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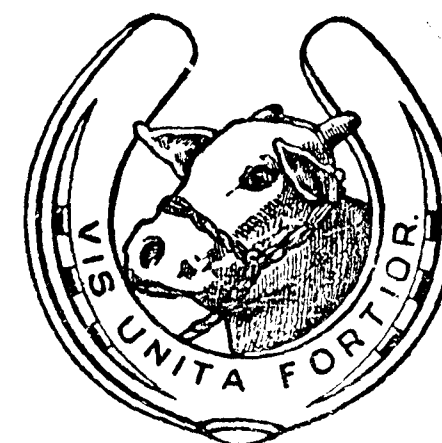
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NOVEMBER, 1956

THE INDIAN VETERINARY JOURNAL

(The Journal of the All-India Veterinary Association)

*A Bi-Monthly Record of
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November, 1956

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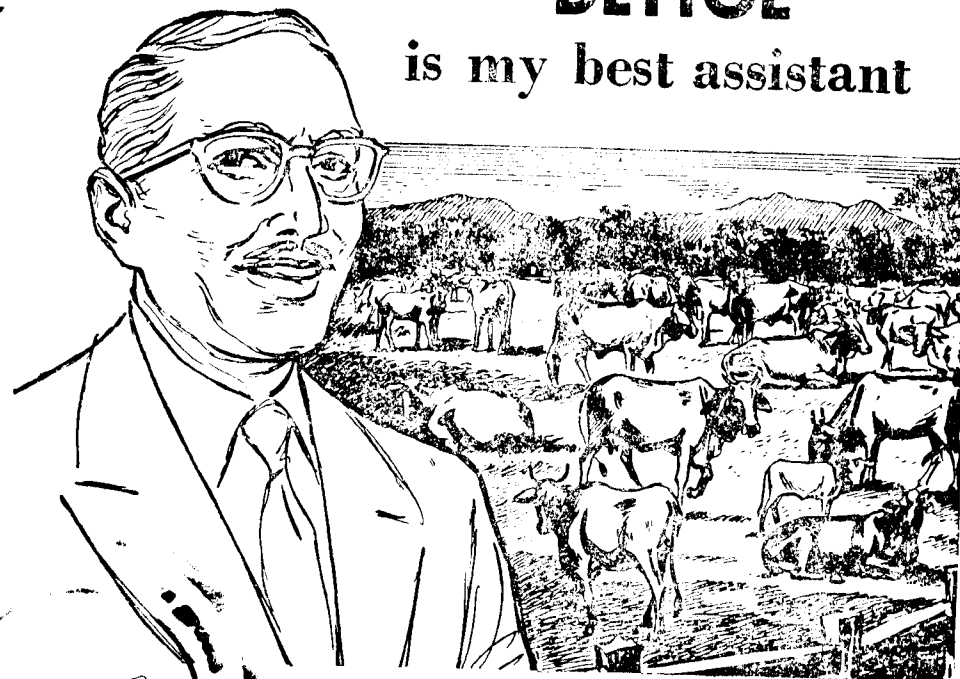
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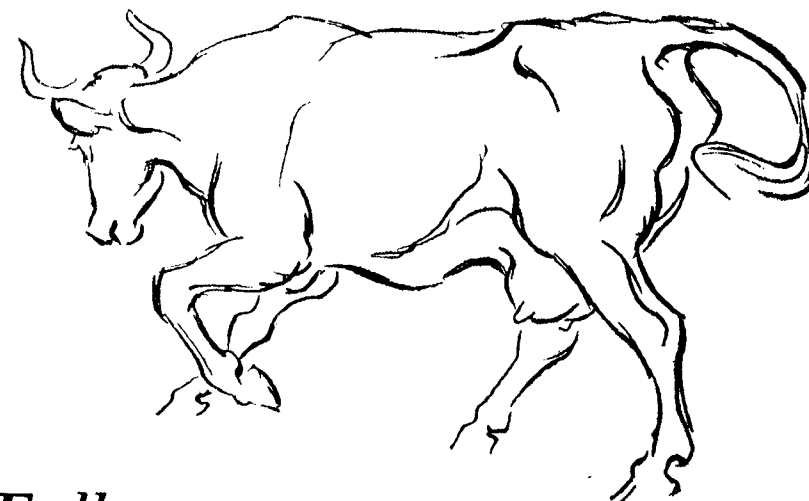


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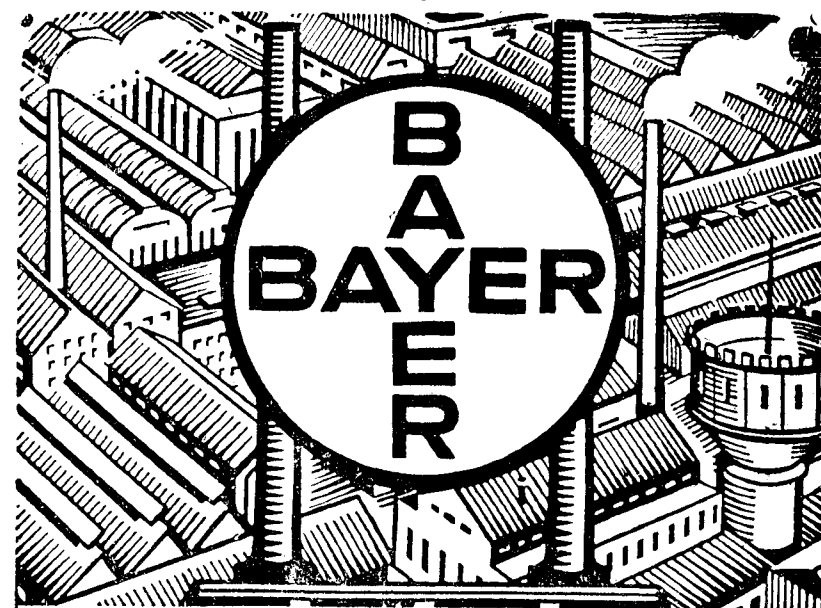
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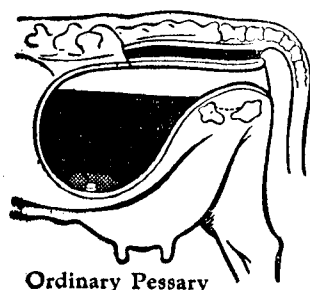
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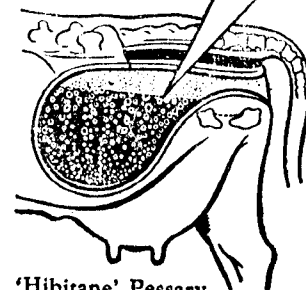
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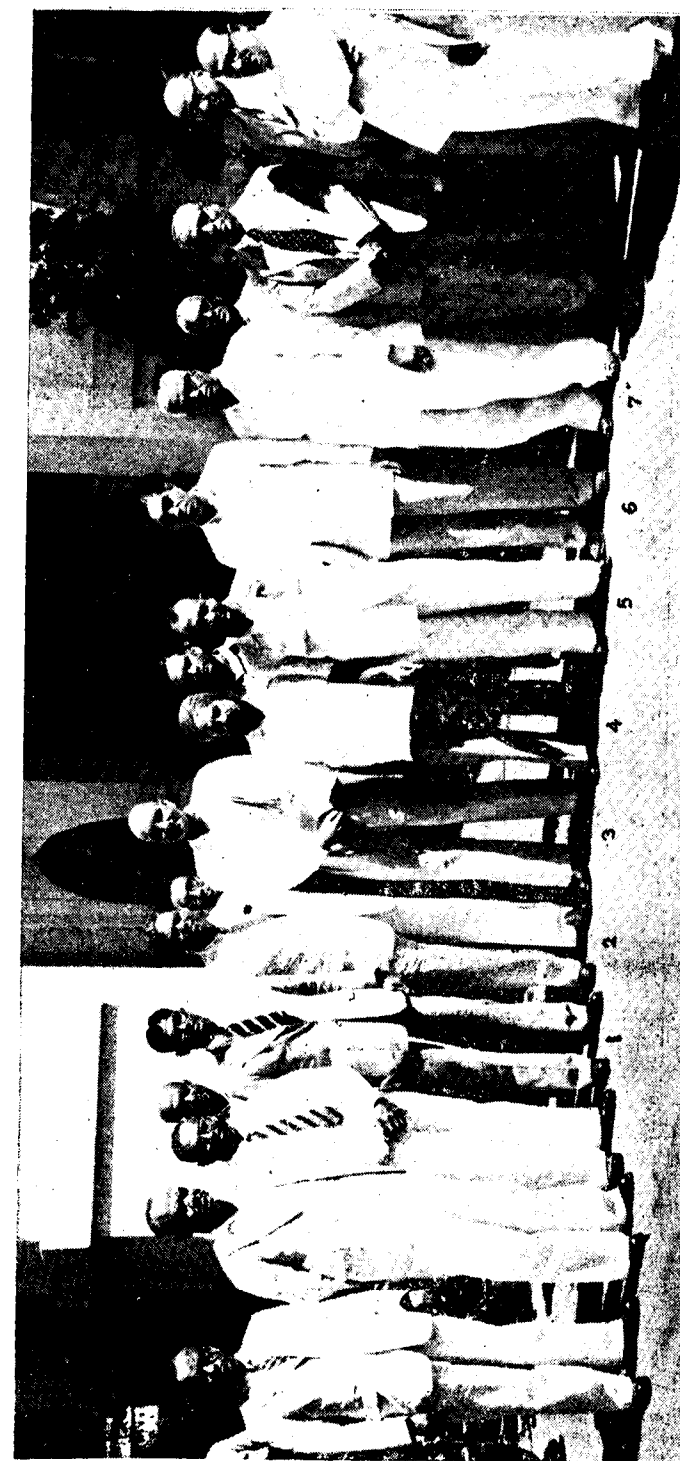
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[See Editorial]



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3. R. N. Mohan, (Member-Secretary), 4. H. S. Bawa, 5. Dr. S. Datta, (Chairman),
6. S. R. Chandra, 7. D. Pattabhiraman,

And other invitees who gave evidence.



Lt. Col. T. MURARI,

B.Sc., (Oxon), F.L.S., F.R.S.A., A.I.R.O.,

*Director of Animal Husbandry, Andhra State,
who retired on 8-10-'56.*

THE Indian Veterinary Journal

(The Journal of the All-India Veterinary Association)

Vol. XXXIII

NOVEMBER, 1956

No. 3

Editorial

MEAT HYGIENE

India has yet a long way to cover in the matter of hygiene. Her low economic condition has been mainly responsible for the deplorable state of affairs in her environmental hygiene, personal hygiene, food hygiene, etc. True it is that some people have developed a very high standard of cleanliness in and around them, but they are a drop in the ocean. Even in big cities like Calcutta, Bombay and Madras, one has to look at the pavement-dwellers, slum-dwellers, etc., to realise the depth of human degradation. In rural areas with all facilities lacking and with a dirty pond serving as the only source of water-supply both for man and beast, the position is anything but satisfactory. It is the climate, the open country, the open air and the customs and manners of the people in certain respects, that have been helping to keep down the evil effects. Superhuman efforts are needed to set matters right—not the least of which being raising of the economic and educational level of the people at large. This is undoubtedly being done but it must be realised that all individual efforts in this direction are as valuable as those at Governmental level.

To confine ourselves to our own field of work we wish to draw pointed attention to the question of Meat Hygiene. A report of the F.A.O., on the subject rightly puts it that "Meat Hygiene measures span the time the live animal enters the abattoir until the final meat product is consumed". One has to merely visualise the existing state of affairs in this country during the above specified period to realise the enormity of the problem

that awaits us, if we wish to lay claim to any equality with a few other advanced countries in this particular field.

Naturally enough, India experiences several snags to furnish the required certificate from an exporting country before her livestock products could be sent abroad and she suffers in consequence financially. The exact extent of this loss in her trade is probably not fully assessed. But this loss in trade is only one aspect of this problem and perhaps a minor one, but what is more important is the amount of risk that the domestic consuming public are subjected to, from point of public health, in being allowed to take this important article of diet without proper expert inspection and control. Several of the Cities and towns have no proper abattoirs and facilities for ante and post-mortem examinations are sorely lacking. The position is much worse in Panchayat and other rural areas. The extent of contamination that one ordinarily notices in the matter of dressing of carcasses, transport of meat, sale of offals, etc., beggars description. It is still worse in the case of fish.

India can certainly compete quite successfully with other countries industrially in animal products like liver extracts, liver oil, insulin, fish-meal, bone-meal, blood-meal, hormones and other glandular products, casings etc., if only her meat inspection service reaches the required standard. Traders in the line are ready to develop this industry but they are handicapped by the low standard of meat inspection facilities available. There is not only no provision for refrigeration, laboratory control, etc., but not even for prevention of gross contamination through lack of abattoir hygiene, proper post-abattoir handling, and efficient control of fly, insect and rodent nuisance. The general over-all picture of the present situation with regard to meat hygiene is therefore very disheartening.

What is the remedy? The F.A.O. report does not mince matters when it says that Meat Inspection should be carried out "wherever possible by Veterinarians or at least under the supervision of Veterinarians". But the mere label of a 'Veterinarian' does not at present necessarily ensure a perfect

examination and control and so the F.A.O. report is right in suggesting that "It is essential that the Veterinary Schools of all countries should include in their curriculum adequate tuition in Meat Hygiene and Meat Inspection". It does not stop with it. "It is also recommended that these Schools should conduct special post-graduate courses to provide a nucleus of highly trained Veterinary Surgeons, who should occupy the higher administrative positions in any meat inspection service. It is desirable that Meat Hygiene be entrusted as much as possible to Veterinarians employed in a whole-time capacity". That is the crux of the problem. This is a subject of first rate importance under Public Health Service, which no Government can afford to ignore. The role of the Veterinarian in connection with this work should be properly understood and appreciated and no time should be lost to saddle him with this highly responsible work. An industry is languishing for lack of attention to this vital subject.

Side by side with development of modern abattoirs and other accessory services, the question of constituting a cadre of *highly trained personnel* should be taken up. The hour must find the men ready and the only way to get it done is to select suitable young men from each State and give them the necessary advanced training, as a post-graduate course. Each State should constitute a separate Meat Inspection service, within the Animal Husbandry Department or the Public Health Department and man it with such specialised men.

With a view to remedy some of these defects, the Government of India recently appointed an *ad hoc* Committee to go into this question and other cognate matters with Dr. S. Datta, D.Sc., M.R.C.V.S., D.T.V.M., F.R.S., F.N.I., Director of Veterinary Services and Animal Husbandry, West Bengal, as the Chairman. The terms of reference of this Committee are very wide. They have to examine the existing slaughter houses and meat inspection practices and then make suitable recommendations so as to bring the standard "to conform to the regulations of U.K. and U.S.A." In addition they have to examine the report of the Pharmaceutical Enquiry Committee in regard "to

improving the supply of Animal glands and organs for the manufacture of hormones and other glandular products".

The Datta Committee have thus a highly responsible work to discharge. On their recommendations will depend the future of the Animal Products industry in this country and what is more important, the required standard in the matter of Meat Hygiene. We are sure they will rise equal to the task and thus serve the nation. Their report, due at the end of this year, will be awaited with great interest, when we shall return to this subject again.

SEPARATE MINISTRY WANTED

Amongst the several causes that are responsible for the slow progress of Animal Husbandry work in this country, nothing is so harmful as the subordinate position allotted to it under the major subject of Agriculture. It cannot be denied that Agriculture is a very vast subject, embracing as it does from soil conservation to the marketing of its innumerable products. Under the shadow of this great giant, the Animal Husbandry work is obliterated and receives only a minor attention. There is only one undivided Ministry, both at State-level and at the Centre, serving as the patrimony for the twin subjects of Agriculture and Animal Husbandry. An undivided patrimony is always a source of great trouble. As it often happens, the big brother manages to claim greater share. He does so because he is more voiceferous through age and experience. This is not merely our opinion. Here is what a Minister has said. Mr. Devisingh Chauhan, Minister for Rural Reconstruction of Hyderabad State, said in 1953. "Of the total allotment, irrigation projects received 28%, Agriculture received 9% and the Animal Husbandry services got only 1%."

The work on Agriculture is so vast and engrossing that a single Ministry is handicapped to do full justice to both the items of work. Against great odds, in way of time, allotment of funds, required personnel, etc., the existing Ministries try to do their best, but the best under such circumstances falls short of the required standard, as it is not humanly possible to work beyond a certain

limit. So we say, have a separate Ministry for Animal Husbandry and see how rapidly the work progresses.

Further these are days of specialisation even in administration through decentralisation. Animal Husbandry deserves that specialisation at Governmental level. A separate Ministry will naturally think only of this one subject and exploit all methods and means for its improvement and progress. It will then have a distinct and separate voice both with the Government and the Parliament, and need not play a dual part as at present.

Apart from all these considerations, the work involved is by itself so vast that we have not touched the fringe of the problem so far, with the existing set up of administration. We do not say that no progress has been made at all. Far from it. Excellent work has been done under the present difficult conditions. We only plead that a separate Ministry will be able to speed up the rate of progress. By having a separate Ministry, the Animal Husbandry work will develop an identity of its own and establish an added importance, which is bound to be reflected in the out-turn of work. At any rate, the present "shadow-play" will cease.

There is so much to be done to bring about an increased output of Animal products, by attending to Animal Nutrition, Animal Genetics, establishment of livestock farms, fodder supply and herd improvement of village cattle etc., that a more careful planning and direction are essential. At present the Nation's food-supply is lop-sided. Greater attention is being paid to cereals and the 300 per cent. deficit in the protective foods of animal origin does not receive the attention it deserves. The nation's food supply is ill-balanced and consequently cases of mal-nutrition, deficiency diseases etc., are on the increase. It is more in the interest of Nation's food-supply that we plead so strongly to bring into existence a separate Ministry for Animal Husbandry work. With the reorganisation of States, the time is quite opportune to undertake such a progressive step.

Only recently we were happy to note that a deputation of some Members of Parliament like Pandit Thakurdas Bhargava

and Shri Seth Govind Das, with a few other non-officials, waited on the President of the Indian Union and made a similar request. We wish more and more Members of Parliament take interest in this matter and convince the Government of the utmost importance of this subject.

Lt. Col. MURARI RETIRES

Lt. Col. T. Murari, B.Sc. (Oxon), F.L.S., F.R.S.A., A.I.R.O., who was till recently the Director of Animal Husbandry, Andhra State, retired from service on 8th October 1956. For nearly 27 years he served the composite State of Madras and the newly born Andhra State with great distinction. A versatile personality with varied interests, he made his presence felt wherever he was.

Born of a highly respectable family, he was educated at the Presentation Convent, Madras and the Bishop Cotton Boys' School, Bangalore. He joined the University College of Wales at Aberystwyth in 1922 and took his Diploma in Agriculture. Later he joined St. Catharines at Oxford and took the B.Sc., degree of the Oxford University and also the Diploma in Rural Economy with special reference to Animal Husbandry and Agricultural Economics. On his return he was appointed as the first Indian Superintendent of the Livestock Research Station at Hosur where he served in that capacity for nearly 10 years. With the outbreak of World War II his services were requisitioned, as he was one of the very few Indians who were holding the King's Commission even from so early as 1929. He was in the R.I.A.S.C., and served finally in the Military Farms Department as the first Indian Deputy Assistant Director of Military Farms (Dairies). He was thus on Active Service from 1940-1945 and then went out on a tour of European countries for nearly a year. On return he was posted as the Livestock Development Officer, Madras and later as Joint Director of Animal Husbandry Department Madras. His experience in the 'field' stood him in good stead no doubt and he again took up a tour of foreign countries including U.S.A. this time.

On the formation of the new Andhra State, his claims for the Directorship of the Animal Husbandry Department were

considered favourably and he lost no time to organise the Department in the new State on sound lines. His record of work there, is something to be proud of. He got the Andhra Veterinary College started at Bapatla and was mainly responsible for the starting of Livestock Farms at Mahanandi, Palamaner, Chintapalli and Yemmiganur. He took pains to expand the existing farms at Visakhapatnam, Guntur and Chintaladevi. He is a person who believed in get going and taking risks. His efforts to revive and rehabilitate the almost extinct breeds of Dupadu and Punganoor deserve to be recorded. Several Poultry Farms have been opened and the work at Chittoor in particular with nearly 10 different breeds of poultry is really praiseworthy. Equally dynamic were his efforts with regard to Sheep and goat development in the State. Increased work naturally meant increase in the number of Officers of the department. The number of gazetted posts is nearly doubled and he leaves behind a band of young and energetic Officers suitably trained for the expanded work that awaits them in the new State of Andhrapradesh. He was instrumental in founding a vernacular Veterinary Journal 'Pasu-Sampada' so as to reach the masses and serve as a liason between the ryots and the Department. He was a sportsman of the first order and was a great figure in social circles.

We wish him a long and useful retired life!

A REQUEST

REORGANISATION OF STATES

The domestic map of India is being revised and rewritten. New and expanded States are coming into existence. Correct recording of addresses in our office is therefore necessary to ensure safe receipt of the journal. We request our subscribers affected by this reorganisation to inform us immediately of any change found necessary in their addresses. The new controlling authorities, if any, of institutions and other billets may be contacted in time to place the renewal order for the journal from January 1957.

EDITOR, I. V. J.

Original Articles

STUDIES ON THE DIFFERENTIAL STAINING OF LIVE AND DEAD SPERM

BY

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Biologists have for a long time been trying to devise ways and means of distinguishing live from dead cells. Many of the techniques for the differentiation of live from dead cells have as the basis, the fundamental fact that when suspensions of cells are mixed with a drop of the particular stain, the dead cells readily take up the stain while the live ones remain unstained.

Differential staining of live and dead bacteria : Burke (1923) used carbol-fuchsin for the differential staining of live and dead bacterial spores. Several techniques were recommended for the differential staining of live and dead bacteria (Bichert, 1930 ; Gay and Clark, 1934 ; Knaysi, 1935).

Live and dead differential staining with animal and plant cells :— Evans and Schuleman (1914) found that dead cells very rapidly took up the vital benzidine dyes. Lewis and McCoy (1922) employed certain criteria for death in cells supravitaly stained with neutral red. Lewis (1923) observed the appearance of "death granules" in dying cells. The same worker (Lewis, 1935) found that fluorescent x was taken up by the living chick embryo cells. In his studies on malignant neoplasms Schrek (1936) employed eosin for the differentiation of viable from non-viable cells. He employed the same technique for the study of a large variety of cells (Schrek 1943 a ; 1943 b ; 1944 ; 1945). In his later studies on bone marrow Schrek (1949) employed safranin. Luyet (1937) reported good results with alkaline neutral red for the differentiation of live and dead plant cells. Goetz and Goetz (1938) used methylene blue for the differentiation of live and dead yeast cells.

Walton (1933) observed that the tails of active sperm coiled when semen was mixed with water, whereas the tails of inactive sperm were unaffected. Lasley, Easley and Mc Kenzie (1942) introduced an opal blue-eosin staining mixture for the differentiation of live and dead ram sperm. Macleod (1942) applied this technique to human spermatozoa. Lasley and Bogart (1943) modified the original formula for use with bull semen. Emik and Sidwell (1947) further refined this formula for use with ram semen. Crooke (1947) introduced revector soluble

blue counterstained with neutral red for the differential staining of live and dead human sperm. Mayer, Squiers and Bogart (1947) and Mayer *et al* (1951) introduced fast green-eosin technique for the live and dead differentiation of the spermatozoa of farm animals. Shaffer and Alinquist (1948) introduced aniline blue-eosin for this purpose. Blom (1950) advocated an aqueous nigrosin-eosin mixture for live and dead staining of bull sperm. Hancock (1951) slightly modified this staining technique. Swanson and Bearden (1951) further refined this technique using 1 gram of eosin B and 5 gms. of nigrosin in 100 c.c.s. of 3 per cent sodium citrate (dihydrate) solution. Boguth (1951), Burgos and Di Paola (1951) and Peser (1952) made studies on the differential staining of live and dead spermatozoa. Rao (1953) reported satisfactory results with a variety of live and dead differential stains.

The technique of differential live and dead sperm staining has several practical applications in artificial insemination work and in physiological studies on sperm.

Materials and Methods

The semen of the buffalo-bull and the bull were used in this study. Semen was collected with an artificial vagina and stored at 45° F. when not required. When necessary, semen was diluted with 6 to 10 parts of egg yolk citrate solution.

All the stains that proved to be satisfactory as negative stains for sperm as reported in another paper (Rao 1956) were tried to determine whether they furnish a satisfactory background in the differential live-dead sperm staining. A large number of biological stains was found to be capable of differentiating sperm in fresh semen into two groups—a stained group and an unstained group. Only such of the red stains as were capable of bringing about this differentiation were tried in combination with the background stains to determine the most satisfactory combination of stains for this differential staining. All stain solutions were prepared in any of the following isotonic solutions—M/8 phosphate buffer, 3 per cent sodium citrate (dihydrate) and normal saline.

The staining procedure was according to the method described by Mayer *et al.* (1951). For determining the proportion of live and dead sperm one hundred sperm were counted (Comstock *et al.*, 1943 ; Mercier and Salisbury, 1945) in each smear.

Results

The studies on live and dead differential staining of sperm were split up into several experiments, each experiment covering a different aspect of the problem.

EXPERIMENT I

**Suitability of various biological stains for the differential
live and dead staining of sperm**

The several stains that were found to be satisfactory for the negative staining of sperm (Rao 1956) were tried in combination with eosin B to determine their suitability for the live and dead differential staining. The following negative stains were studied in the concentrations mentioned against each.

TABLE I

Serial No.	Name of Stain	Concentration %
1	Acid green	5
2	Argyrol	10 to 15
3	Bleu de Lyon	3 to 5
4	China blue	3 to 5
5	Congo red	2
6	Congo rubin	5
7	Cotton blue	3 to 5
8	Light green	5 to 10
9	Methyl blue	5 to 7
10	Mild Silver proteinate	15 to 20
11	Naphthol green	10 to 15
12	New black	5% and saturated solution
13	Soluble blue	3 to 5
14	Thionin	1% or satd. soln.

In view of the established superiority of eosin B over the other red stains (Mayer *et al*, 1951), in preliminary experiments it was used at a uniform strength of 1 per cent with all the negative stains so as to obtain the most satisfactory differential staining of sperm as well as the most desirable background.

All stain solutions in this experiment were made in M/8 Phosphate buffer (PH 7.3 to 7.4). The results of this study are presented in table II.

A small quantity of fresh semen was diluted sufficiently with the phosphate buffer to allow for wide sperm dispersal and a coverslip dropped on the same. A small drop of any of the above mentioned stain mixtures was touched to the edge of the coverslip and the stain sucked across the thin film of semen by applying a blotter to the opposite edge. When such a preparation was watched under the oil-immersion lens the live, motile sperm could be seen to remain unstained while the non-motile presumably dead sperm readily take the stain, thereby indicating that in smears prepared by this staining technique the stained sperm represent those dead at the time of mixing the stain with the semen.

TABLE II

Serial No.	Composition of stain.	Staining results.
1.	5% acid green with 1% eosin B.	Background deep green and granular. Clear differentiation of sperm into stained and unstained groups. Dead sperm take bright pink colour with greenish tinge. Cytoplasmic cap clear.
2.	3% bleu de Lyon with 0.8% eosin B.	Background deep reddish violet colour. Sperm differentiated into two groups. Dead sperm take bright red colour with the bluish tinge. Live sperm unstained.
3.	5% China blue with 1% eosin blue.	Background deep blue and homogeneous. Dead sperm take deep pink colour. Live sperm unstained. Cytoplasmic cap clearly visible.
4.	2% congo red	Deep safron background. Dead sperm take safron colour. Treatment with HCl turns background deep blue.
5.	5% congo rubin	Deep reddish safron background. Dead sperm take a reddish safron colour. Live sperm remained unstained. HCl treatment turns background deep bluish violet.
6.	5% Cotton blue with 1% eosin.	Results very similar to those obtained with china blue-eosin.
7.	5% indulin with 1% eosin blue.	Brownish violet, homogeneous background. Dead sperm take a pink colour. Live sperm unstained. Cytoplasmic cap quite clear.
8.	10% light green with 1% eosin B.	Deep green granular background. Results similar to those obtained with acid green-eosin.
9.	7% methyl blue with 1% eosin B.	Results similar to those obtained with china blue-eosin and cotton blue-eosin.
10.	5% soluble blue with 1% eosin B.	Results very similar to those obtained with china blue-eosin and cotton blue-eosin.
11.	Saturated thionin with 0.6% eosin B.	Background deep reddish violet and homogeneous. Dead sperm take bright pink colour and live ones unstained.

With acid green-eosin and light green-eosin results were almost identical, the background obtained being very similar to that furnished by fastgreen-eosin, except that the latter gave a bluish green background. With these stains it is necessary to take special precautions to prepare thin smears to obtain the best preparations. China blue-eosin, cotton blue-eosin, soluble blue-eosin, and methyl blue-eosin gave about the same type of results. This group gave the best type of differential staining. The back ground was deep blue with no tendency to obscure sperm morphology. The morphology of both the stained as well as the unstained sperm was clearly brought out in sharp contrast with the deep blue background. Such preparations showed no tendency to fade

for an year. Indulin-eosin gave excellent preparations very similar to those obtained with nigrosin-eosin. Smears showed no tendency to fade for over two years. Congo red and congo rubin preparations gave satisfactory live and dead differentiation of sperm. Blueing the smears by HCl treatment improved the preparations (Rao, 1956). The blue colour faded in the course of a few days but could be restored by repeating the acid treatment. Argyrol and silver proteinate did not give live and dead differentiation of sperm even after reducing the concentration of eosin to 0.5 per cent, all the sperm taking a bright pink colour. Naphthol green and new black, although capable of differentiating sperm into stained and unstained groups when used alone, were found to be incapable of bringing out this differentiation in combination with eosin, B, even when the concentration of the latter was reduced to 0.5 per cent. All the sperm took a bright pink colour.

EXPERIMENT II

Comparison of the efficiency of certain new live and dead differential sperm stains with fast green-eosin stain

To determine the efficiency of the new live and dead differential stains mentioned earlier, it is necessary to compare them with standard stain mixtures like opal blue-eosin and fast green-eosin. However, since a comparative study of all the stains listed in Experiment I entails very elaborate work, it was decided to try three representative formulae which gave uniformly satisfactory results. For this purpose indulin-eosin, cotton blue-eosin and methyl blue-eosin were selected. Indulin and cotton blue were dissolved to the extent of 5 per cent along with 1 per cent eosin B in M/8 phosphate buffer. Methyl blue was dissolved to the extent of 7 per cent along with 1 per cent eosin B in the same solvent. Fast green-eosin was prepared according to the directions of Mayer *et al* (1951). Fresh semen was used for this study and the same semen sample was used for all comparisons. The technique of staining was according to Mayer *et al* (1951) and smears were made within thirty seconds after mixing the semen with the stain. Separate comparisons were made for bull and buffalo semen. The results of this study are presented in table III.

The results presented in the above table indicate that the three new stains studied are as efficient as fast green-eosin for live and dead differentiation of sperm.

EXPERIMENT III

Suitability of various live and dead differential sperm stains for use with semen diluted with egg yolk citrate

Since egg yolk citrate solution is the commonest diluent for semen it was considered desirable to determine how far the live-dead differen-

tial stains mentioned earlier are suitable for use with semen diluted with egg yolk citrate. The semen of both the bull and the buffalo was used for this study and semen was diluted in the ratio of 1 : 4 to 1 : 8.

TABLE III

Comparative study of some live and dead differential sperm stains with bull and buffalo semen.

Type of semen.	No. of samples.	Fast green-eosin Mean % live sperm.	Indulin-eosin Mean % live sperm.	Cotton blue-eosin Mean % live sperm.	Methyl blue-eosin Mean % live sperm.
Bull semen	10	88.8	89.4	89.4	89.3
Buffalo semen	10	89.2	89.4	89.4	89.4

Thionin-eosin was found to be unsatisfactory giving rise to precipitation of stain and clumping of sperm. Acid green-eosin and light green-eosin gave a dark green background against which the morphology of stained sperm was clear while the unstained sperm were not so clearly brought out and unless special precautions were taken to avoid thick smears the background may completely obscure the sperm. Indulin-eosin gave excellent preparations very similar to those obtained with plain semen. Bleu de Lyon-eosin, China blue-eosin, cotton blue-eosin, methyl blue-eosin and soluble blue-eosin, all mixed freely with egg yolk diluted semen giving a good background with a sharp differentiation of live and dead sperm.

EXPERIMENT IV

Suitability of certain isotonic solutions as solvents for live and dead differential stains

Different solvents were used for the differentiation of life and dead sperm. Lasley, Easley and Mc Kenzie (1942) and Lasley and Bogart (1943) used M/8 phosphate buffer solution with pH 7.3 for dissolving opal blue-eosin for the differential stain. Emik and Sidwell (1947) used phosphate buffer with pH 8.15 for preparing the opal blue-eosin differential stain. Shaffer and Almquist (1948) employed M/8 phosphate buffer with a pH of 7.2 for making aniline blue-eosine stain. Swanson and Bearden (1951) employed 3 per cent solution of sodium citrate (dihydrate) in distilled water for making nigrosin-eosin stain. Mayer *et al* (1951) recommended M/8 phosphate buffer solution with pH 7.3 to 7.4 prepared by mixing 1 part of mono-sodium dihydrogen phosphate with 4 parts of disodium mono-hydrogen phosphate for making the fast green-eosin stain. These workers also found that 0.9

per cent sodium chloride and isotonic sodium citrate solution gave very good live and dead differentiation of sperm.

It was considered desirable to make a controlled study of the proportion of live and dead sperm in preparations obtained by using the differential stains dissolved in different isotonic solutions. M/8 phosphate buffer solution (Mayer *et al*, 1951), 3 per cent aqueous solution of sodium citrate (dihydrate) and 0.9 per cent aqueous solution of sodium chloride were the solvents employed. The differential stains used were indulin-eosin, cotton blue-eosin and methyl blue-eosin. These stains were dissolved in the solvents in the proportion in which they were found to give the most satisfactory results in Experiment I. Bull semen was used in this study. The results of this study are presented in the following table.

TABLE IV
Proportion of live and dead sperm in preparations with live and dead differential stains dissolved in different solvents.

Stain mixture.	No. of semen samples.	Mean % live sperm		
		M/8 phosphate buffer.	3% Sodium citrate solution.	0.9 per cent sodium chloride solution.
1. Indulin-eosin	10	89.0	89.0	89.1
2. Cotton blue-eosin	10	89.3	89.3	89.6
3. Methyl blue-eosin	10	89.8	89.4	89.8

From the data presented in the above table it is evident that the proportion of live and dead sperm remains the same irrespective of the solvent used for preparing the stain, as long as the solvent is an isotonic solution. There was also no difference in the type of sperm staining or the type of background staining depending on the solvent in which the stain was dissolved.

Summary

Several stain mixtures were studied to determine their suitability for staining differently the live and dead sperm in bull and buffalo semen.

A large number of stains was found to be satisfactory as background stains to be used in live and dead differential staining. These are 5 per cent solutions of acid green, china blue, cotton blue, congo rubin and indulin, 3 per cent bleu de Lyon, 2 per cent congo red, 10 per cent light green, 7 per cent methyl blue, and saturated solution of thionin. While the function of a background stain in a live and dead differential stain is essentially to impart a dark background to provide

contrast to the sperm, the present studies indicated that these also readily penetrate the dead sperm.

M/8 phosphate buffer solution, 3 per cent sodium citrate (dihydrate) solution, and 0.9 per cent sodium chloride solution were all found to be satisfactory as solvents for the stains. It is essential to use only isotonic solutions as solvents for the stains to avoid destruction of sperm and introduction of artefacts like bent-tailed sperm.

2 per cent congo red and 5 per cent congo rubin were satisfactory for their differential staining when used alone. Treatment of smears with HCl turned the background a deep blue to a bluish-violet. Saturated thionin with 0.6 per cent eosin B, and 3 per cent bleu de Lyon with 0.8 per cent eosin B were satisfactory as differential stains. The other background stains mentioned earlier gave very good differential staining in combination with 1 per cent eosin B.

Three of the new differential stains *i.e.*, 5 per cent indulin with 1 per cent eosin B, 5 per cent cotton blue with 1 per cent eosin B, and 7 per cent methyl blue with 1 per cent eosin B dissolved in M/8 phosphate buffer were compared with fast green-eosin and were found to give the same general type of results as fast green eosin.

Of the new stains described, thionin-eosin was found to be unsatisfactory for use with egg-yolk diluted semen while with acid green-eosin and light green-eosin the smears should be thin to provide the satisfactory background.

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General Articles

A STUDY OF MURRAH BUFFALOES IN MADRAS STATE

By

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Introduction

Murrah buffaloes are being maintained in this State at the District Livestock Farms, South Kanara and Malabar since February 1951 and at the Livestock Farm in Orathanad from October 1954. The foundation stock for all the farms was purchased from the Punjab, the home tract of Murrah buffaloes. The study is now confined only to the two farms at South Kanara and Malabar, as sufficient data are available.

A STUDY OF MURRAH BUFFALOES IN MADRAS STATE

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The above mentioned two stations of South Kanara and Malabar receive a high rainfall annually, the Koila Farm in South Kanara recording an average of about 152" in 125 days and the Thiruvazhamkundu farm in Malabar about 118" in 121 rainy days, during the period under study which covers from April 1951 to November 1955. This study is confined to the seasonal variation of Murrah buffaloes coming into heat with the number of calvings and the availability of green fodder, during the course of the year, under controlled conditions.

II. Climatic conditions.—Both the stations receive their rainfall mainly under the influence of South West Monsoon, but the contribution by the North East Monsoon is comparatively more to Malabar; so also the summer rains. The Malabar Farm is right at the foot of the Western Ghats and consequently the summer is comparatively severe. The Koila Farm is on the uplands—the malnad area of South Kanara and consequently the winter is comparatively severe. Barring this difference of intensity, the climate for both can be summed up as rainy season for about 5 months, followed by winter season of about a couple of months and hot season for the remaining 5 months. The distribution of rainfall month wise is tabulated elsewhere.

III. Area.—The total area of the Farm at Koila is 760 acres of which 500 acres are maintained as pastures, 50 acres are cultivated for Fodder production, 100 acres are under forests and the balance of 110 acres is under roads, buildings, valleys, jungles, nullas etc.

The Malabar Farm has a total area of about 380 acres of which about 80 acres are under pastures, 78 acres are used for fodder production, 10 acres under roads and buildings and about 212 acres under forests and jungles.

IV. Topography.—The Koila Farm is more uneven with many mounds alternated with valleys. The soil in general is gravelly sandy loam, with very poor power of retention of moisture.

V. Water supply.—Koila Farm has only one well which is useful only to meet the drinking water and other requirements but practically incapable of commandeering any area for cultivation purposes since it almost dries up during the summer months. There is a river at the farther end of the farm which is not useful for any purpose other than for wallowing of the buffaloes during summer.

The Malabar Farm has also wells which can meet only the requirements of water for other purposes and cannot commandeer any area for cultivation purposes. There is a stream on this farm also, which can commandeer about 4 acres of land apart from being a source for wallowing of buffaloes etc. This stream is more proximate and more useful than the one at Koila.

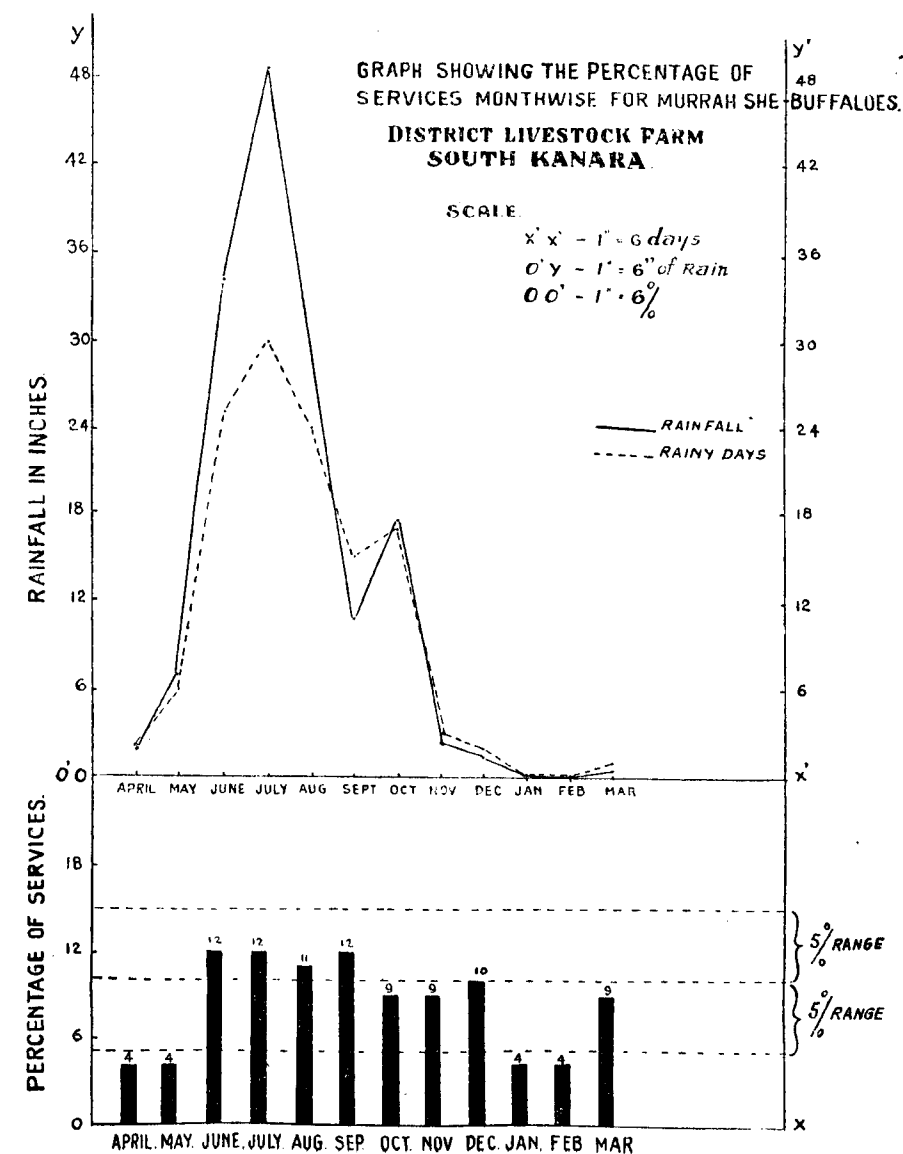
VI. *Cultivation.* 1. The following kinds of fodder were utilised for feeding livestock during the year 1954-1955 in the quantities noted against each.

S. No.	Name of fodder.	Koila Farm (in lbs.)	Malabar farm (in lbs.)
1	Guinea Grass	2,75,000	5,51,198
2	Buffaloes Grass	400	1,08,257
3	Teosint	19,240	1,46,645
4	Thin Napier Grass	2,300	11,935
5	Mixed Grass From Bunds	2,18,590	1,73,193
6	Pasture Grass	2,15,200	9,635
7	Elephant Grass	—	47,211
8	Cholam	—	23,348
9	Rhodes	—	550
10	Kolakkattai	—	29,205
11	Odian Grass	—	24,170
12	Kora	—	10,639
13	Kuduzuvine	—	6,212
		7,30,730	11,42,198
	Total Green Fodder Fed	7,30,730	11,42,198
	Total Silage Fed	3,28,000	2,22,565
	Total Hay Fed	4,36,700	1,59,897
	Total Straws Fed	22,535	—

Note.—It would be seen that the Malabar Farm was able to produce more different types of fodder than Koila which had to depend much on the Pasture grass even for Silage making. This is due to the favourable rainfall of Malabar. Vide Table Annexed.

2. *Stock and incidence of feeding.*

Total No. of adults maintained	Koila farm			Malabar farm		
	Buffaloes 100	Cattle 128	Total 228	Buffaloes 71	Cattle 47	Total 118
<i>Details of fodder fed during the year 1954-55.</i>						
Particulars	Koila Farm		Malabar Farm			
	Total quantity fed in lbs.	Average quantity per head in lbs.	Total quantity fed in lbs.	Average quantity per head in lbs.		
Green Fodder	7,30,730 (July to November)	3,205	11,42,198 (July to November)	9,680		
Silage	3,28,000 (April to June) (December to March)	1,439	2,22,565 (December to June)	1,886		
Hay	4,36,700 (All the 12 months)	1,915	1,59,897 (December to June)	1,355		
Straws	22,535 (January to March)	99	—	—		



The animals on an average were getting fodder rations as detailed below per month in both the farms :

Period	Koila Farm	Malabar Farm
April to June	Silage 240 lbs. plus 160 lbs. Hay = 840 lbs. green. Grazing fair due to summer showers but grazing hours during June limited due to inclement weather.	Silage 269 lbs. Hay 194 lbs. = 986 lbs. green. Grazing fair due to summer showers but grazing hours limited in June.
June to November	Greens: 641 lbs. plus. Hay 160 lbs. = 1121 lbs. green Grazing practically nil during July and August due to extreme inclement weather. September good but October limited, November very good.	Greens 1936 lbs. As in Koila, but comparatively better even during July, August and October.
December	Silage 240 lbs. + Hay 160 lbs. = 840 lbs. green. Grazing good in mown pastures with unraked grasses etc.	Silage 269 lbs. plus 194 lbs. Hay = 986 lbs. green. Same as in Koila.
January to March	Silage 240 lbs. + 160 lbs. Hay + 33 lbs. Straw = 939 lbs. green Scantly grazing.	Silage 269 lbs. + Hay 194 lbs. = 986 lbs. green. Scantly grazing but better than Koila.

Note.—For expressing in terms of green fodder, silage is reckoned as 100=150 greens, Hay 100 = 300 greens.

VII. *Performance of Murrah buffaloes.*—The average number of Murrah she-buffaloes that stood for service monthwar is furnished in the following table expressed in terms of percent to the annual total :

TABLE No. A

Name of farm.	Apl.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March
Koila	4	4	12	12	11	12	9	9	10	4	4	9
Malabar	5	7	5	10	7	15	9	18	7	4	5	8

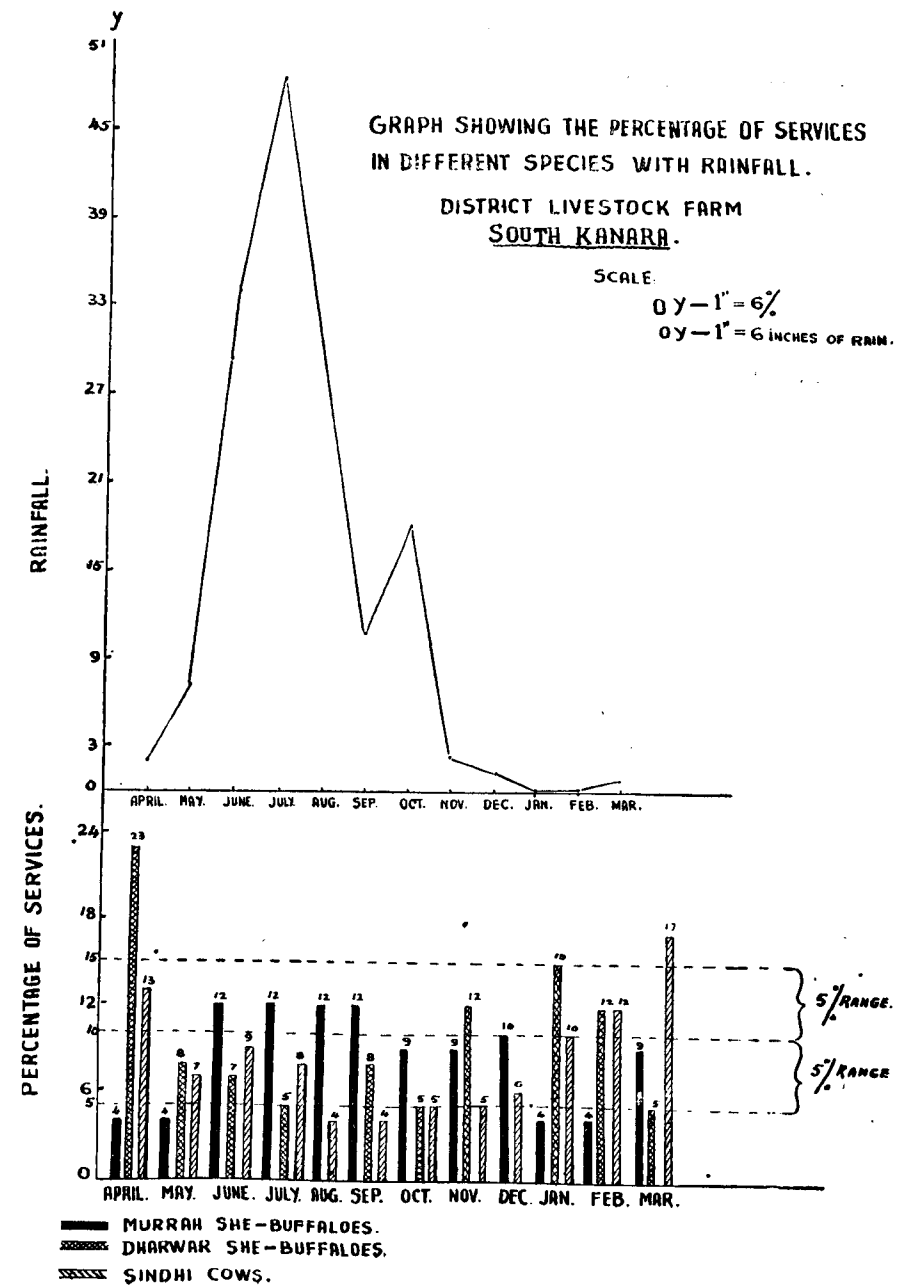


TABLE No. B

The percentage of conception recorded to the total services verified among the Murrah buffaloes is furnished monthwar to both the farms.

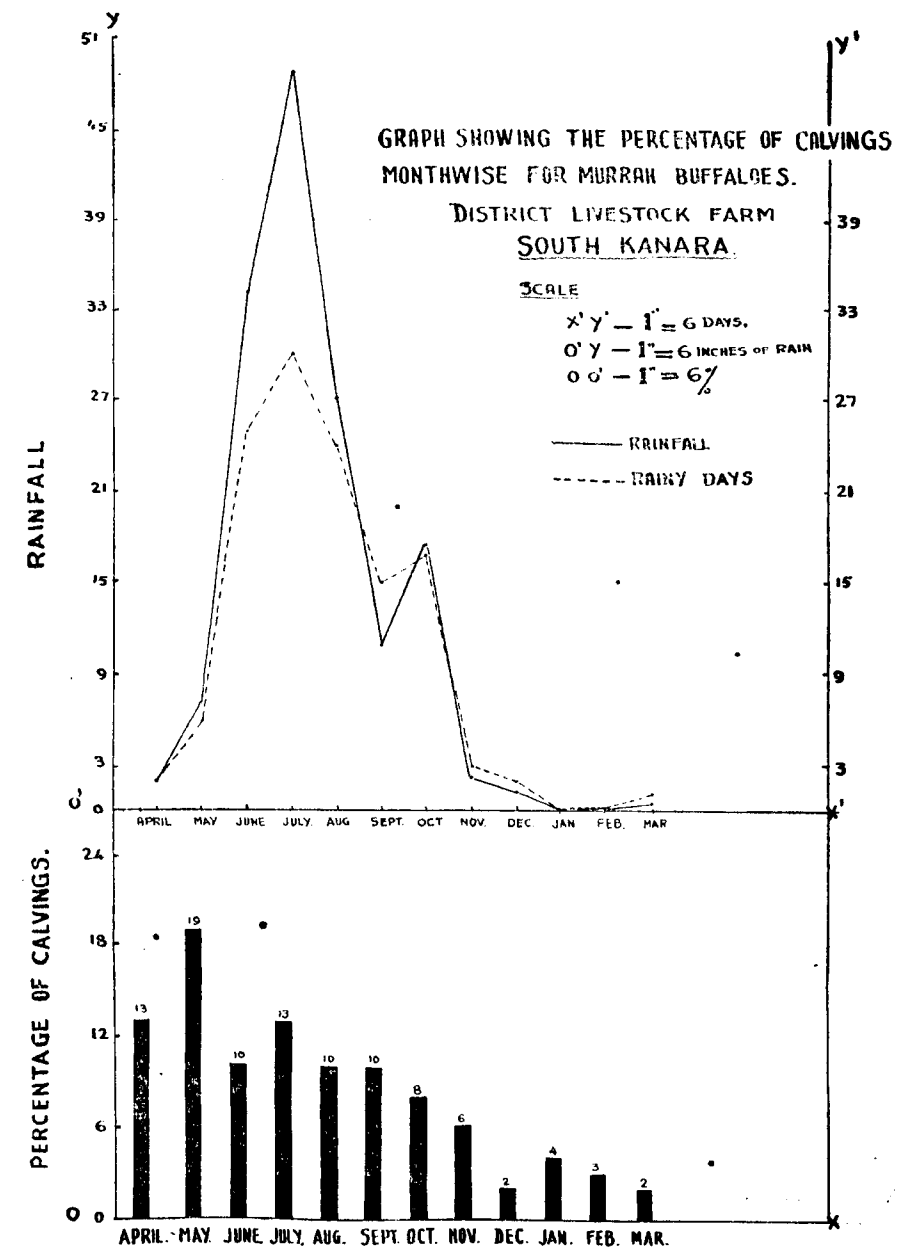
Name of farm.	Apl.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Year
Koila	20	33	81	81	69	64	57	80	55	90	67	33	68
Malabar	56	33	25	31	36	43	53	55	77	75	50	57	48

TABLE No. C

The average number of calvings is furnished below, monthwar expressed in terms of percent to the annual average.

Koila	13	19	10	13	10	10	8	6	2	4	3	2
Malabar	2	5	5	8	9	21	10	8	6	16	5	5

A perusal of the statement of services in Table No. A reveals that at Koila Farm the percentages of the services during the period June to December and March (*i.e.*,) for 8 months in a year are practically the same, ranging from 9 to 12 while during the remaining 4 months (*i.e.*,) January, February, April and May the percentages are same recording 4 each month. It would also be seen from Table No. C. that the percentage of calvings recorded are practically the same during the period April to November with the exception of May and November. The month of May has recorded a slightly higher percentage than April while the month of June has recorded a little less even though the percentage of services during the corresponding periods (June to August) is practically the same. The variation in May can be taken as due to normal factors probably due to more services during later parts of June, as should reasonably be expected in view of the climatic factors and due to the normal variation in gestation days as there is a compensatory drop in the calvings in June. For the same reasons the slight decline in October compared to the services in December and the slight increase in the calvings during November can be taken as normal variations. The slight increase in the number of services during March is suggestive of Pseudo-heats as the percentage of fecundity obtained is the lowest with the result there is no proportionate increase in the percentage of calvings either during December or January or February. From the foregoing it is suggestive that the Murrah buffaloes at Koila have done uniformly well in the matter of



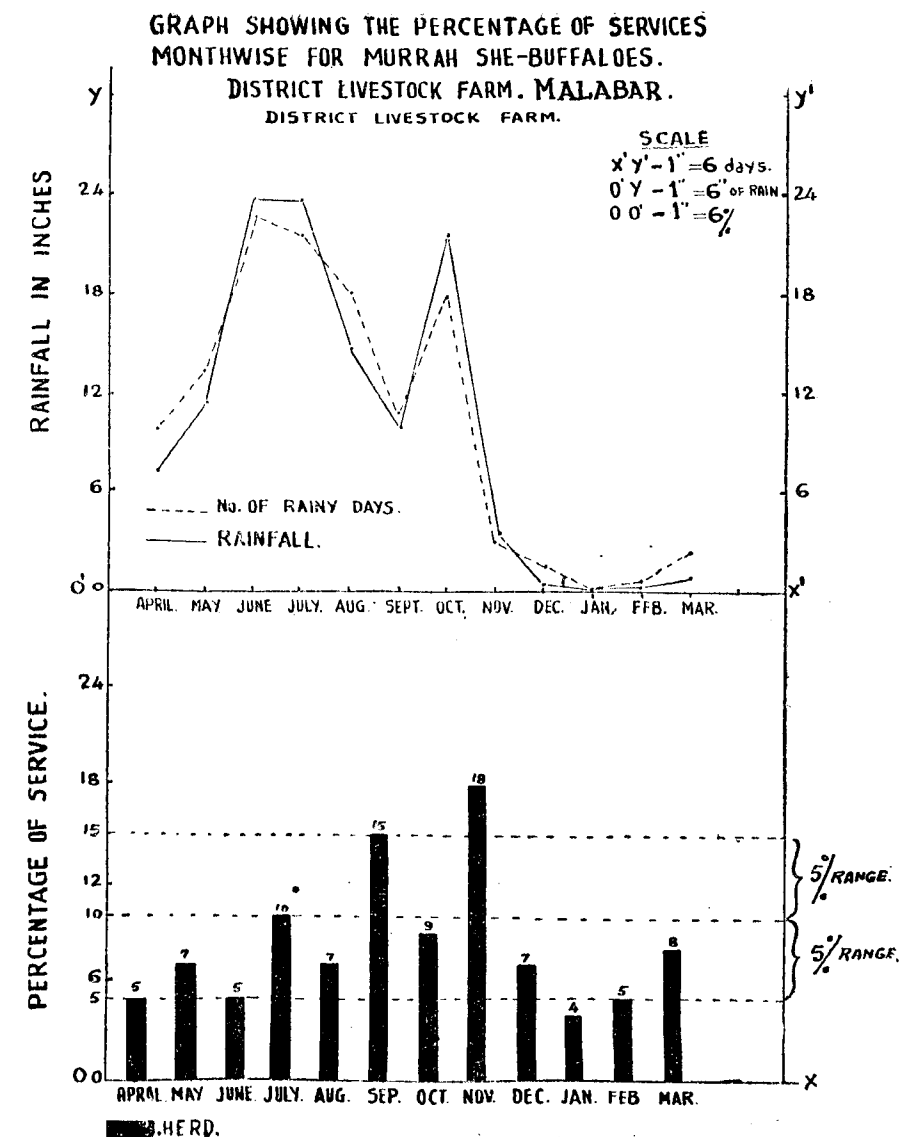
sexual activity during the period June to December. From a perusal of para VI (3) viz. average rate of fodder and grazing available, it can be said that this period is the best in these respects.

Adverting to Malabar Farm a perusal of Table No. A reveals a distinctive increase in the matter of services during the months of September and November (15 and 18) as against other months which record 5 to 10 with the exception of January recording 4 only. The calvings have also recorded a steep increase during September (21). During all other months the calvings had been practically the same ranging from 5 to 10 with the exception of January which has recorded 16 and April 2. The increase during January is probably due to the normal variation factors. From the climatic and other factors September and November are the best, vide para VI (3). The variations in the matter of availability of fodder and grazing had been more marked at the Malabar farm, the period from July to November being more favourable with abundant supply of green fodder while the remaining months being practically without greens.

The comparative uniform practice of feeding of fodder etc., at Koila has resulted in a greater uniformity, in the rate of service and calving than at Malabar, where the variations in the matter of feeding practice of fodder had been more marked. Even during the peak monsoon months the sexual activity at Koila has not diminished as in Malabar, notwithstanding the fact that the peak monsoon period is more intense and severe at Koila than at Malabar (Vide Para 1). These are suggestive that the factor that has bearing on the sexual activity is the level of nutrition in take rather than the direct influence of climate.

VIII. Comparison with other breeds.—The percentage performance of Murrah buffaloes at Koila farm is compared with the Dharwar buffaloes and village buffaloes of Koila in the following table.

Breed	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	March
Murrah	4	4	12	12	11	12	9	9	10	4	4	9
Dharwar	23	8	7	5	—	8	5	12	—	15	12	5
Village buffaloes of Koila	2	6	3	3	14	13	11	28	6	6	6	2



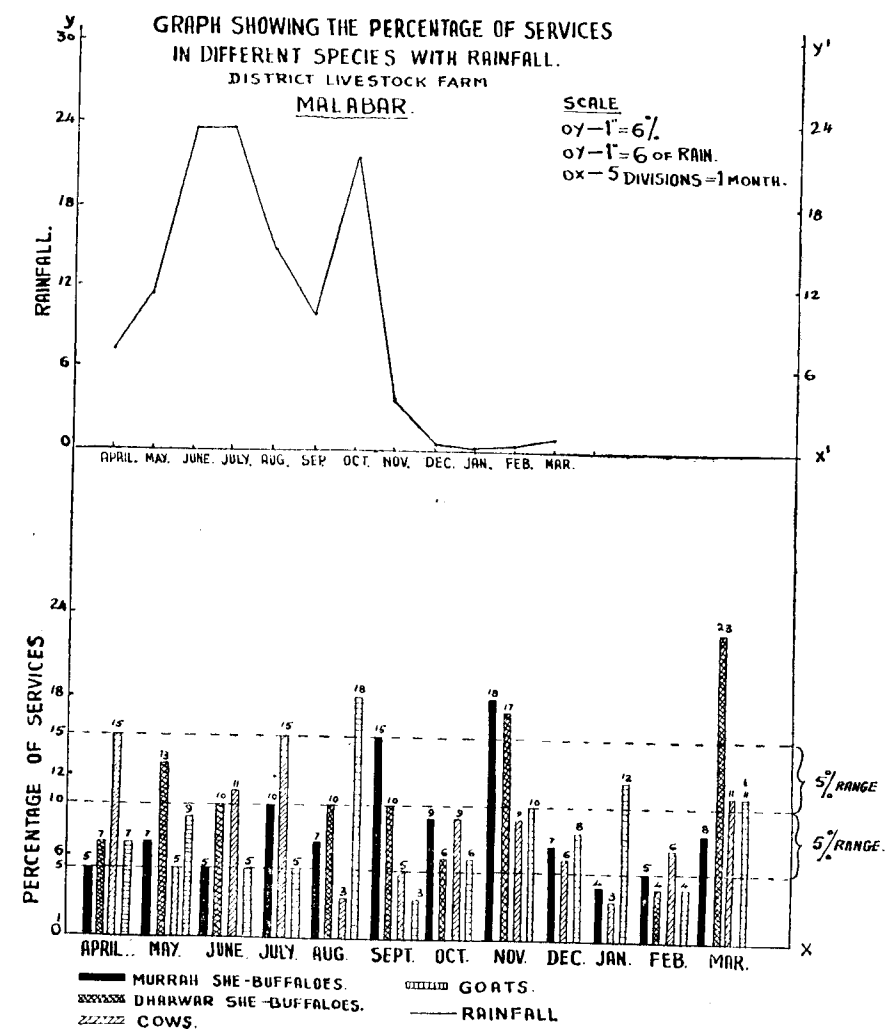
The village she-buffaloes have shown the maximum activity in November (28%) the best month for grazing; Fairly good number of services has been recorded during August, September and October viz. 14% 13% and 11% respectively. The data for Dharwars are erratic on account of very few animals studied. On the same farm the data for cows are tabulated below:

Scindhi	13	7	9	8	4	4	5	5	6	10	12	17
Local breed of cows in the farm	5	8	11	9	8	5	6	3	9	8	13	15
Village cows of Koila	2	5	5	12	7	17	—	14	10	12	6	10

The Scindhis have done low during August to November and have shown best activity during March and generally they have done better during January to July. Even the local breed of cows maintained on the farm has done low during September to November. The village cows have shown low performance during August and October and April to June.

It will be interesting to note that the buffaloes of all breeds at Koila have done well during the rainy and winter months while the cows have done well during the summer season. The cows have generally recorded lowest performance during August to November, notwithstanding the fact that this is a favourable period with regards to fodder and grazing season. This is probably due to the "Winter Drop" in health. As the month of August is the third month in succession in the grip of severe rains with scanty sunlight, the atmospheric temperature becomes cooler and the species of animals with good mechanism of "Heat Regulation" will loose body heat quickly. They will, therefore be mobilising the body reserves if the intake of the food is not such as to help in production of more heat by virtue of the nature and quantity of the food consumed. The cows, therefore, require a greater amount of "Heating foods" to keep them in good health during the winter months.

It would also be seen that the buffaloes have recorded the lowest during the hotter months like April, May, February and January. The buffaloes are poor "Heat dissipators". Consequently during hotter months they are very uncomfortable and they try to reduce heat production in the system by decreased intake of food etc. Making available the succulent feeds and affording facilities like wallowing etc. will help in mitigating this hardship.



Let us consider the data for Malabar farm for different breeds etc., the available data are tabulated below :

Breed	Apl.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Murrah	5	7	5	10	7	15	9	18	7	4	5	8
Dharwar	7	13	10	—	10	10	6	17	—	—	4	23
Scindhis	15	5	11	15	3	7	9	9	6	3	6	11

These data also tally on the general principle that the hotter months had been more favourable for cattle and cooler months more favourable for buffaloes.

Summary

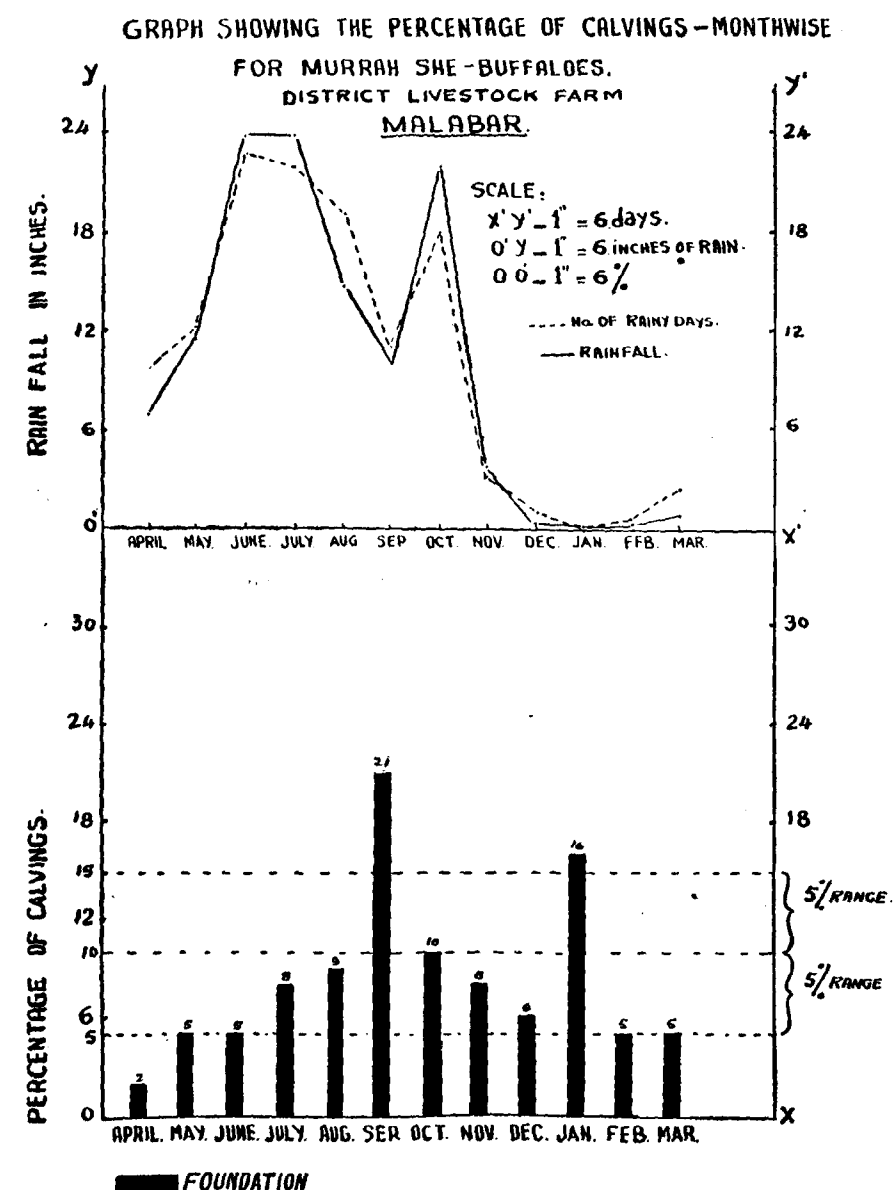
(1) The performances of Murrah buffaloes at Koila in South Kanara and at Thiruvazhankunnu in Malabar for a period of about 5 years are studied.

(2) Both the stations are in high rainfall areas but the rainfall at Malabar is more evenly distributed (*viz*) 61% under South West Monsoon, 22% under North East Monsoon and 17% under hot weather while the corresponding figures for Koila are 80%, 14% and 6%.

(3) In view of the better distribution of rainfall, Malabar Farm is in an advantageous position for the cultivation of fodder crops under dry cultivation. Both the farms did not have much facilities for irrigable cultivation during the period under study.

(4) In view of the better climatic and soil conditions, Malabar was able to produce varieties of fodders with high biological value while Koila had to depend much on the pasture grass, even for ensiling. Notwithstanding these facts Koila was making a steady supply of hay, right through the year as against the supply of hay at Malabar only for 6 months in a year. The rate of fodder supplied in Malabar was uneven with abundant supply for about 6 months in year (July to December) and hardly 50% of the same quantity during the remaining 6 months (January to June).

(5) The Murrah buffaloes at Koila have done well uniformly during the period June to December and March (9% to 12%). Though the performance during the remaining 4 months *viz.* January, February April and May, was low this was also uniform (4%) during all the four months. The Murrah buffaloes at Malabar have shown greater variations in their performance *viz.* the months of September and November have recorded steep rise (15 and 18%) July, October and



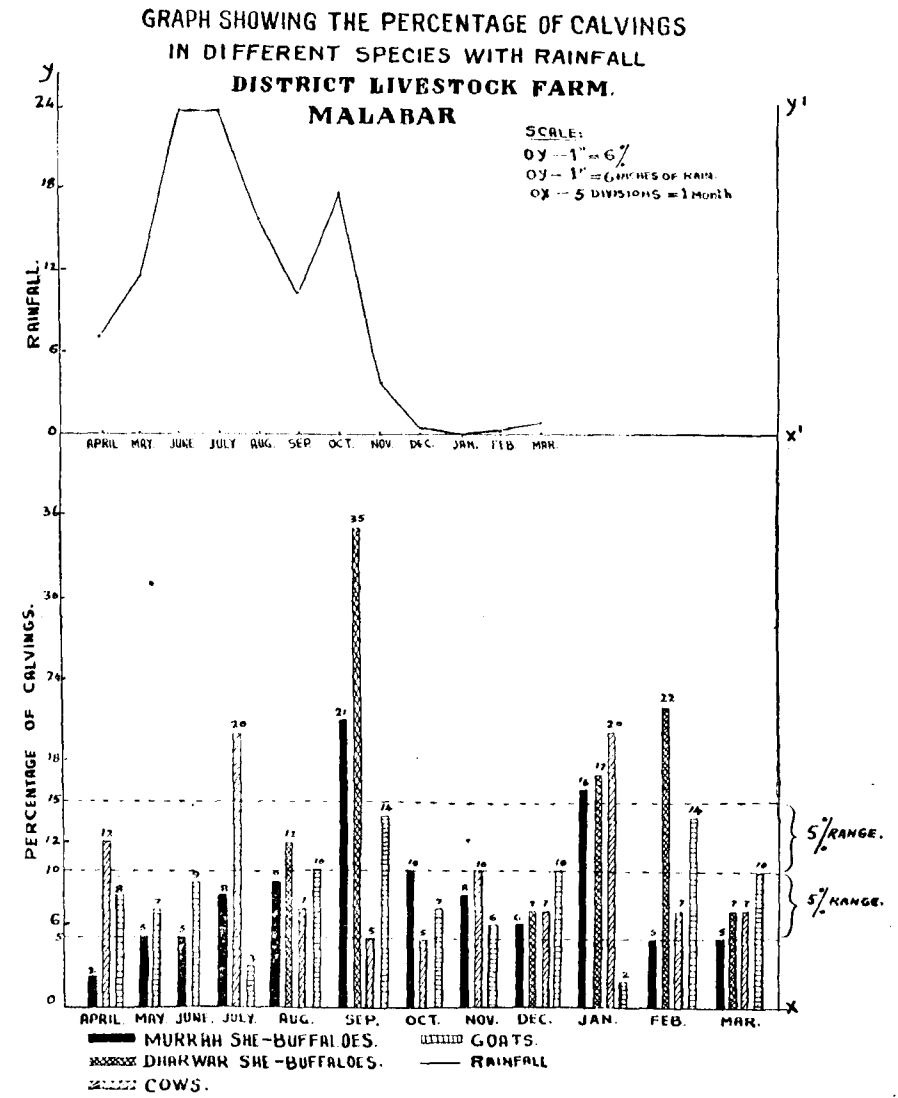
Statement showing the average rainfall in inches monthwise at District Livestock Farm, Koila and Malabar.

Station	April	May	June	July	August	September	October	November	December	January	February	March	Total
Koila Rain Days	1-93 2	7-00 6	34-23 25	48-67 30	27-30 24	10-68 15	17-53 17	2-34 3	1-47 2	—	—	0-53 1	151-68 125
Malabar Rain Days	7-14 10	11-53 12	23-60 23	23-63 22	14-88 19	10-17 11	21-76 18	3-83 3	0-43 1	0-06 —	0-19 —	0-80 2	118-02 121

Abstract of rainfall.

Station	South West Monsoon period				North East Monsoon period				Hot Weather period				Total
	Rain	Days	Percentage of rainfall to total annual rainfall	Rain	Days	Percentage of rainfall to total annual rainfall	Rain	Days	Percentage of rainfall to total annual rainfall	Days	Rain	Days	
Koila	120-88	94	80%	21-34	22	14%	9-46	9	6%	151-68	125		
Malabar	72-21	75	61%	26-08	22	22%	19-66	24	17%	118-02	121		

Note:—A perusal of the above tables indicates that Koila gets about 80% of total rainfall under South West Monsoon, 14% under North East Monsoon and 6% during summer. The corresponding figures for Malabar are 61%, 22% and 17%. The rainfall for Malabar is, therefore, better distributed than at Koila.



March record 8 to 10% April to June, August, December have recorded 5 to 7% and February 4%.

(6) A comparison of performance with other breeds of buffaloes and cattle reveals that the buffaloes of all breeds in general show a tendency for better performance during the cooler months and they show the least activity during hottest months. The cows of all breeds in general show a tendency for declined activity during the coldest months. This is in conformity with the general physiological and anatomical features of buffaloes and cows in the matter of heat regulation of the body.

(7) The data lead to the inference that it cannot be said that Murrah buffaloes have a particular season of breeding. The more uniform results obtained at Koila are suggestive enough that the breeding can be more uniform given the optimum conditions. Even the declined performance during hot months is amenable for control if proper amenities are made available (vide performance in March for both the stations and during May at Malabar).

OBSERVATIONS ON THE TREATMENT OF NASAL SCHISTOSOMIASIS IN CATTLE AND BUFFALOES IN ORISSA

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Introduction

Nasal Schistosomiasis (N. G.) which is locally termed as "Pinus", "Sansara" or "Sun sua" is a nasal affliction of cattle prevailing in almost every district of the State of Orissa, being most predominant in the coastal areas although the exact disease status is unknown due to lack of proper survey. The incidence of buffalo Nasal Schistosomiasis has been recorded by Malkani (1933), Rao (1933 a), Sen (1949), Rao & Mohiyuddeen (1955) and Biswal (1956) from the States of Bihar, Madras, West Bengal, Mysore and Orissa, respectively. Rao & Mohiyuddeen (1955) treated the N.G. affected buffalo with Sodium Antimony Tartarate successfully.

The data to be presented hereunder are in respect of the Farm animals at the District Livestock Breeding (D.L.B.) Farm, Keonjhar,

Orissa. Treatment only of the affected cattle having clinical symptoms of the disease with Sodium Antimony Tartarate was done regularly at the Farm beginning from the year 1951-52 without much success in the eradication of the disease. The pond next to the farm, to which animals had access, had completely dried up during the years 1953-54, 1954-55, owing to the severe drought in Orissa. The infested pond was periodically treated with CuSO_4 at a strength of 1:5000 and ducks were also reared in the pond during the year 1954-55 as a measure of biological control. In spite of this the recurrence of the disease was seen in most of the treated animals. With a view to ascertaining whether complete eradication of the disease can effectively be done by medicinal treatment of affected animals, a regular course of treatment was given during the years 1954-55 and 1955-56 at the D. L. B. Farm, Keonjhar, where the infestation with Schistosomiasis in buffaloes and cattle was appreciably high, using four lines of treatment *viz.* Tartar Emetic (Sodium salt), Antimosan, Fouadin and Anthiomaline in different groups of animals.

General Features of the Disease in Cattle and Buffaloes

(1) *Cattle*:—The clinical symptoms in affected cattle have well been described by various workers (Malkani, 1933; Rao, 1933a; Datta, 1932). The disease usually manifests itself by frequent sneezing with a thick mucous discharge from the nostrils. As the disease advances, the discharge becomes foetid, mucopurulent and sanguinolent and correspondingly the sneezing becomes more frequent and marked producing the characteristic snoring noise. This is why it is very often called the "Snoring Disease" of cattle. The distressed breathing synchronizes with the appearance of the raised patches with the shotty abscesses on its surface. The examination of the nostrils of the affected cattle shows, depending on the chronicity of the disease, the confluence of many pimply eruptions to cauliflower-like masses of very vascular granulomatous tissue. These growths extend from the anterior nares to nearly the middle of the nasal cavity. Many of the affected cattle show raw ulcerations of varying size in the nostrils. In these animals the characteristic snoring sound is not so pronounced in the standing posture as to say that these are harbouring the parasite while other animals, which appear to be clinically free, present roughened mucosal surface whose nasal scrapings on microscopical examination are positive. The general health of the affected animals whether clinically positive or not, depends on the chronicity of the disease and the extent of nasal growth. The breathing of affected animals becomes so difficult, during certain periods, as to interfere with feeding in a trough with the result that they fall off in condition. Desquamation of growths leading to profuse bleeding, and often accompanied by secondary infection is attributable to poor health of animals too.

In young animals and sucking calves irregular areas of congestion and pimply eruptions are most commonly seen. But the snoring noise as observed in adult cattle, is not much pronounced in these animals owing probably to the absence of cauliflower-like masses obstructing the nasal passage. Some of these animals are clinically free but are actually harbouring the parasite as evidenced by the microscopical examination of their nasal scrapings and in these animals the general health is not much affected.

(2) *Buffaloes*:—How appropriate to call it a "Snoring Disease" in buffaloes still remains to be decided, as snoring, one of the clinical symptoms of the disease, is practically nil. The clinical symptoms of sneezing, snoring and profuse nasal discharge, commonly seen in adult cattle are generally absent in buffaloes. Except slight irregular areas of congestion and a few slight pimply eruptions nothing can be seen in the nasal cavities of affected animals including young buffalo calves. The roughened mucosal surface with reddened appearance of the nasal cavity is quite suggestive of the infestation. Invariably the nasal scrapings of animals showing this type of clinical symptoms reveal schistosome eggs on microscopic examination. No annoyance seems to be caused by the presence of these tiny lesions. The general health of the affected animals, in contrast to affected cattle, is good.

Collection and Examination of Nasal Scrapings of Affected Cattle and Buffaloes.

(1) *Cattle*:—The technique of collection and examination of nasal scrapings of cattle affected with Nasal Schistosomiasis has been described (Rao, 1933a; Malkani, 1933, Sen, 1949). The mucopurulent discharge or discharge having flakes of disintegrated tissue is collected as such. The granulomatous masses can be scraped out with the help of a curette, or the simple flushed out normal saline solution (N. S. S.) from the recent raw ulcers of the nasal cavities can constitute the ideal specimen for the evidence of nasal schistosome eggs. When flakes of tissues are present in the specimen, they should be thoroughly ground with pestle and mortar, in order to free the eggs or miracidia. When specimens contain large amount of blood it is always advisable to dilute specimens with a liberal amount of N.S.S. or weak solution of NaOH or KOH so as to make the eggs more discernible in the microscopic field. The addition of KOH or NaOH has the added advantage of dissolving the mucus or mucigenous materials present in the specimens.

Boomerang shaped eggs of *S. nasalis* are seen alive in fresh untreated materials, occasionally a few miracidia are seen swimming

about, while others had micacidia ready to hatch within the egg shell. Some of the egg contents are black or amorphous, probably they are the dead eggs. The nasal scraping or discharge kept at room temperature in the laboratory for 8-12 days without any preservative, was still found to contain eggs although dead at this stage.

In those animals having growths, it is very easy to establish the diagnosis clinically or by microscopical examination of scrapings, whereas in clinically-free adult animals and calves, the deep curetting of the red roughened areas of nasal cavities will help in getting the representative specimens for a microscopical examination.

(2) *Buffaloes*:—As already described, the clinical symptoms in buffaloes are rather so obscure that it necessitates a thorough examination of their nasal cavities without which there is every chance of missing the detection of the case. Only by blind deep curetting of nasal cavities showing minute eruptions or red roughened areas and subsequent flushing with N.S.S. can, in many cases, bring about materials containing quite appreciable number of *S. nasalis* eggs. It is interesting to note, in contrast to cattle, in many of the buffaloes nasal scrapings contain larger number of miracidia. Nasal scrapings of buffaloes mixed with N.S.S. kept at laboratory room temperature for 5 to 6 days, even in summer months are found to contain live eggs and miracidia. The eggs and miracidia seen are all of one type and are indistinguishable from those seen in cattle. The shape of ova is typical, excepting in their size. The measurement of the eggs is $320-384 \mu \times 40-64 \mu$.

Treatment

The nasal scrapings of all animals of the farm irrespective of showing clinical symptoms or not were examined and treatment was carried out in those animals whose scrapings were found positive by microscopical examination.

(1) *Cattle*:—For the purpose of treatment cattle were divided into three groups as stated below:

(a) *Antimosan treated group*:—Eleven cows, three heifers, three young bulls and six suckling calves under 6 to 10 months of age were treated with Antimosan (Bayer). Antimosan, chemically the sodium salt of Antimon-3-Brenz catechin-di-Sulphonic acid was supplied in solution. The dose for cows, heifers and bulls was 20 — 40 c.cs. given subcutaneously at an interval of 3 days. Altogether three injections were given to each animal constituting a full course. The clinical symptoms persisted during the period of treatment. During the period of fifteen days following the last injection, the clinical symptoms tended to disappear in all cases. However, when nasal scrapings of these

animals were examined microscopically after an interval of 21-28 days of the last injection, three animals (one cow and two bulls) showed *S. nasalis* viable eggs in their scrapings suggesting that mere disappearance of clinical symptoms does not guarantee a complete recovery from infestation.

The six suckling calves were given Antimosan at the rate of 10 c.cs. Altogether three injections were given to each calf. First two injections were given intravenously and the last one subcutaneously. The nasal scrapings of these calves when examined after an interval of 28 days of the last injection revealed typical *S. nasalis* eggs.

So nine (39.1%) animals—one cow, two bulls and six calves—out of 23 animals continued to carry the infestation. It shows that Antimosan has no schistosomicidal effect. It probably temporarily arrests or reduces the nasal proliferative growth already there, leading to the subsidence of the respiratory distress in affected animals and thereby giving a false impression of an apparent cure.

Two to four months after the first course of treatment again the manifestation of the clinical symptoms did appear suggesting, as if, no treatment had been done to these animals before. This time the nasal growth in young animals leading to respiratory distress was observed as markedly as in adults. The nasal scrapings of these animals when examined microscopically revealed the presence of *S. nasalis* eggs. That is 100 per cent re-infestation within a period of 2 to 4 months. Then again 11 cows and 3 heifers of this group of 23 animals were given the same course of treatment. Other animals could not be available for the subsequent treatment, as either they were disposed of or have been shifted to other farms. After an interval of 28 days of the last injection of the second course of treatment, four animals (two cows and two heifers) showed the presence of viable *S. nasalis* eggs in their nasal scrapings, though the clinical symptoms of respiratory distress were markedly reduced or absent. Seeing the persistence of *S. nasalis* eggs in the nasal scrapings of the treated animals with varying results even after two courses of treatment with this drug, it was discontinued.

(b) *Fouadin treated group*: One cow, two heifers and eight young bulls of 8-10 months of age were treated with Fouadin-Vet. (Bayer). Each animal received nine intravenous injections of Fouadin constituting a full course. The first three injections were given on every alternative day at the rate of 5.0 c.cs. the next three injections every day at the rate of 6.5 c.cs., and the last three injections every day at the rate of 8.0 c.cs. So by the 11th day the course of treatment was complete. Even after the full course of treatment, the clinical symptoms in the affected animals did not disappear. However, 15 to

21 days after the last injection although the clinical symptoms gradually tended to disappear, yet the nasal scrapings of four animals (young bulls)—constituting 36.3% of the treated cases, showed the presence of schistosome eggs on microscopical examination and after two months when nasal scrapings of animals of this group were further examined, it revealed *S. nasalis* eggs in all the animals giving a picture like that of the Antimosan treated group.

(c) *Sodi-Anti-Tartaratum treated group*:—Fourteen cows, nine heifers, three suckling calves under 6-10 months of age and six bullocks were treated with Sodi-Anti-Tartaratum. The dose was 1.5 grains per 100 lbs. body weight given intravenously every alternate day. A course of six injections effected complete disappearance of clinical symptoms, though in a majority of cases disappearance was observed even after 3rd or 4th injection.

After an interval of six weeks, when the nasal scrapings of this group of animals were examined microscopically, a few (21.8%) animals one cow, two heifers, two calves and two bullocks revealed viable *S. nasalis* eggs in their scrapings though they appeared clinically free of the disease. Treatment was not repeated at this stage. After a further interval of 8-10 weeks (or 14-16 weeks of last injection) the nasal scrapings of animals of this group were examined when the clinical respiratory distress, was moderately pronounced. Fifteen (46.8%) animals—6 cows, 3 heifers, 2 calves and 4 bullocks of this group revealed viable *S. nasalis* eggs in their scrapings.

It appears as time advances the percentage of recurrence of infestation gradually increases. After another interval of 8-10 weeks or 22-26 weeks of the last injection when pronounced respiratory distress was observed in majority of animals of this group, the nasal scrapings examination was done. To one's surprise, at this time 23 (71.8%) animals—11 cows, 6 heifers, 1 calf and 5 bullocks—was found to contain *S. nasalis* eggs in their scrapings. Finding this sort of infestation in ascending order as time advances all the 32 animals of this group irrespective of their clinical symptoms and microscopical findings of nasal scrapings, were given another course of treatment on the same line as before. The results obtained more or less paralleled with those after the first course of treatment.

None of these animals receiving two courses of treatment within a period of 6 to 7 months or 24 to 28 weeks did show any untoward effect of the drug. This finding of gradual ascending order of infestation as the time advances reveals that treated animals do not appear to resist reinfestation after the treatment with Sodium Antimony Tartaratum.

(2) *Buffaloes*:—For the purpose of treatment the animals were divided into the following three groups.

(a) *Anthiomaline treated group*:—Five buffalo-cows and five buffalo-heifers were treated with anthiomaline (M & B). Anthiomaline brand of lithium antimony thiomalate is available as a sterile 6 percent solution in multi-dose containers of 50 c.c.s. Each animal received a course of six injections every alternate day at the dosage rate of 20 c.c.s. First two injections were given intramuscularly and the last four subcutaneously. The intramuscular injection was replaced by subcutaneous as animals showed persistent painful swelling. Twenty-eight days after the last injection when the scrapings were examined one animal (heifer) showed the presence of *S. Nasalis* eggs. Subsequently after an interval of 6–8 weeks the scrapings were again examined. Five animals (3 buffalo-cows, 2 buffalo-heifers, including the previous one) showed the viable *S. nasalis* eggs in their scrapings. It is either Anthiomaline has very little effect on the buffalo Nasal Schistosomiasis or the animals have again picked up infestation within this period of 10–12 weeks. As Anthiomaline was not available, these animals were subsequently treated with Sodi-Antimony Tartaratum and the results of which were not closely followed up as some of these animals were disposed of.

(b) *Antimosan treated group*:—Four adult buffaloes were treated with Antimosan (Bayer) at the rate of 40. c.c.s. subcutaneously at an interval of 3 days. A total number of 3 injections constituting a full course was given. After an interval of 6 weeks when the nasal scrapings of all animals were examined, one was found to contain *S. nasalis* eggs. No treatment was given to this positive case. Twelve weeks after, two more animals showed *S. nasalis* eggs in their scrapings. When within a 12 weeks' time after the treatment, 3 animals out of 4 showed this result all the four animals of this group were repeated with Antimosan treatment. Antimosan produced results in affected buffaloes more or less in line with Anthiomaline.

(c) *Sodi-Anti-Tartaratum treated group*:—Seven buffaloes and two buffalo-calves under 8 to 10 months of age were given Sodi-anti-tartarate at the rate of 1.5 grains per 100 lbs. body weight intravenously every alternate day. The total number of injections given was six. As the clinical symptoms were not the guiding factor in these animals, this course of treatment was given on the experience gained in cattle. When the nasal scrapings were examined 21 days after the last injection one buffalo showed the *S. nasalis* eggs in its scrapings. Again 42 days after the last injection or 21 days at the first post-nasal-scraping examination, four buffaloes revealed viable *S. nasalis* eggs. Seeing this,

all the animals, 9 in number, were given another course of Sodi-anti-tartarate treatment, 49 days or 7 weeks after the last injection of the first course of treatment. These animals did not evince any untoward results. Eight weeks after the last injection of the second course of treatment three animals (two buffaloes and one buffalo-calf) showed *S. nasalis* eggs in their scrapings. Of these, one she-buffalo always had been showing *S. nasalis* eggs in her scrapings 21 days, viz. 42 days after the last injection of the first course of treatment and 56 days after the last injection of the second course of treatment. In all probability Sodi-anti-tartarate gave temporary so-called cure.

Discussion

Jey Singh Raj (1910) was probably the first who recorded this disease in Madras Presidency. In Orissa, the disease in cattle appears to have been reported for over half a century or more by observers but the report of its incidence was made by Das (1929), when he was the Assistant Director of the Orissa Range in the Province of Bihar and Orissa. Malkani (1933), reporting the incidence of the disease in a buffalo at the Bankipore Hospital, Patna, concluded that Nasal Granuloma occurs in buffaloes. The reports of Rao (1933a), Sen (1949), Rao & Mohiyuddeen (1955) and Biswal (1956) are in general agreement with Malkani (1933) that the disease also occurs in buffaloes. But the high incidence of Nasal Granuloma in buffaloes has been reported from West Bengal and Orissa by Sen (1949) and Biswal (1956) respectively, whereas Malkani (1933), Rao (1933a) and Rao & Mohiyuddeen (1955) reported the rarity of the disease in buffaloes. Further, Abdus Salam and Sarwar (1953) recorded the occurrence of *S. nasalis* in 48.9% of buffaloes in the Punjab where N. G. has never been observed in cattle. Buffalo Nasal Schistosomiasis is fairly common in the South, though not to the same extent as in cattle. Perhaps it has not been sufficiently recorded (Mudaliar, 1956). Biswal's (1956) observation is confined to buffaloes of D. L. B. Farm, Keonjhar where the infestation is as high as 50% in buffaloes. The rarity of infestation with *S. nasalis* in the buffaloes as explained by Rao (1935) was that although the hosts are prone to get the infestation because of their wallowing habits in the pond, yet the initial infestation of *S. spindalis* gives certain amount of immunity against any further infestation of *S. nasalis* or other schistosomes. In the face of high incidence of Nasal Schistosomiasis in buffaloes herein recorded, the degree of immunity produced by *S. spindalis* to further schistosome infestation needs further experimental study.

The finding of one type of egg with one typical shape clearly indicates that the cause of Nasal Granuloma in buffaloes is a schistosome, which is indistinguishable from that of *S. nasalis* the cause of "Snoring

Disease" in cattle. The measurement of *S. nasalis* eggs of buffaloes 320-384 μ by 40-60 μ seems to be within the reasonable limits with that of cattle - 336-581 μ x 60-80 μ (Rao, 1934). The ova are of typical shape, excepting in their size. The absence of proliferative growth in the alar fossae of nasal cavities and thereby the absence of the respiratory distress in buffaloes (adults and calves) is not fully understood. Chaudhury (1955) is of opinion that N.G. is more common among bullocks than in cows as the former are subjected to rigorous work for tilling the land for cultivation of various crops without the required balanced feed to combat fatigue. It is probably his presumption rather than based on any statistical data. The authors have seen this disease in cows, calves of 6-10 months of age and also in an appreciable percentage in buffalo-cows and buffalo-calves of varying age which have never been put to hard work. The authors agree to the view points of Verma (1955), on the other hand.

In the study under report the authors found incidence of Nasal Schistosomiasis in a high percentage of cow-calves, buffalo-calves under 6-10 months of age. The popular belief that calves are rarely affected, seems to be lack of proper survey. As a minimum period of incubation in calves to establish the disease is roughly 3 months (Rao, 1933b) it is likely that young animals getting the infestation in latter stage of calfhood manifest the disease, when they are a year old or over. The rarity of infestation, especially in calves may be attributable to their being not allowed to graze along with their dams in the nearby infested pools. Malkani (1933) holds the same view. But the incidence of Nasal Schistosomiasis in buffalo calves for the first time as has been reported by Biswal, 1956 and that too in an appreciable number, seems to account that the source of infestation for calves as well as for the adult buffaloes is common. It is interesting to see that the 1953-54 and 1954-55 droughts leading to complete drying of the pond did not reduce the disease level, suggesting all the more probably that the snails might have burrowed deep into the earth during summer and come up to the surface during rains to rejuvenate to their activity. Doraiswamy (1934) reported that the disease would disappear following the complete failure of rains and resultant drying of the tanks. The disease on the other hand, could not be eradicated from the Farm animals inspite of severe droughts of 1953-54 and 1954-55 and repeated treatment with various medicaments for the last five years from 1951-52 to 1955-56; or it may be true as one expects to find that the chronic nature of the disease is also in keeping with what obtains in other cases of Schistosomiasis, some of the cases in human-beings (*S. haematobium*) lasting for ten years or more; or the parasite undergoes a period of quiescence under the depressing effect of drug. How far the latter statement is correct needs

further experimentation. It is likely that by giving T. E. in frequent doses or other antimonial drugs for a short period of one to two weeks, the clinical symptoms begin to subside and the animals acquire a sort of tolerance to the drugs. It may be also that the drug does not reach the optimal threshold level to give a parasitocidal effect. In a few animals, viable or still eggs are visible in the discharge suggesting that the animals should have received more number of injections than completing the course with three (Antimosan), Six (Sodi-Anti-Tartaratum & Anthiomaline), or nine (Fouadin) as done in the present study. One of the authors (Biswal, 1955—Unpublished data) gave a course of 11 injections of T.E. at the rate of 1.5 grains/100 lbs. body weight daily to a cross-bred Angolo bullock without any by-effect. In this animal the symptoms tended to disappear after 8 injections.

The information as to the disappearance of symptoms of N.G. after 3 weeks in almost all animals that received 6 injections of Sodium Antimony Tartarate, corroborates the observation of Sen (1949) who also reported that although the symptoms disappeared after treatment, about 20% of the treated animals after 8 to 9 months and about 45% after one year exhibited the disease. But in the treated animals as reported here the recurrence of the disease in an appreciable number of animals irrespective of breed (Red-Sindhi, Murrah Buffaloes, country-bred bullocks), age (adult cows, buffalo-cows, bullocks, young bulls, suckling calves under 6-10 months of age) and sex (cows, buffalo-cows, heifers, young bulls and bullocks) was seen. The observation that has been made is that though at the 21st, 28th and 42nd post-treatment day the nasal scrapings of the treated animals revealed *S. nasalis* eggs either viable or still, the marked snoring noise was not present at this stage. After 8-10 weeks, however, the characteristic respiratory distress was seen to develop in treated cattle and by the 22nd to 26th week of the last injection it was greatly pronounced. It has been observed further that the clinical symptoms tend to disappear earlier either during or after the course of treatment with Sodi-Anti-Tartaratum, than with the other three medicaments and also that the reappearance of clinical symptoms in re-infested animals tends to occur earlier in animals receiving Antimosan, Anthiomaline and Fouadin than in animals receiving Sodium Antimony Tartaratum.

All the animals treated with Sodium Antimony Tartaratum in the present study did not show any untoward results. Here the drug used was fresh and when dissolved, gave a clear fluid. However, a few deaths were noticed by one of the authors (Das, 1952) when the drug was old and insoluble in water completely, giving a whitish cloudy filtrate. Tartar Emetic has been found by Christopherson (1918, 1919a, 1919b) and many workers all over the world, to be very nearly a specific in

human Bilharziasis and similar good results have been recorded in animal Bilharziasis by Low and Newham as cited by Malkani in 1933. Parthasarathi Naidu (1921) was the first Veterinarian to report the successful use of Tartar Emetic against Bovine Nasal Schistosomiasis in India.

Oxspring (1932) gave 10 grains of the drug per dose irrespective of body weight of the animal once in four days till ten doses were given. Some of his animals were reported to have had a relapse after an apparent cure and second and even third course of treatment was necessary. Herein the present authors gave 1.5 grains per 100 lb. body weight every alternate day and did observe relapses in a majority of the animals and as such the treatment had to be continued from time to time during the period under observation. Iyengar (1934) used a three percent 2½ c.es. solution of T.E. per hundred pounds body weight without any by-effect. A few casualties in animals receiving T.E. have been reported by Sen (1949). The cause of death in some of the treated animals reported by Sen (1949) was not explained fully whether it was due to toxic effect of the drug or individual idiosyncrasy of these animals to drug or to some other unknown factors. Rao (1934) found large number of schistosomes in the clot of blood in the right heart, pulmonary artery, and its branches in one of his experimental calves (Calf No. 411), which died 38 hours after an injection of 5 grains of Antimony Tartaratum in 20 c.es. of water. His conclusion was that:—

“The calf died of heart failure, due to the dead schistosomes finding their way in large numbers into the jugular vein and then to the heart and blocking the branches of the pulmonary artery. Apparently the death of the calf was not due to the toxic action of the drug”.

T.E. is claimed not only as a curative but also as a valuable prophylactic agent (Malkani, 1933), for this drug not only kills the adult parasites but also destroys their eggs and thus prevents their further multiplication. This is why Malkani (1933) suggested that systemic application of this medicine should be used in eradicating this disease from any affected areas. Patra & Rao (1955) reported that the disease could be eradicated by the T.E. treatment as according to their belief, the treated animals develop a sort of resistance against the disease. In view of the experience of the treatments done and results obtained at the D.L.B. Farm, Keonjhar, the theory of development of resistance against the disease (Patra, & Rao, 1955) is doubtful, and the present authors, however, are inclined to believe that T.E. cannot eradicate the disease so long as the factors that govern the occurrence and incidence of the disease are present. The molluscan fauna of an area of high enzootic index of

the disease with particular reference to the distribution of the known intermediaries of *S. nasalis* should further be worked out.

Roy Chaudhuri (1932) reporting the superiority of Antimosan over T.E. stated that one injection of Antimosan would suffice for the recent infestation and two or three injections for the advanced cases of Nasal Schistosomiasis. In the present observation, complete cure could not be brought about in the affected cattle and buffaloes even with 3 injections constituting a full course. Taking into consideration of other factors, Sodium Antimony Tartaratum appears to be the drug of choice in the treatment of Nasal Schistosomiasis in cattle and buffaloes. It is cheap and its effect produced on the affected animals, is superior to those of the other three. The cost of Antimosan and Anthiomaline which can be given subcutaneously is prohibitive and the desired effect to the same extent as that of Sodium Antimony Tartaratum is not obtained. So also is Fouadin which requires more number of injections than the other three.

The disease has been reported from many States of the Indian Union, especially from the coastal tracts. It is always incriminated that cattle are the only animals affected and the control programme is focussed on them, without much attention to buffaloes which also carry *S. nasalis* infestation in a latent form. Owing to recent progress of the country towards industrialization, the construction of big dams, reservoirs, tanks, irrigation canals, etc. as envisaged in the Five Year Plan periods, it, on the other hand, will create much greater avenues for the rapid multiplication of many molluscan fauna and may with particular reference to the distribution of the intermediaries of *S. nasalis*. In India where water buffaloes form an appreciable bulk of the Livestock Industry, and are reared everywhere for their high milk yield and butter-fat content, the eradication of the disease from them also deserves prompt attention. They like to wallow in water of nearby tanks, reservoirs, canals, etc. in which the concentration of the particular snail(s) acting as the intermediate host(s) of the parasite are present, and if they carry the infestation to the extent as has been reported in the present study and that too in a manner mostly unnoticed, it becomes a problem for the profession to carry out the eradication programme of the disease. To add to this, Caprine Nasal Schistosomiasis (Malkani, 1941) if present to that extent as in buffaloes might offer another impasse which should not be lost sight of. It, therefore, leads to doubt whether the disease can ever be eradicated, so long as the factors that govern the occurrence and incidence of the disease are present.

Summary and Conclusion

A high incidence of Nasal Schistosomiasis in cattle (Cows, bulls, bullock, heifers, young bulls, suckling calves of 6-10 months of age) and

buffaloes (buffalo-cows, suckling-calves of 8-10 months of age) at the D.T.B. Farm, Keonjhar, Orissa, India is reported. Four lines of treatment using Sodium Antimony Tartarate, Antimosan, Anthiomaline and Fouadin were carried out and none of the drugs did give a permanent cure to the treated animals and as such the eradication of the disease from the farm stock was not successful. It is seen, however, that of all the four drugs used Sodium Antimony Tartarate seems to be superior and is the drug of choice in the treatment of Nasal Schistosomiasis in cattle and buffaloes. The severe droughts during 1953-54 and 1954-55 leading to drying of the pond did not appear to affect the molluscan fauna of the area with particular reference to the distribution of known intermediaries of *S. nasalis* and this is probably why the high enzootic index of the disease at the Farm still continues.

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SEXUAL BEHAVIOUR OF MALES

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The term "Sexual Behaviour" in this context, consists of the mating desire (libido, Sex-drive) and the ability to copulate. Many confuse the term 'Potency' as ability to mount only; in fact it means ability to copulate normally and ejaculate viable spermatozoa. A bull may have mating desire and ability to mount but it may not ejaculate normal semen to effect fertilisation and vice versa, it may have normal spermatogenesis, but may exhibit complete lack of sex desire and vigour. In either case, it will be called an impotent bull. In fact, most observations indicate that mating behaviour and sperm production are independent of each other. Anderson¹ has noted that bulls of all grades of fertility exhibit great variation in their ability and desire to serve, and not uncommonly a completely sterile bull will be much keener and more capable of service than a highly fertile one.

Little is known of the sexual behaviour of males although much work has been done on the other phases of reproductive functions both in India and abroad. The subject is of considerable importance, for unless a male is keen and able to copulate promptly, delay and upset in the breeding programme arise. With the large-scale introduction of artificial breeding wherein regulated supply of semen has to be ensured to the insemination units, it all the more becomes necessary for every breeder to keep himself fully abreast of the various stages of sexual activity from normal copulation and ejaculation to complete lack of interest in the females, and the measures adopted for restoring the mating desire and ability to copulate.

The sexual behaviour of an adult male with a fully receptive female covers all the stages of sexual activity from normal copulation and ejaculation to complete lack of sexual interest in the females. The different types and degrees of sexual activity in males are:—

- (1) Normal copulation and ejaculations.
- (2) The bull mounts female, has complete erection and intromission but fails to ejaculate.
- (3) It mounts a female but fails to intromit.
- (4) It mounts but has no erection.
- (5) It fails to mount females; but licks vulval region and hind quarters.
- (6) It approaches the female and follows her when she moves and nothing beyond this,

- (7) It shows complete lack of interest in the female.

Sexual Perversities :—Various sexual perversities observed in bulls are :—

(1) *Inter-specific sexual interest* :—A bull at times develops sexual aversion for a cow when during the sexual pursuits, it is beaten away by another bull or by man or when the cow is not quite receptive. A casual attempt on a male buffalo who is temperamentally a sluggish animal, provides him an easy contact. This develops in the bull a sexual attraction for male buffaloes and subsequently it refuses to take notice of even cows in heat.

(2) *Homo-sexuality* :—Quite often, a bull while playing about jumps on another male and happens to chance an intromission in the rectum and ejaculation occurs. This leads to his sexual interest in the males of his own species.

(3) *Inter-specific hetero-sexual interest* :—This refers to a cow bull developing sexual interest in a she-buffaloe. An interesting observation was recorded in a Key Village centre in Berar where a Harijana bull used to run after she-buffaloes and cover them. He had lost all interest in cows whether in heat or not. In an attempt to collect semen in Artificial Vagina, the bull was so prompt in copulation that it was difficult to divert the penis into the Artificial Vagina.

Advantage of the phenomenon of sexual perversity in males is taken and bulls are trained to mount on males of the same breed, or on buffalo bulls and semen collected at will. At Artificial Insemination centres in Madhya Pradesh, bulls are usually trained to mount on buffalo bulls. This eliminates additional expenditure on maintenance of a cow or a she-buffaloe for serving sexual objects. In some of the western countries, even dummy cows are successfully employed for semen collection.

Sexual behaviour is influenced by (A) Internal and (B) External factors. The internal factors consist of (i) physiological (ii) psychological and (iii) physical conditions, and the external consists of (i) climate (ii) nutrition (iii) exercise and (iv) diseases.

A. Internal Factors

(i) *Physiological* :—A gland called 'pituitary gland' or 'hypophysis' located at the geometrical centre of the skull and weighing only about one gram (in human) secretes nearly 18 hormones of which one is the gonadotrophic hormone. This hormone is fractioned mainly into a Follicle stimulating hormone (F.S.H.) and a luteinising hormone (L.H.) According to Greep, Fevold and Hisaw² and Greep and Fevold³ the F.S.H. is concerned with spermatogenesis and L.H. with production

of sex-hormones in the testes. The sex hormones secreted in the testes are called male hormones, androgens, or testosterone and are responsible for the development and maintenance of masculinity and sex drive. For example, Boar's tusk, the bulls' heavy horn and hump, the stag's antlers, the ram's horns, the cock's comb, the moustache and beard in human beings, are all due to the effect of this hormone. The degree of masculinity as well as the psychic character of the individuals is influenced by this hormone. The Ox is a much more tractable animal than the bull whereas the eunuch besides having high pitched voice a small chest and beardless face is often lacking in courage and is obstinate, mentally lazy and prematurely senile because of want of the male hormones in them. Administration of testosterone acetate or propionate has been reported by many workers as a remedy for restoring sexual activity.

(ii) *Psychological* :—Once reproductive power has been attained, psychological factors, in the absence of testicular secretions, are apparently fairly successful in permitting mating, for a time at least. Psychological factors play considerably in stimulating and maintaining sex drive in animals. Various psychological behaviour of bulls observed at the Artificial Insemination Centres and Key Villages in Madhya Pradesh and those reported by other workers are enumerated below :—

(a) Sexual objects (b) Sexual jealousy (c) Sex-phobia (b) Sex surroundings and (e) Absence of sex experience.

(a) *Sexual Objects* :—A sexual object is a female or a dummy or any other object to which the male is led for service or semen collections. Size, colour, temperament and condition of heat of the sexual objects are observed to have influenced the sexual interests of the males. At the Insemination Centre, Nagpur, it has been invariably noticed that the Sahiwal bulls take little interest in small and stunted cows although in full heat; but an oestrous cow of any breed nearing the height of a Sahiwal cow causes spontaneous erection in them. An interesting observation of colour sex psychology was shown by the Sahiwal bull, Suraj. At the initial stage of its training for ejaculation in the Artificial Vagina with a Sahiwal cow as the sexual object, it gave collections first on oestrous animal and subsequently on non-oestrous ones of the same breed. An attempt was made to make collections of the bull on a white calm and quite Gaolao cow of the same height as that of the Sahiwal, but Suraj did not take notice of the animal. When a small heifer, Gir-crossed, aged only 1½ years and red in colour was put in the crate, it made a spontaneous jump and gave full ejaculation in the artificial vagina. Calm and quite temperament of sexual objects at the time of mating or collection considerably enhances the sexual interest of the males and services or collections are often successful. It is very

important to note that at the initial stage of sexual performance, calm, quiet and oestrous cows must be provided to the bulls or else they may lose sexual interest and subsequently may not take notice of even the quiet and oestrous animals. A stage of oestrous or the heat of sexual objects is known to have varying influences on the males. In the rabbit Macirone and Walton¹ have found that completion of the sexual pattern depends on two supplementary factors (i) the sexual drive shown by the males and (ii) the suitability of the sexual objects. A strong male requires only the minimum of suitability of the sexual objects to produce ejaculations while a weak male may require maximum suitability (*i.e.* oestrous doe). The essential factor with a strong male is the sexual drive, which when a suitable object is provided, finds its expressions in a complete sexual pattern. But it must be noted that a weak male is not merely inhibited by lack of suitability of the sexual objects, but will, in many cases, not attempt to mount the dummy. With an oestrous doe, however, it will immediately show considerable activity and ultimately mate, indicating that some characteristics of the normal female apparently stimulate the male to increased sexual activity.

(b) *Sexual jealousy*:—Fight between the bulls during the chase of the cow in heat is a common feature, and at times, such a great rivalry develops in them that they become enemies of each other forever. If perchance, they are let loose anytime, a severe fight ensues between them. During collection of semen, if the bull takes time in mounting over the sexual objects, he is invariably stimulated to the spontaneous sexual activity, with the appearance of another bull nearer to him. This happens due to fear of opportunity being taken over by his fellow-bull.

(c) *Sex-Phobia*:—It has been observed in the Key Village Centres that bulls of improved breeds like Sahiwal, Sindhi Tharparkar etc. find themselves surrounded by local scrub bulls during their company with cows in heat and are invariably beaten off by them to absolute corners. On repeated occurrences of such instances, they develop a fear of being beaten during their association with cows in heat and in spite of confining the pair into closed quarters free from entrance of the scrub rivals, the bull takes no notice of a cow. This is due to sex phobia developed in them. During collection of semen in the artificial vagina, if the bull happens to receive an injury due to wrong manipulation of the penis into artificial vagina or any other mishandling, he subsequently runs away from the scene of collections.

(c) *Sex surroundings*:—A bull often remembers favourable or unfavourable sex surroundings and when placed in an environment where he has received any setback in his sexual pursuit, he often declines a service or a collection. It was once noticed at Izatnagar that

a ram refused collection over an ewe; but when he was left in a flock of sheep, he easily picked up one of his choice and gave collections. A bull, trained for artificial ejaculations at one centre, was when transferred to another he declined collections for a few days. Many a time, collections could not be made from regular grown up bulls in the surroundings crowded by visitors. Milovanov² cites experiments of Nagaev on rams, confirmed by McKenzie and Berliner³ which show that the training of the males may interfere with his normal mating action and even inhibit it (conditioned reflex block). A ram was led for several days to an ewe in heat, but separated from her by a gate so that he could not reach her; after a time, even when the gate was removed he did not attempt to reach her. Males get sexually excited when led towards the place where they are accustomed to have service. An interesting instance was observed at Izatnagar when a Kumauoni hill bull, trained in artificial breeding, was accidentally let off; it ran to the service crate where a laboratory assistant was doing some repair work and made an instantaneous jump, fortunately without an injury to the man.

(e) *Absence of sex experience*:—Quite often, it has been observed in the farm-bred bulls that they, being separate from the females till their puberty, show no sex desire when first put to service; probably because they are ignorant of what is expected of them. This observation confirms that of Lagerlof⁴ Roux and Hoffman⁵ that at the beginning of the mating season certain rams will not mate when controlled service is practised. Thus this condition is considered to be psychological rather than physiological and may be remedied by leaving the ram alone with oestrous ewe for a few hours or over night.

(3) *Physical conditions*:—Over-exertion or inability to mount or pain felt every time the bull mounts a cow, may cause absence of, or diminished sexual desire. Mating ability or capacity to copulate is affected by over work or inervative food. With lack of exercise and due to rich bulky food, the bull may go fat, heavy and clumsy or big bellied, whereby the markedly pendant or pot "belly" acts as a mechanical obstruction and causes the penis to be directed too low. Morbid changes in the skeleton, joints, muscles, sinews, hooves or peritonium may cause pain when the bull mounts, thus impeding or preventing the act.

B *External factors*:—As already stated, external factors influencing sex behaviour of animals comprise of (i) climate (ii) nutrition (iii) exercise and (iv) disease.

(i) *Climate*:—This consists of temperature, humidity, light and the combination of all these causing seasonal influence on reproduction.

(a) *Temperature*:—Mackenzie and Berliner¹ in their study of "libido" in Sharpshead and Hampshire rams observed that there was no season during the year when the rams showed no mating desire unlike the ewes during the anoestrous period. Their observations, in fact, suggest that breeding desire does not change markedly throughout the year but during February, March and April, the rams apparently do not complete copulation as readily as at other times. During these months erection of penis seemed lacking or imperfect, resulting in failure of intromission. A period of increased mating ability and desire occurs from September to December. Shukla and Bhattacharya⁹ also did not find any significant seasonal trend in the reaction time of sheep and goats; they¹⁰, however, reported the reaction time to be lowest in summer in goats. Temperature is, thus not known to affect breeding activity in a general way.

(b) *Light*:—It has been abundantly demonstrated in recent years that seasonal reproduction is conditioned to a greater or lesser extent by the duration, intensity and wave length of illumination, [Bissonnette^{11 & 12}, Marshall¹³]. This is attributable to action of light in stimulating the secretion of gonadotrophic hormones by the pituitary glands. Keeping animals in darkness retards but does not exclude the onset of rutting. Many animals that hibernate in darkness emerged in active breeding conditions, and some animal had not responded to light treatment.

(c) *Humidity*:—Little is known on humidity as an independent factor in influencing the sexual behaviour but a combination of heat and humidity with sultry weather brings a physiological imbalance with respiratory difficulty resulting in lowered sexual activity.

(i) *Nutrition*:—Proteins, vitamins and minerals are known to have considerable influence on semen production; but very little information is available on the effect of diet on mating behaviour of animals. It has, however, been commonly observed that with bulky food the bull grows fat, heavy and clumsy or big bellied and becomes dull at service. At Telankheri Insemination Centre, the Sahiwal bull, Bhim is a typical example of this phenomenon. Whenever, it has a tendency to grow bulky under the same dietary plane as that of other bulls, and develops sexual lethargy, reduction of concentrates revives its sexual vigour. Phillips¹⁴ *et al* at the University of Wisconsin has reported marked improvement in slow breeding and low potency bulls to the injection of vitamin C.

(iii) *Exercise*:—A regular daily exercise reduces bulkiness and makes the bull active for service.

(iv) *Disease*:—Williams and others stated that an acute infection of testes and seminal vesicles may cause pain on service and hence incapacity to mount but this is not always the case; Lagerlof⁷, Anderson¹. Various degrees of semi-erection and protrusion of the penis and torsion of the penis have been seen in the bull, causing incapacity to mount, Anderson¹. According to Richter¹⁶ Preputial, Catarrh due to trichomoniasis etc., prevents service; frequently the bull is keen to serve but because of pain cannot perform coitus. Chronic Preputial Catarrh causing thickening of the prepuce may restrict protrusion of the penis. Contraction of the retractor penis muscle has a similar effect; Gotze¹⁷.

Summary

(1) Potency is defined as ability to (a) copulate normal and (b) ejaculate viable spermatazoa; and impotency as lack of either or both.

(2) Mating behaviour and sperm production are independent of each other.

(3) Sexual perversity in males is described.

(4) Sexual behaviour is influenced by (a) internal factors *viz.* physiological, psychological and physical condition of the males (b) External factors *viz.* climate, nutrition, exercise and disease.

(5) Observations made of the influence of the various phases on the sexual behaviour of the males in India and abroad are briefly reviewed.

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USE OF ANTI-BIOTICS IN THE PREVENTION AND TREATMENT OF SCOURS IN BUFFALO CALVES

By

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Calves suffer from several diseases, but a very common one, and the one that can cause heavy mortality is scours. They may suffer from it at any time upto the age of three months or so but the disease is mostly encountered during the first month.

Symptoms :—The disease usually begins as a common indigestion, which may develop and culminate into infective scours. The calf shows a rise of temperature and the extremities are cold. It will look listless and may stand with arched back or may even prefer a recumbent position. There may be lachrymation and sour odour of the mouth. Efforts to make the calf stand up may be accompanied by a painful grunt. Bowels may first be inactive and stools hard but soon transform into foul smelling diarrhoea. When this condition sets in rapid dehydration takes place and there is a corresponding loss of stamina. The disease usually runs a course of 6 to 10 days but the first 2 or 3 days are vital as death rate during this period is usually high.

Preventive measures :—These commence not with the calf but before it is born. Birth of calves with a weak constitution should be prevented and this can be done by special care and nourishment of the dam 8 to 10 weeks before calving. An adequate and even a liberal supply of a balanced diet should be given which will go a long way to building up strong constitution of the calf. Proper supplement of minerals is also essential. It is also important to remember that the 'steaming up' during the last 2 months of pregnancy not only helps the foetus but also gives a good start to the lactation if the condition of the dam at the time of calving is good. Having got the animal into the correct state of calving, a clean well bedded and warm calving box, antiseptic treatment of the umbilical cord and use of colostrum by the calf are very important and make all the difference between a good start and a bad start in the life of the calf.

It is claimed by distinguished workers like Prof. Beanflower that calves do not suffer from scours because they are deprived of colostrum but because they have an access to dirt which they pick up so easily. Allowing calves to suckle without proper washing of the teats and allowing them to suck at each other help to pick up infection. Unclean milk utensils are a potent source of infection and digestive disorders.

Housing of calves has also considerable bearing on the incidence of scours and other diseases, particularly when they are very young. It is observed that if young calves are housed with older ones the former are at a great disadvantage. Wherever possible, small individual pens may be aimed at. These should have a raised or false floor of expanded metal, about 9" off the ground so that the calf does not have any chance of picking up infectious material.

Treatment.—Even after taking the above precautions it is likely that the disease may appear. Spotting out the ailing calves at the earliest possible stage is very important. It will prevent the disease to gain an upper hand. Such cases may often respond to giving a teaspoonful of sodium-bicarbonate in a little warm water. Affected cases should also be segregated and the calf pen should be properly disinfected under supervision.

At the Aarey Milk Colony a number of drugs has been tried for treatment of calf scours under identical conditions (mostly with buffalo calves) with varying results. The table below gives the particulars of the number of cases treated and results obtained :—

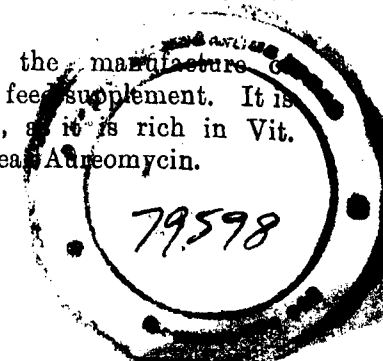
Treatment of scours in buffalo-calves with antibiotics.

Name of drug.	Average dose per calf per day.	Duration of treatment (Days)	No. of cases treated.	No. of cases cured.	Percentage of cured cases.
Terryamycin sol. powder.	6 dra.	4	13	5	38.5
Terramycin tablets	1 gm/day	4	6	2	33.2
Dihydro Streptomycin	1 gm. per day by mouth	4	24	18	75
Aureomycin tinted soluble	400 mgs. of Aureomycin	4	86	76	88.4
Aurofac	4 ozs. (450 mgs. of Aureomycin)	4	611	490	80.1

The number of cases treated with Aureomycin Tinted soluble and Aurofac is much larger because the initial trials indicated the superiority of these drugs over the others. Aurofac is now used as a choice drug for treatment of calf scours as best results are obtained from it.

Aurofac is a by-product obtained in the manufacture of Aureomycin and is used also as an antibiotic feed supplement. It is claimed to have growth stimulating properties, as it is rich in Vit. B₁₂. A pound of Aurofac contains 1.8 gms. of clear Aureomycin.

JL
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N56-33-3



Whereas as a curative a 4 oz. daily dose of Aurofac is to be given for 4 days, in doses of two ounces per calf per day during the first three weeks after birth, it acts as a further sure preventive for scours.

The Cost:—An ounce of Aurofac costs 5 annas and if it is given at the rate of 2 ozs. for the first 20 days, the cost would be Rs. 12-8-0. This cost, is nothing compared to the gain achieved in saving the life of the calf at least so far as scours are concerned.

Summary

(1) In order to prevent losses among calves efforts need be directed to get calves with strong constitution through adequate feeding of dams with a balanced ration, about 8 to 10 weeks before calving.

(2) Hygienic conditions at the time of calving should be paid special attention to, with a view to warding off possible infection of calves. Feeding pails need to be watched very carefully.

(3) Proper regulation of the feed according to the needs and condition of the calves is very important. Over feeding should be avoided at all cost.

(4) Indisposed calves should be watched closely and the treatment should be undertaken at the earliest stage possible.

(5) Use of 2 ozs. of Aurofac for the first 20 days costing Rs. 12-8-0 prevents the occurrence of scours very considerably and its use is recommended.

(6) As a curative, a 4 oz. dose of Aurofac proved superior to other drugs tried at the Aarey Milk Colony.

BLOOD IN MILK

By

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It is not uncommon for Veterinarians to come across cases of cows and buffaloes giving bloody milk. The condition is especially important when there is no clinical mastitis. In the absence of clinical symptoms in the udder one finds it rather difficult to adopt any specific line of treatment. Feeding on some plant of the Ranunculaceae group is sometimes said to give rise to such a condition (Case, 1951). Capillary haemorrhage is also considered as a probable cause. Dykstra (1951) from

his experience states that Thromboplastin is effective when there is reason to suspect a ruptured vessel in the udder as the probable cause. In cases where there is no reason to suspect capillary haemorrhage or in the absence of any infection he uses only Penicillin therapy since he states that some benefit is derived by adopting Penicillin therapy over a period of several days. The present article deals with three cases which were followed clinically as well as bacteriologically. In none of these cases was there evidence of clinical mastitis.

Case 1.—On 14-1-55 blood-tinged milk was noticed from the left fore quarter. As judged by physical examination there was no evidence of any kind of inflammation. The character of the milk was unchanged and there was nothing wrong with the milk to the naked eye except for the presence of blood.

Bacteriological examination:—About 5 c.cs. of the milk were obtained from the quarter in a sterile test tube. A loopful of the material was inoculated on 5% horse-blood-agar plate and the plate incubated at 37°C. Presence of blood was confirmed by making a cover slip preparation and examining under the microscope. Plenty of red blood cells were present. The same sample was incubated for about 20 hours and loopful again streaked on blood agar plate. Both the plates were examined after 24 and 48 hours but no pathogens were isolated. On 22-1-55 another sample showing blood was received in a sterile test tube. Clinical mastitis was not present even at this stage. This sample was kept at room temperature for about 24 hours and a loopful from this was plated on blood-agar plate. After 24 hour incubation small, circular, colourless colonies, surrounded by a clear zone of haemolysis were noted. The colonies were those of a haemolytic Streptococcus. Further tests on this organism were not undertaken. Penicillin was injected into the gland. The condition returned to normal.

Case 2. She-buffaloe.—A sample of milk tinged with blood was received. A loopful was inoculated on blood-agar plate and the plate incubated at 37°C. The plate was examined after 24 and 48 hours but no pathogens were isolated. The blood was present in secretions from all quarters. The quarters were normal when examined physically and there was no evidence of mastitis. The presence of blood was confirmed by microscopic examination. Again a second sample was obtained aseptically and subjected to cultural tests. No pathogens were isolated. This animal did not receive any treatment and after 3 to 4 days was reported to give normal milk.

Case 3. She-buffalo.—About 10 c. cs. of sample were received which showed a distinct tinge of blood. Only one quarter was affected. There was no evidence of clinical mastitis. A loopful of the sample was

streaked on blood-agar plate. After incubating the sample for about 20 hours it was again subjected to cultural tests by inoculating a loopful on a blood-agar plate. The plates were examined after 24 and 48 hours but there were only contaminants and no pathogens. This animal however was given penicillin into the gland and the secretion returned to normal.

From the study of the above cases it is evident that there is no specific cause that would give rise to this condition. A definite conclusion can only be reached after the study of a number of cases. Case 1 revealed a haemolytic streptococcus and the secretion returned to normal after the use of penicillin. Cases 2 and 3 did not yield any pathogenic organisms. Penicillin no doubt was administered to case 3 but it is doubtful what effect could this drug produce when no bacterium was present as the causal agent.

ACKNOWLEDGMENTS

I am extremely grateful to Dr. M. Habib Khan, Principal, for his encouragement and guidance. My thanks are also due to Dr. B. S. P. Rao, D. V. O. Veterinary Hospital, Himayathnagar, for the clinical follow-up of case 1, and to Dr. C. Venkateswara Rao, Lecturer of our College for the material and clinical follow-up of case 3.

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AN OUTBREAK OF PNEUMONIA IN MONKEYS

By

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Lot of work has been done on pneumonia, broncho-pneumonia and influenzal pneumonia in human beings and the organisms responsible for such infections. Lobar pneumonia as it occurs in man is seldom seen in animals and when it occurs it is invariably the result of bacterial infection. Most studies have been done regarding the relation of the carrier rate and prevalence of pneumonia and is well illustrated in the survey of outbreaks of pneumonia in human beings by Simillie Jewetts and Dayer 1941 and 1942. Pneumococci occasionally have been isolated from the upper respiratory tracts of apparently healthy guinea pigs, rabbits, horses, calves, dogs and monkeys (Finland 1942). Lobar pneumonia has been produced in dogs and monkeys artificially. As far as monkeys are concerned in a group of normal monkeys, cultures made from throat swabs shortly after they were received from a dealer (Seegal

et al 1936) found many strains of human pathogens of pneumococcus. In one epidemic of pneumonia among monkeys type II strain was isolated from all the infected and contact animals. (Wisner 1928).

It appears that one rarely comes across an epidemic of pneumonia in animals purely due to pneumococcal infection. In the present paper an outbreak of pneumonia in monkeys is described and the cause investigated by isolating a pathogenic strain of pneumonococcus.

During the month of March 1952 a consignment of monkeys was shipped from Calcutta to U.S.A. Enroute a few of the monkeys died and a few were sick. The ship called at Bombay which provided an opportunity to investigate into the cause of the disease.

Carcases of 13 monkeys were received for post-mortem examinations. 4 of them were reported to have died only a short while ago. Post-mortems were conducted on all the animals. Post-mortem examinations and histopathological examinations of the material revealed the following:—

Heart:—Showed acute congestion and myocardial haemorrhages.

Liver:—Showed congestion of blood vessels and sinusoids and the granular degeneration of parenchymatous cells. The sinusoids were dilated.

Spleen:—Normal.

Kidney:—Showed acute congestion and cloudy swelling of Pr. convoluted tubes.

Large intestines:—The mesenteric vessels were congested and otherwise normal.

Lungs:—11 sections were made from the lungs and all showed various stages of Lobar pneumonia.

Red hepatization was characterised by "Congestion of the alveolar vessels, fibrinous exudate in the alveoli and a moderate migration of polymorphs in it.

Grey hepatization was characterised by congestion of all the vessels, except of the alveolar walls, which were on the other hand collapsed. The air sacs were packed with polymorphs. There were bacterial emboli in the vessels.

Resolution was seen in one section, where the exudate had contracted from the walls, vessels were congested and the monocytes were diminishing from the cellular exudate. Besides emphysema was also noticed. Stained by Gram's method sections showed presence of diplococci.

After conducting the postmortem on each animal, cultures were made from the heart blood in every case and smears were taken from the lungs and other organs. Separate lung materials from the four just dead monkeys were injected separately into rabbits, guinea pigs subcutaneously, and intraperitoneally into Swiss mice.

Pure cultures were isolated from the heart blood of all the monkeys. Similarly each injected lung material into laboratory animals proved pathogenic to rabbits, guinea pigs and Swiss mice as each kind of animal died after six days, five days and one day respectively and pure cultures were obtained from the heart blood of each animal.

All the cultures were further studied and yielded the following results.

Morphology.—Gram positive diplococci and some in chains.

On agar plate.—Small delicate circular, discrete, semi transparent dew drop like colonies.

On blood agar.—The colonies were smooth, slightly raised and produced greenish colouration as the viridans type of streptococcus.

In broth.—It formed uniform turbidity and later granular deposit.

Biochemical Reactions.—Fermented Dextrose, Lactose, Saccharose and Inulin.

Bile Solubility.—10% solution of sodium taurocholate added to actively growing broth cultures dissolved the organisms and the broth could be seen clear after 20 hours.

Pathogenicity Tests.—Proved pathogenic to rabbits, guinea pigs and Swiss mice.

The original smears from the lungs and other organs and the smears from the lungs of experimented animals revealed the typical pneumococcus of the following morphology:—Gram positive, lanceolate or oval, in pairs, with rounded ends together, showing thick capsule, and of 0.8 to 1 micron, in log diameter.

The above studies of smears cultures and biological tests definitely revealed that the cause of deaths amongst monkeys on the ship was a pathogenic strain of pneumococcus. The typing of the strain however could not be carried out for want of specific type sera.

Treatment.—Some of the sick monkeys were treated with Penicillin and Sulpha drugs. The exact details of the results of the treatment could not be obtained as the ship left Bombay Port. However it was reported that the treatment was quite good.

Summary

It was a rare opportunity to investigate an outbreak of Pneumonia in Monkeys. Histopathological examinations of the sections of the lungs revealed various stages of Lobar Pneumonia.

The microscopical, cultural and biological studies were carried out for confirmation of the disease.

The writer is grateful to Shri S. R. Chadha, B.Sc., M.R.C.V.S., Director of Veterinary Services, Bombay State, Poona, for his useful suggestions during the investigation and to late Prof. K. R. S. Aiyar for carrying out the histopathological examinations of the material.

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Clinical Articles

REPAIR OF CENTRAL ACETABULAR FRACTURE BY BONE PINNING IN AN ALSATION DOG

BY

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Introduction.—In recent years bone pinning has gained considerable popularity in small animal practice. Much reference has been made by various foreign authors regarding the fracture treatment by bone pinning but in India the implementation of this work is very much limited. In this article the uneventful recovery of a case of central acetabular fracture by means of bone pinning with Clouston Walker's Human mandible splint is described.

History.—A two year old Alsation Dog sustained injury of the pelvis due to a motor accident. On rectal examination it was suspected to be a case of central acetabular fracture which was confirmed by X-Ray. (Fig 1).

Preparation of the patient and site:—The patient was starved for 24 hours. A saline purgative was given the previous day and a high soft soap enema a few hours prior to operation. The entire croup and the affected thigh were shaved, washed with hot water and soap and dabbed with Acriflavin in spirit.

Technique of operation:—Under nembutal anaesthesia after the usual surgical toilets, the patient was draped with sterile sheets leaving a window at the tuber ischii and the right hip. Two pins were kept convergently at the tuber ischii keeping the left middle finger into the rectum as a guide and the two pins were introduced convergently into the corresponding femur at the upper third. The head of the femur was pulled down, the broken fragments of the acetabulum were pressed and approximated with the left middle finger passed through the rectum and the pins were connected with the connecting rods and screwed. The pin assembly was fixed in such a way that the head of the femur did not play over the acetabulum and the hip joint was immobilised.

After care and treatment.—The movements of the animal were completely restricted and procain penicillin at the rate of 4 lacs units a day intramuscularly was injected for 7 days. After 21 days the pins were removed. There was slight lameness of the affected leg which disappeared after a few days.

Discussion.—It is interesting to note that though no direct attempt for immobilising the broken fragment of the acetabulum was made, yet, by immobilising the hip joint completely and restricting the gliding actions of the head of the femur over the acetabulum by external transfixation of pin assembly the central acetabular fracture could be repaired effectively.

Summary

The uneventful recovery of a case of central acetabular fracture is described.

ECTOPIC PREGNANCY IN A GOAT

By

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D'Ozsa (1950) described a case of abdominal pregnancy in a cat. Two weeks after apparently normal parturition in this animal, laparotomy was performed and three dead foetuses in the abdominal cavity were recovered.

Repair of Central Acetabular Fracture by Bone Pinning in an Alsation Dog.

By
G. B. Singh and M. M. Rao.

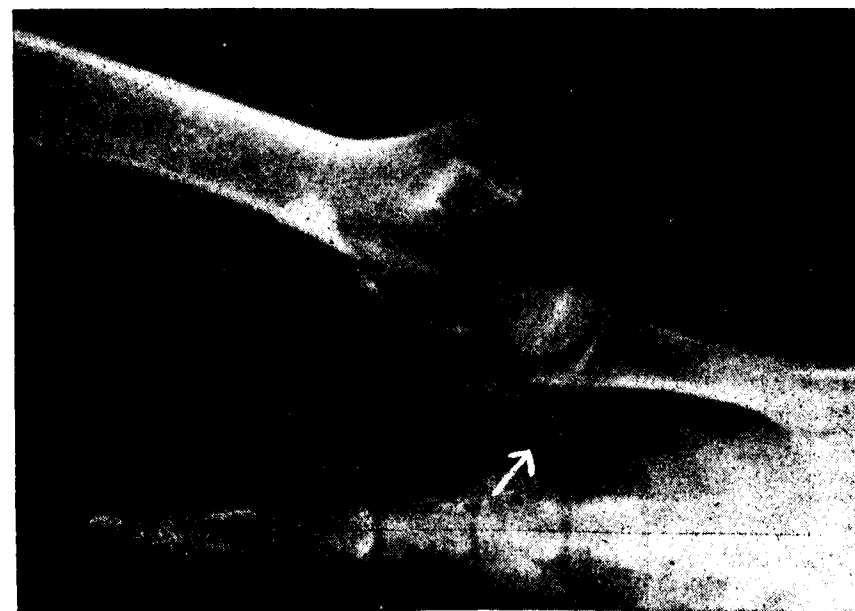


Fig. 1

The Central Acetabular fracture shown by the arrow mark.



Fig. 2

The external transfixation of Clouston Walker's human mandible splint.

Repair of Central Acetabular Fracture by Bone Pinning in an Alsatian dog

By
G. B. Singh and M. M. Rao.



Fig. 3
Acetabulum after repair of the fracture. (Repair indicated at the arrow mark)

Ectopic Pregnancy in a Goat

By
S. P. Kaduskar.



Fig. 1



Fig. 2

[To face page 233]

Schotthaver and Wakim (1955) have recorded a case of ectopic pregnancy in a bitch in America at the Mayo Foundation Institute of Experimental Medicine, where large colonies of mice, rats, guinea-pigs and other laboratory animals are maintained. They have observed ectopic pregnancy in only one animal during a period of more than thirty years. It is a clear evidence of the rare incidence of this condition in smaller species of mammals.

Ayyar (1944) observed in India a case of ectopic pregnancy in a goat. In this case, a mummified foetus was found in the peritoneal sac; in his opinion peritonitis did not cause death in this animal as the foetus was completely walled off.

Rovere, as quoted by Flemings (1918), attended a case of ectopic pregnancy in a cow. The author removed a living calf through an incision in the wall of the vagina.

Fellow, as cited by William (1943), observed a case of abdominal pregnancy in a mare, in which a living foal was removed by laparotomy. The mare, however, died immediately.

A few cases of ectopic pregnancies in women have been recorded. The first recorded case of ectopic gestation was described by Zahwari as quoted by Masani (1954). Patten (1946) and Swyar (1954) estimated that approximately one pregnancy in 300 occurs in an abnormal location in human beings, whereas Ivring, as quoted by Patten (1946), is inclined to believe that in general practice the ratio should be about 1 to 500. The medical literature reports are available about a few authentic cases of abdominal pregnancies in which embryo developed to several months gestation before causing death of the mother by placental perforation of viscera or by intra abdominal haemorrhage incident to trophoblastic invasion. There are also occasional cases on record of abdominal pregnancies in which viable foetus was recovered by laparotomy (Patten 1946).

'Ectopic pregnancy' is actually a deviation from normal gestation *i.e.* the attachment and growth of an embryo in any location other than the uterus. The precise nature and cause of ectopic pregnancy in animals as well as in human-beings have not been definitely ascertained so far. It is, of course, surprising as well as interesting too, to know the manner in which embryo, sometimes, becomes implanted abnormally.

In December, 1952, during routine inspection of slaughter house animals at Boriapura Nagpur, the author came across a local goat having a firm mass of tissue in the abdomen. The goat was slaughtered and post-mortem examination revealed a mummified foetus encased in

peritoneal membranes. The foetus was not developed fully. It was situated on the right side in the duodenal mesentric folds and was attached to the intestines. Considerable amount of fat-deposits was seen between the foetal membranes. The pregnancy was diagnosed as 'ectopic'. The uterus appeared to be normal. The age of the foetus may, approximately, be 3 to 4 months, and was a male one. Right ovary had two corpora lutea.

The foetus was photographed and taken to the laboratory for further investigation. Photographs are presented at Figs. 1 & 2. This specimen, with its natural attachments to the intestines, has been preserved and kept at the Central Veterinary Laboratory, Museum, Nagpur, as one of special interest.

Ectopic pregnancy may occur as (1) Ovarian (2) Tubal (3) Abdominal or peritonal (Patten, 1946).

(1) *Ovarian*.—A follicle may, sometimes, rupture without the ovum being liberated from cumulus oophorum. The sperm may be able to enter the follicle at the point of rupture and fertilize the ovum, while it is actually within the ovary.

(2) *Tubal*.—The fertilized ovum takes about $3\frac{1}{2}$ days to travel down the oviduct to the uterus. Its passage is at times impeded. The ovum starts developing in the oviduct.

(3) *Abdominal*.—Abdominal pregnancy may result when an ovum fails to be picked up by the fimbria of the oviduct and thus remains free in the abdominal cavity. It may then be fertilized by sperm and implant itself on the viscera.

The length of time during which these ectopic foetuses may be retained varies according to circumstances. It will be interesting to note that in women, it is said to have remained in abdomen from 3 months to 56 years without apparently causing much inconvenience to the mother (Craig-1937). In animals the retention of misplaced foetus may also continue for a long time.

Incidence of ectopic pregnancy in farm animals in India is not known. As already mentioned before, there is only one such recorded case in a goat by Ayyar (1944). An attempt is made to present one more observation in goats.

In conclusion I would request my professional brothers to put on record such cases of rare occurrences, in order to throw more light on the subject.

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SULPHAMEZATHINE IN HAEMORRHAGIC SEPTICAEMIA IN CATTLE

BY

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Haemorrhagic Septicaemia is one of the most important contagious diseases of cattle which causes heavy loss of animals every year. The disease is particularly prevalent in buffalo cows. There is no need for us in going into its etiology, as every professional man is conversant with it. The disease is generally found to occur during the rainy season and in the beginning of it. The rate of mortality is very high and varies from 75 to 100%.

During an outbreak of H. S. in Bahal, Mandi in July—August, 1956, an owner brought one buffalo cow and heifer to the Veterinary Hospital Mandi for treatment. Three buffaloes of the same man had died during the previous week due to this disease. The symptoms were swelling in the sub-maxillary space, difficult breathing, dribbling of saliva, protruding of the tip of the tongue, temperature 106°F and off feed. The tongue was swollen. It was a clear clinical case of H. S. supported by the history of three previous deaths. The blood was examined microscopically and numerous bipolar organisms were detected.

The buffalo cow was injected with 70 c.cs. of Sulphamezathine, 33½% (I. C. I.) sod. solution subcutaneously, half the quantity on each side of shoulder. The heifer was given 35 c.cs. No other medicines were given. Next day the animals were found to be better and they were breathing alright. The temperature of buffalo/cow was found to be 103°F. She was given 35 c.cs. of the Sulphamezathine and similarly the heifer was given half the dose *i.e.* 17 c.cs.

On the third day the animals were found to be much better and began to eat. They were given injections of Sulphamezathine, half the dose as on the 2nd day. Next day the animals were found to be perfectly alright and the owner was advised to take them back home.

Another buffalo belonging to a woman was brought to Veterinary Hospital, Mandi, with typical symptoms of H. S. It was also treated with Sulphamezathine (33½%) sod. solution (I. C. I.) and was cured.

From this we have come to the conclusion that Sulphamezathine sod. solution 33½% of I. C. I. is more or less a specific drug in the treatment of H. S. in cattle and buffaloes.

Our thanks are due to the staff of Veterinary Hospital, Mandi, for the help rendered to us.

'SULPHAMEZATHINE' AS A SINGLE INJECTION CURE IN RINDERPEST

By

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On 6-4-1956 evening the Estate manager, Shri. Ganpule of Shree Changdeo Sugar Mills Ltd., Puntamba taluka Kopargaon reported to me by an express letter that there is a peculiar disease of a contagious nature noticed in the working bullocks of his Sugar Mills and that I should visit the estate immediately and help him in the matter of diagnosis and preventive measures. Accordingly I visited the Sugar Mills immediately on the morning of 7-4-1956 and after a thorough examination of the clinical picture exhibited by 13 affected cases I diagnosed the infection as one of Rinderpest, explained all the aspects of the disease to the Sugar Mills authorities, advised isolation and disinfection and treated the affected cases by mouthwash, internal antiseptics and astringents and by feeding with gruel and milk.

The outbreak started on 4-4-1956 and within a short period of three days, there were in all 16 attacks, out of which three died and

thirteen were observed as clinical sufferers on 7-4-56 of which one bullock was so serious that he could not even swallow the mixtures or gruels which were administered. He was lying prostrate with heavy ulceration of the mouth, watery motions, throbbing pulse and hurried respirations and there were little hopes of his recovery.

Realising the virulence of outbreak and severity of symptoms in the rest of 12 affected cases and knowing the importance of Sulphamezathine therapy in Rinderpest, a combined parenteral and oral line of treatment of Sulphamezathine was advised to the Sugar Mills authorities. They immediately made arrangements to secure both the Sulphamezathine solution and tablets from taluka head-quarters of Kopargaon but unfortunately no tablets were available. It was again impossible for me to camp regularly at the scene of outbreak for three days or to pay repeated visits for three days in order to give the maintenance dose of Sulphamezathine at half the initial dose on the second day and third day of treatment as advised by the Imperial Chemical Industries, India Ltd. Circumstantially. I resolved to give a single injection treatment of Sulphamezathine sodium solution 33½% to all the affected cases (11 bullocks and 1 buffalo heifer). Accordingly a massive dose of 100 c.cs. to each case was given subcutaneously behind the shoulder blade taking all antiseptic precautions and except for mouth wash with lotio alum and feeding with rice or jowar kanjee both morning and evening for about 3 to 5 days which was advised by me, no other medicines were administered from second day onwards.

The outbreak was further controlled with the help of Stockman Puntamba by vaccinating 710 heads of cattle with goat blood virus received from the Principal, Bombay Veterinary College, Parel, Bombay. When the estate was visited for the second time by me on 25-4-56 to study the reaction in vaccinated animals and the position of outbreak it was a source of great pleasure for me to learn from the estate manager of the factory that all the 12 cases injected with Sulphamezathine sodium on 7-4-56 made an uneventful and speedy recovery within 3 to 5 days only and are giving regular services with normal bowels, appetite and health.

Conclusion

"Sulphamezathine" which is proved to be very successful when given both parenterally and orally in Rinderpest, has proved equally successful even when given by a single injection method of giving subcutaneously a massive initial dose of 100 c.cs. for an adult animal of average size and body weight. The success of treatment works out cent percent.

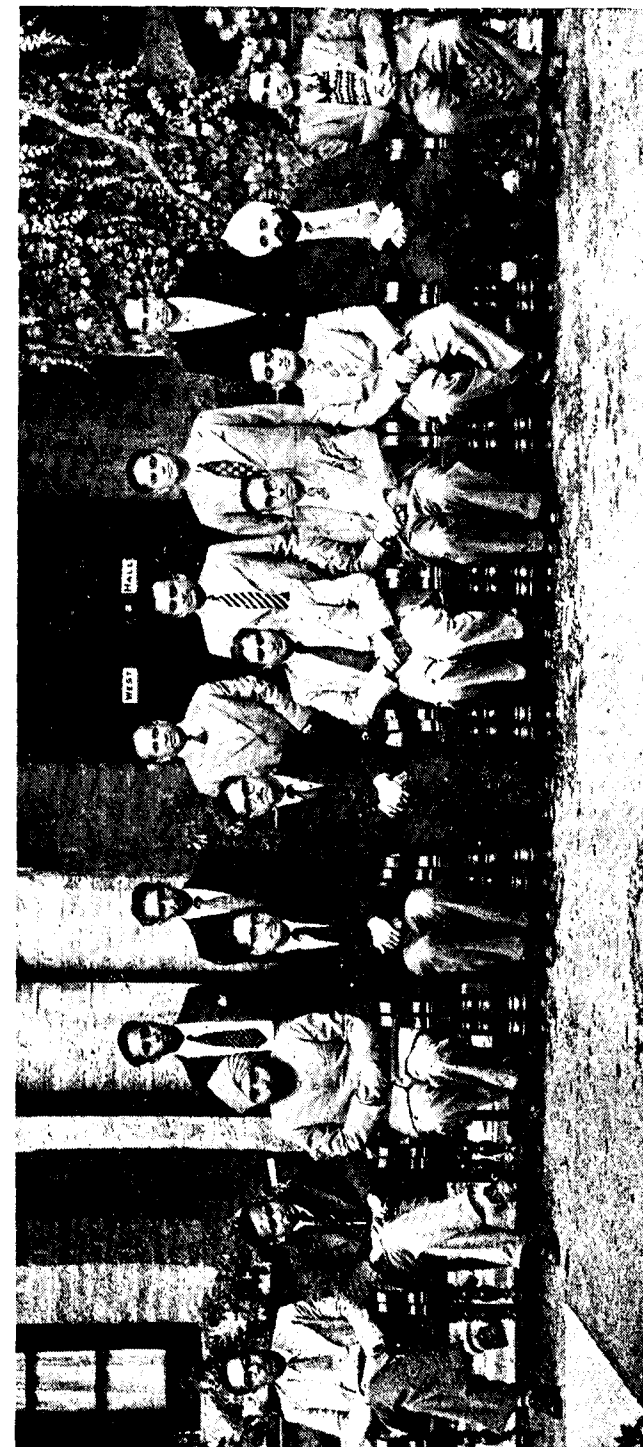
The details of the cases treated, with the results of treatment are as follow.

Case No.	Breed and age	Clinical Symptoms	Dose of S. Solution given	
1	Country breed aged about 7 years.	Temp. 105°F, heavy ulceration of the buccal m.m. and shooting diarrhoea.	100 c.cs.	Diarrhoea stopped in 24 hours feeding ruminating on the 3rd day.
2	Country breed aged about 10 years.	Temp. 104°F Dysentery with straining and extreme weakness.	100 c.cs.	Dysentery stopped in 24 hours, feeding & ruminating on the 4th day.
3	Khillar bullock aged about 5 years.	Temp. 106'2°F watery motions.	100 c.cs.	Diarrhoea controlled on the 3rd day ruminating on 4th day.
4	Cross Khillar bull aged about 3 years.	Temp. 104'8°F dysentery with more of mucus and pieces of intestinal mucosa; straining hard with great weakness.	100 c.cs.	Dysentery stopped in 48 hours. Feeding on the 5th day.
5	Country breed bullock aged about 8 years.		"	
6	Country breed bullock aged about 12 years.		"	
7	Country breed bullock aged about 6 years.		"	
8	Country breed bullock aged about 4 years.	Temp. between 103 to 106°F.	"	Diarrhoea controlled on 2nd or 3rd day and all sufferers started feeding and ruminating on the 4th or 5th day of injection. Case No. 9 recovered without any diarrhoea symptoms.
9	Country breed bullock aged about 8 years.	Diarrhoea in all cases except in case No. 9 where constipation was noticed.	"	
10	Country breed bullock aged about 15 years.			
11	Country breed bullock aged about 7 years.			
12	Buffaloe heifer about 2 years.	Temp. 104'4 F. shivering, salivation and dysentery extreme weakness.	80 c.cs.	Dysentery controlled on the 5th day and ruminating on 8th day got very weak and emaciated despite recovery.

This single injection method of cure in Rinderpest is believed to be the practical method to be adopted by the Veterinary Officers in the field who have to attend to the outbreaks, impart first day treatment to the suffering patients and come back to their headquarters to look after their other manifold duties and responsibilities. Besides,

THE INDIAN VETERINARY RESEARCH INSTITUTE, MUKTESWAR

POST-GRADUATE COURSE IN THE TECHNIQUE OF MANUFACTURE OF BIOLOGICAL PRODUCTS — 1956.



Sitting :—Left to Right : Sarvasri S. Sen, Dr. S. S. Negi, Gajender Singh, P. R. Nilakantan, Dr. G. L. Sharma, M. R. Dhaoda, J. M. Lall, P. C. Gangulee (O/C Class), M. M. Sethi, B. M. Thakral.
Standing : Sarvasri G. K. Ghose (W. Bengal), V. S. Chaudhry (U.P.), M. M. Khan (Hyderabad), B. B. Ghose (W. Bengal), P. Panduranga Rao (Andhra), U. Rahman (Assam).



GANTI A. SASTRY, B.V.Sc., M.Sc.,
Andhra Veterinary College,
who took the M.Sc. degree of the
Madras University recently.



LATE A. JOHN, G.M.V.C.,
District Veterinary Officer,
Mahabubnagar, Hyderabad-Dn.,
who died on 28-7-56.

the cost of treatment in this method also works out cheaper than a combination or repetition method as on an average the cattle owner will have to spend about Rs. 6 for a vial of 100 ccs. required normally for each affected case.

It is hoped that other members of the profession in the field will give a trial to this single injection method of cure in Rinderpest and will record their own experiences in the columns of this journal so as to give a more emphatic opinion about the successful results obtained.

Acknowledgment

I am greatly thankful to Shri T. V. Ganpule B. Ag., the estate manager, Shree Changdeo Sugar Mills Ltd., Puntamba, for securing Sulphamezathine 33% solution immediately and for rendering me necessary help and co-operation in the treatment and preventive measures undertaken.

News and Views

We are happy to note that **Mr. Ganti A. Sastry, G.M.V.C., B.V.Sc.**, has been awarded M. Sc., in Animal Pathology by the Madras University. We most heartily congratulate him. He had a brilliant collegiate career. He secured first class in the Intermediate Examination and later stood first in G.M.V.C., and B.V.Sc., Examinations. He was for some time Assistant Lecturer at the Madras Veterinary College handling subjects like Pathology and Physiology. In World War II he was on active service in Arakan and Assam fronts. Worked at the Indian Veterinary Research Institute Mukteswar for two years as a Research Scholarship holder and is now working in the Andhra State. We wish him the best of luck!

* * * *

Two more Officers have been raised to the cadre of Deputy Directors in the Madras State and they are **Sri M. C. Chellam** and **Sri C. K. Subbu Singh**. Sri Chellam is appointed Regional Sterility Officer and Sri Subbu Singh is to be in charge of the Key Villages. Both the items of work are of vital importance in the development of livestock and they are more or less dove-tailed. A well integrated programme of work will not fritter away the good work that each one may be doing. We wish them all success!

* * * *

New Title for sanitary Inspectors in England.—By an Act of Parliament dated 2nd October 1956 those previously known as Sanitary Inspectors will in future be called Public Health Inspectors. This is a

welcome change indeed and is worthy of being copied by India, in whichever State this has not already been done.

Inaugurating the Third All-India Convention of the Ayurvedic and Unani Boards on September 24, 1956, Rajkumari Amrit Kaur, Union Health Minister said "the true cause of the Ayurvedic and Unani systems of medicines would be served only by a thorough and systematic study to evaluate in terms of modern knowledge, the basic concepts of medicine as propounded in them, and to assess the effectiveness of various forms of treatment prescribed in their ancient texts". That is exactly what India has been clamouring for all these years.

In this process of assessment and evaluation only men with necessary zeal, understanding and sympathy should be employed and not those who assume the God and affect to nod at these indigenous systems of medicine. And the process itself should not be slipshod, fitful and of short duration. It should be sustained and elaborately planned and sufficiently financed. It is not merely the life-time work of one man or two, but of several men at several periods. Let us hope the Government are fully seized now of the importance of this work.

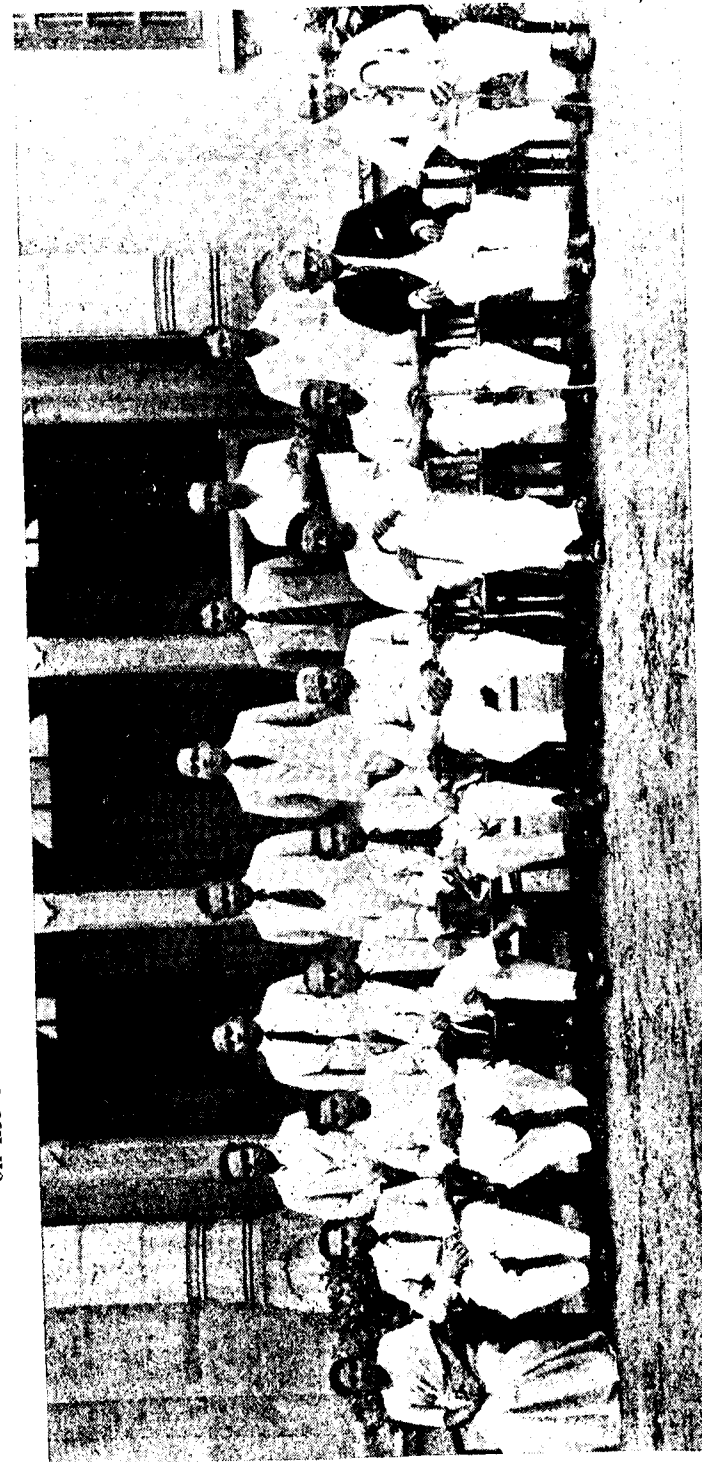
She further added "Medical science is a truly catholic institution. It respects no national flags and knows no boundaries. There is only one world in Medicine and Public Health". It is to that one world, India is anxious to contribute something of her own.

Mr. Binay Ranjan Sen, Indian Ambassador to Japan was recently elected as Director-General of the United Nations Food and Agricultural Organisation. It is indeed a great honour to India. He is the fourth in succession to hold that high office. The first was a Briton and the next two were Americans. True to Indian traditions and culture, Mr. Sen said "I feel no exultation but only humility as I am well aware of the enormous task facing me to lead FAO's efforts to find ways and means of feeding the world's hungry millions".

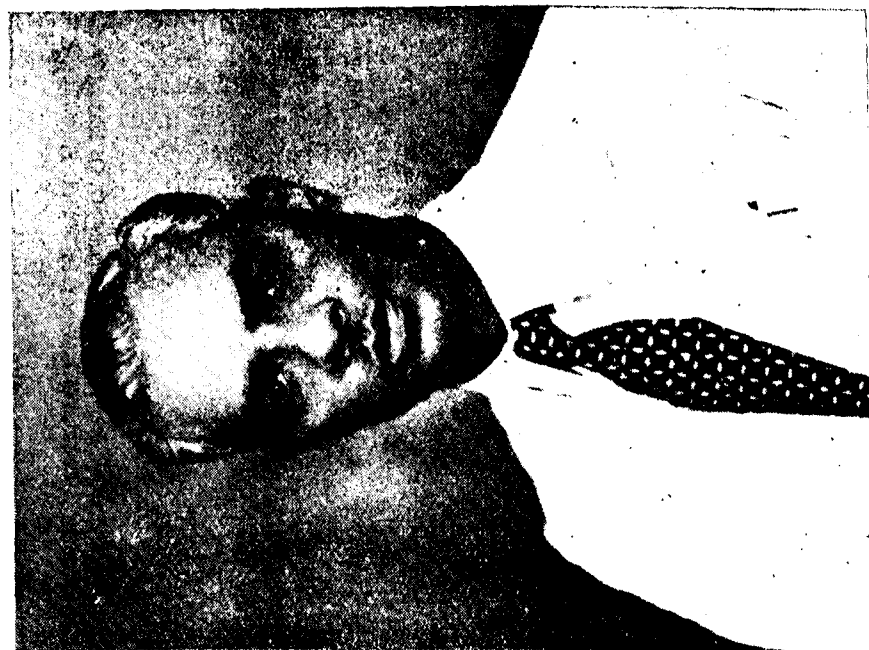
A Committee appointed to go into the question of decline of staff morale of FAO recently, had said the basic cause was "lack of effective leadership". It called for a Director-General "at once wise and strong, just and human, knowing how to choose men and how to lead them". Let us hope Mr. B. R. Sen will fullfill the confidence the employees of FAO numbering over 1000 seem to have expressed in him. Our good wishes go to him for a successful career.

THE MANAGING COMMITTEE OF THE MADRAS STATE VETERINARY ASSOCIATION

Felicitated Sri D. PATTABHIRAMAN, G.M.V.C. A.I.D.R.I.
on his elevation as Director of Animal Husbandry, Madras on 20-7-56.



Sitting :— Kumari C. M. Lalitha, K. P. Chandrasekharan, T. Ananthapadmanabhan, Bertie A. D' Souza, G. O. Khan (President),
D. Pattabhiraman (Director), Rao Sahib M. Anant Narayan Rao, Rao Sahib T. Vinayaka Mudaliar, (Editor, I. V. J.),
K. B. Nair, C. V. Padmanabhan.
Standing :— M. Ranganathan, A. R. Vedanayagam, D. Mariappa, V. Satchidanandam, I. D. Mantra Murty, S. Sourirajan, V. S. Alwar.



C. K. SUBBU SINGH, G.M.V.C.,
who has been appointed as Deputy Director, Animal Husbandry,
(Key Villages) Madras.



M. C. CHELLAM, G.M.V.C., F.R.V.C.S. (Sweden)
who has been appointed as Regional Sterility Officer,
Madras.

NEWS AND VIEWS

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"Why preserve wild life" is a booklet issued in connection with the occasion of the Wild Life Week, celebrated recently. Here are a few gems from the mine of wisdom of Pandit Jawaharlal Nehru given expression to in a message to that publication. "In no country is life valued in theory so much as in India, and many people would even hesitate to destroy the meanest or the most harmful of animals. But, in practice, we ignore the animal world".

The Prime Minister said he wondered sometimes what the animals and birds thought of man and how they would describe him if they had the capacity to do so. "I rather doubt if their description would be very complimentary to man. In spite of our culture and civilisation, in many ways man continues to be not only wild, but more dangerous than any of the so-called wild animals. Man is a strange mixture of good and evil, of civilisation and barbarism, of the divine and the base. We hold aloft noble ideals and shout many slogans, but in our behaviour we belie them".

"Life would become very dull and colourless if we do not have these magnificent animals and birds to look at and play with" said Pandit Nehru. Stressing the inter-relationship between the preservation of wild life and the preservation of forests he said, "It is true as population grows, the need for greater food production becomes necessary. But, this should be done by more intensive cultivation and not by the destruction of the forests which play a vital part in the nation's economy".

Cattle Colony near City.—Madras, October 30, 1956. The Government of Madras has sanctioned Rs. 112.5 lakhs for the Cattle Colony and Central Dairy to be located at Madhavaram, near Madras.

As the Cattle Colony is intended to produce milk and supply it to the local population at reasonable prices, the Government has ordered that the accounts of the scheme should be maintained on a commercial basis and the internal audit of the accounts of the scheme should be done by the Chief Auditor, State Trading Schemes.

Zoo Elephant delivers baby.—Mysore, October 30, 1956. Sixty-year-old "Padmavathi" captive elephant in the Mysore Zoo, gave birth to a 200-lb baby yesterday. This is an unprecedented event in the history of the zoo, as it is generally believed that elephants rarely breed in captivity.

The Kunigal Stud Farm.—The Mysore Assembly Estimates Committee has recommended constitution of a small Committee consisting of representatives of the Bangalore Race Club and some of the leading horse owners in India, to formulate a scheme for the management of the above farm. We hope due weight will be given to the scientific aspect of any proposed scheme and that Officers of the Animal Husbandry Department, Mysore State, will receive due representation. Their past experience in the line must be of inestimable value. We urge the Director of Animal Husbandry Department, Mysore, to take up the question with the Government before it is too late.

The *Indian Express* dated 30th October 1956 has an excellent leaderette on "Improving Pasture". It draws the attention of its readers that "problem of feeding stock through development of village pasture" has been rightly described by the U. N. Technical Assistance Board as "the most difficult problem in Indian agriculture". It pins its faith in "the reconnaissance survey of grass lands undertaken by the Indian Council of Agricultural Research begun in 1954 and expected to last till 1958". Hope Springs eternal in human breast. We also share its hope that something tangible will come out of that survey.

The paper is right in saying that "the prospect of any great increase in specific fodder crop production is not very bright". The paper adds "India has about 193 million head of cattle but the land under fodder is about 11.17 million acres and that the quantity of fodder available is only 78 per cent of the country's requirements and the available concentrates and feeds are sufficient only for about 28 per cent of the cattle". The paper welcomes the proposal under the Second Five Year Plan to convert part of the waste-lands into pasture land. It is up to every State Animal Husbandry Department to pursue the matter in right earnest, formulate definite proposals and force the Government to move in the matter.

The *Sunday Standard* dated 21-10-56 has the following interesting information:—

"Meat coated with plastic by dipping is a new idea in consumer convenience being promoted in the United States.

The meats are designed particularly for self-service stores, which predominate in U. S. grocery and meat sales.

Two types

The plastic coverings come in two types, one of which allows the meat to be cooked by the housewife, while still encased in the

plastic, the other allowing the housewife to pull off the covering just before cooking.

The first system makes use of polyester film that encases the meat throughout the cooking process, eliminating dirty cooking pans. In the second system a colourless liquid coating of plastic is poured over the meat, rapidly hardening and conforming perfectly to the shape of the meat. It can be pulled off easily by the housewife before cooking.

Indian Express dated 18-10-56 under Gauhati dated 17th October 1956 records:—

A cow belonging to a Government official at Mangaldai 30 miles from here, gave birth to three calves three days ago. Of these two are males and the other a female. The cow and calves are making fair progress now.

Block Development Corner

[Articles under this section, should be more in the nature of simple 'talks' to rural folks and village level workers, on Animal Husbandry matters, and not loaded with scientific terms and theories.]

GARDEN FORAGE CROPS

BY

R. VENKATAKRISHNAN, B.V.Sc.,

Department of Animal Nutrition, Madras Veterinary College.

In these days of intensive cultivation of human food crops and reclamation of waste lands and common pasture lands to meet the national food shortage, the city cattle owning public, in particular, are unable to procure enough green fodder for their cows.

To educate the cattle owning public as to how best they can make use of the back yard and otherwise unused areas within the compound of their houses, in economically growing some common green fodders to meet the forage requirements of their cows, an area of 4,147 square feet within the college compound has been taken up and the benefits of growing cattle fodders even on small scale have been demonstrated from the time of celebration of our college Golden Jubilee in January 1955.

The common grasses, legumes and cereals that are best suited to our soil and climatic conditions and give good yield of green forage are briefly detailed as follows. The details of cultivation are shown in Tabular column I (a).

I. Grasses:

(i) *Panicum maximum*:—Guinea grass.

A perennial grass of rich foliage well suited to loamy soil under good irrigation. Root slips are planted 12" apart in ridges of 3' apart.

(ii) *Pennisetum purpureum*:—Napier grass.

A tall perennial of a rougher foliage well suited in heavy soils. Ridges are formed 3' apart and slips are planted 6" apart as against the conventional style of planting 18" apart, for the sake of intensive growth and richer yield of foliage.

(iii) *Brachiaria mutica*:—Buffalo grass.

A perennial, producing rich succulent foliage under water stagnant conditions. The late flowering and its better resistance to disease and pests than other grasses are some of the salient factors helping to give a better yield even in successive cuttings. Ridges are formed 2' apart and slips with few nodes are planted 6" apart.

(iv) *Cenchrus ciliaris*:—Kolukkattai grass.

An indigenous pasture grass with short tufts of soft foliage, flourishing well in black and alkaline soils. Seeds are broadcasted before monsoon after application of manure to the plots.

(v) *Chloris gayana*:—Rhodes grass.

A tall grass of soft foliage and stem with draught resistant capacity, picking up well in all types of soils. Propagation is by broadcasting the seeds before rains, after application of manure to the soil.

II. Tuber:

(i) *Ipomea batata*:—Sweet potato vines.

A tuber of creeping variety giving rich foliage and stem of luxuriant growth on several cuttings. The tuber is a human food. Slips with 2 or 3 nodes are planted in ridges of 3' apart with moderate irrigation in the initial stages of growth.

III. Legumes:

(i) *Medicago sativa*:—Lucerne.

(ii) *Trifolium Alexandrinum*:—Berseem.

They are legumes growing well in calciferous soil, giving quality foliage of high nutritive value. They stand well on cutting, under irrigation. Lucerne is a perennial which suits better to our soil conditions than berseem which is an annual. Culture soil is required for the growth and cultivation.

Details of Cultivation and yield.

S. No.	Grasses.		I (a)			I (b)			T.D.N. obtainable acre year in tons.	D. P./acre obtainable in tons.
	Common name.	Botanical name.	Square feet of area cultivated.	Farm yard manure applied in cartloads per acre.	No. of slips or seeds in ounces used per acre.	Yield in lbs. in 8 months.	Yield in lbs/acre/year in tons.			
1	Guinea grass	<i>Panicum maximum</i>	600	1/2	1200 slips	772	56047	37.53	6.11	0.55
2	Napier grass	<i>Pennisetum purpureum</i>	300	1/4	200 slips	777	112850	75.57	10.43	0.73
3	Buffalo grass	<i>Brachiaria mutica</i>	693	1/2	350 slips	792	49783	33.33	6.83	0.63
4	Kolukattai grass	<i>Cenchrus ciliaris</i>	198	1/5	1.2 ounce of seed	120	26400	17.67	1.68	0.175
5	Rhodes grass	<i>Chloris gayana</i>	198	1/5	1.5 ounce of seeds	97	21340	14.29	2.16	0.16
6	Sweet potato vines	<i>Ipomea batata</i>	400	1/4	200 slips of stems	125	13613	9.11	—	not available.
7	Lucerne	<i>Medicago sativa</i>	180	1/10 ton	1½ ounces of seed	73½	17908	11.09	1.76	0.37
8	Berseem	<i>Trifolium alexandrinum</i>	190	1/10 ton	1½ ounces of seed	33	7566	5.06	0.51	0.11
9	Teosinte	<i>Euchlaena mexicana</i>	980	1/2	12 ounces of seed	254	1129	0.75	0.10	0.01
10	Cholam	<i>Sorghum vulgare</i>	408	1/3	4 to 6 ounces of seed	1064	11395	76.3	1.24	0.08
Total average			4147	—	—	—	31803	21.20	3.42	0.312

The seeds are mixed with sand and culture soil, and are kept in a moist gunny bag overnight. These germinated seeds are sown in ridges or broadcasted.

IV. Cereals:

(i) *Teosinte*.—Gives wide blades of good foliage standing well as ratoon crop under irrigation. Seeds are broadcasted after application of manure.

(ii) *Cholam*.—Gives a high quantity of foliage and stem well relished by cattle. Care should be taken to cut ratoon crops only after 3 node stage to avoid hydrocyanic acid poisoning when fed to cattle.

The plants are given a period of 3 months of growth during which time plenty of irrigation is given in the absence of seasonal rains. No cutting is taken during this period of growth.

During the course of 8 months of standing of the crops, the yield of green fodder given by the above said varieties of grasses, legumes and cereals, their yield per acre in a year, and the net availability of nutrients expressed as total digestible nutrients and digestible protein per acre are detailed in Tabular Column I (b). The economical and scientific method of feeding cows is to meet their maintenance requirements by feeding with succulent green foliage which supplies not only the nutritive needs of the cattle including the vitamins and minerals at a low cost but also provides bulk which is an essential factor to be considered in the feeding of ruminants.

It has been calculated that a cow of 800 lbs. body weight giving 8 lbs. of milk with 5% butter fat needs for her maintenance and milk production 9.5 lbs. of total digestible nutrients and 0.9 lbs. of digestible nutrients.

From the data of cultivation shown in the tabular column I (b) an average yield of mixed forage from one acre of land can support 2 cows of 800 lbs. body weight giving 8 lbs. of milk with 5% butter fat for nearly a year or in other words 1,500 Madras Measures of Milk are obtained from 2 average Indian cows yielding 2 measures a day fed from the forage raised in one acre in a year. The forage crops suitably cultivated when used for milch cows can give in the form of milk, viz. 1,500 Madras Measures or 6,000 lbs. a better income than any cereal or commercial crops grown in an acre per year.

In conclusion it may be drawn that the economics of cultivation, the availability of nutrients in a fresh and succulent state and over and above the presence of vitamins and minerals in the most natural

stage go to show the superiority of feeding cows with a ration of mixed green fodder which can easily be grown in the waste corners of the compounds of houses in the city utilising the wash waters from the drains and the valuable manure of cows which otherwise go to waste.

Acknowledgment

Grateful thanks are recorded to the Principal of the Madras Veterinary College and the Professor of Animal Nutrition for giving facilities to cultivate the crops and their encouragement in this study.

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1. 'Fodder grasses & seeds' a publication of Madras Agricultural Department.
2. Nutritive value of Indian cattle foods and the feeding of animals by Dr. Sen An I. C. A. R. Publication—bulletin 25.

ANIMAL NUTRITION — OUR IMMEDIATE PROBLEM

By

Professor V. MAHADEVAN,

Department of Animal Nutrition, Madras Veterinary College.

[A talk on 6-10-'56, in AII, Madras, under Development Plans in Madras State. Reproduced by the kind permission of All India Radio, Madras.]

"Food is the instrument of nourishment and Nutrition is the act of using it." The Science of Animal Nutrition is one of the youngest sciences, but as an art of Animal Husbandry it is as old as human civilisation.

Although the maximum quantity and optimum quality of an animal product like milk, wool, meat, etc., produced by an animal are determined by its genetic constitution, the importance of nutrition lies in the provision of concrete materials as balanced feed for the full expression of its genetic potentialities. The problem of animal nutrition is only one of the important inter-connected aspects of national prosperity linked essentially with soil fertility or soil nutrition, crop or plant nutrition, animal nutrition and human nutrition, which constitute as a whole the agricultural advancement of a country like India.

The earth is the mother of us all—plants, animals and men. Everything our bodies need, except air and sun, comes from the earth. Nature treats the earth kindly, but man treats her harshly by over-ploughing, over-grazing, making the earth barren, eroded and lowest in soil nutrients. Right thinking, earnest action and team work are needed to preserve the potentialities of fertile mother earth. A teaspoonful of fertile soil is alive with a seething mass of about one thousand millions of bacteria, twenty millions of actinomycetes, one million of fungi, one

million of protozoa, hundred thousands of algae and thousand yeasts—all of which derive nourishment from soil, crop residues, green and organic manures and fertilizers, which are necessary for optimum nutrition of the soil for the proper production of forage plants.

All animals including men get their nourishment ultimately from the soil. The plants require for their growth about thirty four elements out of which twenty four elements in turn are used by animals for building flesh, blood, bones and for making milk. But, if the soil is deficient in one of the necessary elements the plant may be unable to get enough of it to supply the needs of animals. This is notably true of phosphorus, cobalt and copper in several parts of our country. Animals feeding on plants in these areas are subnormal in development and even are subject to severe diseases. The whole subject of the effect of soil composition on plant composition and through this on animal health and human health deserves the increasing attention which it is getting to-day. Soil management, agricultural practices and animal husbandry, besides influences of climate, are the ascending steps in the ladder on which a stable, healthy and vigorous civilisation of human activities is built in a predominantly agricultural country like India.

During the first five year plan, we have achieved self sufficiency in our food grain production. These cereal foods require a minimum supply and consumption of at least ten ounces of milk per adult per day to make them nutritionally balanced. As the total milk supply and the average amount of milk produced by each cow is very low, which gives us only less than 1/5 of our requirement, the immediate importance of Animal Nutrition in the present "Second Five Year Plan", is for improving the milk yield of our cows and draught capacity of our work cattle.

Though only 413 lbs. of milk is the average yield of all of our cows, well nourished animals in Government Farms have given as much as 10000 lbs. in 300 days and as an example, one of our best cows in the Sindhi herd, at Hosur Cattle Farm has given in about ten years of her productive life, 90917 lbs. of standard milk with 4% butter fat or 3637 lbs. of butter and six heifer calves and four bull calves to extend its high future yielding generations, when she was sold still useful. Nearly 4 million gallons of blood must have passed through her udder to produce about 91000 lbs. of milk in ten lactations. The great efficiency and importance to humanity of the well nourished dairy cow in converting material not edible by man into the invaluable human food, milk, is not generally appreciated. A cow producing annually 4000 lbs. of milk employs or uses 80% of the feed for its upkeep and 20% for producing milk; but when milk production attains 8000 lbs. per annum, only 55% of the feed serves for maintenance as against

45% for production. A recent F.A.O. publication called "Agriculture in the World Economy," says:—"How widely is it known, for example that the most important agricultural product in terms of either value or weight is neither wheat nor cereals nor meat, but milk?". The three keys to high goal farming and high net profits are high output per acre, high feed efficiency per livestock and high output per man.

The three cheapest foods of milch cow are pasture or green grass, hay and silage or preserved green grass. We are short of the three ideal feeds to make cheap and more milk, better growth and performance of our cattle. As cereal straws which are available from more than six million acres of irrigated cultivation in our state are very poor in nutrients, lacking completely in digestible protein, we try to compensate the deficiencies in this roughage, while feeding our cattle, by the addition of concentrates like oil cakes, brans and husks. Even here the estimate of our requirements for all our numerous cattle makes us deficient in the supply of these concentrates. In our intensive agriculture under irrigated conditions we have very little land for grazing. Forest grazing is far off to be of use to our milch cows which are needed very close to our homes. With minimum of available land how are we to make our cows receive a complete and nutritious feed and make her yield maximum milk? Is there an ideal forage plant which can form a complete food for the cow and which can be produced to a maximum yield with minimum labour and make it competitive with other commercial crops raised under irrigation? Yes; Among the numerous forage plants, lucerne or alfalfa has been known from very early time as the "Queen" of the forage plant. The name alfalfa means in Spanish language "The best forage plant". It builds soil fertility and furnishes large yields of high quality feed for cows. It is the highest in feed value of all the common hay and forage crops. Its native home is Turkistan in Asia where from it has followed the path of historic civilisation from east to west. To-day it is grown in more than thirty countries and there are about twenty five different varieties which can suit all climates and soils. In India too, it has been famous till fifty years ago, for we learn that two varieties of lucerne, one a frost resistant strain from Ladak Himalayas and another a drought resistant kind called Indian Alfalfa from Poona were introduced in the United States in the beginning of this century and they have been found to thrive well and their cultivation to-day extends to more than twenty million acres in the States. Lucerne or *Medicago Sativa* is a perennial legume with deep penetrating root systems with a very high water requirement and phosphorus and potash in large amounts as manure. Once cultivated during the cool weather, it can stand drought or heavy rainfall. It gives an excellent soil cover and also

serves as a good green manure crop. It is used as a rotational crop to increase the soil fertility. It can give eight to nine cuttings under irrigated conditions and about two cuttings under non irrigated conditions in a year. If an initial stand is established suiting the soil with the addition of required bacterial culture, fertilisation with superphosphate and potash, it easily maintains itself in the subsequent years by its roots penetrating even more than twenty to thirty feet depth to draw its nutrients and water. It is usually cut and made into hay and as the hay contains 15-28% protein with all the vitamins and minerals particularly being rich in calcium and with high palatability cows can consume as much as three pounds for each hundred pounds of liveweight per day as a single balanced food. By feeding this hay, many of the high yielding cows do not require protein concentrates. The yield varies from 4-9 tons per acre and even as high as 15 tons is reported under the best managed experimental plots. Though it is not fit for grazing or for feeding as green crops in larger amounts to the cows as it causes undesirable bloat, alfalfa mixed with grass is harmless for grazing and recently a hybrid creeping alfalfa which is fit for grazing has been developed by crossing the Ladak variety with a strain known as Grimm or a German variety. Alfalfa meal, which is a rapidly dried leaf, is used for poultry. Alfalfa leaf juice is used for human consumption as it is five times richer in vitamin C than the same amount of orange juice. A high yielding cow in a lactation yields about 10,000 lbs. of milk, by eating about daily 30-40 lbs. of alfalfa hay as the sole feed for several lactations without any detrimental effect in breeding efficiency or milk yield or butter fat content. Alfalfa can be used as a rich green manure in preference to other green manure crops because it gives nearly two tons per acre per cut under best managed conditions.

Among the forage plants alfalfa in its high yield per acre and high milk yield as a completely balanced food per cow and as a perennial legume, suited to varying conditions of soil and climate really deserves its name as the "Queen" of the forage plant even under modern conditions, justifying the three important aspects of high level farming by high output per acre and high feed efficiency per cow and high output per man per unit land. Other legumes can also take their place in the forage economy but only second to alfalfa. If we can grow alfalfa at least one acre out of every hundred acres of irrigated land, the hay produced under optimum conditions, can supplement the cereal straws in the place of costly concentrates and the minimum amount of green grass required for feeding our milch cows to increase their milk yield, for alfalfa hay and dairy cow go hand in hand in all the dairy countries.

Memor

A. JOHN, G.M.V.C.

We regret to record the sad demise of **Sri A. John**, District Veterinary Officer, Mahboobnagar, on 28-7-56, at the village of Atmakur where he had been on duty, in connection with the inaugural function of a new Veterinary Dispensary.

He was a very popular officer both with the public and the staff and was held in high esteem. He was a good sportsman and an active member of the Hyderabad Branch of the A.I.V.A. which met at an extraordinary meeting on Tuesday, the 31st July 1956, to record its sense of sorrow and sympathy to the members of the bereaved family. Dr. Shetty the Director of the Animal Husbandry Department and the President of the Association spoke in moving terms and said that "Dr. John was so duty conscious that in spite of his unsatisfactory state of health and brushing aside the pleadings of his friends and relatives, he proceeded to be present at the function at Atmakur, where high officials of the Government were expected to attend and virtually died in harness".

We offer our heartfelt condolences to the members of the bereaved family.

Association News

THE BOMBAY VETERINARY MEDICAL ASSOCIATION

The Annual Conference of the Bombay Veterinary Medical Association will be held on the 17th November 1956. (The Conference was scheduled to be held on the 15th and 16th Sept. 1956 but had to be postponed). The Mayor of Bombay **Shri Salebhoy Abdul Kader** has kindly consented to inaugurate the Conference. All the Veterinarians in the old and new Bombay State are cordially requested to attend the Conference.

Those who wish to contribute professional papers or to bring any resolutions before the Conference should forward the same in triplicate to the Secretary as early as possible.

If invitations already despatched have not reached some of our members, we request this may please be treated as our invitation and attend the Conference without fail. An error in printing has crept in. Please read "32nd instead of 34th Annual Conference" on the invitation.

Bombay Veterinary College }
Parel, Bombay-12. }
18-10-56. }

K. V. DIVEKAR,
V. G. KHARE,
Honorary Secretaries.

THE MADRAS VETERINARY ASSOCIATION

Proceedings of the General Body meeting of The Madras Veterinary Association held on 29-4-56 at the Madras Veterinary College.

The General Body meeting of the Madras Veterinary Association was held on 29-4-56 at 10 A.M. Fifty eight members of the Association were present. Dr. D. Pattabhiraman, G.M.V.C., A.I.D.R.I., Director of Animal Husbandry, Madras was proposed to the chair and he conducted the proceedings. Sri K. P. Chandrasekharan, Secretary, read the report of the Managing Committee from 17-1-55 to 25-4-56 including the audited statement of receipts and expenditure.

The following resolutions were adopted after some discussion by the members.

(1) This meeting of the general body of the Madras Veterinary Association places on record its deep sense of sorrow at the premature death of Sri G. Ramanujachari, Professor of Parasitology, Madras Veterinary College and conveys its heartfelt condolences to the members of the bereaved family.

(2) Resolved to request the Government to increase the scale of pay of the Inspector of Livestock in the Madras Forest Department, to that of the gazetted officers in the Madras Animal Husbandry Department and Veterinary Officers in the Agriculture and Co-operative Departments (Rs. 260-40/2-700).

(3) Resolved to request the Government to raise the pay scale of the Veterinary Assistant Surgeons to Rs. 200-10-400.

The following office bearers of the Association were duly elected : -

1. President: Sri G. Osman Khan.
2. Managing Committee Members :—

- | | |
|-----------------------------|-------------------------------|
| (1) Sri Bertie A. D' Souza. | (8) Sri V. Satchidanandam. |
| (2) „ M. N. Menon. | (9) Miss C. M. Lalitha. |
| (3) „ I. D. Mantramurti. | (10) Sri M. Ranganathan. |
| (4) „ D. Mariappa. | (11) „ S. Vancheeswaran. |
| (5) „ M. Anantapadmanabhan. | (12) „ A. D. Vedanayakam. |
| (6) „ C. I. John. | (13) „ S. Sourirajan. |
| (7) „ V. S. Alwar. | (14) „ K. P. Chandrasekharan. |

The President then delivered his concluding remarks and with a vote of thanks by Sri K. P. Chandrasekharan, Secretary, the meeting terminated.

K. P. CHANDRASEKHARAN,
Secretary.

Report of the Managing Committee of the Madras Veterinary Association from 17th January 1956 to 25th April 1956.

Membership :—The membership on 17-1-55 was 71 (including 34 life members) and the total number on roll on 25-4-56 was 98 (inclusive of 35 life members).

At the general body meeting held on 19-1-55, Sri S. V. Mudaliar was elected President of the Association and at the Managing Committee meeting held on 10-2-55, Sris. K. P. Chandrasekharan and M. Ranganathan were elected Secretary and Treasurer respectively. Two Managing Committee members, viz. Sris. M. S. Ganapathy and M. N. Menon resigned. In one of these vacancies, Sri I. D. Mantramurti was elected and the other remained unfilled.

Activity :—During the period, the Managing Committee met 5 times and discussed various matters pertaining to the profession.

The Managing Committee discussed and took action in regard to matters such as revival of representation of the Association in the State Livestock Improvement Board, recognition of Veterinary Graduates of Indian Colleges for purposes of issue of certificates, inclusion of a representative of the Association in the State Veterinary Council and inclusion of Veterinary Diploma holders in the electoral rolls in Graduates' Constituency.

The Managing Committee discussed the subject relating to the pay of Veterinary Assistant Surgeons and recommended to the Government a scale of Rs. 200-400.

Sris G. O. Khan and J. C. Victor audited the accounts of the Association and a consolidated statement of expenditure and receipts is herewith appended.

K. P. CHANDRASEKHARAN,
Secretary.

Receipts.		Charges.	
	Rs. A. P.		Rs. A. P.
Opening balance in banks	1,075 13 4	Typist Charges	5 0 0
Cash with Treasurer	1 11 2	Affiliation fee to the	
Cash with Secretary	0 14 0	All India Vety. Association	25 8 0
Interest from Bank	26 13 6	Closing balance	1,278 5 0
Subscription	4 0 0		
Conference proceeds minus expenses	199 9 0	In Bank	1271 11 10
		Treasurer	5 11 2
		Secretary	0 14 0
			1278 5 0
	1,308 13 0		1,308 13 0

Note: The closing balance of Rs. 1,278/5/- consists of the following:

Panikkar Memorial Fund	Rs. 669 0 0
Kailasamier Memorial Fund	Rs. 168 0 0
Association fund	Rs. 441 5 0
Total	1,278 5 0

The accounts were audited by
Drs. G. O. KHAN & J. C. VICTOR
on 15-4-56.

M. RANGANATHAN,
Treasurer,
Madras Veterinary Association.

Correspondence

[The views and opinions expressed in correspondence are those of the writers themselves and are not always endorsed by the Editor. Ed. I. V. J.]

NASAL GRANULOMA IN THE STATE OF WEST BENGAL

Varma in his letter to the Editor of this *Journal* (32-76) questions Monnig (1947) about the authenticated basis on which he considers *Limnaea acuminata* as one of the intermediate hosts of *Schistosoma nasalis*. The question was raised in respect of the article by Choudhury (I. V. J. 31, 403) on 'Nasal Granuloma in the State of West Bengal', in which he had mentioned *L. acuminata* also as the intermediate host for *S. nasalis*. A reply awaited from Choudhury has not been forthcoming so far.

The investigations of Varma (1954) did not indicate *L. acuminata* as the intermediate host for *S. nasalis*. Those investigations corroborated the findings of Rao (1933). Peter (1955) too observed only *L. luteola* and *Indoplanorbis crustus* to discharge *Cercariae indicæ* XXX. Hence the findings of Rao, Varma and Peter were alike. But Sewell (1922) recorded *Cercariae indicæ* XXX from *L. acuminata* also besides *L. excrucatus* in the snail collections from Calcutta, whereas the latter alone was found infected in Madras State. Rao (1934) himself had mentioned the above fact in his article on the comparative study of *S. spindalis* and *S. nasalis*. Rao (1933) and Peter (1955) and Varma (1954) who confined their studies to Madras and Bihar respectively did not find *L. acuminata* naturally infected with *Cercariae indicæ* XXX and thus corroborated the negative findings of Sewell in his snail collections from Madras.

I presume that Monnig has mentioned *L. acuminata* as one of the intermediate hosts for *S. nasalis* on the authority of Sewell's publication. Naturally Chaudury hailing from Bengal has aligned himself with Monnig.

Literature cited

1. Monnig, H. O. (1947) ... *Veterinary Helminthology and Entomology*, p. 85. Bailliere Tindall and Cox, London.
2. Peter, C. T. (1955) ... *Ind. J. Vet. Sci. and Ani. Husb.*, 25, 121.
3. Rao, M. A. N. (1933) ... *Ibid*, 3, 160.
4. *Idem* (1934) ... *Ibid*, 4, 1.
5. Sewell, R. B. S. (1922) ... *Ind. J. Med. Res.*, 10, Supplement, p. 251.
6. Varma, A. K. (1954) ... *Ind. J. Vet. Sci. and Anim. Husb.*, 24, 11.

Department of Parasitology,
Madras Veterinary College,
Madras 7, 16-8-1956.

V. S. ALWAR.

Reviews

Veterinary Ophthalmology.—By R. H. Smythe, M.R.C.V.S., Examiner in Surgery to the Royal College of Veterinary Surgeons. Price 35s net. Bailliere, Tindall & Cox, London, W.C. 2.

It cannot be denied that very scant attention was paid to Ophthalmology in Veterinary Science till recently. The paucity of suitable text books on the subject on modern lines is in itself an index to this deplorable fact. But the demands of a growing science cannot long tolerate this deficiency and the above book has not made its appearance a day too soon.

In a modest preface the author states that his object was to present the subject in the form of "a concise and readable text book". That he has succeeded in his object to a remarkable degree, cannot be disputed.

The book is in two parts. The first part takes us through the anatomy and physiology of eye in a very lucid manner and helps the practitioner to refresh his memory. The drawings are all quite illustrative and very helpful. The second part deals with several pathological conditions of the different parts of the eye from the orbit to the optic nerve, with modern surgical techniques well illustrated and described. The last chapter on 'Therapeutics' deals with several preparations, prescriptions and drugs in frequent use and is followed by an appendix of Ophthalmic preparations listed in the British Veterinary Codex. On the whole it is a book of great merit that should find a place in the library of all Veterinary Practitioners. To the student it is an indispensable book to acquire knowledge on Veterinary Ophthalmology. The get-up and printing are in keeping with the high traditions of Messrs. Bailliere, Tindall & Cox.

Diagnostic Methods in Veterinary Medicine.—By Geo. F. Boddie, B.Sc. (Edin.), M.R.C.V.S. Fourth Edition, 1956. Oliver and Boyd, Edinburgh. Price 25s net.

The Fourth Edition of this popular book has been released only in September 1956. Naturally enough, it has been brought quite up to date, more particularly under the Chapters on Clinical Bio-Chemistry, Clinical Bacteriology, Clinical Helminthology and Clinical Haematology.

With the advancement of science, the diagnostic methods and means are bound to change from time to time. It is this fact probably combined with the popularity of the book that has been responsible for compelling the work to run into its fourth edition in 12 years! It is indeed a very handy book for students and busy practitioners for ready reference and we have no hesitation to state that it is a distinct contribution on such a practical subject, which is bound to receive the appreciation of the profession in a large measure.

Errata

Vol. XXXIII, No. 1 (July 1956).

Page-12 last three paragraphs should come under 'Results and Discussion' on page 13.

The following references may be included under Bibliography:—

29. Wilson, L. T. and E. B. Hart.—The Chemistry of the blood dairy cows before and after parturition and its relation to milk fever. *Jour. Dairy Sci.* 15 (1932), 116-131.
30. Youngburg, G. B. and M. V. Youngburg. Phosphorus metabolism. 1. A system of blood phosphorus analysis. *Jour. Lab. Clin. Med.* 16, (1930) 158-166.

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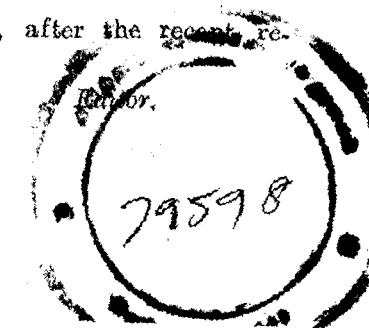
T. VINAYAKA MUDALIAR,
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Madras,
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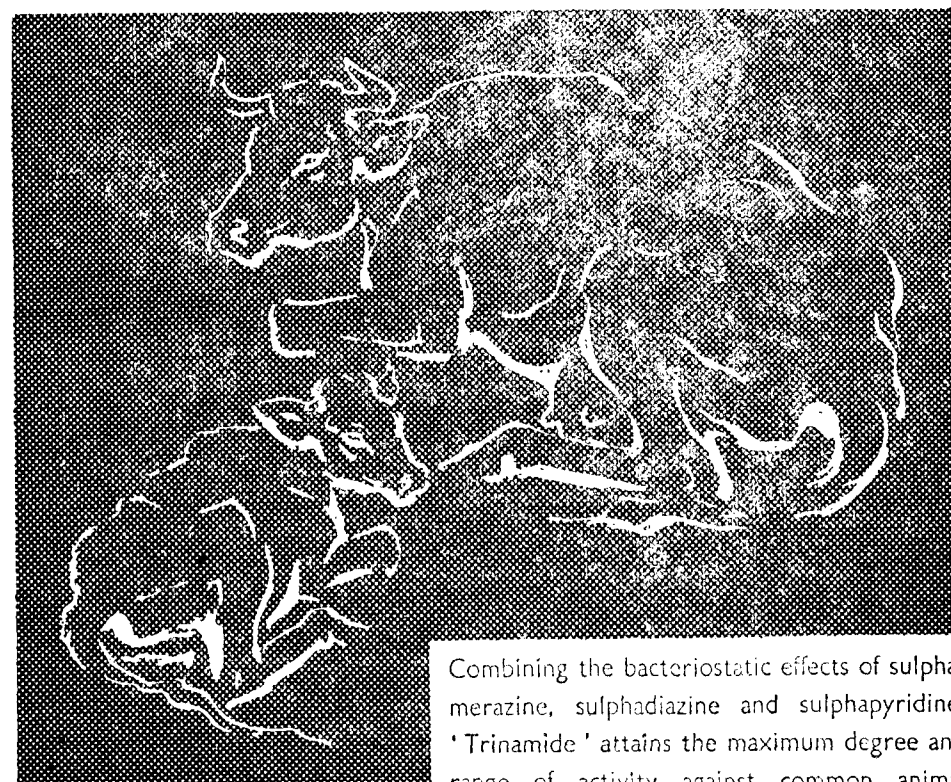
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