example no mention is made of the development of a vaccine for the control of besnoitiosis or the oc-

currence of *Theileria lawrencei* (*T. parva bovis*) in Zimbabwe in the absence of buffalo. The chapter on Rickettsia is very brief with *Ehrlichia canis* being dismissed in 8 lines and the statement that transovarian transmission occurs in *Anaplasma marginale* is not supported by the more recent literature on the subject.

The descriptions of parasites of wild animals, exotic animals and fish serve as a good introduction to the subject but are not complete. This is, however, a very large subject which would have been very difficult to cover completely in a volume of this size. One would have preferred to see an enlargement of the sections on parasites peculiar to Africa rather than the inclusion of the parasites of such a diverse group of animals.

This new edition is a useful basic textbook for the general practitioner and can be recommended to veterinary students, but they will have to bear in mind that some of the sections on tropical parasites are dealt with superficially and that the text is by no means a complete manual on the very diverse subject of Veterinary Parasitology.

C.G. Stewart

BLOOD SELENIUM OF SHEEP IN SOME DISTRICTS OF THE NORTHERN ORANGE FREE STATE: A PRELIMINARY REPORT

J.A. ERASMUS* and A. FAANHOF**

ABSTRACT: Erasmus J.A.; Faanhof A. Blood selenium of sheep in some districts of the Northern Orange Free State: A preliminary report. *Journal of the South African Veterinary Association* (1983) 54 No. 3, 187-188 (En). Veterinary Laboratory, P.O. Box 625, 9500 Kroonstad, Republic of South Africa.

Blood selenium concentrations of clinically healthy sheep were determined using a neutron activation technique. Although the number of samples were relatively small, the selenium concentration in the blood of sheep in the Kroonstad district appeared to be fairly normal. In the Bethlehem and Fouriesburg districts on the other hand, the blood selenium levels indicated the possible appearance of selenium responsive diseases.

INTRODUCTION

White muscle disease, one of the manifestations of selenium deficiency in sheep is noted with irregular frequency in the Northern Orange Free State (N-OFS). This finding warranted an investigation into the selenium status of sheep in this area. For the purpose of such a survey the selenium concentration in the blood of clinically healthy sheep was determined.

MATERIALS AND METHODS

Eight farms in the Bethlehem, Bultfontein, Fouriesburg and Kroonstad districts were randomly selected. On these farms blood samples of 108 sheep were taken from the jugular vein into heparinized Vacutainer tubes (Radem Lab. Equipment, Wynberg). On arrival at the laboratory 1,0 ml was taken from each sample and freeze-dried in the conventional way.

The poolside rotating facility of the SAFARI-1 reactor at Pelindaba was used to determine the selenium concentrations of the freeze-dried samples by means of neutron activation. For this technique the batches of samples and the necessary standards were irradiated for 10 h in a thermal neutron flux of about $10^{12} \text{ n.cm}^{-2}.\text{s}^{-1}$. The activity of the long-life isotopes was measured by Ge-Li gamma-spectroscopy after allowing an isotope decay period of 4-8 weeks. After the appropriate corrections were applied the concentration of selenium in each individual sample could be calculated ($\mu\text{g/ml}$).

RESULTS AND DISCUSSION

The results are summarized in Figure 1 and Table 1.

Table 1: RANGES FOR BLOOD SELENIUM FOR SHEEP IN THE BETHLEHEM-FOURIESBURG, KROONSTAD AND BULTFONTEIN DISTRICTS ($\mu\text{g/ml}$)

District	Figure shown by median (50 %)	Ranges		
		80 %	10 % lower	10 % upper
Bethlehem-Fouriesburg	0,065 (n = 39)	0,026–0,120	0,010–0,026	0,120–0,253
Kroonstad	0,165 (n = 56)	0,090–0,305	0,020–0,090	0,305–0,420
Bultfontein	0,360 (n = 13)	–	–	–

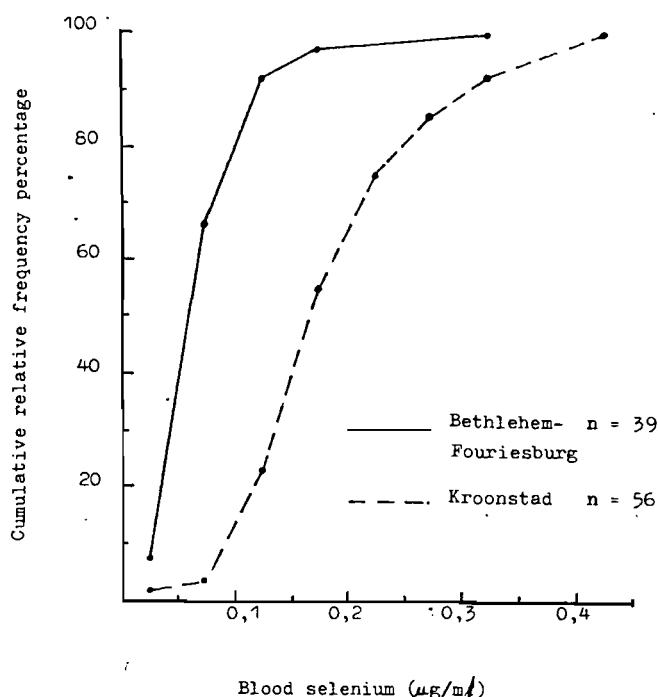


Fig. 1: Cumulative relative frequency curve for blood selenium of sheep in the Bethlehem-Fouriesburg and Kroonstad districts

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Although the concentration of selenium in the blood of animals depends on the selenium content of the diet, the normal levels commonly lie within the range of 1,0-2,0 $\mu\text{g}/\text{ml}$ ⁶. Selenium responsive diseases are likely to occur when blood selenium levels are below 0,075 $\mu\text{g}/\text{ml}$, and levels below 0,05 $\mu\text{g}/\text{ml}$ are considered to indicate a deficiency state.¹ About 67 % of the samples taken in the Bethlehem and Fouriesburg districts had selenium concentrations of less than 0,075 $\mu\text{g}/\text{ml}$ (Fig. 1). In fact, about 40 % of the samples contained less than 0,05 $\mu\text{g}/\text{ml}$. Only 4 % of the animals selected in the Kroonstad district had blood selenium concentrations of less than 0,075 $\mu\text{g}/\text{ml}$. Accordingly selenium responsive diseases of sheep could be expected to occur fairly generally in the Bethlehem-Fouriesburg area, but to a much lesser extent in the Kroonstad district.

Too few sheep were included in the Bultfontein sample to express the data in a relative frequency curve. The median level of 0,360 $\mu\text{g}/\text{ml}$ (Table 1) which was arrived at by inspection, is however much greater than the median of 0,165 $\mu\text{g}/\text{ml}$ for the sample from the Kroonstad district. The occurrence of selenium responsive diseases could thus be expected to be even less than in the case of the Kroonstad area.

In their chapter on normal and abnormal biological observations, King & Wootten⁴ considered as normal values 80 % of a population observed, when such data are grouped and arranged as a frequency polygon or histogram. The upper and lower 9 % of the population are considered as being possibly abnormal and the outer 1 % are considered definitely abnormal. On this basis the normal levels of blood selenium of sheep in the Kroonstad district could be taken as 0,090-0,305 $\mu\text{g}/\text{ml}$ (Fig. 1, Table 1). The lower level appears to be in agreement with the figure of 0,10 $\mu\text{g}/\text{ml}$ as suggested by Underwood⁷. Definitely increased values would then be 0,420 $\mu\text{g}/\text{ml}$ and more (Table 1).

On a ration with a selenium content of about 0,33 $\mu\text{g}/\text{g}$ the blood selenium concentration of cattle varied between 0,833 and 0,323 $\mu\text{g}/\text{ml}$ ⁹. Blind staggers, a form

of chronic selenosis in cattle and sheep occurs when 2 mg/kg body mass is supplied in an organic form in the ration⁵. The high blood selenium levels found in the blood of clinically healthy sheep in the Bultfontein district could thus indicate the ingestion of high, but non-toxic amounts of selenium.

With regards to selenium in sheep in the N-OFS, two avenues for further investigation have been identified viz.

1. Due to low blood selenium values in sheep in some of the eastern districts of the area, the occurrence of selenium responsive diseases could be expected. The mapping of the actual deficient area and an investigation into the selenium responsive diseases occurring should be a fruitful exercise.
2. Additional blood samples should be analyzed in order to determine a feasible norm for blood selenium of sheep in the more western parts where high blood levels have been noted.

REFERENCES

1. ANDREWS E D, HARTLEY W J, GRANT A B 1968 Selenium responsive diseases of animals in New Zealand. *New Zealand Veterinary Journal* 16: 3-17
2. ANDERSON P H, BERRETT S, PATTERSON D S P 1979 The biological selenium status of livestock in Britain as indicated by sheep glutathione peroxidase activity. *The Veterinary Record* 104: 235-238
3. BACKALL K A, SCHOLTZ R W 1979 Reference values for a field test to estimate inadequate glutathione peroxidase activity and selenium status in the blood of cattle. *American Journal of Veterinary Research* 40: 733-738
4. KING E J, WOOTTON I D P 1959 *Micro-analysis in medical biochemistry*. 3rd edn, J and A Churchill, London
5. ROSENFELD I, BEATH O A 1964 *Selenium*. Academic Press. New York and London
6. UNDERWOOD C B E 1966 *The mineral nutrition of livestock*. Food and Agricultural Organization of the United Nations By Commonwealth Agricultural Bureaux. The Central Press, Aberdeen
7. UNDERWOOD E J 1971 *Trace elements in human and animal nutrition*. 3rd edn, Academic Press, New York

BOOK REVIEW

BOEKRESENSIE

CURRENT THERAPY IN EQUINE MEDICINE

N. EDWARD ROBINSON

Consulting editors H.D. Knight, H.F. Hintz, Christopher M. Brown, V.K. Ganjam, Robert H. Whitloch, Gary P. Carlson, I.G. Mayhew, Gretchen M. Schmidt, A.C. Asbury, N.E. Robinson, A.A. Stannard, T. Tobin and F.W. Oehme.

W.B. Saunders Company, Philadelphia and Toronto 1983 XVI XXVI 637, Figs. 49, Tabs. 128, Publ. Price £56,50

The contents of the book are divided into 14 sections which include the usual system subdivisions plus sections on infectious diseases, nutrition and toxicology. The appendices contain information on normal clinical pathology data, a table of drugs commonly used with approximate doses and information on ageing of the horse.

The basic aim of the book, as set out by the author, is to provide the practising veterinarian, and veterinary student, with the most recent information on the therapy of the

common medical diseases of the horse. In my opinion this aim is most certainly achieved and this book fills a definite gap in the reference work on equine medicine.

In general each article contains a brief description of the disease and diagnostic procedures with emphasis on treatment and prevention. The section editors are all known experts in their fields which accounts for the high standard of information contained in this book.

S. van Amstel

CLINICAL DIAGNOSIS OF *SPIROCERCA LUPI* INFESTATION IN DOGS

L.B. EVANS*

ABSTRACT: Evans L.B. *Clinical diagnosis of Spirocerca lupi infestation in dogs.* *Journal of the South African Veterinary Association* (1983) 54 No. 3, 189-191 (En) 8 Village Road, 3600 Kloof, Natal, Republic of South Africa.

The clinical criteria used to establish a diagnosis of *Spirocerca lupi* infestation in dogs are discussed, with special emphasis on the radiographic feature that may be observed. Plain radiographs show a typical grey circumscribed area posterior to the heart. Following the administration of a barium meal this area takes on a dappled appearance due to barium accumulated in the crypts of the *S. lupi* granuloma. The granuloma itself may be outlined by the barium.

Key words: dog, *Spirocerca lupi*, radiographic features.

INTRODUCTION

Spirocerca lupi, or the oesophageal worm, is a helminth parasite found in dogs in tropical and subtropical areas through out the world. The worm itself is red in colour, usually spirally coiled and the males are 30-54 mm in length and the females 54-80 mm^{1 2}.

The life cycle of the worm is well documented and briefly is as follows: the eggs are passed out in the faeces or vomitus of the host and hatch only after they are ingested by a coprophagus beetle (dung beetle). The larvae develop to the infective stage in the beetle and become encysted here.

The beetles in turn are swallowed either by another intermediate host, such as lizards, frogs, birds or by the final host namely dogs. The dog becomes infested either by swallowing the dung beetles directly or by eating the infected vertebrates².

Once in the dog's stomach the larvae are released from their hosts by gastric digestion. They penetrate the stomach wall and then migrate via the gastric and gastro-epiploic arteries to the coeliac artery and so to the aorta.

Finally they reach the upper aorta from where they migrate through the wall to the oesophagus¹. Here they form granulomatous tumour-like growths in which they reach maturity and reproduce. Eggs are passed via a small opening (or openings) into the oesophagus and so the cycle repeats itself.

The migrating larvae produce haemorrhages, inflammatory reactions and necrosis, all of which lesions heal, but stenosis of blood vessels may remain¹. The adult worms produce nodules in the oesophagus, stomach and aorta. The lesions in the aorta wall may result in stenosis, aneurysm formation and even rupture of the vessel, with consequent fatal haemorrhage¹. Although aneurysm formation and fatal rupture of the aorta is well documented, in our experience, it is not common.

The nodular mass in the oesophagus, which may be in the form of a single mass or several discrete nodules, may become so large as to obstruct the lumen and so interfere with the swallowing of food. This may then result in persistent vomiting and emaciation¹.

Other complications that may arise include oesophageal sarcoma development, hypertrophic pulmonary osteoarthropathy of the long bones (so-called Marie's disease), spondylitis of the thoracic vertebrae, pyaemic nephritis and aplastic anaemia¹.

The purpose of the article is to aid the clinician in diagnosing *S. lupi* infestation in the dog.

DIAGNOSIS

History

This is important because in our experience the vast majority of cases seen are in dogs living in *rural areas*. This is logical when one bears in mind the importance of dung beetles in the life cycle.

Secondly, the history is typically one of *chronic vomiting* (up to 3 weeks duration) and often *chronic debilitation*. Response to any symptomatic treatment that may have been applied will have been poor.

Clinical signs

On examining and observing the dog one finds evidence of a generalized loss of condition, dysphagia, frequent vomiting, salivation and emaciation. The dog is willing to accept food but finds itself unable to pass the food down the oesophagus into the stomach, due to the presence of the obstructing intra-oesophageal granuloma. Consequently the food accumulates in the oesophagus and is soon vomited. Some dogs show evidence of coughing and secondary lung problems, namely either a secondary foreign body pneumonia due to the inhalation of food material into the lungs, or even possibly the presence of secondary lung tumours.

Generally the dog's breathing is shallow and it may sit with its head stretched slightly forward. Sudden death due to aneurysm rupture and severe internal haemorrhage may also occur.

Occasionally a dog will be presented with thickening of the long bones (Marie's disease). In these cases too the clinician should also consider *Spirocerca* infestation as a possible differential diagnosis.

However of all these clinical signs, the dysphagia, vomiting and emaciation, all of long-standing duration, are to us the most important.

Faecal examination

This method of confirming the diagnosis is found in many text books but in our experience it is not easy to find the worm eggs in faeces, vomitus or bronchial washings. The eggs are thick-shelled, 30-37 by 11-15 mm in size and contain larvae when laid.

A solution consisting of 33,3 % crystalline zinc sulphate, 33,3 % glycerine and 33,3 % water and a density of 1,32 has been reported as being satisfactory for worm flotation³.

Radiographic examination

In practice the tentative diagnosis will often be made on the history and clinical signs and it then becomes essential to know not only if *S. lupi* parasites are present but also to what extent pathological changes may have

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Fig. 1: Plain radiograph showing grey area within lung shadow, referred to in the text.

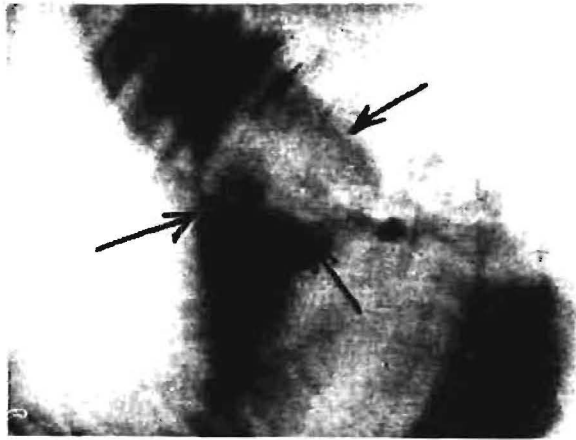


Fig. 4: Another example of a plain radiograph of a dog's chest, revealing the circumscribed grey area posterior to the heart.



Fig. 2: Barium filled oesophagus, showing the oesophageal dilatation resulting from the obstruction within the oesophagus.



Fig. 3: Barium traces showing up the irregular surface of the *S. lupi* granuloma within the oesophagus. Note also the oesophageal dilatation.



Fig. 5: The same case as shown in Fig. 4 but with barium outlining the *S. lupi* granuloma within the oesophageal lumen.

taken place. The dog is often only presented when the infestation is chronic with well-advanced pathological changes.

We have found the most satisfactory method of confirming the diagnosis to be with the aid of radiographs.

Thoracic radiographs are taken, both plain and following a barium meal. Plain radiographs show a very typical grey circumscribed area, appearing within the confines of the lung shadow, caudal to the heart (Fig. 1 & 4). A barium meal is then administered and further radiographs are taken. In addition, the barium meal may show an increase in the diameter of the oesophageal lumen and possibly a space occupying mass here (Fig. 3). The irregular surface of the granulomatous mass results in barium accumulating in the crypts, thereby producing a stippled or dappled pattern³. This circumscribed dappled area of increased density often seen between the heart and diaphragm outlines, is of major importance in making the diagnosis and we regard it as highly suggestive of *S. lupi* infestation.

Endoscope examination

Although this is obviously a valuable means of confirming the diagnosis of *S. lupi* infestation, due to the lack of access to an endoscope, most clinicians in practice are unable to avail themselves of it. However, should one be available the clinician may well see evidence of the tracts of worm larval migration in the oesophageal mucosa and also the small openings in the mucosa leading to granulomas situated outside the oesophageal lumen. Nodules or even granulomas of varying size may also be seen protruding into the oesophageal lumen. All of the above are positive evidence of *S. lupi* infestation in the patient.

Exploratory thoracotomy

In practice this is sometimes used as a means of confirming the diagnosis. Although requiring a certain degree of surgical and anaesthetic expertise, it offers the advantage of direct observation of any oesophageal and mediastinal lesions.

DISCUSSION AND CONCLUSION

The clinician, faced with a possible case of *S. lupi* infestation in a dog often has difficulty in confirming the diagnosis. The history and symptoms, together with the clinical examination of the dog is sufficient to give a very strong indication of the possibility of the presence of a *S. lupi* granuloma in the oesophagus or elsewhere. We have found oesophageal lesions to be the most common finding in dogs exhibiting clinical signs.

As mentioned we have not found the search for *S.*

lupi eggs to be particularly rewarding. Firstly, in perhaps less skilled hands, it is difficult to both find and identify the eggs. Secondly, even if the eggs are found and identified, this gives no indication of the size of any granuloma that is present. This factor is important, particularly with regard to any surgery that may be attempted.

The average clinician does not have an endoscope available to him and so cannot avail himself of this diagnostic aid. Similarly he may not feel sufficiently adept at surgery to attempt an exploratory procedure.

This leaves the question of radiographs. The vast majority of practitioners have and frequently use radiographic apparatus and are also confident regarding the method of administering a barium meal. All that remains is for them to be equally confident in reading the radiographic plates thus obtained and it is for this purpose that this article was written. As shown above, we have found consistent results in dogs with *S. lupi* granulomas in the oesophagus.

Both plain radiographs and radiographs following the administration of barium are taken. The radiographs will then show the typical dappled (or stipple) effect of the barium trapped in the crypts on the irregular surface of the granuloma.

It may even be possible to see the outline of the space-occupying mass in the oesophagus. However, even without this outline, we have consistently found that the well-defined dappled area, often situated just caudal to the heart shadow corresponds to the position of the *S. lupi* granuloma found within the oesophagus during subsequent surgery or autopsy. This finding we feel will be of value to the clinician as an aid to confirm his diagnosis of *S. lupi* infestation.

ACKNOWLEDGEMENTS

I wish to acknowledge the assistance of firstly Dr S. Burrows, without whose enthusiasm and assistance this paper would not have been possible and secondly the assistance of Dr J. Adams with the taking of the photographs.

REFERENCES

1. SOULSBY E J C 1968 Helminths, Arthropods and Protozoa of Domesticated Animals 6th ed. Bailliere, Tindall & Cassell. London
2. KIRK R W Current Veterinary Therapy IV (1971) & VII (1982). W.B. Saunders, Philadelphia
3. ARCHIBALD J 1965 Canine Surgery American Vet. Publication

ABSTRACTS

ABSTRACT: Littlejohn, A., Bowles, Felicity & Maluleka, W., 1982. Studies on the physiopathology of chronic obstructive pulmonary disease in the horse. VII. Percentage venous admixture. *Onderstepoort Journal of Veterinary Research*, 49, 211-214 (1982).

The percentage venous admixture was calculated in 21 clinically normal horses and ponies and in 13 horses and ponies with chronic obstructive pulmonary disease (COPD). The oxygen contents of pulmonary end-capillary blood, arterial and mixed venous blood were calculated from blood and respiratory gas values and substituted in the shunt equation.

The mean percentage venous admixture of the COPD subjects was significantly greater than that of the normal subjects. It was concluded that a larger proportion of alveoli in the lungs of COPD subjects were hypoventilated than that of alveoli of the normal lungs.

ABSTRACT: Pitchford, R.J. & Visser, P.S., 1982. *Schistosoma mattheei* Veglia & Le Roux, 1929, egg output from cattle in a highly endemic area in the Eastern Transvaal. *Onderstepoort Journal of Veterinary Research*, 49, 233-235 (1982).

The results of 6-months estimations of *S. mattheei* faecal egg counts on 513 cattle in a highly endemic area of the Eastern Transvaal over a 2-year period are given. After an initial high egg output of short duration the egg counts stabilized at a low level. The frequency of high egg counts in young cattle which died naturally was more than twice that of all other cattle, suggesting that *S. mattheei* egg counts in highly endemic areas is debatable and it is suggested that egg counts in man might follow a similar pattern.

ABSTRACT: Van Wyk, J.A., Gerber, H.M. & Alves, Regina M.R., 1982. Slight resistance to the residual effect of closantel in a field strain of *Haemonchus contortus* which showed an increased resistance after one selection in the laboratory. *Onderstepoort Journal of Veterinary Research*, 49, 257-262 (1982).

On the strength of a complaint of suspected resistance to closantel, a field strain of *Haemonchus contortus* was isolated from sheep on a farm near Pretoria and tested for resistance to the remedy, both without exposure to closantel in the laboratory (designated the "unselected" substrain of the parasite) and after a single selection with closantel (called the "selected" substrain). For comparative purpose a few sheep were treated with rafoxanide to ascertain whether the efficacy of this drug was unchanged.

While the unselected substrain appeared to show only slight increased resistance to the residual effect of closantel drenched at a dosage rate of 5 mg/kg, there was a dramatic increase in resistance after one selection. The residual efficacy (determined by the modified NPM test of Groeneveld & Reinecke, 1969, as outlined by Reinecke, 1973), 13-14 days after treatment with closantel was reduced from the registered claim of the remedy in South Africa of > 80% effective in > of the treated flock to "ineffective", or < 50% effective in < 50% of the treated flock. Furthermore, there also appeared to be a slight increase in the resistance of this substrain to rafoxanide, as its efficacy was reduced from 99-100% to about 92%.

This sharp reduction in efficacy after a single selection with closantel seemed to indicate that the slight increase in resistance of the unselected substrain was probably due not to possible variation in the repeatability of the trial method but to repeated treatment with closantel on the farm.

ABSTRACT: Doube, B.M., Fay, H.A.C. & Aschenborn, H.H., 1982. Rearing the blood-feeding fly *Haematobia thirouxii* potans in the laboratory. *Onderstepoort Journal of Veterinary Research*, 49, 255-256 (1982).

Two methods for rearing the African blood-feeding fly *Haematobia thirouxii* potans in the laboratory are described. The adult flies can be fed either on a bovine calf or *in vitro*, where they produced viable eggs only when provided with a 2% sodium/potassium chloride solution in addition to citrated bovine blood. The larvae were fed bovine dung.

ABSTRACT: Naudé, T.W. & Schultz, R. Anita, 1982. Studies on South African cardiac glycosides. II. Observations on the clinical haemodynamic effects of cotyledoside. *Onderstepoort Journal of Veterinary Research*, 49, 247-254 (1982).

Cotyledoside, a bufadienolide isolated from *Tylecodon wallichii* Harv., Toelken, subs. *wallichii* (= *Cotyledon wallichii* Harv.) was dosed to guinea-pigs and sheep

In guinea-pigs, the oral and subcutaneous LD₅₀ values were very similar (cf. 0,173 mg/kg over 48 h with 0,116 mg/kg over 24 and 48 h). When dosed subcutaneously, a cumulative effect was observed. Intravenous administration of cotyledoside to anaesthetized guinea-pigs resulted in: dyspnoea, increased heart rates and blood pressures, and electrocardiographic changes typical of cardiac glycoside poisoning. A positive cardiac inotropic effect was succeeded by a positive chronotropic one.

In sheep, acute and subacute intoxication resulted in ruminal, respiratory and cardiac changes. The signs included ruminal stasis, cyanosis, cardiac arrhythmia, ectopic foci and AV dissociation, followed by hypotension and progressive respiratory and cardiac failure. The skeletal muscles were affected in only 1 sheep *vide infra*.

In chronically intoxicated sheep typical clinical signs of "krimpsiekte" developed, e.g. weakness, reluctance to stand, unsteadiness on feet, tremor and paresis of hindquarter muscles, paresis of the neck, arching of the back and standing with the feet close together. Respiratory function was affected in all 3 cases; ruminal stasis, with concomitant loss of appetite occurring in one, and a transient change in heart function in another.

The syndrome induced by acute cotyledoside poisoning is similar to that of other cardiac glycosides, but the parietic signs of chronic intoxication resemble "krimpsiekte", a disease associated only with intoxication with the plants of the family Crassulaceae.

DIAGNOSIS AND SUCCESSFUL TREATMENT OF SUBACUTE ERYSIPELAS IN A CAPTIVE DOLPHIN

G.D. THURMAN*, S.J.T. DOWNES**, M.B. FOTHERGILL*, N.M. GOODWIN*** and M.M. HEGARTY**

ABSTRACT: Thurman G.D.; Downes S.J.T.; Fothergill M.B.; Goodwin N.M.; Hegarty M.M. **Diagnosis and successful treatment of subacute erysipelas in a captive dolphin.** *Journal of the South African Veterinary Association* (1983) 54 No. 3, 193-200 (En) South African Association for Marine Biological Research, Oceanographic Research Institute, P.O. Box 10712, 4056 Marine Parade, Republic of South Africa.

Erysipelas, a common disease of swine, is caused by *Erysipelothrix rhusiopathiae*. The organism was isolated in a blood culture taken from an infected captive dolphin. The dolphin showed typical subacute symptoms of square- and diamond-shaped skin lesions as seen in swine. It was surmised, in retrospect, that the disease was secondary to a primary pneumonia. The symptoms, clinical pathology and other special examinations, treatment and response are discussed.

INTRODUCTION

Erysipelothrix rhusiopathiae is the cause of swine erysipelas in pigs and erysipeloid in man. The bacteria are Gram variable with a tendency towards being Gram-negative, non-motile and catalase negative¹. The organism has also been reported in turkeys and wild birds. Fish may harbour the bacteria in the skin mucus². When ingesting infected fish, both wild and captive dolphins may become infected with this organism and, as a result, numerous dolphinariums worldwide have lost valuable animals due to this disease^{1,2,4}.

CASE HISTORY AND CLINICAL SIGNS

The subject, a female Indian Ocean bottlenosed dolphin, *Tursiops aduncus* (Ehrenberg, 1932), aged approximately 6 years and having a mass of 117 kg was captured on 15 June 1979 off the coast of Natal, South Africa. She was part of a large resident school. Although initially selective in her diet she soon settled into captivity. Blood analyses over the following months showed, however, a gradual decline in haemoglobin levels from 164 g/l to 128 g/l. A diagnosis of gastric ulceration was based on the declining haemoglobin levels, a consistently high eosinophil count (32 % to 39 %), interrupted anorexia and the fact that other dolphinariums had found that gastric ulceration was common in newly captured animals adapting to a thawed fish diet where the histidine content is higher than in fresh fish⁶. After 3 months of oral treatment with cimetidine (Tagemet, Smith Kline and French), enteritis suspension (Centaur) sodium bicarbonate powder in water, as well as gentamicin sulphate (Cidomycin, Roussel) and chloramphenicol (Panvet) parentally, the dolphin appeared to recover sufficiently to recommence training and begin performances. Her condition remained stable until November 1980 although she never appeared to gain weight despite adequate feeding.

During mid-November 1980 the dolphin often exhibited a non-productive, explosive cough during performances and during resting and appeared to be in pain when coughing as indicated by tightly closing the eyes. In December 1980 and January 1981 she progressively became more and more fussy with her feed, for example not accepting tails of fish. Although she was still working, she appeared to be lazy.

In early January, the dolphin developed a diarrhoea and started to open her mouth and close both eyes underwater as if in pain. Although her feed intake was adequate, she started to spit out pieces of fish.

A week later she regularly began to tilt to her left side when surfacing or descending to the bottom of the tank. Her breathing became shallow, laboured and rasping. Her feed intake remained adequate.

By the end of January her breathing had improved after an antibiotic course (gentamicin) but her feed intake again started to decline. She occasionally regurgitated her food but it was thought that this was due to an ototoxic reaction from the chosen antibiotic (vide infra). She became very listless preferring to remain motionless in a corner of the pool.

In early February it was necessary to force feed gruel as she no longer accepted fish. If whole fish were given, they were regurgitated shortly after feeding. She frequently began to arch her neck and raise her left pectoral flipper in pain. The exact location of the pain could not be determined. At the end of February, after a different antibiotic course (see Treatment and Response section (c)), she was eating well on her own and became more interested in her surroundings.

However, on 3 March 1981, her condition rapidly deteriorated and blood cultures and radiographs were taken. Whilst taking radiographs on 5 March 1981, 3 square or diamond shaped, raised (± 1 mm) pale grey, warm, painful lesions were observed on the beak, rostrum and laterally on the tail stock. The number of lesions gradually increased over the next 2 weeks until they covered the entire body, dorsal fin, tail flukes and pectoral flippers. The lesions on the pectoral flippers and dorsal fin were not as angular in appearance as the body lesions and eventually eroded leaving permanent scarring and notching (Fig. 2-5).

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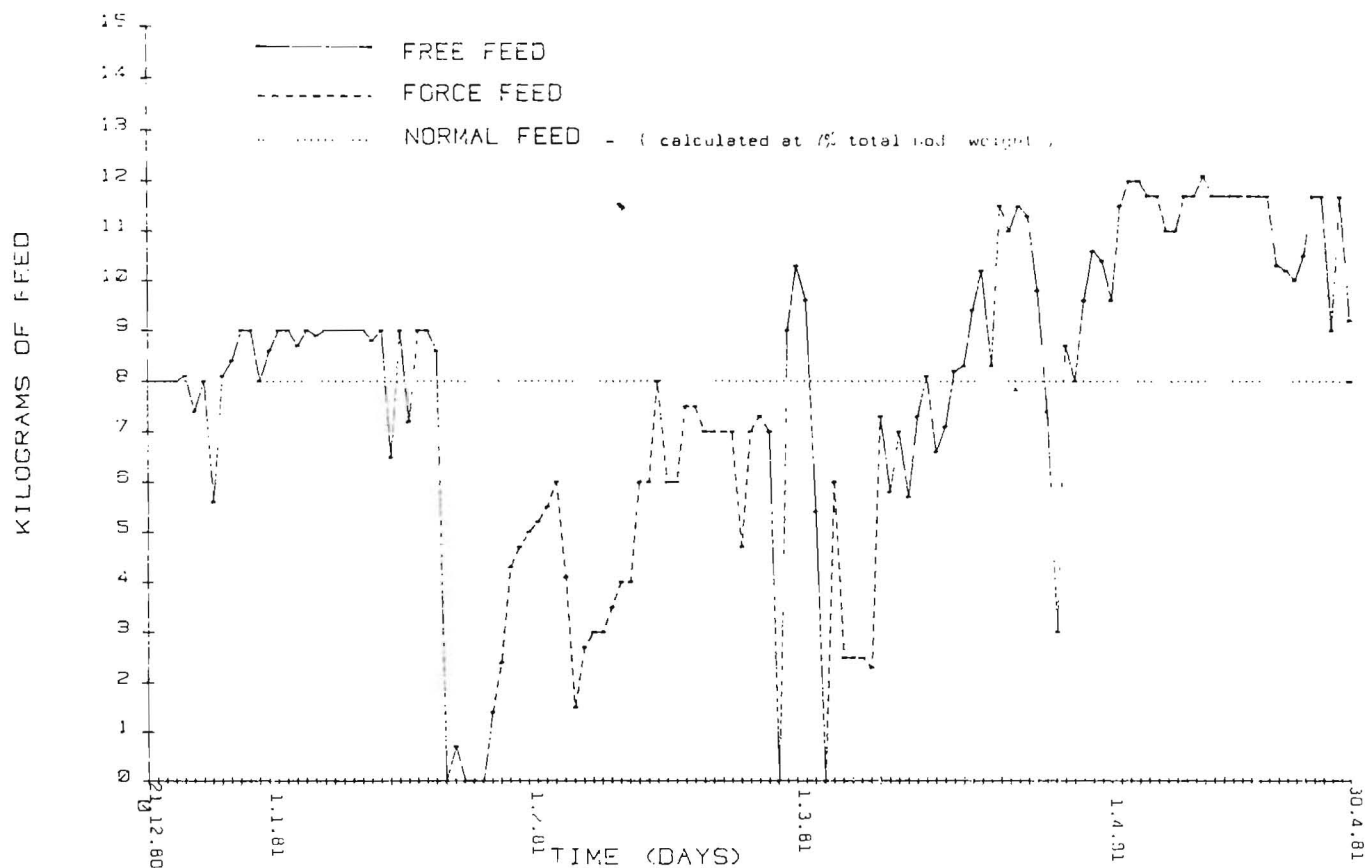


Fig. 1: Daily fish feed intake for "Asra" (*Tursiops aduncus*) 21.12.80 – 30.4.81



Fig. 2: Right lateral aspect of dolphin showing distribution of erysipelas skin lesions over thorax, abdomen, tail stock and dorsal fin.



Fig. 3: A typical square-shaped skin lesion in the early stage of development.



Fig. 4: A typical square-shaped skin lesion showing necrosis with haemorrhage in the central region indicating the progression of the lesion.

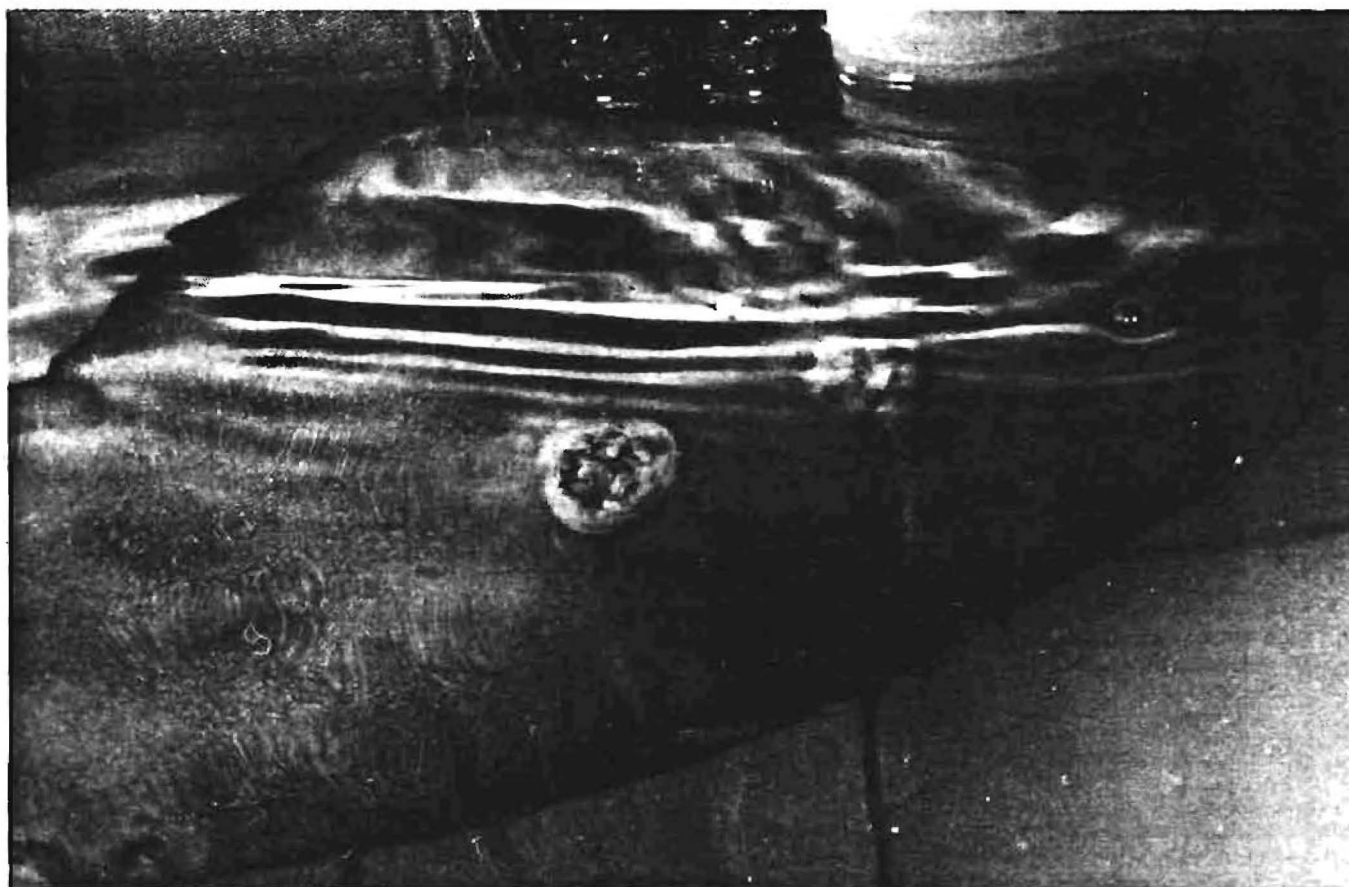


Fig. 5: Atypical round necrotic lesions observed on the pectoral flippers (as above) and dorsal fin. These lesions eroded, resulting in permanent scarring.

By mid-April the dolphin had recovered sufficiently from the subacute disease and was eating well. The lesions, except on the dorsal fin and pectoral flippers, had faded and were barely visible.

SPECIAL EXAMINATIONS

1. Clinical Pathology

a) Haematology

The results are given in Table 1.

The most significant alteration in the blood picture was the marked increase in the white blood cell count due to the neutrophilia in response to the erysipelas bacteraemia⁴. The slight increase in haemoglobin recorded from 2 February 1981 to 5 February 1981 was due to a transient dehydration as evident in the increase in the haematocrit. The eventual slight decrease in haemoglobin was probably attributable to the general body debility.

b) Blood Chemistry

The results are given in Table 2.

No significant alterations were evident in the blood chemistry. The increase in GGT, AST and LD tend to indicate liver necrosis possibly due to the toxic effects of

the septicaemic condition. The decrease in alkaline phosphatase (ALP) cannot at this time be explained and is a phenomenon frequently encountered in other diseased dolphins with non-related conditions.

c) Serum protein electrophoresis

The results are given in Table 3 and represented graphically in Fig. 6 A-D.

The increase observed in the total serum protein may be attributed to a slight dehydration but chiefly to the large elevation in the globulin fraction due to a chronic infection. The albumin levels were lowered but this was to be expected due to the decreased feed intake and general body debility. The globulin fraction was considerably elevated chiefly as a result of a large increase in the gamma-globulin fraction. Both alpha-globulin fractions were raised indicating constant tissue damage. The beta-globulin fraction remained at a low level and indicated either a more chronic infection, where IgA and IgM levels had already decreased or that the animal had suffered a crudescence of the disease.

The strong response in the gamma-globulin range was due to high IgG levels as a result of chronic exposure to the infection.

Table 1: HAEMATOLOGICAL ANALYSIS OF BLOOD TAKEN FROM THE VENOUS PLEXUS IN THE TAIL FLUKE OF THE DOLPHIN (*TURSIOPS ADUNCUS*) OVER THE PERIOD 30.2.80 TO 28.4.81

	Date	30/12 1980	16/1 1981	19/1	22/1	26/1	2/2	3/2	4/2	5/2	11/2	23/2	3/3	9/3	13/3	16/3	28/4	Nor- mals
	B-Hb (g/l)	169	161	164	170	169	181	198	188	169	153	154	162	157	156	152	157	171
	B-Ht	0,46	0,47	0,47	0,50	0,45	—	0,59	0,53	0,47	0,43	0,43	0,47	0,45	0,45	0,47	0,45	0,51
	B-RBC ($\times 10^{12}/l$)	4,12	4,25	4,32	4,53	4,20	4,61	5,16	4,87	4,28	3,93	3,94	4,24	4,28	4,20	4,25	4,01	4,22
	E-MCV (fl)	110	110	108	108	107	110	—	—	110	108	108	108	106	111	110	111	120
	E-MCH (pg)	39,4	38,1	37,7	37,3	39,0	39,2	—	—	39,2	38,7	39,3	36,7	36,8	—	—	39,1	40,4
	E-MCHC (g/dl)	35,9	33,7	34,3	34,1	36,9	35,4	—	—	35,3	35,3	35,8	34,4	35,5	—	—	34,7	33,6
	B-WBC ($\times 10^9/l$)	7,3	8,4	7,6	5,6	5,2	3,8	2,9	5,0	7,2	22,0	11,1	31,6	34,9	56,1	46,4	9,9	7,3
DIFFERENTIAL COUNT	B-Neutrophils	0,67	0,68	0,56	0,67	0,71	0,70	0,71	0,77	0,78	0,79	0,80	0,95	0,77	0,94	0,96	0,68	0,44
	B-Lymphocytes	0,17	0,15	0,18	0,15	0,14	0,23	0,19	0,18	0,9	0,10	0,6	0,3	0,7	0,1	0,0	0,12	0,23
	B-Monocytes	0,3	0,1	0,6	0,2	0,4	0,1	0,2	0,3	0,2	0,4	0,1	0,0	0,13	0,2	0,2	0,3	0,3
	B-Eosinophils	0,13	0,16	0,20	0,16	0,11	0,6	0,8	0,2	0,11	0,7	0,13	0,2	0,3	0,3	0,2	0,16	0,29
	Anisocytosis	+	+	+	+							+		+			+	
	Macrocytosis	+			+													
	Microcytosis																	
	Polychromasia			+	+							+		+			+	
	Nucleated RBC			+														
	Atypical Monocytes																1 %	
	Right Shift		+			+	+											
	Platelets ($\times 10^9/l$)	240	166	150	240	240	230	180	250	220	—	210	160	160	230	240	200	218

*Howell-Jolly body

Table 2: BLOOD CHEMISTRY OF THE DOLPHIN (*Tursiops aduncus*) TAKEN FROM THE VENOUS PLEXUS IN THE TAIL FLUKE OVER THE PERIOD 30.12.80 TO 28.3.82

Date	Sodium (mmol/l)	Potassium (mmol/l)	Chloride (mmol/l)	Alk. Res/Tot.CO ₂ (mmol/l)	Urea (mmol/l)	Creatinine (μmol/l)	Osmolality (mmol/l)	GGT (i.u.)	ALP (i.u.)	Bilirubin Total (μmol/l)	S-TSP (g/l)	S-Albumin (g/l)	S-Globulin (g/l)	AST (i.u.)	LD (i.u.)	CK (i.u.)
30/12 1980	157	4,2	117	25	16,8	97	313	18	645	8	90	36	54	79	476	43
12/1 1981	149	4,0	119	21	15,4	—	335	18	705	6	95	37	58	94	573	48
16/1	156	3,8	119	24	19,3	110	330	19	—	5	89	37	52	104	606	208
19/1	152	4,3	—	26	18,3	96	326	15	492	6	89	37	52	189	800	227
22/1	158	4,3	118	29	14,4	118	—	18	546	16	99	38	61	290	911	335
26/1	145	4,0	112	27	13,2	140	320	13	328	16	90	37	53	338	936	175
2/2	157	4,4	125	22	19,3	85	334	20	248	7	90	37	53	250	606	—
5/2	—	—	—	—	—	—	—	—	216	13	—	—	—	168	551	38
11/2	149	3,9	104	31	11,1	80	307	—	171	9	84	36	48	208	797	43
23/2	157	4,2	117	27	13,7	93	328	—	231	5	88	37	51	357	962	205
9/3	140	3,7	95	28	9,4	—	—	68	282	9	88	35	53	257	1153	125
16/3	—	—	—	—	—	—	—	—	291	7	—	—	—	892	1590	200
28/3	156	4,1	119	27	23,7	71	338	26	2016	4	87	40	40	12	589	130
*Nor-mals	156	3,6	113	26	19	101	339	19	891	9	77	42	34	145	731	91

*Normal values for *Tursiops truncatus* taken from Medway & Geraci (1965)³

2. Auscultation

In view of the fact that the dolphin's breathing was laboured and she tended to lie on the left side whilst on the surface, it was decided to attempt auscultation of the lungs. On 14 January 1981 she was placed in a stretcher and the lungs auscultated and despite the very short duration of the respiratory effort and the long intervening periods, it was decided that in the basal lobes of the left lung a distinct moist rale could be heard. On 21 January 1981, after she had been receiving tylosine (see Treatment and Response section d)), the exercise was repeated and in the opinion of S.J.T.D. the rales had disappeared and with it the tendency to lie canted to one side in the water.

3. Radiographs

Due to the dolphin's deteriorating condition and the presence of rales on auscultation, radiographs were taken of the thoracic cavity on 5 March 1981. Two dorso-ventral exposures and one lateral exposure were taken. There appeared to be an area of consolidation in the apex of the right lung but this could not be identified accurately.

4. Blood culture

a) Blowhole culture

Routine monthly blowhole cultures were taken on blood agar and McConkeys media. This was achieved by holding the culture plate directly over and approximate-

ly 10 cm above the blowhole of the dolphin who is trained by reward to blast expired air onto the exposed culture media. This is then incubated at 37,0 °C.

Up until November 1980 the dolphin appeared to have resident commensal *Staphylococcus aureus* and *Pseudomonas* spp. The following *Proteus* spp. were isolated:

11 November 1980: *P. mirabilis*

4 January 1981: *P. vulgaris*

b) Blood culture

Blood was collected into a blood culture bottle (containing trypticase and soyabroth) on 3 March 1981. This was then incubated aerobically and anaerobically. After 48 hours bacterial growth was observed in both cultures. Microscopically they appeared as spiral, Gram variable bacilli which on further tests were found to be *E. rhusiopathiae*. A diagnosis of a septicemia caused by this organism was therefore made, augmented by the presence of the square and diamond shaped lesions observed (Figs 2-5 and 7).

5. Gastroscopy

In order to assess pathology at the thoracic inlet suspected on the radiograph, pharyngoscopy and gastroscopy were performed on 7 March 1981. No sedation was used. The endoscopy passed easily through a mouth gag and down into the proximal stomach. A good view was obtained of the oesophagus and first

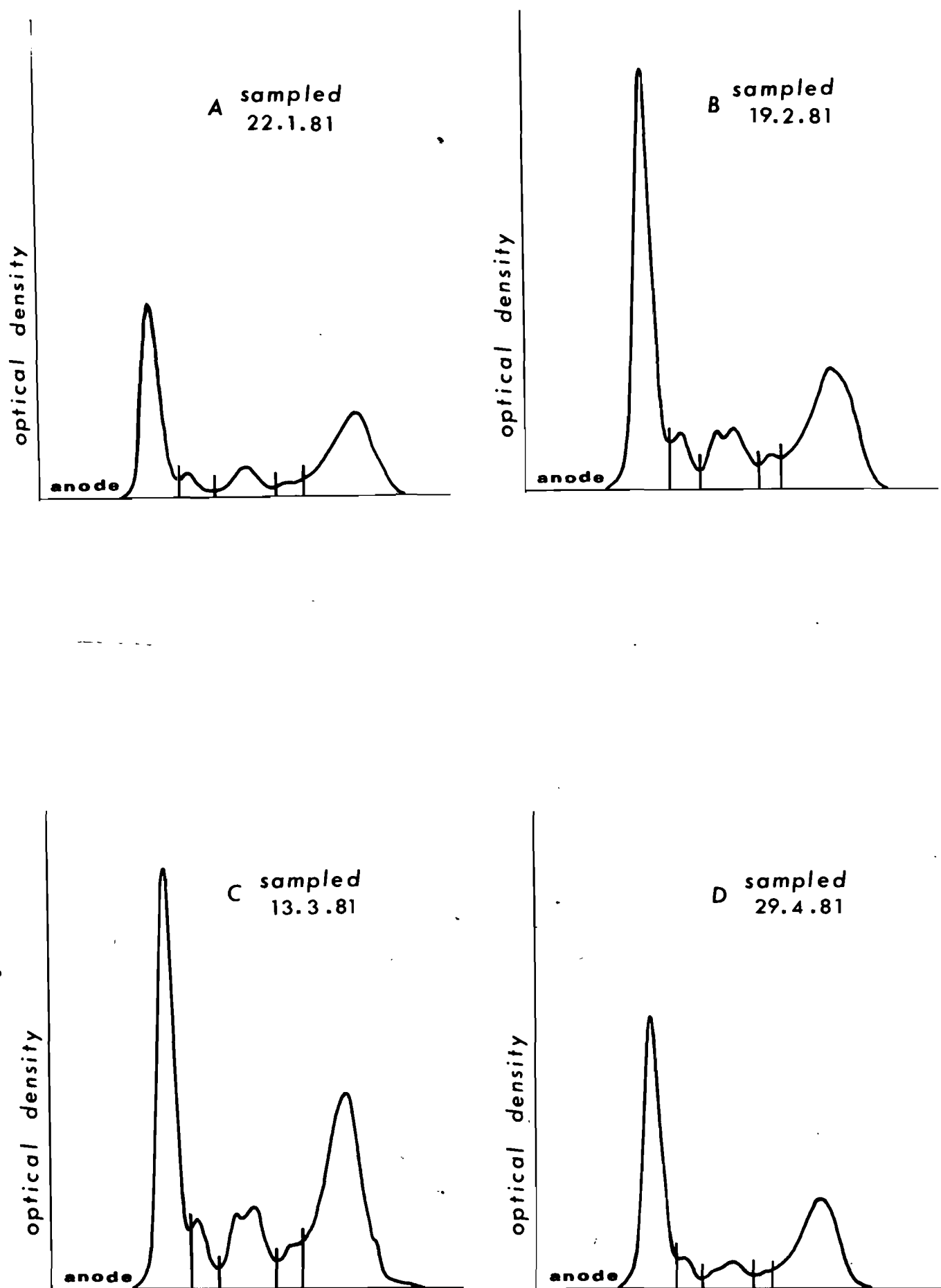


Fig. 6 A – D: Cellulose acetate electrophoretograms recorded for four blood sampling periods and obtained using a barbitone buffer, pH 8,6, with a milliamperage of 2 mA.

Table 3: ELECTROPHORETIC PATTERN OF THE SERUM PROTEINS TAKEN FROM VENOUS BLOOD IN THE DOLPHIN (*TURSIOPS ADUNCUS*)

Date	Total Protein (g/l)	Albumin (g/l)	Globulin (g/l)	Alpha 1 (g/l)	Alpha 2 (g/l)	Beta (g/l)	Gamma (g/l)	A/G. Ratio
22.1.81	99,0	40,0	59,0	5,3	10,0	3,3	40,4	0,7 : 1*
24.1.81	92,0	37,6	54,4	5,0	10,9	3,0	35,5	0,7 : 1
26.1.81	90,0	38,2	51,8	4,0	8,2	2,0	37,6	0,7 : 1
29.1.81	81,0	36,7	44,3	4,1	7,5	2,1	30,7	0,8 : 1
5.2.81	91,0	42,6	48,3	4,6	7,8	2,7	33,2	0,9 : 1
9.2.81	86,0	41,4	44,6	4,7	8,9	2,8	28,2	0,9 : 1
11.2.81	84,0	40,1	43,9	4,5	10,3	2,9	26,2	0,9 : 1
16.2.81	88,0	37,0	51,0	6,0	9,3	2,9	32,8	0,7 : 1
19.2.81	85,0	37,3	47,7	5,6	10,6	2,7	28,8	0,8 : 1*
23.2.81	88,0	40,3	47,7	5,2	10,6	3,3	28,6	0,8 : 1
25.2.81	89,0	40,9	48,1	4,7	9,7	3,2	30,5	0,9 : 1
3.3.81	90,0	39,7	50,3	4,1	7,3	2,2	36,8	0,8 : 1
5.3.81	94,0	42,7	51,3	3,4	8,1	3,8	36,0	0,8 : 1
9.3.81	88,0	35,8	52,2	4,4	12,5	3,3	32,0	0,7 : 1
13.3.81	93,0	34,8	58,2	5,6	12,4	3,7	36,5	0,6 : 1*
16.3.81	95,0	36,9	58,1	5,4	13,1	3,4	36,2	0,6 : 1
28.4.81	87,0	41,9	45,1	4,7	7,1	33,3		0,9 : 1*
Normals*	73,0	50,7	21,7	3,1	3,1	3,3	12,2	2,4 : 1

* = Graphic representation included.

* = Normal values for *Tursiops truncatus* taken from Medway and Geraci (1965)³

stomach, which was empty apart from a small amount of fluid. There was a superficial patch of hyperaemia in the proximal stomach which could be compatible with minor trauma caused by eating fish. There was no distortion or ulceration and the mucosa was otherwise healthy. No geometrical lesions similar to those on the skin were seen in the mouth, oesophagus or stomach.

TREATMENT AND RESPONSE

1. Gentamicin sulphate (Cidomycin, Roussel)

This antibiotic was initially selected based on the antibiogram results following the blowhole cultures. Intramuscular therapy commenced on 15 January 1981 at 250 mg gentamicin sulphate q.i.d. On 16 January 1981 blood was withdrawn to determine serum levels of the antibiotic which in man should be between 4-12 µg/ml an hour post injection. The blood levels were found to be less than 1 µg/ml pre-injection and 4,4 µg/ml post-injection. The antibiotic administration was increased to 300 mg gentamicin sulphate q.i.d.

The dolphin was disinterested in her feed but still continued to eat. From 17-19 January she started to eat well and appeared to be improving. Blood was withdrawn on 19 January to ascertain the antibiotic blood levels. They were 0,9 µg/ml pre-injection but had increased to 6,8 µg/ml post-injection. This therefore ap-

peared to be the correct dosage and she was maintained on 300 mg gentamicin sulphate q.i.d. However, on 20 January 1981 she did not eat well and on 21 January 1981 was again disinterested in food. She appeared to be imbalanced and started to bob her head. As one of the side effects of gentamicin sulphate is ototoxicity, it was thought that this imbalance could be due to the an-



Fig. 7: Spiral-shaped bacilli of *E. rhusiopathiae* observed in the smear made from the blood culture. Gram's stain x1250

tibiotic, despite the correct dosage. Gentamicin therapy was therefore discontinued on 22 January 1981. Auscultation of the lungs on 21 January 1981 indicated that the lung condition had improved so that further therapy was not considered necessary. On reflection it is possible that 8th nerve lesions may occur in the dolphin, at the low blood levels noted. The toxic level in humans is usually 16 µg/ml.

2. Chloramphenicol (Chloramphenicol 25 % (250 mg/ml), Panvet) and Cloxacillin sodium (Orbenin, Beechams)

Two days after withdrawing gentamicin therapy, blood results still indicated a neutrophilia and a decreasing white blood cell count. A combination of chloramphenicol and cloxacillin was administered orally from 27 January 1981 to 2 February 1981. As the dolphin refused to feed this was done in conjunction with force feeding every 6 hours. The dose used was 1 250 mg chloramphenicol q.i.d. and 1 000 mg cloxacillin q.i.d. The dolphin was weighed on 2 February 1981 and appeared to be losing weight rapidly. Her blood results revealed a further decrease in the white blood cell count, possible due to chloramphenicol-induced depression.

3. Cefamandole nafate (Mandokef, Eli Lilly)

The dolphin's breathing became progressively more laboured and blowhole platings revealed a heavy growth of *Proteus* spp. An antibiogram indicated cefamandole nafate as the drug of choice, and therapy commenced on 12 February 1981 for 12 days until 25 February 1981. The dose used was 1 000 mg cefamandole nafate q.i.d. given intramuscularly. Her condition slowly improved but she still had to be force fed. On 19 February 1981 300 mg gentamicin sulphate q.i.d. given intramuscularly was combined with the cefamandole sulphate to augment the therapy. From 22 February 1981 she began to free feed and from 17 February to 3 March 1981 she ate regular feeds and appeared to be making a full recovery.

4. Tylosine (Tylan 200 (200 mg/ml), Elcano)

Once the diagnosis of erysipelas was confirmed on blood culture tylosine was selected as the antibiotic of choice as it was indicated for use in both *Erysipelothrix* and *Proteus* infections. The dose was 1 100 mg tylosine given as a single daily intramuscular injection. The dolphin had stopped eating on 3 March 1981 and again had to be force fed until 10 March 1981 when she began to free feed. Her condition improved considerably and no new lesions developed. Tylosine therapy was discontinued on 18 March 1981.

5. Benzathine penicillin (Bicillin, Wyeth Laboratories)

The original lesions had started to resolve and the dolphin was eating well. However, on 17 March 1981, new painful and hot square lesions developed although the dolphin continued to eat well. As a relapse of erysipelas was feared, a long-acting penicillin was administered intramuscularly. The dose used was 3,6 mega units benzathine penicillin as a single injection. The dolphin rapidly improved in condition and started to regain interest in her surroundings and in her mate. No new lesions developed.

In view of the relapses that occurred in this case, the prolongation of penicillin therapy for 14 days might be advised in cases of erysipelas.

CONCLUSION

A final diagnosis of erysipelas was established on the basis of a septicæmic *E. rhusiopathiae* infection. As blood cultures were not taken initially, it is difficult to say whether the infection was primary or secondary to the pneumonia. Since the organism is sensitive to penicillin, the combined chloramphenicol and cloxacillin therapy should have eliminated the infection. Therefore, in retrospect, it appears that the erysipelas organism acted as an opportunistic bacterium secondary to a primary respiratory infection.

As indicated in the latest blood results and on the animal's behaviour, there appears to be complete recovery from the subacute *Erysipelothrix* infection. The high increase in the ALP level is, however, disturbing and may indicate possible bony changes in the joints due to a chronic manifestation of erysipelas, as seen in swine. Radiographs of the joints should be taken at a later stage to substantiate this possibility.

Although a vaccine exists for erysipelas, it was decided not to vaccinate the remaining dolphins for fear of post-vaccinal anaphylactic shock⁴ (W.H. Dudok van Heel, 1981, Nederlandse Stichting voor onderzoek Waterzoogdieren 3840 Al Harderwijk, Nederland, personal communication). The remaining animals were carefully monitored and when showing signs of ill health were placed on a course of tylosine. No other dolphins, however, showed the skin lesions.

The original source of infection cannot be determined. Possible sources are:

- a) Trainers' hands – no lesions were observed, so this source seems unlikely¹⁴.
- b) Fish – the organism is found in fish and could possibly result in the infection¹². All the fish are deep frozen at -30 °C for a considerable period but it appears that the organism can survive freezing for 30 days⁷.
- c) Flies – contaminated flies settling on the thawed fish could also act as a vector in the transmission of the diseases¹².
- d) Wild pigeons – these birds may carry the bacteria and as there are many in area this could well be a source of infection¹².
- e) Carrier states in dolphins – the possibility of one of the captured dolphins harbouring the organisms should be investigated.

REFERENCES

1. GERACI J R, SAUER R M, MEDWAY W 1981 Erysipelas in dolphins. *American Journal of Veterinary Research* 27: 597-606
2. HARRISON J R (ed.) 1974 Functional anatomy of marine mammals. Academic Press, New York: 90-91
3. MEDWAY W, GERACI J R 1965 Blood chemistry of the bottlenose dolphin (*Tursiops truncatus*). *American Journal of Physiology* 209 (1): 169-172
4. RIDGWAY S H (ed.) 1972 Mammals of the sea: biology and medicine. Charles C Thomas, Springfield, Illinois: 1-812
5. SMITH H A, JONES T C, HUNT R D 1974 Veterinary pathology 4th edn Lea & Febiger, Philadelphia: 585-589
6. SWEENEY J 1978 Noninfectious diseases. In: Fowler M E (ed.) Zoo and Wild Animal Medicine. W B Saunders Company, Philadelphia: 599-601
7. TURNER G V S 1977 The aetiology, nature and public health significance of arthritis in slaughter pigs at a South African abattoir. M Med Vet (Hyg) dissertation, University of Pretoria, Republic of South Africa.

CASE REPORT

GEVALVERSLAG

THE EFFECT OF PRE-DOSING *HOMERIA PALLIDA* BAK. TO CATTLE TO PREVENT TULP POISONING

J.A. STRYDOM* and J.P.J. JOUBERT**

ABSTRACT: Strydom J.A., Joubert J.P.J. The effect of pre-dosing *Homeria pallida* Bak. to cattle to prevent tulp poisoning. *Journal of the South African Veterinary Association* (1983) 54 No. 2, 201-203 (En) State Veterinarian, PO Box 19, 3318 Estcourt, Republic of South Africa.

Newly weaned calves with no previous exposure to *Homeria pallida* were dosed with *H. pallida* material prepared as a broth, a suspension of charred leaves of leaves chopped into small shreds. Three hour later they were put into a camp where *H. pallida* constituted 50 % of the grazing. Equal numbers of animals in each of the treated groups and in the untreated control group subsequently developed *H. pallida* poisoning. By about the 4th day, both the treated and untreated animals appeared to have adapted to *H. pallida* and to avoid it while grazing.

INTRODUCTION

For more than 60 years cattle farmers have administered preparations of Natal yellow tulp (= *Homeria pallida* Bak., Syn. *H. glauca*) and other poisonous Iridaceae (tulp) as a prophylactic drench to cattle before allowing them onto tulp infested grazing. This was done to prevent deaths from tulp poisoning amongst newly introduced or young stock.

Steyn⁴ remarked that cattle learn to "know" tulp and to avoid it. He also stated that calves, newly introduced and extremely hungry animals are prone to eat tulp when put into tulp-infested camps. This "knowledge" of tulp may be acquired as a result of being mildly poisoned by it and then associating the unpleasant experience with the plant. Alternatively, tulp may have a bad taste to cattle, which would put them off tulp after the first few mouthfuls. Thirdly, repeated low grade exposure to tulp may eventually induce an immune response in the animal. As the cardiac glycosides (active substances²) can only become antigenic when covalently bonded in vitro to a protein³ this third hypothesis seems less probable than the others.

The pre-dosing of cattle with tulp may thus make them aware of the unpalatability or poisonous effect of tulp in a safe and controlled way before they are exposed to tulp-grazing. A single dose of tulp given a few hours before they are put onto tulp-grazing cannot stimulate an immune response, however. This reasoning, and the good results claimed by farmers with pre-dosing, led to this evaluation of the efficacy of the various methods of pre-dosing. For this experiment, the circumstances which often occur on maize farms during winter were closely simulated. Newly weaned calves unaccustomed to tulp and a harvested maize land with 50 % of its available grazing being green tulp leaves, were accordingly used.

MATERIALS AND METHODS

Forty-seven 8 months old Simmentaler cross heifers and castrated bull calves with an average live mass of about

200 kg, which had no previous exposure to tulp, were fed on maize silage for 1 month before the experiment began.

The Natal yellow tulp was identified at the Botanical Research Institute as *Homeria pallida* Bak. The tulp leaves were 100-800 mm long, green and without flowers. About 2 kg tulp leaves with bulbs were divided into 3 lots of about 667 g each. One lot was chopped into pieces about 25 mm in length (chopped tulp); the second lot was also chopped and then boiled in 3 l of water for 1 h (tulp infusion); and the third lot was charred, broken into small shreds and suspended in 800 ml of water.

Pre-dosing of cattle

The calves were randomly divided into 3 groups of 12 and 1 of 11. The various tulp-preparations were dosed by means of a small cup into the mouths of all animals in Groups 2-4 as shown in Table 1.

Table 1: PRE-DOSING OF CALVES WITH TULP

Group	Animals n	Tulp preparation	Dose per animal
1	11	None	—
2	12	Tulp infusion	50 ml
3	12	Charred tulp	50 ml
4	12	Chopped tulp	25 g

The animals were kept in a kraal from 09h00 until they were dosed at 13h00. They were then transported to the toxic camp about 30 km away; this they entered at 16h00. Those that subsequently developed pronounced signs of tulp poisoning, such as walking with difficulty and lying down frequently, were treated per stomach tube with 500 g of activated charcoal¹ suspended in 2-3 l water. This constituted a dose of approximately 2g/kg body mass.

Toxic camp

A rectangular area of 150 x 70 m in size, part of a maize land, was fenced off. Sufficient water was available in a trough in one corner of the camp. Grazing consisted of maize plants with only a few cobs and dry *Eragrostis* spp. and *Cynodon* spp. grass mixed 50:50 with long

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green tulp leaves. In addition there was 3 strips of headland, with areas of respectively 70 x 3 m, 150 x 2 m in this camp. The first one was without any vegetation while the others were covered with dry giant thatchgrass (*Hyparrhenia* sp.), *Eragrostis* spp. and *Cynodon* spp.

RESULTS

Table 2 presents a summary of the results.

The following aspects need more elaboration; the clinical signs of poisoning varied from sudden death during night (1 control animal) to posterior paresis of varying degrees, light to severe diarrhoea, gnashing of the teeth and anorexia. No cases of severe dehydration occurred. Eight animals out of all 4 groups were treated and only 1 was treated twice. One of the treated animals died due to dosing-asphyxia; it was lying on its side when dosed. The control animal which died was autopsied and the findings, such as general congestion, hydropericardium and hydrothorax, supported a diagnosis of tulp poisoning.

Another 10 animals were poisoned but did not show symptoms severe enough to necessitate treatment. The more acute cases of poisoning occurred on Days 1 and 2 while on Day 3, the newly-sick animals showed mild clinical signs and no new cases occurred on Day 4.

Grazing pattern

When the cattle were released into the tulp camp at 16h00 on Day 0, they inspected their new surroundings while keeping together as a closely bunched herd. Throughout the experiment they went about as a herd. At first they only drank water but did not graze. They were not under observation during the night and early in the morning of Day 1 they appeared listless, lying down most of the time or moving reluctantly when disturbed. At 16h00 they drank water and started to graze on a grassy headland and then into the rest of the camp. They followed the same routine on Day 2.

The sky was overcast and cool weather prevailed during the morning of Day 3, which apparently influenced them to graze along the grassy headlands. They were careful to avoid the areas overgrown with tulp. After a long midday rest they had water and went off to graze again, once more on the grassy headlands. The same weather conditions occurred on Day 4 and they followed the same grazing pattern.

DISCUSSION

The Natal yellow tulp, *Homeria glauca* (Wood & Evans) N.E. Br., is now regarded as being synonymous with Transvaal yellow tulp, *Homeria pallida* Bak. The latter name has been retained for the species.

Table 2: RESULTS OF PROPHYLATIC TULP DOSING IN CATTLE

Cattle		Time lapse: Pre-dose to Tulp camp (h)	Clinical Signs													Total (Sick and Dead)			
			Day 1				Day 2				Day 3				Day 4				
			Number			Clinical Signs	Number			Clinical Signs	Number			Clinical Signs	Number			Clinical Signs	
Sick	Treated	Dead	Sick	Treated	Dead		Sick	Treated	Dead		Sick	Treated	Dead						
n	Group and pre-dose																		
11	1	—	2	1	Diarrhoea, paresis of hind-quarters General congestion, hydrothorax, hydropericardium	—	—	—	—	2	—	—	Slight diarrhoea	—	—	—	5		
12	2 Tulp infusion	3	—	—	—	3	2	—	Diarrhoea, paresis of hind-quarters, gnashed the teeth	1	—	—	Slight diarrhoea	—	—	—	4		
12	3 Charred tulp	3	2	2	—	Paresis of hind-quarters, gnashed the teeth	1	—	—	Diarrhoea	2	—	—	Slight diarrhoea	—	—	—	5	
12	4 Chopped tulp	3	1	1	—	Paresis of the hindquarters, gnashed the teeth, diarrhoea	2	2	1*	Diarrhoea, paresis of hindquarters, recumbent. Dosing asphyxia	2	—	—	Slight diarrhoea	—	—	—	5	

*1 Dead animal also reflected in the "sick" column

All the calves which became sick developed typical clinical signs of tulip poisoning. These included a diarrhoea, which was unusual as Natal Yellow tulip is known rather to cause constipation². However, the untreated animals did recover exceptionally rapidly from the diarrhoea, which suggests that they could eventually have become constipated. The treatment with activated charcoal seemed to be effective but since none of the very sick ones were left untreated, the possibility that some of them could have recovered without any treatment cannot be ruled out.

Equal numbers of animals in each group suffered from tulip poisoning. Furthermore, since the experiment was done under management similar to that practised by most farmers, it would appear that pre-dosing does not afford appreciable protection against tulip poisoning.

It was interesting to note that most cases of poisoning occurred on Days 1 and 2, with less severe cases occurring on Day 3 and none on Day 4. This drop in incidence correlated with a tendency by the calves to graze more selectively from Day 3 and 4. The calf herd as a whole seemed to adapt to the grazing and learned to avoid tulip within 4 days.

In conclusion, it can be suggested that new stock and calves should be introduced to tulip-grazing when well

fed and in company of animals already adapted to tulip grazing. The first 4 days can be regarded as critical and the animals must then be kept under observation to identify and treat poisoned animals as soon as possible. This can minimise the hazards of the adaptation period.

ACKNOWLEDGEMENTS

We thank the staff of the Agricultural Colleges Cedara and Nthabamhlope for their cooperation and assistance which contributed to the successful completion of this experiment and Mr E.O.W. Struck of Empangweni, P.O. Draycott for making a camp available to us.

REFERENCES

1. JOUBERT J P J, SCHULTZ R A 1982 The treatment of *Urginea sanguinea* schinz poisoning in sheep with activated charcoal and potassium chloride. Journal of the South African Veterinary Association 53: 25-28
2. NAUDÉ T W 1977 The occurrence and significance of South African cardiac glycosides. Journal of the South African Biological Society 18: 7-20
3. SMITH T W, BUTLER V P Jr, HABER E 1970 Characterization of antibodies of high affinity and specificity for the digitalis glycoside digoxin Biochemistry 9: 331-337
4. STEYN D G 1949 Vergiftiging van mens en dier. Pretoria: J L van Schaik Beperk

BOOK REVIEW

BOEKRESENSIE

HYGIENIC PROBLEMS OF ANIMAL MANURES

D. STRAUCH

Institut für Tiermedizin und Tierhygiene, Universität Hohenheim -460, Postfach 700 562, D-7000 Stuttgart 70, Bundesrepublik Deutschland, pp: 314, price not quoted.

This book constitutes the proceedings of a joint workshop of the EEC-Expert Group "Communicable Disease Resulting from Storage, Handling, Transport and Hand-spreading of Manure", the "Animal Hygiene Working Group" of the German Veterinary-medical Society and the FAO-European Network on Animal Waste Utilisation - Subnetwork 1 "Influence of Animal Manure Handling & Utilisation Systems on Animal & Human Health", organised by the Institut für Tiermedizin & Tierhygiene of the University Hohenheim, Stuttgart, Federal Republic of Germany and held there from October 11-13, 1982. The Workshop was sponsored by the Commission of the European Communities, the Deutsche Veterinär-medizinische Gesellschaft e.V., Giessen and the Food & Agricultural Organisation in Rome.

The proceedings provide the text of some 23 papers presented under 4 themes i.e.

1. The hygienic aspects of handling, storage, composition and composting of manures; 2. Hygienic aspects of chemical disinfection of manures; 3. Economic and

hygienic aspects of anaerobic or aerobic, thermophilic or mesophilic treatment of manures; 4. Legal & practical approaches for management and disinfection of infected manures in some countries. The papers are followed by "Conclusions" and 3 Appendices.

The Proceedings reflect the problems which arise from the need to economically dispose of manures of animals, kept under intensive systems, in such a way that the material does not constitute a nuisance, transmit disease to animals and man or lead to pollution of the environment. Papers deal with matters such as the survival of pathogenic and indicator bacteria, viruses and some helminth eggs in manure subjected to various forms of treatment. Several tables and informative figures are published and in general, the text provides up to date and useful information.

The accent on preventing environmental pollution and the advent of large scale intensive livestock holdings makes this book an important one in every developing country and certainly also in the RSA.

L.W. v.d. Heever

BOOK REVIEW

BOEKRESENSIE

AN OUTLINE OF THE ZOONOSES

PAUL R. SCHNURRENBERGER AND WILLIAM T. HUBBERT

The Iowa State University Press, Ames, 1981, pp. V + 157, Tabs 7, Price \$14,95

The primary purpose of this outline is to present the veterinary practitioner with an all-encompassing, concise, desk-top reference to the zoonotic diseases.

The text is divided into 8 sections. The first 5 sections contain pertinent information on bacterial, rickettsial, viral, mycotic and parasitic diseases transmitted between, or common to, humans and other animals. Each section progresses logically from diagnosis and treatment to transmission, prevention and control for each disease. Section 6 provides information on collection, packaging and shipment of relevant laboratory specimens. The final 2 sections deal with state laboratory services and reportable zoonotic diseases in relation to the United States. An appendix is provided which tabulates the effects of 137

zoonotic agents on specific body systems.

Since this is an outline, it can serve only as a quick guide, not a complete discussion. References for additional reading may be found in 2 locations. Those that pertain to specific conditions are listed with the appropriate disease. A bibliography with a broader application is provided at the end of the book.

The book is specifically designed for rapid references and features an easy-to-read outline format comprised of boldface topic headings. Although designed for the veterinary practitioner, it should be of value to physicians, nurses, public health officials, wildlife workers and many others.

G.V. Turner

BOOK REVIEW

BOEKRESENSIE

BIOCONTROL OF MEDICAL AND VETERINARY PESTS

MARSHALL LAIRD

Praeger Publications New York, USA 1981 pp xx + 235 Figs 26 ISBN 0-03-059392-1. Price: pounds sterling 23,75

This book is based on the proceedings of the 16th International Congress of Entomology, held in Kyoto, Japan in August 1980. It consists of 9 chapters, 6 of which deal with the ecology, population dynamics and methods of biocontrol of mosquitoes. Of the agents pathogenic to mainly the larvae of mosquitoes, *Bacillus thuringiensis israelensis* and possibly *Bacillus sphaericus* seem to be particularly effective. However, the use of a number of fish species, protozoa, fungi, mermithid nematodes and even a planarian are discussed in some detail, and it appears that the fungi *Culicinomyces* and *Coelomycidium* hold promise for the future. One chapter deals with the pathogens of 3 *Simulium* spp. larvae that were found in Guatemala, and one wonders if the time has not come for studies of a similar nature to be undertaken in South Africa.

The final chapter essentially is an overview of the previous ones, but it also clearly points out the shortcomings of, problems with and areas for further research on the biocontrol of medical and veterinary pests.

This is not the kind of book that the practising veterinarian will find of value and, in fact, it seems to be directed to the medical profession. However, researchers and persons teaching veterinary or medical entomology should be aware of this book, and should incorporate some of the facts and sentiments in their lectures. The development of resistance and cross-resistance to pesticides and the continuous pollution of the environment with them indicates that biocontrol, together with strategic chemical control may well be the methods of the future.

J. Boomker

CHIRURGIESE EN CHEMOTERAPEUTIESE BEHANDELING VAN FIBROSARKOOM IN 'n KAT

J.S.J. ODENDAAL*, J.D.E. CRONJE** en STELLA S. BASTIANELLO***

ABSTRACT: Odendaal J.S.J.; Cronje J.D.E.; Bastianello Stella S. *Surgical and chemotherapeutic treatment of fibrosarcoma in a cat.* *Journal of the South African Veterinary Association* (1983) 54 No. 3, 205-208 (Afrik.) 152 Benade Drive, Fichardt Park, 9322 Bloemfontein, Republic of South Africa.

Fibrosarcoma in a cat was repeatedly treated unsuccessfully by surgery and chemotherapy, which included drugs such as amethopterin sodium at very high dosages, vincristine sulphate and doxyrubicine hydrochloride.

Key words: Cat, fibrosarcoma chemotherapy, high dose amethopterin sodium

INLEIDING

Twee tipes fibrosarkoom kom in die vel van katte voor. In ouer katte is die letsel gewoonlik 'n enkele infiltrerende gewas wat geneig is tot hergroei na chirurgiese verwydering. In jonger katte kom 'n oordraagbare fibrosarkoom voor wat multisentries van aard is en gewoonlik self regressie ondergaan².

Die makroskopiese en mikroskopiese beeld van fibrosarkoom by die kat moet onderskei word van onder andere limfosarkoom, ongedifferensieerde leiomiosarkoom, neurofibrosarkoom, kwaadaardige Schwannoom, mastositoom, liposarkoom, melanoom en inflammatoriese reaksies^{2,3}. Daar is geen ras- of geslagsvoorkeure ten opsigte van die voorkoms van fibrosarkoom nie.

Uit 'n reeks van velgewasse is 4,1 % van die gewasse in katte as fibrosarkoom gediagnoseer³.

GESKIEDENIS, KLINIESE ONDERSOEK EN DIAGNOSE

'n Sesjarige, gekastreerde mannetjieskat is aangebied vir konsultasie en behandeling, met 'n groeisel aan die linker agterbeen. Volgens die eienaar het hierdie massa oor 'n tydperk van ongeveer 2 maande ontstaan met geleidelike progressiewe vergroting.

Met 'n ondersoek van die dier is 'n groot ferm massa aan die been, bo die knie, kraniolateraal, tot byna by die hak, waargeneem. Die groeisel was nie pynlik met betasting nie en geen limfkliere was vergroot nie. Daar kon ook geen ander soortgelye groeisels op die liggaam vasgestel word nie. Die massa was beweeglik onder die vel.

Die habitus, eetlus, asemhaling, pols en temperatuur was normaal.

Die groeisel is chirurgies verwyder vir 'n histopatologiese ondersoek.

Met chirurgie is 'n geel-wit, glinsterende, ferm weefsel in die subkutis ontbloot. Die massa, ongeveer 100 x 50

mm, was swak omskewe, was aan die vel vas en is as 'n enkel massa verwyder. Monsters vir histopatologiese ondersoek is in gebufferde formalien versamel.

Met ondersoek van hierdie monsters kon geen teken van 'n gewas gewaar word nie en 'n diagnose van 'n fokale akute inflammasie is gemaak.

'n Tweede biopsie is 70 dae later histologies ondersoek en 'n diagnose van 'n anaplastiese fibrosarkoom is gemaak.

Hierdie gewas het in die dermis ontstaan. Dit het tot diep in die weefsel van die subkutis infiltrer (Fig. 1) en tot teenaan die epidermis gegroei sonder om nekrose of ulserasie van die epidermis te veroorsaak. Die gewas het uit plate spindelvormige selle bestaan (Fig. 2) wat in uiteenlopende bondels gerangskik was. Op plekke het die selle 'n ineengevlegde patroon soos in tipiese fibrosarkoom gevorm (Fig. 3), maar elders het die selle 'n gekronkelde patroon aangeneem. Foki van limfosiete het regdeur die gewas verspreid voorgekom, maar was meer algemeen om bloedvate (Fig. 4) aan die rande van die gewas. Die spindelvormige selle aan die rande het ook meer anaplasties voorgekom. Die gewas het 'n hoë mitotiese indeks gehad. Reg om die gewas was daar 'n gebied van hipervaskularisasie met akute inflammasie asook trombose in sommige bloedvate (Fig. 1-4).

Na 'n verdere 33 dae is 'n derde biopsie histologies ondersoek. Weer 'n keer kon geen neoplastiese weefsel waargeneem word nie. 'n Diagnose van akute inflammasie met die teenwoordigheid van heelwat mastselle is op hierdie ondersoek gemaak.

BEHANDELING EN RESULTATE

Tydens die eerste chirurgie is die gewas volledig verwyder. Sewentig dae na hierdie behandeling het hergroei in so 'n mate plaasgevind, dat die gewas 'n tweede keer chirurgiese verwydering is. Alhoewel die hergroei weer op dieselfde area tevoorskyn gekom het, het dit veelvuldig voorgekom met 4 knopagtige groeisels wat feitlik aan mekaar geskakel was.

As gevolg van hierdie hergroei is besluit om die gewas radioterapeuties te behandel. Nadat die chirurgiese wonde 16 dae later genees was, is die voorgestelde radioterapie toegepas.

Drie-en-dertig dae later het die gewas weer gegroei en

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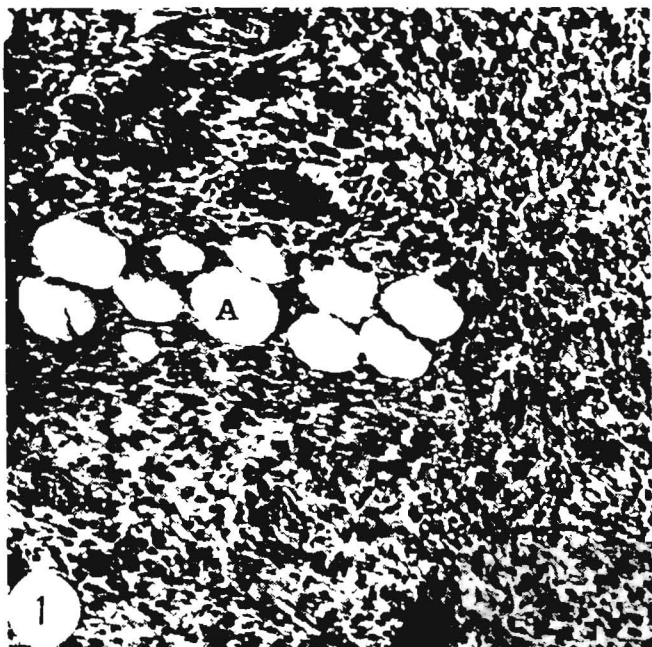


Fig. 1: Gewasselle wat die vetweefsel (A) van die subkutis binnedring. HE. x10.

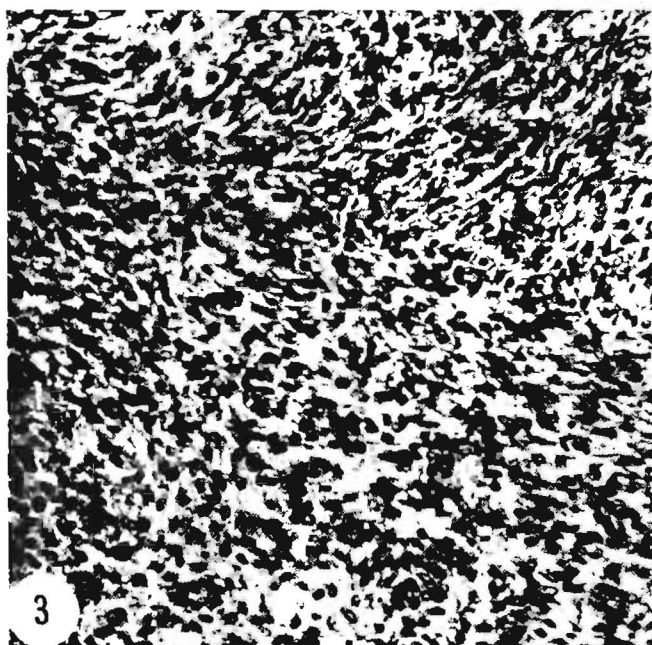


Fig. 3: 'n Gebied van die gewas met 'n inengevlegde patroon. HE. x10.

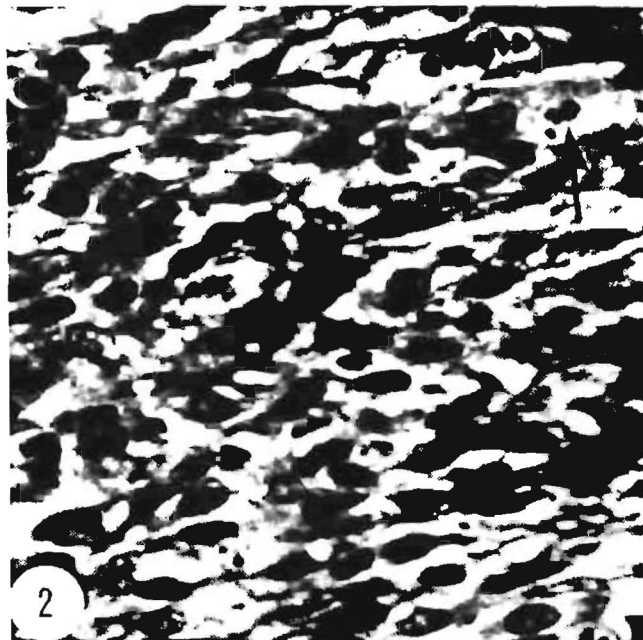


Fig. 2: Plate spindelvormige fibroblastiese gewasselle. Merk die mitotiese figuur (pyl). HE. x40.

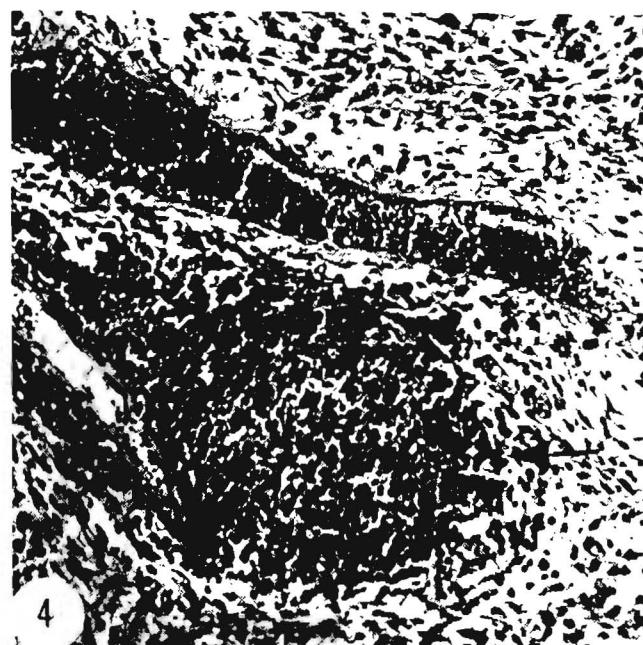


Fig. 4: 'n Groot fokus van limfosiete rondom 'n bloedvat (pyl). HE. x10.

2 kleiner gewassies is chirurgies verwyder. Na wondgenesing, 10 dae later, is 'n tweede dosis radioterapie toegepas. Die radioterapie is in 2 dosisse van 500 Rads toegedien oor 'n tydperk van 43 dae. Hierdie radioterapie word nie as 'n voldoende bestraling vir die gewas beskou nie. Die rede vir 'n laer dosis bestraling is omdat hoë dosisse op ekstremitate tot vele komplikasies lei.

Elf dae later is 'n enkel hergroei weer aangeteken en toe is besluit om chemoterapie aan te wend. Ametopteriennatrium (Methotrexate, Lederle) is teen 1 mg/kg binnespiers toegedien en na 7 dae herhaal. Antibiotika (ampisillien, Penbritin, Beecham) is saam met sitotoksiese middels toegedien om sekondêre infeksie te beheer.

Sewentien dae ná die laaste chemoterapie is 'n op-



Fig. 5: Fibrosarkoom verwyder vanaf linker bobeen.

volgondersoek uitgevoer waartydens waargeneem is dat die gewas net groter gegroei het.

Twaalf dae later was die gewas so groot dat dit weer chirurgies verwyder is (Fig. 5).

Dertien dae nadat die chirurgiese wonde genees het, is besluit om meer aggresiewe chemoterapie toe te pas. Hierdie behandeling staan bekend as die sogenaamde 'reddingsbehandeling' aangesien 'n potensieel-dodelike dosis ametofteriennatrium toegedien word, terwyl die effek daarvan 24 uur later omgekeer word om die pasiënt se lewe te red. Die behandeling het bestaan uit 'n dosis van 10 mg/kg ametofteriennatrium binne-aars. Die teenmiddel, 1 mg/kg foliensuur (Leucovorin Kalsium, Lederle), is 24 uur later per os toegedien en is elke 6 ure herhaal vir 72 uur. Die kat het hierdie behandeling sonder enige komplikasies oorleef.

Dertien dae na hierdie drastiese behandeling is waargeneem dat die gewas steeds vergroot en dieselfde reddingsbehandeling is herhaal. Negentien dae later was die gewas so groot dat dit weer chirurgies as 'n enkel massa verwyder is.

Een-en-twintig dae later is besluit om 'n kombinasiechemoterapie toe te pas. Die behandeling het bestaan uit die bogenoemde reddingsbehandeling tesame met die intraveneuse toediening van 0,5 mg vinkristiensulfaat (Pericristine, Petersen) en 5 mg doksorubisienhidrochloried (Andriblastina, Chemfarna Laboratories).

'n Opvolgsondersoek, 18 dae later, het vir die eerste keer geen groei van die gewas getoon nie. Nege dae later is 'n verdere dosis van 5 mg doksorubisienhidrochloried intra-veneus toegedien. Met 'n verdere kleiner ondersoek 3 dae na die laaste behandeling, is die kat klinies normaal bevind en geen groei van die gewas kon waargeneem word nie.

Dertig dae later is die kat egter weer ingebring met hergroei van die gewas. Die enigste voorstel wat nog oorweeg kon word, was amputasie van die been. Die eienaar wou egter nie hiervoor instem nie, en het die kat 18 dae later aangebied vir genadedood. Op daardie stadium was die kat andersins gesond en het geen sistemiese tekens van siekte getoon nie. Die gewas het egter weer onbeheersd begin groei. 'n Post mortem is uitgevoer en die volgende organe is histopatologies ondersoek: longe, hart, milt, lewer en niere. Geen tekens van skade as gevolg van chemoterapie of metastase kon waargeneem word nie. Daar was wel 'n graad van kroniese interstisiële nefritis, maar dit is nie 'n gevolg van die chemoterapie beskou nie.

Die enigste nuwe-effekte waargeneem was tydens die kombinasiechemoterapie en het 6 dae na behandeling 'n aanvang geneem. Die belangrikste nuwe-effekte was ligte vomisie met gepaardgaande aptyt verlies. Die toestand het geleidelik verbeter en die kat het weer 12 dae nadat die simptome begin het, normaal geëet. Slegs simptomatiese behandeling met anti-emetika en tonikums is toegedien. Die kat het self genoeg vloeiistowwe ingeneem.

BESPREKING

Volgens Theilen en Madewell³ is fibrosarkoom in katte gewoonlik stadig groeiende gewasse. In die geval onder bespreking het die gewas histologies anaplasties voorgekom en 'n hoë mitotiese indeks getoon. 'n Omliggende gebied van akute inflammasie was ook teenwoordig. Al 3 hierdie bevindings dui 'n vinnige groei aan en kan die herhaalde hergroei van die gewas verklaar.

Table 1: BEHANDELINGSREGIME

Dag	Chirurgie	Radio-terapie	Chemoterapie tesame met antibiotika dekking	Nuwe-effekte en Reaksie Pasiënt
1	Enkel gewas			
70	Multipel 4 gewasse			Hergroei
86		500 Rads		
119	Multipel 2 gewasse			Hergroei
129		500 Rads		
140			ametofteriennatrium 1 mg/kg binnespiers	
147			ametofteriennatrium 1 mg/kg intraveneus	
176	Enkel gewas			Hergroei
189			ametofteriennatrium 10 mg/kg, intraveneus met 1 mg/kg foliensuur vir 3 d na 24 h	
202			ametofteriennatrium 10 mg/kg, intraveneus met 1 mg/kg foliensuur vir 3 d na 24 h	
219	Enkel gewas			Hergroei
242			ametofteriennatrium 10 mg/kg, intraveneus met 1 mg/kg foliensuur vir 3 d, plus 0,5 mg vinkristiensulfaat en 5 mg doksorubisienhidrochloried intraveneus	
248				Vomisie Aptytverlies
260				Terug na normaal
269			5 mg doksorubisienhidrochloried intraveneus	
272				Kontrole Normaal
302				Hergroei
320			Genadedood	Postmortem Geen metastase op histologiese ondersoek

Drie diagnoses is ook van 'n ander laboratorium ontvang wat as volg was: kwaadaardige Schwannoom, 'n nie-spesifieke sarkoom en ongedifferensieerde sarkoom. Al die genoemde diagnoses kan differensiële diagnoses van fibrosarkoom wees en dit toon die belangrikheid van herhaalde histologiese ondersoeke wanneer gewasse hergroei.

Volgens Theilen en Madewell³ bestaan die behandeling van fibrosarkoom uit chirurgiese uitsnyding, maar hulle meld dat fibrosarkome dikwels daarna hergroei en selfs kan metastateer. Hulle meld ook dat fibrosarkome relatief bestralingsbestand is alhoewel hulle glo dat gedeeltelike chirurgiese verwydering die mitotiese indeks kan verhoog, wat weer die bestralings sensitiviteit kan verhoog. Min besonderhede is beskikbaar oor die reaksie van fibrosarkoom op chemoterapie in honde en katte.

In die lig van hierdie inligting, is met die behandeling van hierdie geval 'n daadwerklike poging aangewend om vas te stel of die gewas op enige behandeling sou reageer. Daar is 5 keer ekstensiewe chirurgie uitgevoer en die been is met 2 fraksies 'n bestraling tot 1 000 Rads toegedien, nadat daar 2 keer chirurgie toegepas is. Ten spyte van die lae dosering bestraling het die hergroei aanvanklik buite die bestralingsarea voorgekom. Hergroei het egter tog op 'n later stadium op die bestralingsarea voorgekom soos 'n mens sou verwag met lae dosis bestraling.

Daar is toe besluit om chemoterapie toe te pas. Nadat gewone dosisse ametofteriennatrium ook geen uitwerking op die hergroei van die gewas gehad het nie, is tot die drastiese stap van reddingsbehandeling oor gegaan. Sover ons kan vasstel was dit die eerste keer dat so 'n behandeling in 'n kat toegepas is. Omdat daar nie onmiddellik nuwe-effekte was nie, is die proses tot 3 maal herhaal. Die laaste keer is die reddingsbehandeling tesame met 2 ander sitotoksiese middels toegedien. Eers 6 dae later is die eerste nuwe-effekte gerapporteer. Die nuwe-effekte het met die minimum behandeling geleidelik verminder totdat die kat weer 'n normale lewe gevoer het. As in ag geneem word dat die kat nadoods selfs 'n graad van kroniese interstisiële nefritis gehad het, is die min nuwe-effekte gerapporteer, opvallend.

Alhoewel hergroei weer na die drastiese behandeling plaasgevind het, is dit ons insiens belangrik om te weet dat reddingsbehandeling suksesvol in katte gebruik kan word sonder dat dit die pasiënt ernstig benadeel.

Wat die behandeling van fibrosarkome in katte betref, kan geen definitiewe behandeling aanbeveel word nie. Genadedood is egter in hierdie pasiënt toegedien voordat die kat aan ernstige lyding onderwerp is en dit is nie op hierdie stadium duidelik of herhaalde reddingsbehandelings dalk tog die gewas uiteindelik sou kon beheer nie. Amputasie van die betrokke ledemaat is ook 'n behandeling wat moontlik oorweeg kon word.

VERWYSINGS

1. HASKELL C.M. 1980 Cancer Treatment W.B. Saunders Company Philadelphia: 81
2. MOULTON J.E. 1978 Tumours in domestic animals. University of California Press, 2nd edn. Berkeley: 313-314
3. THEILEN G.H., MADEWELL B.R. 1979 Veterinary Cancer Medicine Lea & Febiger, Philadelphia: 377-378

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BOOK REVIEW

BOEKRESENSIE

MECHANISMS OF DISEASE: A TEXTBOOK OF COMPARATIVE GENERAL PATHOLOGY

D.O. SLAUSON and B.J. COOPER

1st edn. Williams & Wilkins Baltimore 1982 pp xi and 420, Figures 211, Tables 45, ISBN 0-683-07742-2 \$37,50

In their selective rather than encyclopaedic approach to the subject, the authors have been successful in deciding what to omit from this book and have thus created an excellent work for student teaching. With the accent on pathogenesis, written in easy-to-understand language, this book is an asset to every veterinary pathologist and a must for all students of veterinary pathology.

The book includes 8 chapters devoted respectively to: Pathology; The study of disease; Disease at the cellular level; Disturbances of blood flow and circulation; The inflammatory process; Healing and repair; Immunopathology; Disturbances of growth and neoplasia; The nature and causes of disease; Interactions of the host, the parasite and the environment. Each section is adequately and clearly illustrated by schematic drawings and photographs at the macro- and microscopic as well as ultrastructural levels. Throughout the text the fresh ap-

proach of emphasis on pathogenesis runs like a golden core that absolutely binds the reader's mind and imprints the facts upon it. The factual knowledge is of high standard and is in accordance with current concepts. Very few, insignificant printing errors are present. It is a pity that in Fig. 3,7, according to the legend, petechiae are illustrated while in the actual picture both petechiae and ecchymoses are present. This may possibly confuse the pregraduate student. Fortunately, this small error is absolutely the exception in what I regard as a book of truly high quality and standard. There is no doubt that each student who has read this book will have a much clearer picture of the complex processes set in motion by disease resulting in what is observed by the pathologist. It is therefore highly recommended that this book be prescribed for students in general veterinary pathology.

I.B.J. van Rensburg

LYMPHOSARCOMA IN A SPOTTED HYENA, *CROCUTA CROCUTA*

T.A. NOBEL*, U. KLOPFER*, S. PERL, and B. YAKOBSON*

ABSTRACT: Nobel T.A.; Klopfer U.; Perl S.; and Yakobson B. *Lymphosarcoma in a spotted hyena, *Crocuta crocuta*. Journal of the South African Veterinary Association* (1983) 54 No. 3, 209 (En). Department of Pathology, Kimron Veterinary Institute, Bet-Dagan, 20500, P.O. Box 12, Israel.

Lymphosarcoma of the mesenteric and mediastinal lymph nodes with peritoneal and mediastinal implantations, as well as widespread intravascular metastases and thrombosis with haemorrhages was diagnosed in a spotted hyena.

Key words: Hyena, *Crocuta crocuta*, lymphosarcoma.

INTRODUCTION

Infrequent reference is made in the literature on the occurrence of tumours in hyenas. Halloran³ refers to a carcinoma of the thyroid⁴ and Strong and Shattuck⁵ to a "vaginal tumour"; Kronberger² also describes a fibroadenocarcinoma and a struma in hyenas.

As far as haematopoietic neoplasms are concerned, Dobberstein¹ and Wiesner⁶ mention the occurrence of leukosis (lymphosarcoma) in hyenas but without noting the species or giving reference to their statement. Thus, to the best of our knowledge, this is the first report of a lymphosarcoma in a spotted hyena.

CLINICAL FINDINGS

A spotted hyena about 22 years of age, died suddenly in the Jerusalem biblical zoological garden and was submitted to us for necropsy. The spotted hyena is not autochthonous to this country, while the striped hyena, *Hyaena hyaena* is found here. They were mentioned in the Bible but their identification is uncertain. The only clinical sign added to the submission form was "superficial rapid respiration" with suspicion of choking.

POST-MORTEM FINDINGS

Necropsy revealed the following changes: The mesenteric lymph nodes were enlarged to twice their normal size, had an irregular knobby surface and a grey-red colour. The consistency of the lymph nodes was soft, the tissue disintegrated on sectioning and the cut surface resembled a poorly encapsulated abscess. The spleen had a nodular surface while small round to ovoid greyish-white, opaque nodules covered the liver and parietal peritoneum including that of the diaphragm. The bronchial and mediastinal lymph nodes were similarly affected, while a sheet of tissue resembling that covering the peritoneum occurred in the anterior mediastinum.

Histopathological examination revealed that the lymph nodes, the knobby protrusions around them and the peritoneal tumours consisted of uniform accumulations of poorly differentiated lymphoblasts. Less commonly, the neoplastic cells were more differentiated being larger with a vesicular nucleus and a broad elongated cytoplasm, imparting a reticulo-histiocytic feature. The cells were mostly uniform with a round to oval nucleus, with distinct nuclear membranes. Mitotic figures were common and small spaces with macrophages inside produced the "starry sky" effect. Furthermore, round empty spaces, similar to fat vacuoles were observed inside sheets of lymphoblasts. No germinal centres were seen in the lymph nodes. Neoplastic cells infiltrated the fat capsule and connective tissue. The neoplastic cells very often concentrated perivascularly when found outside the lymph node. On the diaphragm, the lymphoblasts also infiltrated the adjacent muscle fibres. The nodules implanted on the Glisson's capsule of the liver did not infiltrate the liver parenchyma but remained isolated. The liver itself was devoid of neoplastic tissue.

Another feature of the tumour was the high frequency of the presence of neoplastic cell groups and thrombi in the lumen of blood vessels. Furthermore numerous hemorrhages with thrombus formations were seen in the spleen and lymph nodes. This was probably the consequence of the above-mentioned thrombus formation. The spleen was filled with tumorous nodules of various sizes, which protruded from the surface but were also present in the parenchyma.

REFERENCES

1. DOBBERSTEIN J 1958 Ueberblick ueber die Leukoseforschung beim Tier. Monatshefte für Veterinär-Medizin 13:259-264
2. KRONBERGER H 1962 Tumours in zoo animals. Nordisk Veterinär Medicin 14:297-304
3. HALLORAN P 1955 A bibliography of references to the diseases of wild animals and birds. American Journal of Veterinary Research 16:198-201
4. RATCLIFF H L Report Penrose Research Laboratory as cited by Halloran⁴
5. STRONG R P SHATTUCK G C 1930 Medical and pathological investigations in Liberia and Belgian Congo as cited by Halloran⁴
6. WIESNER E 1967 Die Leukosen des Rindes. VEB Gustav Fischer Verlag Jena: 9

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BLOOD SELENIUM LEVELS IN UNTHRIFTY LAMBS IN THE KROONSTAD DISTRICT

On a farm in the Kroonstad district unthriftiness in Merino lambs aged 12-14 months was diagnosed. Diarrhoea could not be detected in any of the affected cases. Post mortem examinations performed on 2 of the animals revealed emaciation and a mild whipworm infestation. Coagulative necrosis, the pathognomonic change of white muscle disease, could not be detected during the histopathological examination of heart muscle samples.

Blood from the jugular vein of 25 unthrifty lambs was collected by venepuncture into heparinised vacutainer tubes. The samples were freeze-dried and analysed for selenium using a neutron activation technique². Thirty healthy lambs from 2 nearby farms were bled as controls. The distribution of the blood selenium concentrations of both groups are given in Table 1.

Three samples only from the unthrifty groups of lambs revealed normal blood selenium levels (Table 1). The balance was characterised by marginal to definite deficiency values. This is in contrast to the control group where one case only showed a marginal deficient blood selenium concentration. For the rest normal selenium values were obtained. One feature of healthy sheep in the Kroonstad district which is also true of healthy sheep on the particular property where illthrift was diagnosed, is normal blood selenium concentrations¹. It is thus reasonable to assume that even the unthrifty cases ingested normal quantities of selenium. The possible explanation for the obviously decreased selenium levels in the unthrifty lambs could have been the presence of the whipworm infestation. It is thus postulated that the negative influence of the particular parasite on selenium metabolism resulted in the diagnosed syndrome.

Table 1: BLOOD SELENIUM CONCENTRATIONS OF UNTHRIFTY AND HEALTHY CONTROL LAMBS IN THE KROONSTAD DISTRICT ($\mu\text{g/ml}$)

Blood selenium concentration*	Number of lambs in		Average selenium levels** of	
	Unthrifty group	Control group	Unthrifty group	Control group
$\leq 0,05$	4	0	$0,074 \pm 0,014$	$0,165 \pm 0,030$
$0,051 - 0,075$	12	0		
$0,076 - 0,100$	6	1		
$\geq 0,100$	3	29		

*Selenium categories defined for sheep in Britain¹

**Average \pm standard deviation

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REFERENCES

1. ANDERSON P H, BERRETT S, PATTERSON D S P 1979 The biological selenium status of livestock in Britain as indicated by sheep erythrocyte glutathione peroxidase activity. The Veterinary Record 104: 235-238
2. ERASMUS J A, FAANHOF A 1983 Blood selenium of sheep in the Northern Orange Free State: A preliminary report. (This issue)

BOOK REVIEW

BOEKRESENSIE

MEDICAL PARASITOLOGY

J. WALTER BECK & JOHN E. DAVIES

The C.V. Mosby Book Co., 11830 Westline Industrial Drive, St. Louis, Missouri C3144, U.S.A. 1981 pp. 355 Figs 339 (7 in colour) Tabs. 19 ISBN 0-8016-0552-0. Price: not stated. (Submitted for review by United Book Distributors, Box 17294, Hillbrow 2038, RSA).

This well known soft cover teaching manual is now in its 3rd edition since first being published in 1971. Its periodic revision and updating as well as the quality of the text and the numerous line drawings, photographs and tables are undoubtedly factors responsible for its excellence and popularity. The text is precise, succinct and to the point, the printing being good and clear and the style attractive.

Apart from its general value to all interested in parasitology, veterinarians will find the book particularly valuable because of the numerous parasitic zoonoses which are included. Obviously the emphasis is placed on the human aspects of these infestations and diseases but this is more of a virtue than a disadvantage because by so doing

balance is given to the veterinary approach to the zoonoses.

The book is divided into sections or parts dealing with parasitic protozoa, helminths and arthropods respectively. Each part deals with several sections and there are review questions provided at the end of each section. A list of references is provided at the end of each chapter.

Four appendices at the back of the book provide precise technical data on solutions, stains, media and procedures for examining faecal material and the study of blood, tissue and arial parasites, the collection and preservation of arthropods and a list of available drugs for chemotherapy.

Acquisition is highly recommended.

L.W. v.d. Heever

PRAKTIESE ELEKTROKARDIOGRAFIE. II: S – T SEGMENT VERANDERINGE BY DIE HOND

J. VAN HEERDEN*

ABSTRACT: Van Heerden J. 1983 *Practical electrocardiography. II: S – T segment changes in the dog*. *Journal of the South African Veterinary Association* (1983) 54 No. 3, 211-212 (Afrik) Department of Medicine, Faculty of Veterinary Science, Medical University of Southern Africa, 0204 Medunsa, Republic of South Africa.

The clinical importance of S – T segment changes in the dog is briefly discussed and illustrated by cases with severe ventricular anoxia and haemopericardium.

Key words: Canine electrocardiography.

Die S – T segment en T-golf van die elektrokardiogram (Fig. 1) verteenwoordig ventrikulêre repolarisasie. Die S – T segment stel die periode van stadige repolarisasie van die ventrikels voor. Hierdie segment is gewoonlik iso-elektries van aard en gelyk met die basislyn, maar kan ook effens hoër (elevasie) of effens laer (depressie) as die vlak van die basislyn wees. S – T segment afwykings bestaan gewoonlik uit abnormale elevasie of depressie daarvan, sowel as veranderinge in vorm van die normaalweg kort horisontale lyn. Normaalweg is die standaard bipolêre afleidings en versterkte unipolêre afleidings voldoende vir evaluering van die S – T segment. 'n S – T segmentdepressie van meer as -0,2 mv of elevasie van meer as 0,15 mv in afleidings II en III word gewoonlik as abnormaal beskou³.

Die polariteit van die S – T segment en T-golf in die hond is nie noodwendig dieselfde as die van die QRS-kompleks nie.

S – T segment afwykings word assosieer met 'n wye reeks van toestande⁴ waarvan die volgende miskien die belangrikste is:

Kom voor as normale variasie

Miokardiese isgemie as gevolg van swak sirkulasie, infarksie van die miokard of hipoksiese toestande

Oordosering met digitalis

Perikardiese effusie

Hiperkalemie

Die volgende voorbeelde dien ter illustrasie van afwykings van die S – T segment:

Geval 1: 'n Volwasse Pirenese Berghondteef is aangebied vir elektrokardiografiese ondersoek in 'n terminale toestand van apnee. Sy was onder diep verdowings nadat 'n noodoperasie as gevolg van ruptuur van 'n septiese baarmoeder op haar uitgevoer is. Die elektrokardiogram het aanvanklik 'n sinus tagikardie met matige S – T segmentdepressie getoon. Die pasiënt se toestand het, ten spyte van pogings om asemhaling te inisieer, vinnig verswak. Alle reflekse was afwezig, totale apnee was teenwoordig asook bilaterale midriase. Die elektrokardiogram (Fig. 2) het nou totale afwesigheid van P-golwe getoon met erge depressie (-0,6 mv) van die S – T segment.

Hierdie tipe van elektrokardiogram kan verkry word met hiperkalemie of hiperkalemie geassosieer met 'n hipoksiese toestand¹. 'n Kenmerk van die elektrokardiogram by 'n pasiënt met hiperkalemie is, onder andere, die afwesigheid van P-golwe. Geen kaliumbepalings is uitgevoer nie maar as die geskiedenis van die geval in ag geneem word, is die S – T segment verandering in hierdie geval bes waarskynlik te wyte aan die anoksiese toestand en gepaardgaande hiperkalemie.

Die verandering van die elektrokardiogram (Fig. 3) binne enkele sekondes het die hopelose prognose van die geval beklemtoon. Ventrikulêre fibrillasie dui op terminale swak ongekoördineerde ventrikulêre sametrekings.

In 'n eksperimentele studie is gevind dat versmoring altyd lei tot vergroting van T-golwe in dié positiewe rigting². Dit gaan gepaard met elevasie van die S – T segment soos geïllustreer in Fig. 5. Hiperkalemiese toestande daarenteen gaan gepaard met S – T segmentdepressie en vergroting van die T-golf. Hierdie T-golfvergroting kan óf in 'n positiewe of negatiewe rigting plaasvind maar meesal negatief² (Fig. 2).

Geval 2: 'n Twaalf jaar oue Duitse Herdershondreun in goeie fisiese toestand is aangebied in 'n toestand van kollaps. Volgens die eienaar het die pasiënt ongeveer 'n uur voor aanbieding skielik 'n ineenstorting gehad. Die pasiënt het tagipnee, salivasie asook 'n baie swak pols gehad. Geen kardiële geluide kon met auskultasie gehoor word nie. 'n Elektrokardiogram (Fig. 4) het die volgende abnormaliteite getoon:

Sinus tagikardie

lae amplitude QRS-komplekse

S – T segmentelevasie

komplekse variërend in amplitude en polariteit ("electrical alternans")

Hierdie elektrokardiografiese kenmerke is tipies vir vloeistofaansameling in die perikard⁴. Perikardiosentese is onmiddellik uitgevoer en bloed is uit die hartsak geaspireer.

Die pasiënt is kort hierna dood ondanks pogings om die harttoestand te verlig. Met 'n nadoedse ondersoek is die oorsaak van die hemoperikardium aangegee as 'n hemangiosarkoom.

Geval 3: 'n Elektrokardiogram is van hierdie hond geneem (Fig. 5 & 6) terwyl genadedood toegepas is. 'n

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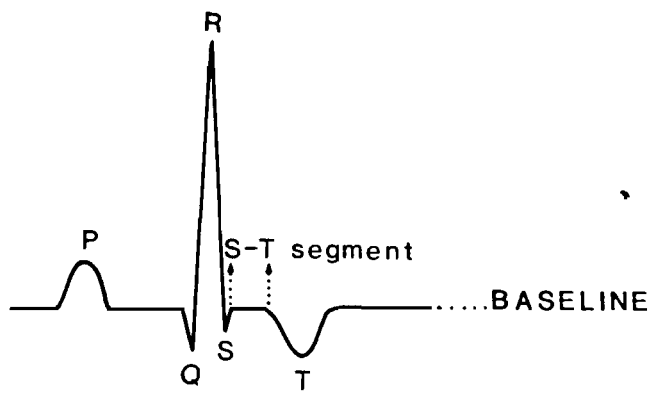


Fig 1: S – T segment in 'n normale elektrokardiogram van die hond. Afleiding II



Fig 2: Gevorderde S – T segment depressie met afwesigheid van P-golwe.

Oordosis babituraat is intraveneus toegedien. Die geweldige elevasie van die S – T segment kan duidelik gesien word. Let daarop dat die S – T segment en T-golf moeilik van mekaar onderskeibaar is. In Fig. 6 vind atriale en sporadiese ventrikulêre kontraksies onafhanklik van mekaar plaas (volledige hartblok). Op hierdie stadium was die pasiënt se slymvliese reeds diepblou van kleur.

Dit is belangrik om 'n S – T segmentverandering in die elektrokardiogram van 'n pasiënt nie terstond te assosieer met sistemiese siekte of patologie nie. 'n Aan-sienlike variasie kom voor by normale diere.

Die S – T segmentveranderinge geassosieer met elektrolietveranderings en oordosering met digitalis kom gewoonlik voor in assosiasie met ander spesifieke veranderinge in die elektrokardiogram en sal elders illustreer word.

S – T segmentveranderinge is dus in die hond veral van belang in die evaluasie van isemie van die miokard hetsy in pasiënte met hartversaking of in pasiënte onder algemene verdoving en in hiperkalemiese toestande.

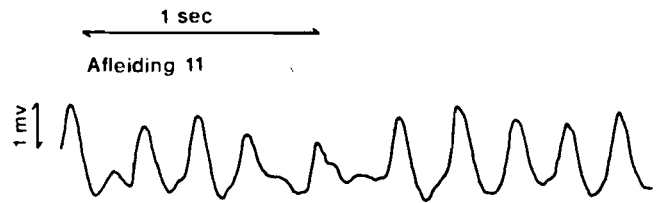


Fig 3: Ventrikulêre fladdering

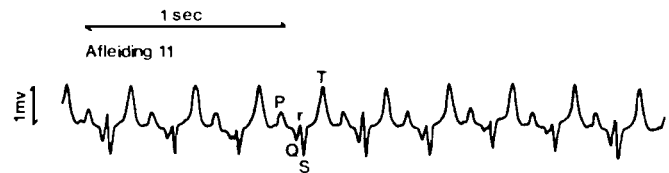


Fig 4: Elektrokardiogram van pasiënt met perikardiese effusie

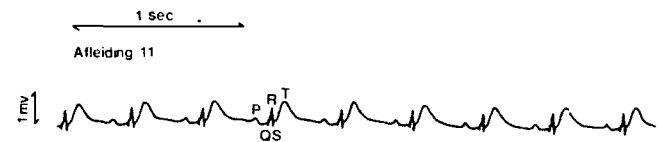


Fig 5: S – T segment-elevasie

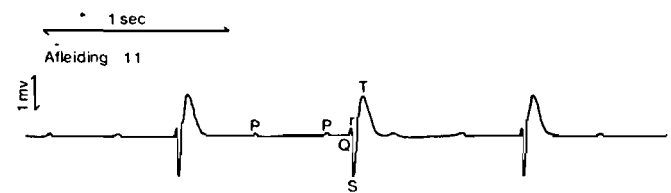


Fig 6: S – T segment-elevasie en volledige hartblok

VERWYSINGS

1. COULTER DB, DURBAN RJ, SANDER PD 1975 Effects of asphyxia and potassium on canine and feline electrocardiograms. Canadian Journal of Comparative Medicine 39:442-449
2. COULTER DB, ENGEN RL 1972 Differentiation of electrocardiographic changes due to asphyxia and to hyperpotassaemia in dogs. Journal of the American Veterinary Medical Association 160: 1419-1422
3. ETTINGER SJ, Suter PF 1970 Canine Cardiology. W.B. Saunders Company, Philadelphia
4. TILLEY LP 1979 Essentials of canine and feline electrocardiography. C.V. Mosby Company, London.



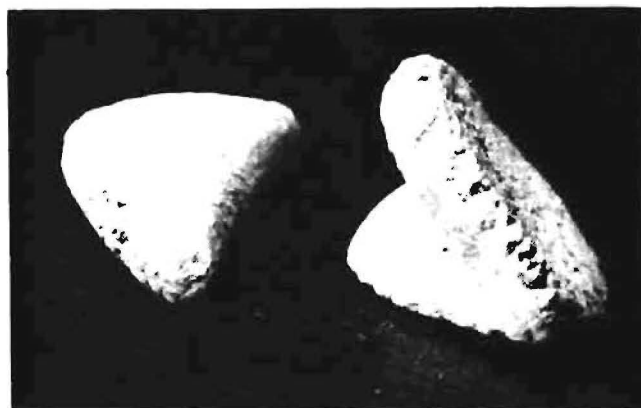
ONGEWONE GELEDE BLAASSTENE:

'n "PREHISTORIESE GEWRIG"?

'n Vierjarige gesteriliseerde Dachshundteef is ingebring met 'n geskiedenis van bloedgemende uriene. Ten spyte van die feit dat die hondjie baie vet was kon daar tydens kliniese ondersoek harde voorwerpe in die urienblaas gepalpeer word. Tydens die daaropvolgende sistotomie is 2 blaasstene verwyder, ongeveer 50 by 30 mm (Fotos 1 & 2). Die herstel van die hond was sonder enige komplikasies.

Opvallend in hierdie geval was die vorm waarin die blaasstene ontwikkel het. Die 2 stene het heen en weer teen mekaar beweeg om sodoende die vorm van 'n gewrig aan te neem. Alhoewel blaasstene by honde redelik algemeen voorkom, is dié besondere vorm seker uniek.

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UNUSUALLY ARTICULATED VESICAL CALCULI:

A "PREHISTORIC ARTICULATION"?

A four-year-old spayed Dachshund bitch was presented with a history of blood stained urine. Despite the fact that she was overweight, foreign bodies could be palpated in the urinary bladder. During the following cystotomy 2 bladder calculi were removed measuring approximately 30 x 50 mm (Fig 1 & 2). The dog made an uneventful recovery.

An interesting feature of this case is the shape of the calculi. The 2 calculi articulated to and fro in the bladder resulting in the development of jointlike surfaces. Although the presence of cystic calculi is a common phenomenon in dogs, this specific shape is, to my experience, unique.

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BOOK REVIEW

BOEKRESENSIE

GENETIESE EN STATISTIESE WOORDEBOEK VIR VEEKUNDE. GENETICAL AND STATISTICAL DICTIONARY OF ANIMAL SCIENCE.

D.R. OSTERHOFF and L.C. EKSTEEN

J.L. van Schaik (Pty) Ltd., Pretoria 1983.

This hardcover book of 91 pages is a bilingual compendium of terminology presented in two parts. Part I is an English-Afrikaans dictionary. Part II consists of a word index.

The contents have a predominance of genetic terminology with concise definitions, as well as some related terminology which belongs in other areas of animal science.

The authors are complimented in initiating such a publication which could be expanded into a more comprehensive compendium in due course.

A dictionary can never be considered as complete. This is particularly true in the sciences.

P.A. Boyazoglu