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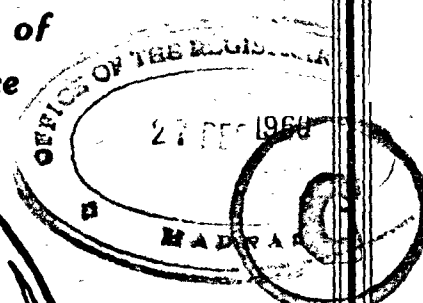
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[THE JOURNAL OF THE INDIAN VETERINARY ASSOCIATION]

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Devoted to the cause of the
Veterinary Profession



EDITOR

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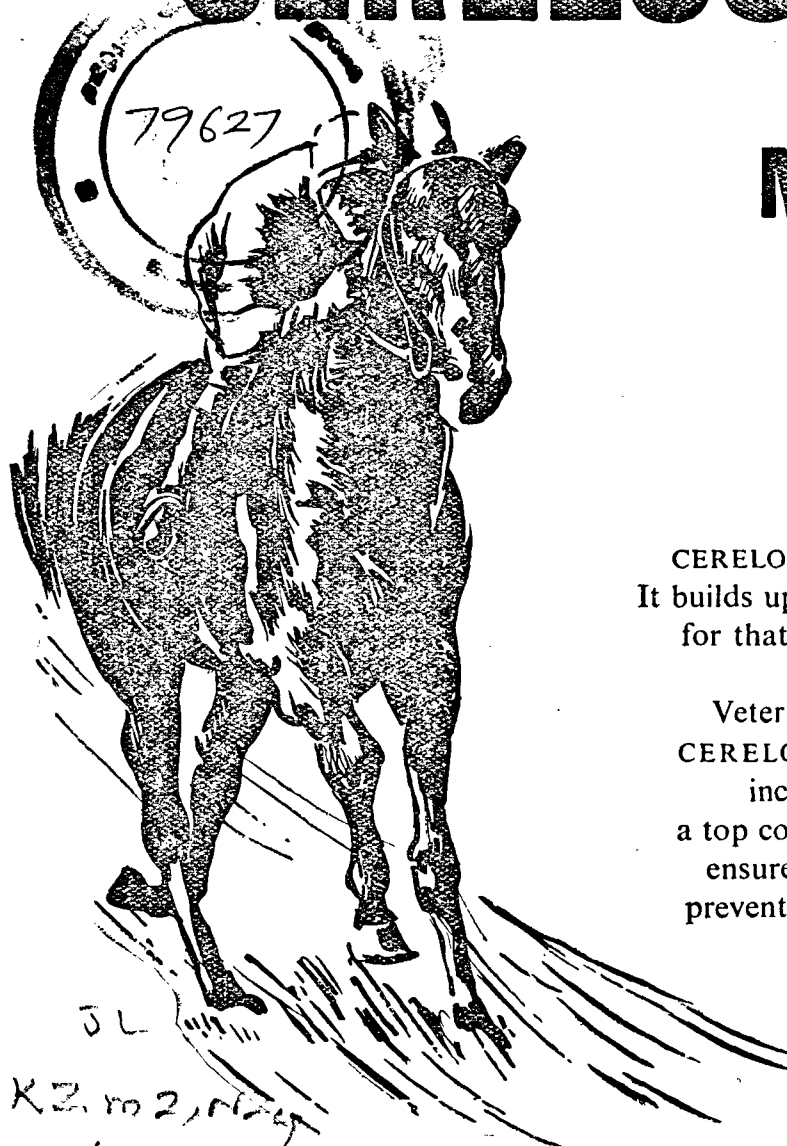
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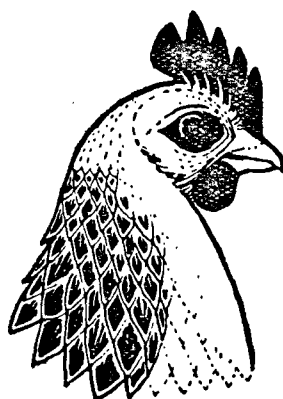
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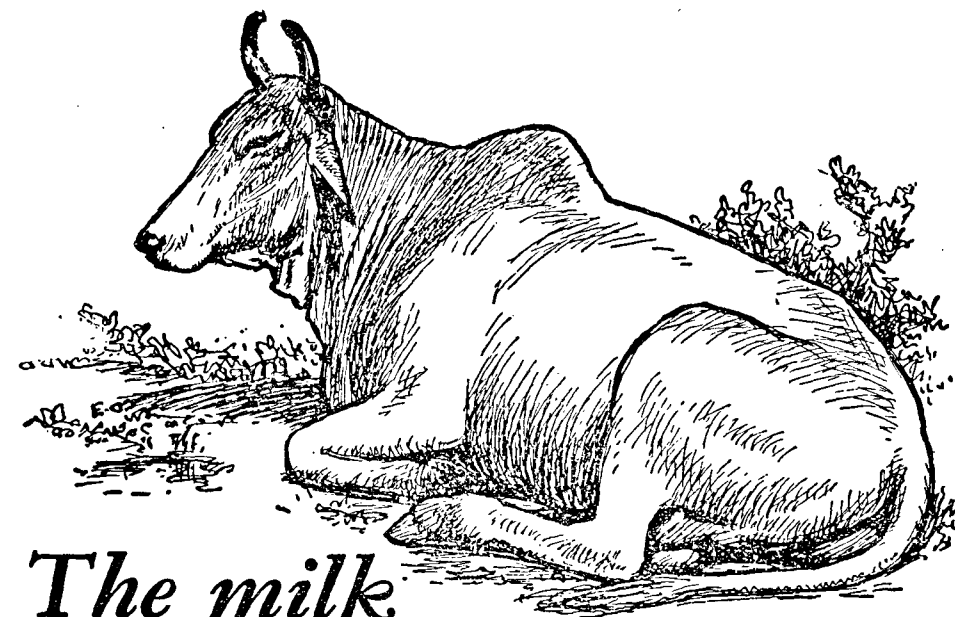
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THE

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Editorial

ESPIRIT DE CORPS

One of the main objects of any association or body is to create *esprit-de-corps* amongst its members. It merely means cultivating a habit of regard and respect for the body which one belongs to and thus creating a feeling of oneness among its members. The Indian Veterinary Association has laid this down as one of its objects from its very inception and has been trying its best to bring about this happy state of affairs amongst the members of the profession. But it has been so elusive that we confess we feel extremely disappointed after all our strenuous efforts for well nigh four decades now.

Unless and until the profession develops this much needed *esprit-de-corps*, it is doubtful if the other objects of our Association can ever be achieved to the extent we ought to. How can we uphold the dignity and honour of the profession and safeguard its rights and interests without this sense of unity amongst ourselves? How can we help the advancement of Veterinary Science in all its aspects, if we don't meet and discuss? How can we improve the professional knowledge of our members if we do not pool our experiences together and share the knowledge gained? How can we bring about the development of the livestock wealth of the country if we do not pull our weight together? These are serious questions which should be faced boldly by every member of the profession.

We often see the sad spectacle of a member here and a member there decrying the profession itself or even playing into the hands of non-professional men, who have their own axe to grind. A nobler profession than ours it is hard to conceive of and if we have not succeeded to the extent we ought to have, it is not a little due to this

lack of *esprit-de-corps* amongst us. Like the quality of mercy, it blesses him that gives and him (or body) that receives. It is an idle talk to speak of belonging to a profession, without this *esprit-de-corps*.

As a glaring example of this lack of *esprit-de-corps* we have the monumental failure (so far) of the Reserve Fund of the *Indian Veterinary Journal*. In a Country which boasts of nearly 5 to 6 thousand Veterinary Surgeons, it should have been possible to raise 50 to 60 thousand rupees, even at the rate of Rs. 10/- each, which can by no means be considered as a high rate of contribution. Instead we see the sad spectacle of our not raising even one fourth of that amount! As a profession we stand disgraced before the eyes of the World. We say this with a sad heart and not in any spirit of reproach. The individual thrives if the profession thrives. One cannot always be drawing on the profession, without contributing anything towards its welfare.

We are deeply thankful to all those who have so far contributed to the Reserve Fund. They are the salt of the earth. Some of them have done so quite liberally and at great sacrifice. We appeal to one and all in the profession once again to send in their mite to the Reserve Fund. Personal prejudices should not be allowed to affect the common good of the profession. The economic status of the profession has been considerably raised in most of the States and there is hardly any excuse on that ground. This indifferent attitude of the profession has broken the heart of many an enthusiastic worker in the cause of our profession. This lack of response threatens to disintegrate what has so far been built up with such assiduous care and sacrifice. This Reserve Fund will soon be converted into a Building Fund to house the *Indian Veterinary Journal*, which even after 36 years of its existence still remains without an abode of its own. Does this speak well of the profession in India? It has been our personal ambition to locate the *Indian Veterinary Journal* in a building of its own before we lay down office. But that is not to be. Anyhow we feel this un-finished work will be taken up by others and completed. The profession could then hold up its head high and cry out "Hurrah!". May that day dawn sooner than we all could anticipate!

Remember! United we stand and divided we fall.

General Articles

SOME OBSERVATIONS ON THE SERUM ALKALINE PHOSPHATASE ACTIVITY OF CATTLE, GOATS AND SHEEP

By

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Various reports suggest that defective calcification may be explained by reference to the alkaline phosphatase enzyme system. A decrease in alkaline phosphatase activity of bones (Wiess *et al*, 1939 and Combs *et al*, 1942) is a general characteristic of the manganese depletion and explains failures in bone formation. Though the alkaline phosphatase of the bone is less active in the manganese deficient chick and rabbit, conflicting results are obtained for phosphatase in the rat (Wachtel *et al*, 1943 and Amdur *et al*, 1945). Kay (1929 and 1930) studied the relative phosphatase activities of the plasma from many clinical conditions and found a marked elevation in generalized bone disease; though malignant conditions of the bone which are destructive without replacement cause no elevation of the enzyme in the plasma (*vide* King, 1953). Ahmed *et al* (1945) investigating the blood conditions of people in the Kangra Valley of Panjab, where the incidence of rickets and osteomalacia was established observed that the serum phosphatase values ranged within a normal range in spite of the fact that other clinical symptoms of rickets were present. Ranganathan and Patwardhan (1949) in studies relating to the influence of rickets in rats showed that there was a very large decrease in plasma alkaline phosphatase. The importance of the determination of plasma alkaline phosphatase activity as a useful aid in the diagnosis of generalised bone disease and other disorders has been recently pointed out by King (*loc. cit.*). Results obtained by Tuba and Madsen (1952) and Jackson

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(1952) also indicate that the serum alkaline phosphatase activity reflects the nutritional state.

Since there is little recorded information on the normal serum alkaline phosphatase activity of Indian cattle, goats and sheep, it is desired to report some data obtained on healthy animals under normal conditions of feeding and management during the course of nutritional or disease investigation experiments.

Experimental

Blood was drawn from the jugular vein of the animals in the morning before feeding or watering. The clotted blood was centrifuged and the clear supernatant serum separated by decantation. The alkaline phosphatase activity of serum was measured in Bodansky Units (B.U.) following the method of Bodansky (1933) as detailed by Hawk *et al.* (1947) - a B.U. being defined as that amount of inorganic phosphorus in milligrams which is liberated from an alkaline substrate of sodium B glycerophosphate during one hour's incubation with one milliliter of serum at 37°C.

Results

The data obtained on cattle, goats and sheep are collectively given in the table I.

Cattle: For the purpose twelve healthy adult Kumaoni bullocks were selected at random from a herd which is ordinarily kept at the maintenance level. In the following year the observations were repeated on six animals out of which four were the same as used in the previous year. Since, however, all the animals used during the two years were healthy and normal, the fluctuations in the value of the common animals may be only around the mean value (see under discussion). On this consideration, the common animals are treated as individuals and the data obtained during the two years are regarded as having been obtained on 18 different animals. The mean value worked out on this basis is 4.35 ± 0.35 B.U. per 100 c.c. serum.

Goats: Observations on goats were made on both young and adult animals. The young animals were born to goats reared on the institute farm under conditions of scientific feeding and management. The data for these animals are divided into three groups on an age basis - the ages in the three groups being $1\frac{1}{2}$ months, 3-4 months and $8\frac{1}{2}$ - $15\frac{1}{2}$ months respectively. The variations in the data for the different age groups are discussed below. The data for all the 26 young animals when considered together give an average value of 5.03 ± 0.57 B.U. per 100 c.c. serum.

TABLE I

Serum alkaline phosphatase activity of cattle, goats and sheep in Bodansky Units per 100 c.c. serum.

Sl. No.	Cattle		Goat				Sheep	
	Age	Adult	Young		Adult *		Gr. I	Gr. II *
			$1\frac{1}{2}$ months	3-4 months	$8\frac{1}{2}$ - $15\frac{1}{2}$ months		9-17 months	Approx. same as Gr. I
1		7.57	8.75	2.42	2.97	3.08	6.49	2.72
2		4.89	7.34	6.41	3.77	14.62	3.44	4.37
3		4.15	3.32	1.10	2.07	1.11	5.02	3.61
4		3.92	4.42	6.18	2.45	3.37	3.70	3.77
5		4.97 (3.25)	9.10	5.54	3.52	11.05	5.02	5.02
6		8.58	3.32	6.95	4.46	14.43		8.84
7		5.18 (2.36)		1.16	7.61	3.42		5.46
8		5.32		7.05	2.75	18.74		
9		3.53 (2.86)		3.13	2.46	12.77		
10		6.82 (4.11)		6.47		16.96		
11		6.14		16.15		11.25		
12		4.27				8.18		
13		(2.89)				1.54		
14		(2.40)				0.58		
Average ...		5.03 (2.98)	6.04	5.69	3.56	8.65	4.73	4.83
Overall average ...								
No. of animals...		18	26		14		12	
Mean ...		4.35	5.03		8.65		4.79	
± S. E. ...		± 0.35	± 0.57		± 1.70		± 0.50	

|| Data taken from the Ph.D. thesis of one of the authors (S. S. N.)

() Observations made in the following year (see text).

* Procured from divergent sources (see text).

The data on the 14 apparently healthy adult goats are also included in the table. These goats were newly purchased from outside from divergent sources and their previous dietary history was unknown. The average value for serum alkaline phosphatase activity is 8.65 ± 1.70 B.U. per 100 c.c. serum. An interpretation of the data obtained follows from the discussion.

Sheep: Observations were made on a total of 12 sheep. Five of these were born to sheep maintained on the Institute farm and at the time of examination, their ages averaged 11 months (with a range of

9-17 months). Seven of the sheep were purchased from outside from divergent sources. They were apparently normal and belonged to almost the same age group as the sheep from the Institute farm. The data for the two groups (I and II) are given separately. The overall average value for 12 sheep is 4.79 ± 0.50 B.U. per 100 c.c. serum. The results are discussed.

Discussion

The serum alkaline phosphatase activity of adult Kumaoni bullocks as obtained here averages 4.35 ± 0.35 B.U. per 100 c.c. serum. An average value of 9.8 B.U. for normal animals of the same breed has been recorded by Majumdar (1945). Kay (1930) and Stearns and Warweg (1933) observed higher phosphatase values in children than in adults. Muley and Hurwitz (1938) in a study of the human subjects have shown that the very high values obtained between the ages of 10 to 15 years showed a decline with advance in age and thereafter remained fairly constant. According to Hawk *et al.* (*loc. cit.*) in normal human adults the alkaline phosphatase activity ranges from 1.5 to 4 B.U. and in normal children from 5 to 12 B.U. with corresponding average values of 2.7 and 8.0 B.U. respectively. In India Ahmed *et al.* (*loc. cit.*) also noted a highly significant difference in the mean phosphatase value for adults and children - their values for male and female adults being 2.29 and 2.45 B.U. respectively, compared to the average values of 8.31 and 9.56 B.U. respectively for young male and female children. Similar age differences have been found in rabbit and rat (Kay, 1930) and dog (Badansky, 1934). In view of these findings, in human beings and other animals it appears that the animals used by Majumdar (*loc. cit.*) were comparatively younger to those used in the present work. Majumdar (*loc. cit.*) has also recorded that five growing calves at two different times had average values of 11.4 and 11.8 B.U. with corresponding ranges of 10.5 to 12.3 B.U. and 10.7 to 12.9 B.U. respectively. Duckworth and Golden (1943) working on calves have recorded values of 3.4 to 13 B.U. (approximately equal to 8 to 35 King and Armstrong Units; *vide* Garner, 1952). Allcroft and Folley (1941) recorded very wide values of 0.3 to 114.3 King and Armstrong Units in case of cows and 3.0 to 166.1 units in case of ewes. They also observed that there were wide fluctuations in the mean value at successive samplings.

The influence of age on the serum alkaline phosphatase level is also illustrated by the data presented for the three groups of young goats from the same stock. With advancing age there is a progressive decrease in the mean alkaline phosphatase activity. Though the difference in the mean values between the different groups was not found to be statistically significant, it may follow that with further advance in

age, the serum alkaline phosphatase activity may be still further lowered. The average value of 8.65 ± 1.70 B.U. for the serum alkaline phosphatase activity of adult goats is much higher than the average value of 5.03 ± 0.57 obtained for the young animals. It has been pointed out before that the adult goats were purchased from outside from divergent sources of unknown dietary history whereas the young animals were reared up from kids born to goats maintained on the farm under scientific conditions of feeding and management. It may be argued that various other factors come into play in determining the serum alkaline phosphatase activity. Tuba *et al.* (1949) found that the serum alkaline phosphatase activity rises on low protein diets. This finding is corroborated by Srinivasan and Patwardhan (1955) who observed that the serum alkaline phosphatase level was considerably raised in experimental animals in the first month on protein deficient diet. The mean values progressively increased upto three months but were restored to normal on feeding the animals a diet supplemented with proteins. On the other hand the high carbohydrate diets have the effect of increasing the activity of the enzyme (Cantarow and Trumper, 1950). It is likely that the adult goats, though apparently normal, suffered from acute protein deficiency which is not improbable under ordinary field conditions in this country.

There are other variables which govern the phosphatase activity. Weil and Russell (1940) studied the relationship between feed consumption and phosphatase levels and found that the levels in rats decreased after fasting. Roy and Sen (1944) also found that starvation markedly reduced the alkaline phosphatase activity of tissues and serum. Roy (1944) observed that serum and bone alkaline phosphatase activities of scorbutic guinea pigs were markedly lowered. Fell *et al.* (1946) also reported that in vitamin C deficient guineapigs the phosphatase activity was defective. Nerurkar and Sahasrabudhe (1956) observed that administration of excessive vitamin A to rats produced skeletal fractures characterised by undisturbed serum calcium and phosphorus levels but an increased bone alkaline phosphatase activity. Evidence is also available to show that vitamin D (Zetterstrom, 1951) and fatty acids (Dickie *et al.* 1955) also affect the alkaline phosphatase activity. Various trace elements influence the activity of phosphatases (Cantarow and Trumper, *loc. cit.*). Recently Newland *et al.* (1958) have observed that diets rich in calcium unsupplemented by zinc produced a significant drop in serum alkaline phosphatase activity in pigs. Allcroft and Folley (*loc. cit.*) have discussed the available evidence showing that there are species differences as regards changes in serum phosphatase and that the values are also affected by physiological conditions such as pregnancy and lactation or by treatment with thyroxine or

oestrogenic hormones. In their work on cattle Kunkel *et al.* (1953) observed that breed and environmental factors affected the serum alkaline phosphatase values markedly though sex had only little effect. Combs *et al.* (1959) as well found that there were no sex differences at 7 days of age though at one day of age female pigs exhibited a significantly higher phosphatase activity than male pigs. Insecticide residues in feeds may also influence the phosphatase values. Serum alkaline phosphatase values were significantly higher in rates consuming endrin than in the controls (Nelson *et al.* 1956).

The various opposing factors may bring about an equilibrium around the normal mean value. This is shown to a certain extent by the data presented for sheep. The average and individual values for 5 sheep reared on the farm and for 7 sheep procured from sources of divergent nutritional status are of the same order of magnitude.

From the foregoing discussion on the limited data presented in this note, it is evident that there is a wide variation in the serum alkaline phosphatase values of animals under the varying nutritional and physiological conditions. Pal *et al.* (1954) who made a study of the serum alkaline phosphatase level in human beings in health and disease, have discussed the various opposing factors which influence the activity of the enzyme and have rightly concluded that the determination of the alkaline phosphatase value of blood is not a very reliable diagnostic method for any pathological condition.

Summary

Some observations have been recorded on the serum alkaline phosphatase activity of cattle, goats and sheep. On the basis of the data obtained and the available evidence it appears that there is a very wide fluctuation in the normal range of activity of this enzyme.

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DURATION OF IMMUNITY IN FOWLS FOLLOWING VACCINATION WITH FREEZE DRIED RANIKHET (NEWCASTLE) DISEASE VACCINE

BY

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Following the method adopted by Iyer and Dobson (1940), Haddow and Idnani (1946) evolved an attenuated strain of Ranikhet disease virus by serial passages of a virulent strain of the virus through embryonating hen eggs. Ever since the evolution of this attenuated strain, millions of birds in India and elsewhere have been protected year after year against this deadly disease of poultry. It was the usual practice to vaccinate fowls through subcutaneous or intramuscular routes with 1 ml. of a 1 in 1000 dilution of allanto amniotic fluid collected from embryonating eggs infected with the attenuated strain of the virus. The wet vaccine had to be preserved in cold, that is, in a thermos flask containing ice from the time it left the production centre to the time it was actually inoculated into fowls in the field. The duration of immunity following vaccination of chicks of 6 to 8 weeks of age using the wet vaccine lasted for a period of four years (Seetharaman, 1951).

Dhanda, *et al* (1951) reported that the keeping quality of the vaccine could be considerably enhanced by freeze drying the vaccine. With the improved types of freeze drying equipment available in the country, the Ranikhet disease vaccine for the past 5 or 6 years, is being produced in the freeze dried state and distributed for use in the field. The work reported in this paper was undertaken to find out whether the duration of immunity in chicks following vaccination with freeze dried Ranikhet disease vaccine was as good as that produced by the wet vaccine reported by Seetharaman (1951). Further, there were reports from some field workers that the immunity subsequent to vaccination with Mukteswar strain of Ranikhet disease virus lasted for a period of only eleven months. (Report 1955).

Experimental

The work was undertaken in an experimental poultry farm maintained for the supply of fertile eggs essentially for virus cultivation.

Ready to lay pullets along with a requisite number of cocks were obtained for the farm periodically, from a central poultry farm where as a routine, all the chicks when 6 to 8 weeks of age were immunized with freeze dried Ranikhet disease vaccine. No further immunization against the disease was carried out after receipt of the fowls in the experimental farm mentioned above. There was also no possibility of the birds of the farm coming in contact with other birds infected with the virus. After keeping the birds for 2 to 3 years they were culled in small lots of 15 to 20 birds at a time and these culled birds were used in the experiment to study the duration of immunity. Generally the age of such culled birds varied from 2½ to 3½ years. All the birds were first bled and their sera were subjected to haemagglutinin-inhibition test. Later, they were challenged with 1 ml. of 1 in 100 suspension of liver and spleen of fowls died of Ranikhet disease due to infection with a virulent strain of the virus. This dose of challenge virus constituted approximately 10,000 m.e.ds. Unvaccinated birds were used as controls along with each test. Observations accumulated for the past nearly three years are presented in table I.

TABLE I

*Showing the results of HI test and challenge infection
with virulent RD virus.*

Number of fowls	Percentage	Average HI titre	No. of survivals
			No. challenged
8	3.94	1280	8 / 8
20	9.85	640	20 / 20
28	13.79	320	28 / 28
37	18.23	160	37 / 37
38	18.72	80	38 / 38
36	17.74	40	36 / 36
13	6.40	20	13 / 13
4	1.97	10	8 / 4
19	9.36	0	14 / 19
10	...	not determined	10 / 10

Note:—All the eighteen unvaccinated birds used as controls in the above experiment succumbed showing typical symptoms of the disease.

Further, on two occasions at an interval of nearly 2½ years all the birds of the farm were bled and their sera were subjected to HI test. The age of the birds at the time of collection of blood for the test varied from 1½ to 3½ years. Number of samples of sera thus tested were 519. Results of the HI test on these samples of sera are presented in table II.

TABLE II

Showing the result of HI test of sera of birds of
1½ to 3½ years of age.

Number of birds	Percentage	HI titre
17	9.28	1,280
40	7.71	640
61	11.75	320
75	14.45	160
112	21.58	80
80	15.41	40
55	10.60	20
31	5.97	10
48	9.25	0

Discussion

The results obtained, as anticipated, revealed that a high degree of immunity was established in fowls that were vaccinated with freeze dried Mukteswar strain of Ranikhet disease vaccine were comparable to those obtained by Seetharaman (1951) with wet vaccine. Of the six birds that succumbed to the challenge infection five did not reveal the presence of any HI antibody while the other one had a titre of 10. It may be pointed out that in the authors' experience birds showing a HI titre of 20 or more resisted challenge infection with virulent virus. The break down of immunity in a few cases might be either due to omission during primary vaccination or that these birds might not have been able to produce sufficient quantities of antibodies subsequent to vaccination. Individual variation in the development of immune bodies has been reported by the authors earlier. Immunity produced by Mukteswar strain of RD virus is more or less life long in birds which is borne out by the fact that in some of the large poultry farms where vaccination against the disease was carried out only once in birds at the age of 6 to 8 weeks no outbreak of the disease was ever reported.

Summary

Challenge infection with virulent Ranikhet disease virus of 213 birds of 2½ to 3½ years of age and haemagglutinin inhibition test on samples of sera obtained from 519 birds of 1½ to 3½ years of age revealed that the immunity produced by freeze dried Mukteswar strain of RD virus lasted practically throughout the useful span of life of birds.

Acknowledgment

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SOURCES OF VARIATION IN SKIN THICKNESS AND ITS RELATIONSHIP WITH MILK YIELD IN MURRAH BUFFALOES

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Introduction

Scholz (1950) attempted to correlate skin thickness with milk yield in cattle. Some information on the skin thickness of buffaloes is also available (Hafeez *et al*, 1954; Badreldin and Ghanny, 1954; and others). There is, however, no scientific evidence to suggest the extent to which the skin thickness is related to milk yield in buffaloes. In India it is a common practice to select milch cattle on the basis of skin thickness. A soft, thin and pliable skin is considered to be a desirable characteristic of milch cattle. This study was therefore, undertaken in continuation of our previous work (Taneja and Bhatnagar 1958 a, b) to complete the deficiency in our present knowledge.

Material

Twenty Murrah buffaloes belonging to the Dairy Section of the Livestock Research Institute, Mhow, constituted the experimental animals. The conditions of management have already been described (Taneja and Bhatnagar 1958 a, b)

Methods

(a) *Measurement of skin thickness* :—Skin thickness was measured on three regions (neck, shoulder, and belly). Measurements were taken by verniform callipers. After the animals were measured once on each region, the measurements were repeated two times again without making any reference to the previous observations. The measurements used for the final assessment of the analysis are the average of the three regions.

(b) *Analyses* :—(i) Analyses of data were carried out on the following mathematical model :

$$Y_{ijk} = \mu + p_i + a_j + B_k + (pa)_{ij} + (aB)_{jk} + (pB)_{ik} + e_{ijk}$$

$$(i = 1 \dots r; j = 1 \dots a; k = 1 \dots b)$$

where μ = mean effect;

p_i = effect of the i^{th} series of observations;

a_j = effect of the j^{th} animal;

B_k = effect of the k^{th} region;

$(pa)_{ij}$ = effect of the interaction of i^{th} series of observation with j^{th} animal;

$(aB)_{jk}$ = effect of the interaction of the j^{th} animal with k^{th} region;

$(pB)_{ik}$ = effect of the interaction of the i^{th} series of observation with k^{th} region;

e_{ijk} = error

(ii) Repeatability:

This was estimated by the following formula:

$$r = \frac{\sigma_a^2}{\sigma_a^2 + \sigma_{e_{ijk}}^2}$$

The components σ_a^2 and $\sigma_{e_{ijk}}^2$ were determined from the equation mentioned in (ii).

(iii) Phenotypic correlation coefficients: Correlations between skin thickness and milk yield were calculated by the usual methods (Fisher, 1948).

Results

TABLE I

Means, variances, standard deviations and percentage coefficients of variation of skin thickness of different regions in Murrah buffaloes.

Character	Mean (c.m.)	Variance	Standard deviations	Percentage coefficient of variation
<i>Skin thickness</i>				
Neck region ...	1.01	0.2392	0.49	16.11
Shoulder region ...	1.16	0.3129	0.55	15.85
Belly region ...	1.49	0.3715	0.60	13.42

Table 1 indicates that skin thickness on belly region is significantly higher than that of the neck region ($t = 2.80$; $P_{(18)} 1\% = 2.86$).

As we proceed from anterior to the posterior end of the animal's body, the skin thickness gradually increases. It is interesting to note that the means and variances are positively correlated.

TABLE II

Analysis of variance.

Source	D.F.	M.S.	E.(M.S.)	Component
Between animals (a) ...	19	0.2159**	$\sigma_e^2 + 3\sigma_a^2 \times r + 3\sigma_a^2 \times o + 9\sigma_a^2$	0.0165
Between regions (r) ...	2	3.6071**	$\sigma_e^2 + 3\sigma_a^2 \times r + 20\sigma_r^2 \times o + 60\sigma_r^2$	0.0594
Between observation (o)	2	0.1550	$\sigma_e^2 + 20\sigma_o^2 \times r + 3\sigma_a^2 \times o + 60\sigma_o^2$	0.0020
Between region X Observation (r X o)	4	0.0069	$\sigma_e^2 + 20\sigma_o^2 \times r$	-0.0001
Between observation X animals (o X a)	38	0.0356**	$\sigma_e^2 + 3\sigma_a^2 \times o$	0.0084
Between animal X region (a X o)	38	0.0420**	$\sigma_e^2 + 3\sigma_a^2 \times r$	0.0106
Error ...	76	0.0102	σ_e^2	0.0102

** Highly significant.

Results in Table 2 indicate that :—

- The difference between buffaloes for skin thickness were highly significant.
- Variations between series of observations were not significant.
- Variations between regions were highly significant suggesting that the thickness of the skin is not uniform over the animals' body.
- The interaction between regions and series of observations was not significant. This would indicate that observations were consistent relative to each other at different occasions of measurements.

- (v) The interaction between series of observations and animals expresses those differences between total measurements of skin thickness given to the same buffalo in different series of observations. There were significant differences between total scores of buffalo.
- (vi) The interaction between region and animal was significant indicating particular buffalo appeared to be different in different observations and on different regions.

Repeatability of measurements of skin thickness is 0.61 ± 0.24 . As repeatability is 0.61, an extra observation would give an improvement of only about 12% (Lush 1945) and therefore any additional measurement capacity is best exploited in other directions.

TABLE III
Phenotypic correlations.

		r	z	n - 3	Reciprocal
1st calver	...	0.30	0.2913	4	0.250
2nd calver	...	0.02	0.0200	8	0.125

Diff. $\pm 0.2713 \pm 0.6009$.

0.2713 is less than half of the standard error.
Therefore, there is no significant correlation.

The phenotypic correlations were carried out separately for the first and second lactational yield with skin thickness. The correlation coefficients were homogenous. The figures for milk yield and skin thickness of all the animals were pooled together and the correlation of 0.11 was observed ($P_{(18)} 5\% = 0.44$). The regression of milk yield (lb.) on skin thickness (c.m.) was 532.2 ± 1092.0 ($t = 0.48$; $P_{(18)} 5\% = 2.1$). (see Fig. 1). The regression coefficient is, therefore, not significant. The equation for the regression of milk yield (y) on thickness of skin (x) has been calculated as below:

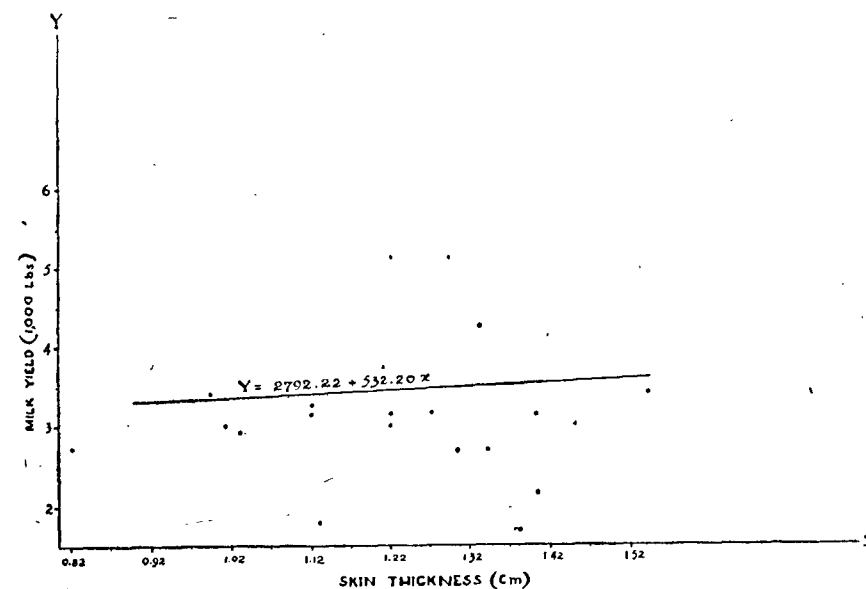
$$y = 2792.22 + 532.2 x$$

Discussion

Recent investigations on thermo-regulatory mechanism (Findley 1950) of cattle seem to indicate that animals with soft, thin and pliable skin have the advantage over the rough, coarse and thick skinned animals in unloading body heat. It would therefore, appear that animal which can dissipate more heat would conserve more energy for production. Patel and Anderson (1958) observed the variation of skin

thickness in Dairy cattle. The workers in Australia as per report of C.S.I.R.O. (1951) observed inherent breed differences in skin thickness of cattle. These authors reported skin thickness for different breeds of cattle, and their measurements were 5.5, 7.0, 7.1 and 7.2 m.m. for Jersey, Hereford, Zebus and Africanders respectively. Bedreldin and Ghanni (1954) measured the skin thickness on the shoulder region of buffaloes and found that buffaloes were more hyperthermic than cattle when exposed to direct solar radiation. Skin thickness of buffaloes as observed in this study was twice that of cattle and increased with age of the animals. The repeatability of 0.61 of skin thickness determined in this study is well in agreement with that of cattle (Patel and Anderson 1958). Scholz (1950) attempted to correlate skin thickness with milk yield but his results were inconclusive. In our experiments we failed to establish any correlation between skin thickness and milk yield in buffaloes.

Sinha and Minnet (1947) observed that sprinkling water on buffaloes during hot weather increased milk yield. The point whether the rate of evaporation from thick skin and from thin skinned buffaloes differ significantly, remains yet to be investigated. If there are no such differences in the rates of evaporation as mentioned above, then the selection of buffaloes on the basis of skin thickness is invalid.



Further this study indicates high repeatability of skin thickness and significant differences between animals for the same character. These could be utilised as aids to selection.

Summary

Twenty Murrah buffaloes were used in this experiment. Skin on the neck, shoulder, and belly regions were measured in centimeters by verniform callipers. The mean values of 1.01, 1.16, 1.49 were obtained for neck, shoulder, and belly regions respectively.

Analysis of data indicates significant differences between animals, between regions, between observations $\times$ animals and between animals $\times$ regions. Repeatability of observations for skin thickness was calculated to be 0.61 ± 0.24 .

Correlation coefficient of milk yield with skin thickness is 0.11 which is not significant. The regression of milk yield (lb.) on skin thickness (c.m.) has been observed to be 532.2 ± 1092.0 (S.E.). The regression equation for milk yield in pounds (y) and skin thickness in centimeters (x) has been calculated to be:

$$y = 2793.22 + 532.20 x$$

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BACTERIAL FLORA WITH SPECIAL REFERENCE TO THE STAPHYLOCOCCI OF THE APPARENTLY NORMAL UDDERS OF HEALTHY GOATS AND COWS COLLECTED FROM SLAUGHTER HOUSE

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Mukerji and Das (1957), while studying etiology of goat mastitis, found that *Staphylococci* were the commonest organisms both in the acute and chronic cases. The ratio of incidence between *Staphylococcus aureus* and *Staphylococcus albus* was found to be 3:1. The *albus* variety was isolated in pure culture from a number of clinical cases of goat mastitis. It was evident that the *albus* variety, under certain circumstances, may cause mastitis. Discarding the earlier theory that milk within the healthy udder is germ free, numerous investigators observed that milk drawn aseptically from apparently healthy cows contained bacteria largely composed of *Staphylococci* and *Streptococci*. While it is true that certain types of bacteria, particularly non-haemolytic, coagulase negative *Staphylococci*, may inhabit the milk cistern and larger milk ducts for indefinite periods without causing clinical mastitis, there is reason to doubt that this condition should be regarded as normal. Evans (1916) obtained "micrococci" from 58.8% of the milk samples drawn from udders regarded as normal. Most of the "udder micrococci" studied appeared to be of the same type as those commonly found on the skin of man and animals. Other investigators also observed that "micrococci" were the predominant organisms found in "normal milk". Little and Platridge (1946) observed that the possibility that *Staphylococci*, which originally possess little or no pathogenicity, may gain entrance to the udder and in time acquire more aggressive properties, as manifested by an increased irritation of the udder tissue and haemolysin and coagulase production, would seem to be worthy of investigation. Nakagawa (1958) observed that pigment production and mannitol fermentation did not distinguish pathogenic from non-pathogenic strains. He concluded that non-coagulase and non-haemolytic strains were not necessarily non-pathogenic. The available literature mostly deals with studies on micrococci of the normal bovine udders, but references for such studies of the normal goat udders are rather rare. The object of the present work is to investigate the

the bacterial flora of the apparently normal udders of healthy goats with special reference to *Staphylococci* which were found to be the commonest organism in clinical goat mastitis. Similar investigation of the apparently normal udders of the healthy cows was also undertaken for the purpose of comparison.

Materials and methods

Udders of 93 healthy goats, with no physical evidence of mastitis, were carefully dissected after slaughter with all bacteriological precautions and 2 swabs were taken from lactiferous sinus and mammary gland of each udder. The total number of swabs collected from goats for examination was 186. Similarly from 24 healthy cows with apparently normal udders 4 swabs from each udder, 2 of lactiferous sinus and 2 of mammary gland, were collected after slaughter for comparing the results. The total number of swabs collected from cows for examination was 96. Out of 93 goat udders 27 were in lactation stage and similar figure for 24 cow udders was 10. At the time of dissection of the udders macroscopical changes of the mammary glands, whenever present, were noted. The swabs were brought to the laboratory within an hour of their collection. These were then moistened with a little sterile N.S.S. and blood agar plates were streaked with the squeezed out fluid from the swabs. The plates were incubated at 37°C for 24 hours. Individual colonies were then studied. *Staphylococci* were differentiated on the basis of pigmentation, haemolysis, coagulase and biochemical reactions. Violet red agar plates, advocated by Nyireddy (1958), containing 1% mannitol, 5% defibrinated blood and 4% bromocresol red saturated solution, were also used for differentiation of pathogenic from non-pathogenic *Staphylococci* by their different haemolytic and mannitol-splitting properties. Majority of the isolated strains of *Streptococci* were typed on the basis of haemolysis and biochemical reactions.

Result

In 2 goat udders suppurative foci were observed from which pure growths of coagulase positive *Staphylococcus aureus* was culturally isolated. The remaining goat udders appeared to be normal to the naked eye observation. No abnormalities were observed in the dissected cow udders. 51% of the swabs collected from lactiferous sinus and 75% of swabs collected from mammary gland of goat udders were found to be bacteriologically sterile. Similar figures for cow udders were 46.1% and 66.2% respectively. It was revealed that the percentage of sterility was greater in the non-lactating udders than in the lactating udders. This observation holds good both for the goats and the cows. Among the *Staphylococci* isolated from goats about 10% belonged to *Staph. aureus* variety and the rest were of *albus* variety. Corresponding figure for

Staph. aureus variety isolated from cows was 4%. It is significant to note that the percentage of *Staphylococci* isolated from goat udders is about double that isolated from cow udders. In this connection it may be pointed out that *Staphylococcus* was the foremost organism (61.1%) in the clinical goat mastitis reported by Mukerji and Das (*loc. cit*) and the same organism was found only in 25% of cases of clinical mastitis of cows and buffaloes reported by Mukerji *et al* (1956). The ratio of *Streptococcus agalactiae* to other saprophytic *Streptococci* in both goat and cow udders was 1:5. It was observed that there were comparatively less number of bacteria in the dorsal regions of the udders both of goats and cows than in the ventral regions. The results of the present investigations are given in the following table.

TABLE

Animal	No. of animals	No. of samples collected			Percentage of organisms isolated from non-sterile samples								Percentage of sterility in	
		L.S.	M.G.	Total	Staph		Strept		Coliform		Other bacteria		L.S.	M.G.
					L.S.	M.G.	L.S.	M.G.	L.S.	M.G.	L.S.	M.G.		
Goat ...	93	93	93	186	65.2	60.8	20.8	16.6	16.6	12.5	25.0	14.6	51.0	75.0
Cow ...	24	48	48	96	35.7	27.2	22.2	18.7	18.7	11.1	25.0	11.1	46.1	66.2

L.S. = Lactiferous sinus. M.G. = Mammary gland. "Other bacteria" included Diphtheroids, *Pseudomonas*, *Proteus*, *Achromobacter* and *Anthracooids*. They were present singly or in small combinations in many samples.

Discussion

That some of the *Staphylococci*, which are generally regarded as avirulent, can, under certain circumstances, assume virulence in the tissues has been discussed earlier. The results of the present investigation show that a large percentage of apparently normal goat udders are carriers of *Staphylococci* and these are the organisms which are also most frequently encountered in the clinical forms of goat mastitis. It is, therefore, considered necessary to adopt effective prophylactic and curative measures against *Staphylococcal* mastitis. Such measures have been tried through vaccination with beneficial results in other countries. Some of those findings are mentioned here for stimulating interest. Slanetz, *et al* (1959), in a five-year study in a number of herds, found that vaccination with a toxoid or vaccine-toxoid produced a significant protection although it did not result in elimination of the organisms from infected quarters. In a controlled trial carried out by Pearson (1959), using a vaccine-toxoid, hopes were raised that it might

be possible to use this form of treatment in a herd where Staphylococcal mastitis was a problem. Derbyshire (1960) had most successful results when vaccinating goats with a vaccine-toxoid using 10% aluminium hydroxide as an adjuvant. The vaccinated goats showed only a transitory reaction in the udder while control goats died from gangrenous mastitis when challenged with a culture of the homologous strain. Minett (1939) has summarised experiments carried out by earlier workers who had used vaccines to prevent Staphylococcal mastitis in the sheep with some evidence of success. Minett's own work showed that the use of toxoid in sheep prevented the systemic effects and, to some extent, the local effects resulting from inoculation of a mixture of *Staphylococcus* culture and toxin into the teat canal. However, with one exception, all Minett's sheep were non-lactating and it could not be concluded that lactating animals would react in a similar manner. On this point, Derbyshire's (*loc. cit*) work clearly showed that, under the experimental conditions employed, severe Staphylococcal mastitis in goats and cows in full lactation can be prevented by vaccination with an adjuvant celltoxoid prepared from the homologous strain. Murphy (1946) remarked that three or sometimes more intramuscular injections of *Staphylococcus* toxoid at 2 or 3 days intervals with doses of 10 c.c., 15 c.c., or 20 c.c., (even subsequently 30 to 40 c.c.) gave excellent results in cows. Percentage of cure claimed by the author was 72.5%.

Summary

186 swabs from dissected, apparently normal, udders of slaughtered goats were collected for studying bacterial flora. For comparison, 96 swabs from apparently normal udders of slaughtered cows were also collected. *Staphylococci* were found to be the most predominant organisms in the udders of both goats and cows, but they were found in much greater number in the goat udders than in the cow udders. The problem of *Staphylococcus* - carrier udder is discussed with special reference to the scope of vaccination.

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TREATMENT OF FASCIOLIASIS

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 Orissa, Cuttack.

Treatment of fascioliasis has been receiving attention throughout the world. Though the causative parasite of the disease has been known to man time-out-of-mind, its first correlation with the disease was only established during the 19th century when Leukart in 1881 and Thomas in 1881 worked out the life cycle of the parasite and successfully infected healthy animals producing similar symptoms (Taylor 1937). Since then various drugs were under trial to cause effective removal of the worms from the livers.

Of the various drugs found useful in successful elimination of the parasite, carbon tetrachloride and Hexachloroethane deserve special mention. Hall in 1921 (Quoted by Chopra and Chandler 1928) first introduced carbon tetrachloride as an anthelmintic against hook worms in dogs. Subsequently it has been found that this drug also exerted specific action against liver flukes in cattle, sheep and goats. In India Mahajan (1942) and Rao (1944) obtained good results with this drug when administered orally in controlling fascioliasis in Hyderabad with a few casualties. Quite recently this drug came to be used as a subcutaneous injection as a curative in fascioliasis. Appreciable amount of work has been done by workers in the Soviet Union and the Continent of Europe. Demidov (1953), Kagramanov (1953), Zavgorodni (1955) and Yakovlov (1955) have all reported very good results by this method without any casualty or reaction in thus treated animals. They administered the drug in pure form. Grabda and Grabda (1954) employed this drug in combination with liquid paraffin

in proportion of 1:5 and observed that young animals, emaciated ones and those in advance stage of pregnancy have tolerated this drug very well with good results. The Director of Animal Husbandry and Veterinary Services, Mysore (1957-58) reports successful treatment of three fasciola positive buffaloes with 20 c.c. of carbon tetrachloride given subcutaneously.

It was Hall again in 1925 who tried Hexachlorethane as a hookworm remedy in dogs and found it useless. But subsequently German and Bavarian workers found it useful against fasciola in 1926 from which time the drug was popular in Europe (Harrow, 1959).

During the war due to shortage of gelatine and glycerine, administration of carbon tetrachloride was felt difficult to animals and hexachloroethane became more popular.

Ganslmayer and Gromovsek (1941) employed hexachloroethane as a war time remedy in sheep and successfully treated them in doses of 8 grams per animal.

Olson (1943) employed hexachloroethane in combination with bentonite as a suspension with water and obtained good results. Olson (1944, 1946) stated that cattle under normal conditions of health have tolerated doses of 100 grams of this drug *per os*. He (1947) further contended that cattle of below average standards had shown reaction to single dose treatment with this drug. The reaction was giddiness, mild diarrhoea, loss of appetite and death. He also observed that this drug did not act on animals with extensive pathological liver changes and in very young stages of the parasite. Shah (1944) reported 50% efficacy in steers treated with hexachloroethane employing Olson's formula. Potemkina (1945) treated cattle and sheep with this drug in varying concentrations and she found that in doses of 0.8 grams per Kilo gram body weight it is 100% efficacious. She further observed that milk was tainted for 3 days and flesh for 8 days after treatment. Refuerzo (1947) found that hexachlorethane acted better when administered with Extract of Kamala in support of the treatment adopted by Alicata (1941). But he however felt the necessity of intravenous administration of 20% calcium-borogluconate 3 hours after dosing, the dose being given on two consecutive days. Lapage *et al* (1947) recommending the use of hexachloroethane-bentonite suspension recorded that in divided doses they could not obtain 100% cure. Eggs were still found in the faeces of some animals thus treated. Olson (1948) working on the comparative efficacy of the two drugs administered by mouth observed that carbon tetrachloride acts earlier, dead flukes appearing in stools 19 hours after treatment. Writing about the toxicity of Hexachloroethane, Harrow (1959) observes that poisoning with

this drug occurs as "out breaks" which strongly suggests the susceptibility to the drug of animals under definite circumstances *viz.* high fluke infection, feeding of certain diets and in areas with high incidence of milk fever.

Materials and Methods

Twenty five cattle presented at the Veterinary Dispensary, Bhubaneswar and nine cattle encountered at Cuttack, on different dates were subjected to faecal examination and after finding them positive for eggs of fasciola they were given treatment.

"Avlothane" brand of hexachloroethane in doses of one ounce per 500 lbs. body weight was administered as a drench either in single dose or in two divided doses in case of weak animals, the drug being administered early in the mornings on empty stomachs.

Carbon tetrachloride was administered subcutaneously in doses of 1 c.c. per 100 lbs. body weight mixed with an equal amount of sterile liquid paraffin.

Fifteen animals (all adults) of both sexes were subjected to treatment with hexachloroethane and 19 adult animals of both sexes were subjected to subcutaneous treatment with carbon tetrachloride.

Results of both the methods of treatment are shown in table I and II appended below.

Faecal samples in all the 34 cases were examined on alternate days from the date of treatment till eggs disappeared from the stools; thereafter faecal examination was conducted in each case for 3 consecutive days for negative findings of eggs in stools after which it was considered that the cases have been cured clinically. The period taken for clinical cure is also recorded (vide table I and II).

In the group of 15 animals treated with hexachloroethane one emaciated bullock (case No. 2156) died two days after treatment with fractional doses of the drug.

Post-mortem examination of this bullock revealed extreme cachexia and anaemia; liver was highly enlarged and affected with clay pipe cirrhosis with dead *Fasciola gigantica* in the organ. Besides liver-flukes the bullock had lung worms *Dictycaulus viviparus* and *Mecistocirrus digitatus* in the abomasum. The mucous membrane of the small intestine was congested with petechial haemorrhages.

None of the nineteen animals treated with carbon tetrachloride evinced any signs of toxicity except a slight inconvenience experienced by them at the site of injection which lasted for 2-5 minutes after injection. Neither calcium nor glucose was administered

TABLE I
Showing results of treatment of affected cases with *Hexachloroethane*.

Sl. No.	Sl. No. of Patient Register	Date of treatment	Description of Animal	Date when faecal sample was negative	No. of days taken for elimination of infection
1	2	3	4	5	6
1	697	31-5-58	Adult C.B. Cow	23-6-58	23 days
2	707	1-6-58	do.	15-6-58	14 "
3	724	2-6-58	do.	20-6-58	18 "
4	746	5-6-58	Adult C.B. Bullock	26-6-58	21 "
5	764	6-6-58	do.	4-7-58	28 "
6	1056	1-7-58	Adult C.B. Cow	24-7-58	23 "
7	1057	14-8-58	Adult C.B. Heifer	18-7-58	17 "
8	1583	24-8-58	Adult C.B. Bullock	2-9-58	18 "
9	1669	29-9-58	do.	14-9-58	21 "
10	1972	2-10-58	do.	20-10-58	24 "
11	2034	2-10-58	do.	28-10-58	21 "
12	2031	6-10-58	do.	26-10-58	24 "
13	2076	17-10-58	Adult C.B. Cow	28-10-58	22 "
14	2156	10-11-58	Adult C.B. Bullock	Bullock died two days after treatment	23 days
15	2479		Adult C.B. Cow	12-12-58	

Average number of days taken to eliminate eggs from stools is 19.8 days.

Note:—The date under column five indicates the first day of the three consecutive days when faecal samples remained negative for eggs of fasciola.

TABLE II
Showing results of treatment of affected case with *Carbontetrachloride* subcutaneously.

Sl. No.	Sl. No. of patient register	Date of treatment	Description of Animal	Date when faecal sample was negative	No. of days taken for elimination of infection	Remarks
1	2	3	4	5	6	7
1	1585	14-8-58	Adult C.B. Bullock	28-8-58	12 days	
2	1770	3-9-58	Adult C.B. Cow	14-9-58	11 "	
3	2259	29-10-58	Adult C.B. Bullock	4-11-58	8 "	
4	2261	27-10-58	do.	8-11-58	12 "	
5	2278	28-10-58	do.	10-11-58	13 "	
6	2426	14-11-58	Adult C.B. Cow (aged)	28-11-58	14 "	
7	2438	15-11-58	Adult C.B. Bullock	2-12-58	16 "	
8	2443	15-11-58	Adult C.B. Cow	27-11-58	12 "	
9	2445	16-11-58	Adult C.B. Bullock	25-11-58	9 "	
10	2459	16-11-58	do.	27-11-58	11 "	
11	Private cases	14-3-59	Adult C.B. Cow	26-3-59	12 "	
12	Private case	3-4-59	do.	17-4-59	14 "	
13	U.G.S.	9-4-59	R.S. Bull No. 223	22-4-59	13 "	
14	U.G.S.	18-5-59	Hariana Bullock	2-6-59	15 "	
15	U.G.S.	19-5-59	do.	31-5-59	13 "	
16	A.H.D.	4-6-59	Hariana Bull calf No. 1	15-6-59	11 "	
17	A.H.D.	4-6-59	Hariana Bull calf No. 2	18-6-59	14 "	
18	A.H.D.	4-6-59	Hariana Bull calf No. 3	13-6-59	9 "	
19	A.H.D.	4-6-59	Hariana Bull calf No. 4	16-6-59	12 "	

Average number of days taken to eliminate eggs from stools is 12.15 days.

Note:—The date under column five indicates the first day of the three consecutive days when faecal samples remained negative for eggs of fasciola.

U.G.S. = Stands for Utkal Gomangal Saniti.

A.H.D. = Stands for Animal Husbandry Department, Orissa.

to any of these 19 animals either before or during or after treatment with carbon tetrachloride. The site of injection in all cases was the folds of skin at the base of the neck.

Results

The fifteen cases treated with hexachloroethane were all clinically cured with one mortality. The time taken for the disappearance of eggs from the stools ranged from 14 to 28 days the average being 19.8 days.

All the nineteen cases treated with carbon tetrachloride given subcutaneously were clinically cured and the time taken for the disappearance of eggs from the stools ranged from 8 to 16 days, the average being 12.15 days. None of the nineteen animals thus treated had any swelling at the site of injection.

Discussion

Studying the comparative efficacy of the two drugs in fascioliasis, Olson (1948) contends that Carbon tetrachloride acted earlier than Hexachloroethane by recovering dead worms from stools after nineteen hours of treatment.

Rao (1944), Mahajan (1942) and many other workers had reported the toxicity of carbon tetrachloride in animals when given *per os*.

This however is not noticed when the same drug is administered even in larger doses subcutaneously and at the same time exerts 100% anthelmintic action on the liver-flukes during its elimination via that organ.

Investigating into the phenomenon of tolerance of carbon tetrachloride by bovines when given subcutaneously Rahman (1958) intimated me that cattle tolerated as much as 50 c.c. of this drug without showing any symptoms of discomfort when given parenterally while even 10 c.c. of this drug produces pathogenesis when given *per os*.

The Director of Animal Husbandry Department of Mysore in his annual report says "It was found that animals can withstand 50 c.c. of the drug if given intramuscularly whereas there was profuse swelling when given subcutaneously". He however does not mention about the applicability of this method as a curative against fascioliasis, which needs a fair trial.

Evidently it is felt that carbon tetrachloride is acted upon in the alimentary canal by the digestive juices, the end products of which when absorbed cause pathogenesis. But when administered parentally

the drug is eliminated through bile without causing any damage to the organ. This is seen quite clearly from the work of Rahman (1958) as well as the many workers of the Soviet Union who have cured fascioliasis with 100% success without any noticeable reactions. Edwards (1959) treated a large number of lactating ewes by intramuscular administration of carbon tetrachloride with equal quantity of Diloma compound D in doses of 6 c.c. of the mixture and observed 0.5% deaths while by oral medication he records 1.75% mortality. He however fasted the patients 12 hours prior to treatment.

As this drug in pure form was reported to produce swellings if given subcutaneously, it was mixed with an equal amount of sterile liquid paraffin and injected subcutaneously without any reaction. Edwards (1959) also reports that there was neither reaction nor residue at the site of injection when given intramuscularly.

From the table showing the results of treatment by the two methods it is quite clear that carbon tetrachloride acts quicker. This confirms Olson's findings of 1948.

Olson (1947) observed that hexachloroethane does not act on extremely damaged livers and in very early cases of fascioliasis when the parasites are still in the stages of adult cercariae, and Harrow (1959) remarks susceptibility of animals under certain circumstances giving rise to "out breaks" of Hexachloroethane poisoning.

Administration of a 20% calcium borogluconate solution intravenously to animal treated with hexachloroethane 3 hours after dosing was found necessary to avoid toxic symptoms by Refuerze (1957).

All the points are ruled out when carbontetrachloride is administered subcutaneously though it becomes necessary to administer calcium salts to animals treated with this drug *per os*. This drug also acts on the flukes in the liver whatever be the stage of damage sustained by that organ, and on flukes at whatever stage of development they be and in animals irrespective of their diet. No fasting has been found necessary in the subjects treated by us.

Thus carbon tetrachloride gains added advantage over hexachloroethane in the treatment of fascioliasis.

It is interesting to note that in the 3 buffaloes treated at Mysore the time taken to rid the animals of the infection was 19 days whereas in the animals treated in this state it ranged between 8 and 16 days the average being 12.15 days. This gives rise to another aspect of the problem. It may be seen that all the animals treated by us are cattle (*Bos-indicus*) and all the 3 animals treated at Mysore were buffaloes

(*Bos-bubalis*). It is quite possible that in *Bos-indicus* the drug acts quicker but this needs investigation.

Another point which should not be lost sight of is that the subcutaneous administration of carbon tetrachloride is a quicker, safer and easier method ensuring complete administration of the drug to the animals whereas hexachloroethane has to be drenched making the position of the treated animals very much vulnerable for drenching complications with all its cumbersome time consuming process and with chances of the drug being spilled on the ground when the animal struggles. Finally the lesser cost of carbon tetrachloride is an added advantage.

Summary

Fifteen animals (*Bos-indicus*) affected with *Fasciola gigantica* were treated with "Avlothane" brand of hexachloroethane in doses of 1 oz. per 500 lbs. body weight. One emaciated animal with extensive liver damage died two days after treatment and fourteen other animals were clinically cured in 14-28 days the average being 19.8 days.

2. Nineteen animals affected with *Fasciola gigantica* were treated with carbon tetrachloride in doses of 1 c.c. per 100 lbs. body weight mixed with an equal quantity of sterile liquid paraffin administered subcutaneously. All the 19 animals were clinically cured in 8 to 16 days the average being 12.15 days without any signs of toxicity. They only evinced slight signs of discomfort at the time of injection at the site lasting for 2 to 5 minutes.

3. Carbon-tetrachloride is found to be very effective on account of its quick and easy administration, quicker anthelmintic action, acts in all conditions of liver damage, in all degrees of infestation of liver with the flukes, in all stages of development of the flukes, under any dietary conditions and does not require either calcium or glucose injections. It is also much cheaper.

Acknowledgment

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EFFECT OF WEANING ON RED SINDHI COWS

Part III

Fertility after Different Calvings and after Different
Intervals of Calvings

By

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Biswal and Rao (1960a, 1960b) showed that weaning of cows reduced lactational length, lactational yield, daily milk yield, the period for the animals to come in oestrus and interval between calvings. Since occurrence of oestrus after calving and inter-calving interval are intimately related to fertility rates, an attempt is made to find out if weaning of Red-sindhi cows affects the fertility rate of cows bred after different calvings, and after different intervals of calving.

Materials and Methods

The study was done in 89 red-Sindhi Cows of the State Livestock Breeding Farm, Khapuria for a period of 7 years during which time, some cows after calving were weaned and some were not. During the period under study, both groups of animals were under the same management, fed the same ration depending on their production, were bred to the same bulls by the same inseminators and were from the same foundation stock except 8 cows which were imported from outside into the farm.

In the present study under report "Weaned Cows" is used to mean those cows whose calves were removed at birth and such cows never suckle nor ever see their calves. "Non-weaned Cows" is used to mean those cows which suckle their calves throughout their lactational period.

Results

During the period under study, 318 conceptions were recorded of which 143 were after weaned calvings and 175 were after non-weaned calvings. The details of the fertility of weaned and non-weaned cows are recorded after 1st, 2nd 3rd and/or more calvings in Table I.

From Table I, it can be seen that after 1st calvings, 70.4% of cows conceived by 1st insemination when weaning was done, while 50.0% of cows conceived by 1st insemination when weaning was not practised. Weaned cows required 1.50 services per conception while their non-weaned counterparts required 1.74 services per conception.

TABLE I

*The Fertility of Weaned and Non-Weaned Red Sindhi Cows
After 1st, 2nd, 3rd and /or More Calvings.*

Particulars of calvings	Weaned or non-weaned	No. of conceptions studied.	% of cows conceived by 1st insemination	% of cows requiring repeat insemination	No. of Services required per conception
1	2	3	4	5	6
After 1st calvings	Weaned	54	70.4 %	29.6 %	1.50
	Non-weaned	34	50.0 %	50.0 %	1.74
Difference	...	...	20.4 %	20.4 %	0.24
After 2nd calvings	Weaned	45	73.8 %	26.7 %	1.36
	Non-weaned	39	53.8 %	46.2 %	1.66
Difference	...	...	19.5 %	19.5 %	0.30
After 3rd and/or more calvings	Weaned	44	75.0 %	25.0 %	1.41
	Non-weaned	102	56.9 %	43.1 %	1.71
Difference	...	...	18.1 %	18.1 %	0.30
After all calvings	Weaned	143	72.7 %	27.3 %	1.43
	Non-weaned	175	54.8 %	45.2 %	1.70
Difference	...	...	17.9 %	17.9 %	0.27

After 2nd calvings, 73.8% of weaned cows conceived by 1st insemination and required 1.36 services per conception as against 53.8% conception by 1st insemination and 1.66 services per conception for non-weaned cows.

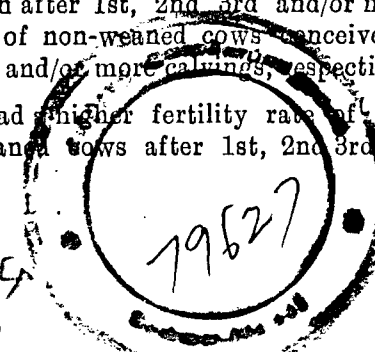
After 3rd and/or more calvings 75.0% of weaned cows conceived by 1st insemination and took 1.41 services per conception while in non-weaned cows the % of conception to 1st insemination was 56.9% and the the number of services per conception was 1.71.

After all calvings, weaned cows had 72.7% fertility by 1st insemination whereas non-weaned cows had 54.8%. Weaned cows required 1.43 services per conception while non-weaned cows required 1.70 services per conception. Non-weaned cows had a lesser fertility by 17.9% than when weaning was practised; they also required 0.27 services more per conception than when weaning was practised.

From Table I, it can also be seen that breeding efficiency improved with increasing order of calvings both in weaned and non-weaned animals, vividly, 70.4%, 73.8% and 75.0% of weaned cows conceived by 1st insemination after 1st, 2nd 3rd and/or more calvings while 50.0%, 53.8% and 56.9% of non-weaned cows conceived by 1st insemination after 1st, 2nd 3rd and/or more calvings, respectively.

The weaned animals had higher fertility rate of 20.4%, 19.5% and 18.1% than in non-weaned cows after 1st, 2nd 3rd and/or more calvings, respectively.

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The fertility of weaned and non-weaned cows inseminated within 90 days, 91-120 days, 151-180 days and over 181 days after calving was studied. The results are given in Table II. The number of weaned and non-weaned animals inseminated after different intervals of calving the % of animals of the total number of the group observed to be in heat after different periods of calving are also given in Table II.

From Table II, it can be seen that 80.3% of weaned animals came in oestrus before 120 days of calving ($32.4\% + 47.9\% = 80.3\%$), whereas 62.8% of non-weaned animals came in oestrus after 121 days of calving ($13.7\% + 15.4\% + 33.2\% = 62.8\%$).

TABLE II
The Fertility Rate of Weaned and Non-Weaned Cows Inseminated after Different Intervals of Calving.

Animal inseminated after calving	Weaned Cows			Non-weaned Cows		
	No. of Animals	% of all weaned cows	% conceived by 1st insemination	No. of Animals	% of all non-weaned cows	% conceived by insemination
1	2	3	4	5	6	7
I. Within 90 days	46	32.4 %	78.3 %	18	10.3 %	55.5 %
II. Within 91-120 days	68	47.9 %	72.1 %	48	27.4 %	66.6 %
III. Within 121-150 days	20	14.1 %	65.0 %	24	13.7 %	58.3 %
IV. Within 151-180 days	8	5.6 %	62.5 %	27	15.4 %	55.5 %
V. Over 181 days	—	—	—	58	33.2 %	39.6 %

Highest fertility i.e., 78.3% was observed in weaned group of animals when they were inseminated before 90 days of calving. Weaned animals when inseminated within 91-120 days, 121-150 days, 151-180 days had fertility rate by 1st insemination in the decreasing order of 72.1%, 65.0% and 62.5% respectively.

When weaning was not done, 55.5% of cows inseminated within 90 days of calving conceived by 1st insemination. Highest fertility by 1st insemination (66.6%) in non-weaned group of animals was seen when insemination was done within 91-120 days. In the non-weaned group of animals, the fertility rate is in the decreasing order of 58.3%, 55.5% and 39.6%, respectively when animals were inseminated within 121-150 days, 151-180 days and over 181 days, respectively.

Discussion

Olds *et al* (1950) reported highest conception rate of 55.0% for cows bred 50-75 days after calving and a drop in conception rate when bred 4 months or more after calving. Edwards (1950) reported highest fertility of 73.1% when insemination was done between 60-90 days of calving and also observed a gradual drop in conception rate when

inseminations were done at later periods. Holt (1952), on the contrary, reported that there is no variation in conception rates taken at various periods after calving. None of these authors reported whether the cows under their study were weaned or non-weaned.

The authors found that when weaning was done, highest fertility of 75% was observed after 3rd and/or more calvings whereas the reducing order of fertility was 73.3% after 2nd calvings and 70.4% after 1st calvings. In other words, the % of fertility improved with age upto 3rd and/or more lactations.

When weaning was not done, the conception rate to 1st insemination was in the decreasing order after 3rd and/or more calvings, after 2nd calvings, and after 1st calvings of 56.9% 53.8% and 50.0%, respectively. That means the fertility rate improved with age after 3rd and/or more calvings in both weaned and non-weaned animals. The difference in the conception rate to 1st insemination after 1st calvings between weaned and non-weaned animals was 20.4%. After 2nd and 3rd calvings, such difference was 19.5% and 18.1%, respectively.

The findings of the authors i.e., the conception rates and the gradual reduction of 78.3%, 72.1%, 65.0% and 62.5% in weaned animals is in general agreement with the findings of Edwards (1950) who reported 73.1% conception rate for cows bred before 90 days and 69.7% for those bred between 151-180 days after calving. It is not known whether the findings of Edwards were for weaned animals or non-weaned animals.

The findings of Van Demark and Salisbury (1950) that fertility was increased with the length of post-partum interval to 1st service upto 100-120 days is in general agreement with the findings of authors who found that highest conception rate to 1st service in non-weaned cows was 66.6% bred 91-120 days after calving.

Van Demark and Salisbury (1950) reported that the reproductive efficiency of cows 1st bred 120-200 days remained fairly constant while the authors found when weaned and non-weaned cows were 1st bred 121-150, 151-180 days after calving, the fertility rates were 65.0%, 58.3% and 62.5%, and 55.5% respectively. No weaned cow was observed to be bred after 180 days of calving. The fertility rate for 33.2% of non weaned cows bred after 180 days was the lowest i.e., the % of conception by 1st insemination was 39.6%.

Hignett (1953) found that conception rate was lowered when phosphorus intake was low. Holt (1952) and Anon (1951) reported that

there was no seasonal variation in fertility rates nor was any relationship shown to feed intake while Korkman (1947) reported that higher protein and phosphorus feeding were accompanied by somewhat higher relative number of pregnancies following single service. Axelsson (1947) showed that cows fed low carotene feed had significantly lower fertility rate.

Biswal & Rao (1960 a) found that when weaning was done, the lactational length, lactational yield and daily milk yield of animals were reduced significantly. Lewis & Horwood (1950) and Anon (1940-41) reported that cows producing at high levels have lower fertility rate. But Gaines (1927) and Boyd (1951) reported that level of production had no significant effect on fertility. Lactogenic hormone was shown to affect ovarian activity through the formation of Corpora lutea. (Cole, 1946). Casida (1946) reported that "the absence of fertility appears to be associated either with the degree of development of the corpora lutea or with the interval of the time during which the corpora lutea may have been a part of the physiological complex". He also stated although ovulation may be induced with considerable certainty at various times in oestrus cycle, the potential fertility of eggs will still be determined by the animal's basic physiological state".

Biswal & Rao (1960b) found that when cows were weaned, they were in heat much earlier than when weaning was not done. Clinical observation by the authors (unpublished data, 1960) has shown that the inhibitor to occurrence of oestrus when cows were allowed to suckle their calves was in most animals corpora lutea resulting from sub-oestrus.

Summary

The fertility rate for 1st inseminations in 318 conceptions of which 143 were weaned and 175 were not weaned was studied. It was found that when cows were weaned, the conception rate for 1st insemination was 72.7% and when cows were not weaned, it was 54.8%. Weaning increased the conception rate for 1st insemination by 17.9%.

The conception rates after 1st, 2nd, 3rd and/or more calvings for 1st inseminations in weaned cows were 70.4%, 73.3% and 75.0%, respectively, while in non-weaned cows, the conception rates were 50.0%, 53.8% and 56.9%, respectively.

The conception rates for 1st insemination after different intervals in weaned and non-weaned animals were studied. The conception rates in weaned animals when inseminations were done before 90 days of calvings, 91-120 days, 121-150 days, 151-180 days, were 78.3%, 72.1%, 65.0% and 62.5%, respectively while the conception rates after

the same intervals in non-weaned cows were 55.5%, 66.6%, 58.3% and 55.5%, respectively.

The conception rate in non-weaned cows when inseminations were done after 180 days of calving was 39.6%.

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STUDIES ON SOME HIGH PROTEIN GREEN FEEDS OF UTTAR PRADESH

3. The Chemical Composition and Nutritive value of Karr-Hay (*Carthamus tinctorius* Linn)

By

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In our previous articles in this series (Ranjhan *et al*, 1959), we have shown the chemical composition, digestibility coefficient and the nutritive value of the green feed Karr which is fed to cattle in large quantities in this part of the country. The advantage of this plant is that it can be cultivated during the winter when the weather is favourable for turning green feeds into hay. It is from this consideration that an attempt has been made to study the nutritive value of this fodder when turned into hay.

Accordingly seeds of the Karr plant were sown at the rate of about 15 lbs. per acre during the month of October. Usual farm yard manure was used in preparing the field. When the plants reached a height of about 5 feet (pre-flowering stage) and the dry matter 20 per cent, the crop was harvested in the morning and was allowed to dry in clear sun shine for the whole day. At the end of the day the dry matter of the plant, which was 20 percent at the time of harvesting, rose to about 45 percent. At this stage the half dried crop was transferred to a properly constructed frame where the hay can be aerated from below. The hay was thus taged for a considerably long period for further drying and ultimately the dry matter of the hay rose to 85 percent. The hay thus prepared retained considerable green colour.

Chemical Composition of the Hay

The chemical analysis of the samples were carried out according to the A. O. A. C. methods (A. O. A. C. 1955) and Talapatra *et al* (1940). The chemical composition of the Karr hay, Karr green, Karr leaves, Karr stem, Residue 1 and Residue 2, has been shown in the following table.

It has been observed that the plant at the time of hay making contained about 40 percent high protein leaves and 60 percent of stem on dry matter basis. It may be seen from the data shown in the above table that crude protein, ether extract and ash were slightly decreased when the green fodder was conserved as hay. It may be due to the slight shedding of the leaves which contain a higher proportion of these three nutrients. The content of crude fibre was about 28

TABLE I

Chemical Composition of Karr hay, Karr Green, Karr leaves, Karr stem,
Residue 1 and Residue 2.

Name of Feeds	Chemical composition on dry matter basis.									
	Dry matter	Crude protein	Ether extract	Ash	Crude fibre	N-free extract	Total carbo-hydrates	Ca.	P.	Mg.
Karr hay	85.3	12.8	1.8	9.5	31.7	44.2	75.9	1.4	0.21	0.43
Karr Green (4.7 ft. ht.)	15.3	15.2	2.1	10.3	25.0	47.4	72.4	1.1	0.38	0.87
Karr leaves	15.6	28.9	4.0	11.5	10.9	44.7	55.6	1.7	0.46	0.55
Karr stem	15.3	7.4	0.7	8.7	39.8	43.4	83.2	0.8	0.28	—
Residue 1	85.0	6.6	0.9	6.9	42.4	48.2	85.6	0.81	0.13	0.30
Residue 2	85.4	7.7	1.0	7.1	38.7	45.5	84.2	0.90	0.14	0.80

percent more than that found in the green feed which confirms slight shedding of leaves during the hay making operation.

Palatability of the hay

The hay thus prepared was then fed to two Bikaneri rams weighing on an average 100 lbs. The rams seemed to relish the feed very much. The palatability of the hay as determined by dry matter consumption is shown below:—

TABLE II
Palatability of the Karr hay.

Animal Number	Body weight	Dry Matter Consumed	Feed consumed per 100 lb. body weight
1	100	2.71	2.5
2	90	2.27	2.5
Average	100	2.49	2.5

It appears from the above table that Karr hay is very highly palatable to sheep. On an average 2.5 lb. were consumed per 100 lb. body weight, as compared with 2.7 lbs. when the same fodder was fed as green. Thus Karr hay is almost equally palatable to sheep as the green feed.

On a careful observation on the feeding habits of sheep with special reference to Karr hay it has been found that the sheep were eating only the high protein leaves of the hay leaving the stem as such; in fact stems were not eaten at all.

Evaluation of Karr hay.

Having determined the palatability of Karr hay it was considered desirable to take up digestibility experiments with a view to evaluate the hay. Accordingly digestibility experiments were conducted on these animals after a preliminary period of 10 days which was followed by a 7-day collection period. It may be mentioned here that the large quantities of this feed could not be procured to carry out metabolism experiments with large number of experimental animals. Although it is desirable to take more animals for such experiments, many instances may be cited where foreign workers (Riddle *et al* (1934) and Steuber & Stotz (1931) have relied upon two experimental animals.

The chemical composition of the feed under trial has already been shown in Table I.

The digestibility coefficients of the various organic nutrients have been set forth in the following table:—

TABLE III
The digestibility coefficients of Karr hay.

Animal Number	Intake gm.	Voided in faeces gm.	Amount digested gm.	Percent digestibility	Average
<i>Dry Matter.</i>					
1	1233	360	873	70.7	71.5
2	1035	287	748	72.2	
<i>Crude protein.</i>					
1	291.9	58.6	233.3	79.9	81.7
2	252.5	41.2	211.3	83.6	
<i>Ether extract.</i>					
1	39.2	12.0	27.2	69.4	64.5
2	33.8	10.4	23.4	59.6	
<i>Crude fibre.</i>					
1	155.5	80.4	75.1	48.3	49.9
2	158.5	76.9	81.6	51.4	
<i>Nitrogen free extract.</i>					
1	571.6	132.7	438.9	76.6	76.1
2	431.0	105.0	326.0	75.6	
<i>Total carbohydrates.</i>					
1	727.1	213.1	514.0	70.8	72.2
2	689.5	181.9	507.6	73.6	

In determining the digestibility coefficient of various organic nutrients shown in the above table great care was taken to analyse the residue, which consisted entirely of stem, left by the individual animal. The analysis of residue has also been shown in table 1. In fact they were practically eating a sort of leaf meal containing over 28 per cent protein. This is one of the reasons why the protein digestibility of the Karr hay has been so high as shown in the table.

The dry matter digestibility of the feed is quite high, on an average of 71.5 percent, while the average of crude protein digestibility is as high as 81.7 per cent. Such high digestibility of crude protein is not to be observed ordinarily in case of roughages, but as has been stated earlier, the animals consumed only the high protein leaves which thus

accounts for the high digestibility of protein. The average ether extract digestibility has been found to be 64.5 per cent, crude fibre as 49.9 per cent, Nitrogen-free extract as 76.1 per cent, and that of total carbohydrate 72.2 per cent. It has been found in most of our experiments that the crude fibre digestibility is always somewhat lower when the feed is very high in protein. Since the animals consumed the high protein leaves the comparatively low digestibility of crude fibre is thus accounted for. The high digestibility of nitrogen-free extract indicates again that only the softer leaves were taken by the animal because the digestibility of nitrogen-free extract could not have been so high had the animal eaten stem along with leaves.

The average digestibility coefficient obtained in Karr hay has been shown in the following table and compared with the similar figures obtained in green Karr feed at about 5 feet eight.

TABLE IV

Average digestibility coefficients of green Karr and Karr hay.

Name of feed	Dry matter	Crude protein	Ether extract	Crude fibre	N-free extract	Total carbohydrates
Karr green	66.4	75.3	45.1	51.1	75.6	67.7
Karr hay	71.5	81.7	64.5	49.9	76.1	72.2

From a perusal of data in table IV it appears that except in crude fibre all the digestibility figures are higher in case of hay. This is because, as has been reported earlier, the animals consumed only the high protein leaves. Under green conditions the stem remains comparatively softer and this is the reason why sheep normally eat a mixture of both leaves and stem but when the same fodder is dried, the stem becomes woody and hard and they completely refuse the stem.

From the average digestibility coefficients the digestible crude protein, the total digestible nutrients and S. E. per 100 lb. of hay have been calculated as 10.45, 62.56 and 43.29 on dry matter basis.

It is obvious that Karr hay is quite a valuable feed for sheep. From its D.C.P. and T.D.N. it appears that the Karr hay has the potentiality to replace wheat bran almost weight for weight. The nutritive value of Karr hay along with other legume hays has been compared and shown in the following table.

TABLE V

Nutritive value of Karr hay as compared with other legume hays.

Name of hay	Dry matter	Digestible nutrients per 100 lb. of hay	
		D. C. P.	T. D. N.
Karr hay	85.3	8.91	53.86
Alfalfa hay all analyses	90.5	10.9	50.7
Alfalfa hay stemmy	90.5	8.2	46.3
Berseem hay	90.6	9.0	51.9
Clover hay, bur.	92.1	13.4	54.4
Clover hay, crimson	89.5	9.8	48.9
Clover hay, Ladino	89.5	14.2	59.5
Clover hay, red	88.3	7.2	51.8
Clover hay, sweat	91.8	11.9	50.3
Clover hay, white	88.0	10.5	55.6
Cowpea hay	90.4	12.3	51.4
Kudzu hay	89.8	10.2	49.3

From a perusal of the data in Table V it is obvious that Karr hay is quite comparable with most of the leguminous hays.

The nitrogen, calcium, phosphorus and magnesium balances have been worked out and shown in the following tables.

TABLE VI

The balances of nitrogen, calcium, phosphorus and magnesium with Karr hay.

Animal Number	Intake gm.	Voided in faeces	Excreted in urine gm.	Total excretion	Balance
<i>Nitrogen</i>					
1	46.74	9.41	23.44	32.85	+13.89
2	40.44	6.61	16.37	22.98	+17.46
<i>Calcium</i>					
1	29.1	19.6	1.5	21.1	+ 8.0
2	25.4	18.0	1.6	19.6	+ 5.8
<i>Phosphorus</i>					
1	4.23	3.85	0.08	2.93	+ 0.30
2	3.73	2.80	0.90	2.89	+ 0.84
<i>Magnesium</i>					
1	8.14	6.01	1.96	7.97	+ 0.17
2	7.54	3.96	1.39	5.35	+ 2.19

As expected all the animals recorded positive balance in nitrogen, calcium, phosphorus and magnesium.

Summary

The nutritive value of Karr hay (*Carthamus tinctorius* Linn) has been determined with sheep as experimental animals. The average chemical composition of the hay on dry matter basis has been found to be 12.8 per cent crude protein, 1.8 percent ether extract, 31.7 percent crude fibre, 44.2 Nitrogen-free extract, 75.9 total carbohydrates and their digestibility coefficients are 81.7, 64.5, 49.9, 76.1 and 72.2 respectively. The hay appears to be highly palatable — sheep consumed on an average 2.5 lb. of dry matter per 100 lb. of body weight. The nutritive value as expressed in the D.C.P., T.D.N. and S.E. has been found to be 10.45, 62.56 and 43.29 lb. respectively on dry matter basis.

Conclusion

It is obvious from the data given above that Karr hay is a valuable feed for sheep. But it is difficult to ignore one point, that when Karr is turned into hay, the hard woody stems are not eaten by sheep. Thus 60 per cent of the total feed which consists only of stem cannot be utilized properly. Therefore, the overall utilization of this fodder in the form of hay is only 40 percent. As the average yield of Karr is about 300 to 500 maunds green then only 21 to 35 maunds of hay can be utilized. From this stand point it appears that the conversion of Karr into hay is not very profitable for sheep feeding. It is, therefore, not recommended to feed the stuff in the form of hay to sheep unless it is available free in the wild state.

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OBSERVATIONS ON THE BLOOD SEDIMENTATION RATE AND PACKED CELL VOLUME OF BUFFALOES

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Studies made on the Haematology of local buffaloes of non descript breed of different age groups revealed certain important points in Sedimentation rate and also in the Packed cell Volume of *rbcs*. A survey of literature revealed little information about the relationship of sedimentation rate with P.C.V.; the number of *nbc*. and the number of *wbc*. in Buffaloes.

Technique:—Blood was collected from apparently healthy animals. The animals were examined thoroughly for body temperature, pulse rate and respiration. Animals showing normal temperature, pulse and respiration were selected for the experiment. Particular care was taken to avoid undue excitement of the animal. Blood was collected from the jugular vein in sterile 5 c.c. vials, containing a mixture of anticoagulants, Pot. oxalate and Ammn. oxalate in the proportion of 4:6. Empty Penicillin vials cleaned and sterilized were used for this purpose. The method was to prepare a 10% solution of oxalates and place 0.15 cc. of this solution into the empty Penicillin vials. The vials were dehydrated at a temperature of 70° c. in a Hot air oven, cooled and then used for the collection of blood samples.

Oxalated blood samples were filled in Wintrobe Haematocrit tubes. Four tubes were filled for each sample of blood. Two were used for recording the sedimentation rate and the other two for recording the Packed cell Volume. In our laboratory we have found that the use of a 5 cc. syringe equipped with a 6" 18 gauge needle is best suited for filling the Wintrobe tubes. The observations were made soon after the collection of blood. The room temperature and the atmospheric conditions were also taken into consideration and it was observed that they do not have any bearing on the sedimentation rate.

TABLE I

Sedimentation rates in mm.

S. No.	Age	30'	60'	90'	120'	180'	240'	300'	360'
1	15 days	0.1	0.4	1.0	2.0	2.2	3.5	4.0	4.2
2	"	0.2	0.6	1.2	2.2	—	3.7	4.0	—
3	"	0.1	0.7	1.3	2.3	3.5	3.8	4.1	—
	Average	0.1	0.5	1.1	2.1	2.8	3.6	4.0	4.2
4	1½ months	0.2	1.0	2.0	2.5	3.9	4.0	4.6	4.6
5	"	0.4	1.1	2.0	2.5	3.0	4.2	4.7	4.7
6	"	0.5	1.0	2.3	2.6	3.0	4.3	4.5	—
7	"	0.3	1.2	2.0	2.7	4.0	4.0	4.5	—
8	"	0.2	1.1	2.2	2.5	3.5	4.4	4.7	—
9	"	0.4	1.1	2.3	2.8	3.8	4.1	4.5	—
	Average	0.3	1.0	2.1	2.6	3.5	4.1	4.5	4.6
10	4 years	4.0	5.5	6.3	6.2	6.4	6.6	6.8	6.8
11	"	4.2	5.6	6.1	6.3	6.5	6.5	6.5	—
12	"	4.5	6.0	6.5	6.6	6.6	6.7	6.7	6.7
13	"	4.7	5.5	6.3	6.5	6.6	6.6	6.6	6.6
14	"	4.9	5.7	6.1	6.4	6.5	6.5	6.5	—
15	"	5.0	5.6	6.5	6.6	6.6	6.6	6.6	—
16	"	4.2	5.7	6.1	6.3	6.5	6.6	6.7	—
17	"	4.0	5.6	6.2	6.6	6.6	6.7	6.7	—
	Average	4.4	5.6	6.2	6.4	6.5	6.6	6.6	6.7
18	5 years	5.8	6.5	6.8	6.8	6.9	7.0	7.0	—
19	"	5.9	6.5	6.8	7.0	7.0	7.0	7.1	—
20	"	6.5	6.8	6.9	6.9	6.9	7.0	7.0	—
21	"	6.4	6.8	6.9	7.0	7.0	7.1	7.1	7.1
22	"	6.3	6.8	6.9	6.9	7.0	7.0	—	—
23	"	6.0	6.7	6.9	7.0	7.0	7.1	—	—
24	"	5.9	6.6	6.8	6.9	7.0	7.1	—	—
25	"	6.0	6.8	6.9	7.0	7.0	7.1	7.1	7.1
	Average	6.1	6.6	6.8	6.9	7.0	7.1	7.1	7.1
26	7 to 9 years	6.0	6.5	6.7	6.9	6.9	7.0	7.0	—
27	"	6.2	6.7	6.9	7.2	7.2	7.2	—	—
28	"	6.4	6.8	7.0	7.3	7.3	7.3	7.3	7.3
29	"	6.8	7.0	7.2	7.3	7.3	7.3	7.3	7.3
30	"	6.6	6.9	7.1	7.3	7.3	7.3	7.3	7.3
31	"	6.5	6.8	7.0	7.2	7.3	7.4	7.4	7.4
32	"	6.0	6.8	7.2	7.3	7.3	7.4	7.4	7.4
33	"	6.7	6.9	7.2	7.3	7.3	7.4	7.4	7.4
	Average	6.4	6.8	7.0	7.2	7.3	7.3	7.3	7.3

Sedimentation Rate:—The recordings of the rate of sedimentation were made at 30', 60', 90', 120', 180', 240', 300' and 360 minutes. It was observed that the sedimentation rate in calves was very slow in the first half hour, usually ranging from 0.1 to 0.5 mm. according to the age, slower in the young calves and rapid in the older ones. The sedi-

mentation after one to one and half hour increased very rapidly from 1 mm to 2.3 mm.

In adults it was observed that the sedimentation rate was very rapid in the first half hour, gradually becoming slower after one hour. During the first 30 minutes the sedimentation rate ranged from 4 mm. to 6.8 mm according to the age, and was found to be rapid in older animals and less rapid in young animals. The rate gradually decreased to 0.1 to 0.3 mm. every one hour after 1½ hours.

Packed Cell Volume:—To estimate the Packed cell volume two Wintrobe tubes were filled with a sample of oxalated blood. The tubes were centrifuged for 30 minutes at 3000 rpm. After 30 minutes the tubes were taken out, recording made and were again centrifuged for 10 minutes, after which the readings were taken. This procedure was continued till two successive readings were identical.

Observations on the average Packed cell volume revealed the following points:—

The Packed cell volume is more in a calf and gradually becomes lesser and lesser as the age of the animal increases which is evident as given in the following table.

TABLE II

Age	Packed cell Volume	Buffy coat
15 days	47-51 %	1 mm.
1½ months	38-42	"
4 years	30-37	"
5 "	28-32	"
7-9 "	24-28	"

The relationship between the P. C. V. and the Sedimentation rate is, the greater the P. C. V. the slower the sedimentation rate and *vice versa*.

Buffy Coat:—This term is applied to the reddish-grey layer of packed leucocytes and platelets which accumulate over the deep red layer of packed red blood cells. Observations on the buffy coat revealed that it ranged from 0.5 to 1.0 mm in thickness. White blood corpuscular count conducted in most of the samples of blood indicated that the counts ranged from 8,000 to 10,000 /cmm.

Summary

The variations which occur in blood sedimentation rate according to age and packed cell volume are described. The rate is slow in very young animals, increases as the age increases and is very rapid in

old animals. It is also influenced by the Packed cell volume of the rbc. The greater the P.C.V. the slower the sedimentation rate and vice versa. The buffy coat varies from 0.5 to 1 mm. representing 8,000 to 10,000/cmm. Further work is in progress.

Acknowledgment

The authors are highly obliged to the Principal Dr. M. Ahamed Hussain for his valuable suggestions in preparing this article and for his keen interest in the work from the very beginning which enabled the authors to complete it.

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Clinical Article

URETHRAL CALCULUS IN A BULLOCK REMOVED BY POST-SCROTAL URETHROTOMY

By

D. R. KOLHEKAR, B.V.Sc.,

Veterinary Assistant Surgeon, Risod, Maharashtra State.

Urinary calculi are described to be of quite a frequent occurrence in cattle. They originate anywhere in the urinary tract *i.e.* the kidneys, ureters, bladder and in their passage get arrested producing urinary colic. Cases of renal calculi in cattle diagnosed in life have rarely been reported and are more often a pathological entity found postmortem but those of urethral calculi especially in bullocks are met with very commonly and diagnosed too. In bovine male, the calibre of the urethra diminishes from behind forwards and the penis forms an S-shaped curve behind the scrotum. Calculi which escape from the bladder pass forwards and get arrested at this curve where they increase in volume by constant deposition of urinary salts. This is principally the reason why Veterinary Surgeon is often confronted with cases of urethral calculi in bullocks. Treatment of such cases is principally surgical, both as palliative and curative. Palliative treatment by performance of Ischial urethrotomy is indicated to prepare the animal for the butcher while Post-scrotal Urethrotomy is the treat-

ment indicated as a curative measure. Veerayya (1957) in two cases of bullocks has successfully done surgical removal of urethral calculi while the author of this article, himself, has performed Ischial urethrotomy in two cases of urethral calculi. Medicinal treatment alone has probably no value in this disease but Das (1955) has successfully treated a case of urethral calculi in a bullock by feeding horse-gram decoction to the animal. In the case under report, the author has successfully treated a case of Urethral calculi in a bullock by post-scrotal urethrotomy.

History of the case

A bullock aged 6-7 years was brought to the hospital on 26-6-58 with a history that the animal showed difficulty in urination and since two days it had passed no urine at all.

Symptoms and Physical signs

The animal showed a distinct starnguria. Temperature was 103 degrees F, pulse fast and weak and respirations accelerated. Agitation of the tail, stamping with the limbs, lifting of hind limbs as if to kick *i.e.* all the symptoms typical of urinary colic were evident. Examination per rectum revealed a great distension of the urinary bladder. A little swelling tender on palpation was present behind the scrotum. A wave of urine was also constantly visible passing downwards and upwards along the perineum behind the swelling.

Diagnosis

The typical symptoms of retention of urine together with the tender swelling behind the scrotum at the level of the S-shaped curve of the penis were sufficient to give the diagnosis of a urethral calculus arrested at the S-curve of the penis.

Treatment

The emergency of relieving the bladder was first met with. The bladder was emptied per rectum by puncturing it with a trocar and canula. The symptoms of distress gradually disappeared. The owner was apprised of the disease and was told that a radical operation would be necessary to save the animal. The owner being helpless otherwise, gave his approval. Postscrotal urethrotomy was decided upon.

The Operation

The perineal region immediately behind the scrotum and at the level of the S-curve of penis was selected as the site for operation and was prepared accordingly. Infiltration anaesthesia with novocain 2½% sol. 20 c.c. was given. A bold incision along the median raphe of the perineum was made 4" long at the site. Subcutaneous tissue was exposed and the bleeding points secured. Blunt dissection was then resorted to until the Retractor penis was reached. It was carefully secured aside

and blunt dissection was further carried on. The -S- curve was reached and secured. The connective tissue between arms of the curve was carefully torn and using the index finger as a hook the curve was brought out of the cutaneous wound. The wound was packed with sterilized cotton and cloth leaving the penile curve free for operation. A careful search for calculi was made by palpation. They were found located in the anterior curve of the -S- curve of the penis. The urethra was exposed from the dorsum of the penis incised longitudinally at the seat of calculus. A slight incision was made over the urethra. Immediately urine started flowing out freely. It was seen that the trouble was done by two calculi lodged in the curve. They were removed with forceps. The size of the calculi was that of a small pebble, one of the calculi being bigger than the other. The urine was drained off in a kidney tray. The urethral m.m. and the surrounding penile tissue were then irrigated with sterile normal saline solution and penicillin G solution was applied to all the parts. The urethral wound was closed with fine nylon sutures in Lambert's fashion. The penile tissue was sutured with nylon in the interrupted fashion and the -S- curve was then returned to its original position. The Retractor muscle was released. The perineal wound was also washed with normal saline and sprinkled with sulphanamide powder. The bleeding points were released and after ensuring that there was no further bleeding from the points the wound was closed with nylon with interrupted sutures. The blood was mopped out, the line of sutures was cleansed with Cetavlon sol., allowed to dry and painted with Tr. Iodine. The animal was then released and allowed to get up. The wound was covered with a thick pad of absorbent cotton and a three-tailed bandage.

Postoperative care and treatment

Water was withheld till free urination could be obtained. Sulphamezathine oral and procain penicillin 20 lacs were given for three days. The wound was daily painted with Tr. Iodine. Carbachol 2 c.c. was injected the second day after operation.

Result

The animal made an uneventful recovery. The owner was pleased to see his animal come back to normal life, but was anxious to return home. The patient was therefore, discharged after 3 days from operation to reappear in the hospital after 4 — 5 days for the stitches to be removed. It came accordingly and the animal was discharged cured after removing the stitches.

Prognosis

Favourable, unless stricture of the urethral wound supervenes later on in life.

Conclusion

Urethral calculi located in the -S- Curve of the penis can be removed and the result of the operation should be good provided the usual surgical and postsurgical care is properly exercised.

Summary

A case of Postscrotal Urethrotomy performed to remove urethral calculi is placed on record.

Acknowledgment

My sincere thanks are due to Dr. T. M. Ashtikar District Animal Husbandry Officer, Akola for his interest in going through this article and for allowing me to publish it.

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Abstracts

Inbreds produce fewer calves.—Inbred lines produced about 10% fewer calves than did out-breds and hybrids or line crosses in Colorado State University experiments. Lowered conception rate and a larger percentage of embryonic deaths in the inbreds were the two factors accounting for difference. (*County Agent*, March, 1960).

B. PANDA.

Effects of incubation and brooding on pheasants.—A study was made to measure the changes in organs, body weights and depot fat during the various stages of incubation and brooding of the pheasant-hen. Non-broody hens lost 49% of their fat stores, broody-hens lost 83%. Brooder showed greater weight loss of liver, pancreas, kidney, gizzard and intestines. These data indicate that broody pheasant-hens seriously deplete their energy stores by the 11th day of brooding, and thus, perhaps, are more vulnerable to other stress factors than non-brooding hens. (*Poult. Sci.* p. 1014, Sept. '59).

B. PANDA.

Bruised silage better.—In tests conducted at the Agricultural Research Centre, Beltsville, Maryland, it was found that finely chopped and bruised forage made better silage than when coarsely cut. Almost 10% more dry matter was recovered in the preceding, and it was also more acidic, containing larger quantities of desirable lactic acid. Further, butyric acid and ammonical nitrogen, not desirable, were lower in the bruised silage. (*Hatchery and Feed*, Feb., 1960).

B. PANDA.

Spermatozoa in the female genital tract.—BY VANDEMARK, N. L., 1958. *Int. Journ. Fertil.*, 3 : 220-230.

A comprehensive review is presented of the current state of knowledge of the mechanism of Spermatozoa distribution in the ♀ genital tract and the nature of the environment the ♀ organs provide. Sperm transport to the oviducts takes place almost instantaneously in a number of species, and non-motile forms as well as inert particles are rapidly distributed in the tract, suggesting that sperm motility in itself is not essential for sperm transport. The distribution of sperm throughout the genital tract in some species is caused by the action of oxytocin released by the stimulation of mating or A. I. The available data on the characteristics and nature of the vaginal and cervical secretions and the luminal fluid of the uterus and oviduct are considered in relation to sperm survival time and the maintenance of sperm motility within the female genital tract.

B. PANDA.

Physiological mechanisms concerned in the maintenance of lactation in the goat and sheep.—BY DENAMUR, R. and J. MARTINET, 1960. *Nature* (Lond.), 185 : 252-253.

Denervation experiments have shown that goats and sheep can give substantial yields of milk in the absence of milk ejection reflex. An attempt has been made to explain how the galactopoietic activity of the anterior pituitary can be maintained in the absence of the milk-ejection reflex and of all mammary sensation.

B. PANDA.

Preliminary report on an effective anti-pruritic agent.—BY KNOWLES, J. O. and KNOWLES, R. P. (1960). *Vet. Med.* 55 (8) : 67.

In the authors' initial trials on 32 dogs with long history of pruritus, Trimeprazine, a phenothiazine derivative was found to increase the effectiveness of prednisolone while at the same time reducing its dose. Best results were observed when trimeprazine and prednisolone were combined in the ratio 5 : 2. Maintenance dose in most cases was

considerably less than half the initial dose (0.2 mg. of Trimeprazine and 0.08 mg. prednisolone per kg.) Trimeprazine helped to interrupt 'Itch-scratch-itch' cycle thus encouraging healing of lesions. Its anti-histaminic action was of added value. It was devoid of side reactions like jaundice and agranulocytosis. In their limited studies on cats (3) side reactions do not recommend its use.

M. S. J.

A new Sulfonamide for small animal practice.—BY FISH, J. C. (1960). *Vet. Med.* 55 (6) : 65.

The comparatively new sulphonamide — Sulfadimethoxine which maintains adequate serum levels for 24 hours following single daily dose and is excreted as a highly soluble glucuronide, thus reducing greatly the possibility of renal damage was administered to 308 dogs with a variety of infections (Pharyngitis, Pneumonia, Pustular dermatitis, Sinusitis, Metritis, Distemper, etc.). Maintenance doses which was half the starting dose ranged between 6.5 to 15 mg./kg. Duration of treatment was from 5 to 15 days. Recovery was more than 80% in all types of infection except in distemper. Compared with broad spectrum antibiotics, its therapeutic efficiency, its economy and ease of administration recommended its use.

M. S. J.

Barbiturate antagonism.—BY ARANEZ, J. B. and PACULDO, D. J. (1960). *Vet. Med.* 55 (5) : 56.

Methetharimide (Mikedimide-Parlam) was tried in 35 dogs on a grain for grain basis for its effectiveness as an analeptic for barbiturates (Halatal). Studies comprised different groups viz. straight Halatal anaesthesia without operation; Halatal anaesthesia followed 45 minutes thereafter by Mikedimide administered intravenously without operation; straight Halatal anaesthesia with operation; Halatal anaesthesia followed 45 minutes later by Mikedimide administered through different routes with operation.

There was a notable increase of the mean pulse and respiration rate following administration of Mikedimide. Mean recovery time as tested by palpebral, corneal, pinch and pedal reflexes was also distinctly reduced. Intravenous route gave instantaneous and vigorous results followed by intra-thoracic, intra-peritoneal and intramuscular routes in the order mentioned.

M. S. J.

A killed vaccine against para-tuberculosis (Johne's Disease) in sheep. —
By BJORN SIGURDSSON (1960). *Amer. J. Vet. Res.* 21: 54.

A field experiment designed to test the protective value of a killed vaccine against Paratuberculosis (Johne's disease) in sheep is described. The experiment was carried out on 141 farms in 4 districts having heavy incidence of paratuberculosis. Half of the animals on each farm were vaccinated in the autumn of 1950 and 1951 (a total of 3273 lambs) and the other half left as controls (a total of 3184). All groups were closely followed up to the end of 1956.

In the 1950 group vaccination reduced the average annual specific mortality from 11.9 to 0.8% a reduction of 93.3%. In the 1951 group the specific mortality was reduced from 8.5 to 0.5% a reduction of 93.9%.

The vaccine is a suspension of heat killed *Mycobacterium paratuberculosis* in light mineral oil. The dose is 1 ml. of vaccine containing 5 mg. of dried bacteria. Only one injection is given and it is administered subcutaneously.

About 450,000 sheep have been vaccinated during the past seven years. Excellent protection has been obtained.

(Authors' summary).

Effects of feeding Aurofac upon the growth of Sindhi X Jersey, male calves to six month of age. JOHN, G., VELU and ALEX, REED (1960). *J. Dairy Sci.* 43 (8): 1094.

Calves were fed 5 g. Aurofac per day first in while milk, then in skim milk from four days to four weeks of age. From 4 week to 24 week Aurofac was fed in grain at the rate of 20 lbs. per ton of feed. The calves fed Aurofac gained 18% more in weight and 23.6% more in height at withers than untreated calves during a 24 week feeding period. These differences are statistically significant at the 1% level of probability.

(Authors' summary).

News and Views

Multiple calves by arrangement: In an experiment in Wales, twin births were induced by hormone injections. There were a few triplets also. The man who developed this technique is a Veterinary Surgeon, Dr. Joseph Edwards, working on the Milk Marketing Board of Britain. When interviewed, Dr. Edwards said "We are aiming now to get an average of 130 calves a year from a herd of 100 cows instead of the usual average of 95 calves a year. The idea of course is to get nearer the 200 mark" (*Madras Mail* 15-10-60). We expect more detailed information through our professional journals in Great Britain.

Association News

The Indian Veterinary Association

THE RESERVE FUND

An event of great importance to the Veterinary profession in India, took place in August 1924. It was the birth of the *Indian Veterinary Journal*. Circumstances were positively hostile and yet the profession took that bold step and the lion-heartedness of the early pioneers cannot be too highly praised. Ever since then, the *I.V.J.* has toiled hard under very adverse circumstances. The *I.V.J.* lives to-day so that the profession could prosper and science advance.

And now the hat is sent round so as to place this journalistic venture on a sounder and firmer basis. The *I.V.J.* is a priceless possession of our profession. It has placed the Indian Veterinary Surgeon, on the map of the scientific world. Just pause and ponder over, how much we owe to the Journal both individually and collectively. Is it too much then to expect the profession to respond to the appeal issued for a Reserve Fund? We hope not.

Some enquiries have come to us asking us to indicate the extent of help expected. We do not want to put the members of the profession to any undue financial strain in these hard days. At the same time, a certain amount of sacrifice is needed to make this fund a great success, so as to make it worthy of our profession. So we feel that the following scale of contribution will be quite reasonable. It could even be paid in two or three instalments.

Class I Officers	...	Rs. 100/- and above.
Class II Officers	...	Rs. 50/- and above.
All others	...	Rs. 25/- and above.

It is our ambition that no Veterinary Surgeon in this land should remain without contributing to this fund. Brick by brick, this great edifice of our's should begin to rise higher and higher. On the success or otherwise of this venture, the solidarity of our profession depends. "Pay and Prosper" is the slogan we pass on to the members of our profession.

Jai Hind!

T. VINAYAKA MUDALIAR,
Editor, *The Indian Veterinary Journal*.

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THE ANDHRA PRADESH VETERINARY ASSOCIATION

A General Body meeting of the above Association was held at the Osmania Veterinary College, Hyderabad, at 4-30 p.m., on 6-9-60 with Sri M. Ahamed Hussain in the Chair.

The meeting commenced after tea and there were as many as 48 members present. After prayer, the President reviewed the proceedings of the last inaugural meeting and indicated the agenda that has to be gone through at this meeting.

The Secretary and Treasurer next presented their respective reports, which were duly moved and adopted by the General Body. The summary of the Treasurer's report was as follows :

Receipts	...	Rs. 504'00
Expenditure	...	" 298'12
Balance on hand	...	" 205'88

The draft rules and bye-laws of the Association were than taken up and gone through clause by clause and finally adopted with necessary modifications. The subscription was fixed at Rs. 6/- per year and the Life Membership at Rs. 116/-. This will come into force only from 1-1-1961.

Next the draft bill of the Veterinary Council which was referred to by the Director of Animal Husbandry for remarks was taken up and gone through clause by clause and it was finally decided to refer it to the Managing Committee for further scrutiny and reply.

Regarding the merger of the Andhra Animal Husbandry Association with this Association, it was resolved that the question may be deferred for the present, until concrete proposals are received from them.

The Managing Committee was authorised to decide upon the ways and means of collecting funds for a building and getting the approval of the Government.

The following office-bearers were next elected :—

President	...	Sri M. Ahmed Hussain.
Vice-President	...	Dr. C. Krishna Rao.
Secretary	...	Sri M. V. Krishna Rao.
Joint Secretary	...	" C. Venkateswara Rao.
Treasurer	...	" V. Gurumurti.

Managing Committee:

Sri B. A. Shirazi.	Sri G. Umamaheswara Rao.
" K. Govinda Sastry.	" P. S. Rajulu.
" T. S. Ayyaswamy.	" M. Muthugopal.
" B. S. Purushothuma Rao.	" M. Nasrullakhan.
" P. Panduranga Rao.	

After the usual vote of thanks by the Treasurer and the singing of the National Anthem, the meeting came to a close late in the evening.

Hyderabad, A.P.

M. V. KRISHNA RAO,
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B. C. P. W.

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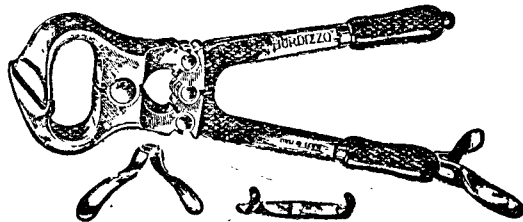
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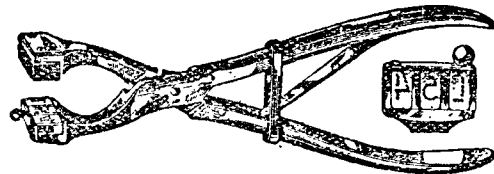
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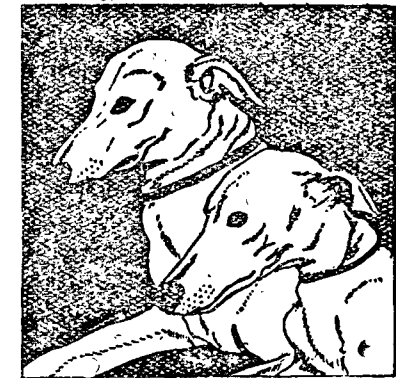
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