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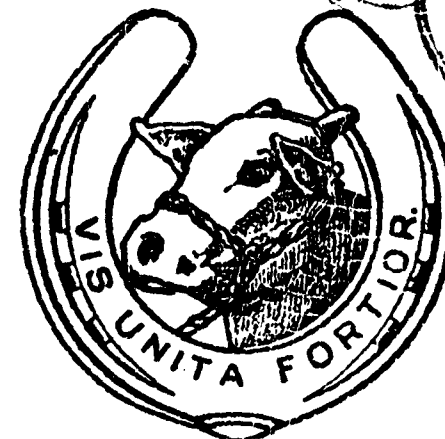
Vol. XXXIV, No. 3

MAY, 1957

THE INDIAN VETERINARY JOURNAL

(The Journal of the All-India Veterinary Association)

*A Bi-Monthly Record of
Veterinary Science*



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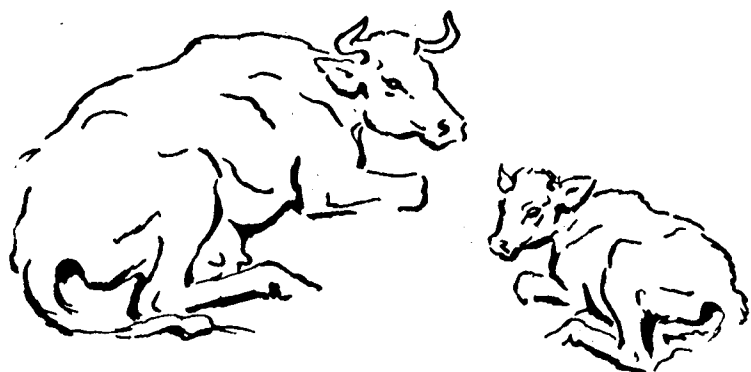


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May, 1957

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[THE JOURNAL OF THE ALL-INDIA VETERINARY ASSOCIATION]

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A Bi-Monthly Record of Veterinary Science
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★

EDITOR

Rao Sahib T. VINAYAKA MUDALIAR, G.M.V.C.,

Office:—23, First Street, Vidyodaya East, T'Nagar,
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(The Journal of the All-India Veterinary Association)

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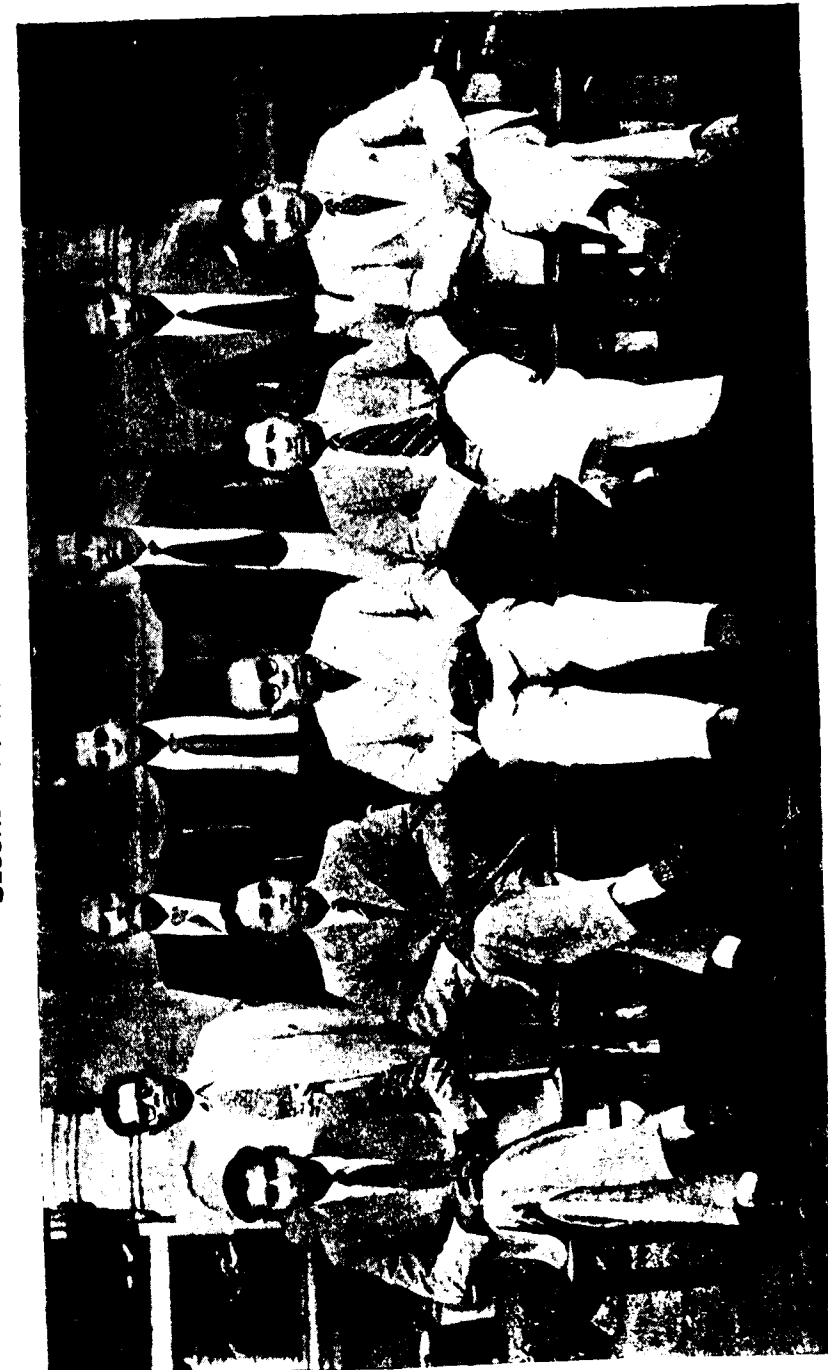
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THE Indian Veterinary Journal

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MAY, 1957

No. 3

Editorial

SIR WILLIAM SLATER'S MEMORABLE ADDRESS

WE reproduce below from the *Veterinary Record*, London, a highly stimulating and thought-provoking address given expression to by Sir William Slater, K.B.E., D.Sc., F.R.I.C., Secretary of the Agricultural Research Council, London, at the time of the official opening of the new session of the Royal Veterinary College in 1956.

Rarely have we ever come across an address of such understanding, such depth of vision and of such dynamic nature. It is an address which must be read with diligence, digested and remembered by every Veterinarian whether in the East or the West. It must also be brought to the notice of the public at large and to the various Governments. The profession has cause to remember Sir Slater for such a clear exposition of its duties and its dues. Here is the address:—

"I believe that Veterinary Science is entering into a golden age. For too long it has suffered from an inferiority complex, trying to compare itself with human medicine. So long as it did so it was certain to be looked on as the poor relation. It is essentially different, equally important, and in many ways more difficult and complex.

"It is true that Veterinary Science is younger than the science of human medicine, in that until recently there have been far fewer workers and much poorer facilities. The position is

steadily improving. The Veterinary Schools have been strengthened in staff and in equipment, and more research laboratories are available for a growing army of workers. There is still much to be done before the position can be considered adequate. Even with its so far limited resources, Veterinary Science has a proud record of achievement.

"Expansion is not merely a question of providing more funds; it depends to a much greater extent on the supply of well-equipped and enthusiastic workers. The financial rewards of the research worker, or the University teacher, are never likely to be as high as those in Veterinary practice—they are not in human medicine or other branches of science—but provided they are adequate a research career holds out prospects of an exciting and full life.

"You may feel that I am stressing too much the research side of Veterinary work, but I would remind you that the profession as a whole will be judged on its ability to explain the causes of disease and to develop new methods of combating it. If Veterinary Science is to win its rightful place it must never rest on its laurels and be complacent, it must be continually advancing in its knowledge and techniques.

"Because it is young in this sense, Veterinary Science holds out more fascinating prospects than the older sciences. Many of the fields are still relatively unexplored and a rich reward is waiting for those who enter into them.

"Another way in which Veterinary Science differs from that of human medicine is that over a large part of the work economics enters into our considerations. However economically valueless a human life is, it must be saved; the same applies to our pet animals, whose companionship and affection cannot be measured in terms of money. But in food-producing animals the cost of treatment must be less than the economic value of the animal. The farmer in general will not pay to keep a useless animal alive. This inevitably means that the Veterinarian has to think increasingly of preventive treatments applied to a herd

or flock, and to a decreasing extent of the treatment of the individual animal. Farmers are becoming more alive to the need for considering the Veterinarian not as someone to call in only in an emergency, but as a regular visitor whose task it is to guide him in maintaining high standard of health in the animals on his farm. We need, however, to develop this conception until the farmer thinks of his Veterinary fees as a regular and proper insurance policy, and not as something which only appear in his accounts when he is unlucky. This is particularly important where the individual animals are of small value, such as a commercial poultry flock. If Veterinary advice could eliminate half the diseases of our poultry flocks, the saving would, I believe, pay a large part of the fees of all those in Veterinary practice.

"Veterinary Science differs, too, from human medicine in that it deals not with one animal species but with many. There has been an unfortunate tendency in the past to assume that findings in medical research can be used by analogy in veterinary work. It is true that in medical research the cat and the dog have been widely studied and workers in this field have used the findings from these investigations in human physiology and pathology. The extent to which this knowledge can be applied to most of our farm animals is, however, limited, and even within these limits the evidence must be most critically examined.

"It is in order to further as rapidly as possible the extension of our knowledge of the physiology of farm animals that my Council has set up the Institute of Animal Physiology at Babraham, near Cambridge.

"The Veterinary Surgeon working with farm animals is like the private doctor to an eastern potentate, in that the population he has to consider consists of one important male together with a large number of females and their numerous offspring. Gynaecology, obstetrics and pediatrics must form a much larger part of his work than they do in that of the ordinary medical practitioner, with the accompanying need to study the endocrinology of the reproductive processes in different species.

"On the other hand, because few farm animals ever reach old age, the problem of geriatrics and the diseases of the aged, which loom so largely in human medicine, are relatively unimportant.

"Perhaps the Veterinarian is fortunate in that his patients cannot tell him about their symptoms; it saves him time and prevents him from being unnecessarily bored, but it does present him with a special set of problems, particularly in the early diagnosis of disease before the more marked symptoms appear. I believe that in the future the Veterinarian will overcome this difficulty by the extended use of chemical and biological tests. Before he can do so, however, we must know far more than we do at present about the normal variations in the healthy animal.

"Human medicine, of course, has a special place in Society. We are told: 'the devil was sick, the devil a saint would be' and certainly nothing — his wealth, his power, his ambitions — is so important to man as his life. The practice of medicine, therefore, holds the highest place in his esteem and by the side of it Veterinary Medicine may be dwarfed. This is, however, a wholly mistaken view. The ultimate health and survival of a human population, which is growing at an alarming rate, will depend upon a soundly balanced diet, which must include a minimum of high quality protein from animal sources. Over large areas of the world men are now suffering from a lack of this essential element in their food. It is on the Veterinarian more than on anyone else that the task of increasing the world's supply of animal proteins rests. Whilst, therefore, human medicine has the task of maintaining the health of mankind, it cannot achieve success, and in fact may fail miserably by merely creating more hungry mouths unless the Veterinarian at the same time maintains the health and increases the productivity of flocks and herds upon which mankind depends".

THE FIRST MADRAS STATE CATTLE SHOW

Never perhaps in the history of the Department of Animal Husbandry in Madras was a Cattle Show of such magnitude and brilliance ever held, as the one which the metropolis witnessed in the last week of March 1957. It gave a peep into the silent but solid work which the Department has been doing during the last two decades or so. If there are still people who live in the border-land of doubt as to who is best suited for Livestock work, they had only to witness this great Show which practically took the City by storm. It is barely two decades since the livestock work was entrusted to the Veterinarians in this State and it was the opinion of both the High and the Low that they had brought about a tremendous improvement in this field.

The running commentary given in regional language by the Director himself as the animals of different breeds passed by as if in a slow-motion picture, on a raised mound closeby, sent the audience into ecstasy and made them realise the glory of the cattle wealth of our land. The main breeds represented were Kangayam, Sindhi, Umblacheri, Gir, Barghur, Ongole, Murrah, Punganur and cross-breds. There were some very fine graded stock also. Sheep and poultry were also on the Show and it was a pleasure to see Romney Marsh thriving so well on the Nilgiris. The Nilgiris sheep have practically been salvaged and put on their feet again. The milk yield competition was a centre of attraction and a Sindhi cow from Hosur Cattle Farm topped the list with 31 lbs. a day. She had calved only three days ago and had yet to touch her peak yield! The Pattagar of Palayakottai still holds sway where Kangayams are concerned but the Government-bred stock at the Hosur Cattle Farm served him as an eye-opener of the very close competition that awaits him in the not distant future. The Sindhis of Hosur have developed into a magnificent lot and with proper husbanding and distribution we must soon be able to forget that this is a breed which we have lost to Pakistan. The Show served as a healthy competition even between the Government-owned livestock farms at Hosur, Orathanad and Pudukottai. Many were the prizes shared between these farms. The private individual owners of cattle, poultry and sheep were not negligible and the Department was generous with them in the matter of value of prizes awarded. This is bound to stimulate more interest in the future.

The judging was of a very high order as there was close competition under each class. The Supreme championship was awarded to a Kangayam Cow of the Pattagar of Palayakottai and to a Murrah Buffalo-bull of Orathanad Farm for the other sex. A gold medal presented by the Zamindar of Naikarapatti was awarded to the best Sindhi cow from Hosur Cattle Farm. Three of the State Ministers *viz.* Mr. Manickavelu, Mr. Bhaktavatsalam and Mr. C. Subramaniam patronised the Show on three different dates and the Governor Mr. John presided on the last day and Mrs. John gave away the prizes.

The Show was of highly educative value. There was a judging competition also for the students, which proved of immense benefit to them. The work done in rural areas was dished up and served at the Metropolis with tremendous effect. The organisational capacity, the team-work, and the orderliness shown by the Officers and staff of the Department cannot be too highly praised. The head of the Department, Mr. D. Pattabhiraman, deserves great credit and he had it in no small measure both from the public and the Government.

Dr. ALAGAPPA CHETTIAR PASSES AWAY

The country mourns the loss of a great Philanthropist and business magnate who had contributed over one crore of Rupees in way of endowments on educational institutions. He was so bountiful in his charities that he was known as '*Karna*' of the modern times. He was a prince amongst Philanthropists, the like of whom it is difficult to come across. A remote, dry, arid and unattractive place like Karaikudi in Madras State is to-day humming with life and activities of several professional Colleges and Scientific Institutions. The University Campus there is his creation entirely and will serve to keep his memory ever-green. It is bound to serve also as an object lesson to others who are blessed like him with wealth.

We offer our heartfelt condolences to the members of the bereaved family. May his soul rest in peace!

The First Madras State Cattle Show



KANGAYAM COW
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Romney Marsh Ram at the First Madras State Cattle Show

Gir Breed of Cattle at L. R. S. Hosur

BY
D. PATTABHIRAMAN



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To face page 174

Original Articles

SOME OBSERVATIONS ON THE LARGE-SCALE PRODUCTION OF FREEZE-DRIED GOAT ADAPTED RINDERPEST VIRUS VACCINE

By

D. R. UPPAL AND C. SEETHARAMAN,
Indian Veterinary Research Institute, Izatnagar.

Freeze drying is the modern practical form of the age old observation that a suspension of particulate material when frozen would give out its water content in the form of water vapour without melting. The application of principle of freeze drying to biological work was first introduced about 50 years ago. During the Second World war and during the recent years rapid developments in the field of freeze drying of biological materials have been made. Notable contributions were those of Flosdorf and Mudd (1935) and Greaves and Adair (1936—1939).

In a country like ours where for a major part of the year it is hot throughout and where transport facilities are poor because of the vastness, the problem of reaching home to the common man, relatively labile materials like vaccines, antitoxins, vitamins, hormones, etc., has been rendered easy by adopting the technique of freeze drying.

In the Veterinary field, advantage has been taken to freeze dry some of the more common living modified viruses, e.g., goat adapted rinderpest virus, attenuated New Castle disease virus, fowl pox virus, etc., Freeze drying of such vaccines of veterinary importance was introduced in 1938 by Daubney and Hudson at the Veterinary Research Institute, Kabete. Goat adapted rinderpest virus was also freeze dried by Pfaff (1938) at Insein, Burma. In view of the many advantages of using freeze dried virus vaccines over wet material and the urgent need to effectively control Rinderpest in the country, the Government of India launched during the First Five-Year Plan a scheme for the eradication of Rinderpest on an all-India basis. It has been emphasised in this campaign that only freeze dried, standardised Rinderpest vaccine would be used. In view of the very large quantities of vaccine that are required for the campaign, a large production unit has been established at the Indian Veterinary Research Institute, Izatnagar. The object of this paper is to set out in detail observations on the technique of large scale manufacture of freeze-dried and standardised Rinderpest Goat-tissue vaccine. The two main stages in the process of freeze drying are, firstly to freeze the product and secondly to get rid of the moisture by evaporation but without melting the frozen product. The process of freezing the product, depends on the consistency of the product and the container in which the product is to be dispensed for

use in the field. The process of freezing may be undertaken by any of the three methods *viz.*, shell freezing, spin freezing and self freezing. The former two, are eminently suited for freeze drying liquid suspension *e.g.*, Antitoxins, Cultures, Viruses in suspension, etc. But for a material like spleen pulp, it can be achieved by "degassing". Rapid evaporation which follows after degassing results in complete freezing within very few minutes.

Varieties of equipments for freeze drying are available in the market but the one used by us is Edwards' freeze drying system wherein self freezing and primary drying are attended to by a refrigerated condenser and a rotary high vacuum pump.

Materials and Methods

Observations were carried out on 5,509 female Goats which were selected for virus work. These, will be, for brevity, termed as 'donors'. Donors of 1 — 3 years of age in good condition were purchased and kept under observation for a period of seven days prior to inoculation of virus, to exclude the possibility of introduction of other infectious diseases. Three morning temperatures were recorded of goats prior to inoculation and only those showing normal body temperature were selected. The seed virus used for inoculation was the Indian Sub-strain line 'W' Mukteswar virus which has been maintained in goats without interpolation or out passage in other species of animal. Either the wet spleen or freeze dried virus was used for inoculation in the form of one percent suspension. 2 c.c. of this was injected subcutaneously. Each lot of donors consisted of usually sixty goats. Donors were kept in ordinary sheds with the usual ration of green leaves and concentrates. On the fourth morning donors showing satisfactory reaction were destroyed by stunning and bleeding to death. Spleens were removed aseptically, rejecting where there were evidences of purulent peritonitis or frank consolidation of lungs. Harvested spleens were then freed from fascia and other tissues and pulped through a tissue grinder (Latapie). The pulp was spread in thin layers in petri dishes and prefrozen at -30° to -40°C . in deep freeze cabinets. This procedure appreciably suppressed foaming of the material and aided in reduction of sudden and heavy load on the refrigerated condenser. Usually 20 hours of primary drying was found optimum to get the material dried satisfactorily. The dry material was then ground fine in wedge-wood pestle and mortar, and sieved through a fine wire strainer $\frac{1}{100}$ " mesh, to remove the particles of capsular tissue, trabaculæ or blood vessels which are devoid of virus. The material after straining is thoroughly mixed and dispensed in special glass ampoules, in 0.25 and 0.5 gm. quantities. After the "necking" of the ampoules, these were loaded for secondary

drying on a manifold containing phosphorus pentoxide. Secondary drying was carried out for a period of 18—20 hours. Vacuum of 0.01 m.m. in the ampoules indicated the sealing time. After sealing the ampoules, these were stored in deep freeze cabinets at -20°C . Each batch of vaccine was subjected to safety test in buffalo-calves, guinea-pigs and rabbits. Viability test was carried out in goats. Every fifth batch of vaccine was put to a full titration test either in buffalo-calves or hill bulls. Periodic observations were carried out to test the keeping quality of vaccine under laboratory storage conditions enumerated above.

Observations

Observations are set out in detail under the following heads:—

- (1) Donors
- (2) Freeze drying
- (3) Titration tests
- (4) Keeping quality of the vaccine

(1) *Donors*:—In view of the various precautions taken in respect of purchase of goats, there had not been any out-break of infectious disease among healthy goats kept in sheds. However, a mortality of five percent was observed due to purulent peritonitis, non-specific pleuro-pneumonia, verminous gastro-enteritis, etc. Quite a few cases of rickettsial infection were also observed. To exclude the possibility of Brucella infection, sera of 200 healthy goats of local breed were tested by agglutination test and all were found negative. Where B. Melitensis infection is known to occur goats should be tested by agglutination before they are inoculated with virus.

Among the inoculated animals, reaction to either wet or freeze-dried goat adapted virus was satisfactory, though donors inoculated with freeze-dried virus reacted about 12 hours later than those inoculated with wet virus. All the batches did not react uniformly. Some batches showed very satisfactory reaction whereas others showed milder but decided reaction. Even though all these goats were procured locally from different parts of U.P., it is worth while to assess the susceptibility of different breeds of goats to goat adapted Rinderpest virus. The reaction in donors from one to three years of age was almost uniform. Among the donors twenty percent of goats were found to be non-reactors, which can further be classified as frank non-reactors, (5%) and poor reactors (15%). A rise of about $3 - 5^{\circ}\text{F}$ above the threshold temperature was considered a good reaction. Donors which were either pregnant or extremely debilitated were found to be poor reactors or non-reactors. Those which were in fairly advanced stage of pregnancy

aborted on the second or third day of virus inoculation. With the abortion, body temperature usually dropped down appreciably and the donor usually died on the 4th to 5th day. Thermal response to virus inoculation in different category of reactors is set out in Figure I.

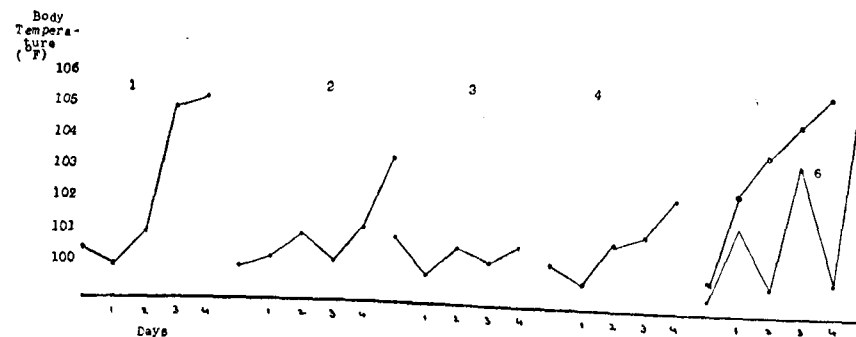


Fig. 1

Showing different types of donor goats

- | | |
|-----------------|---|
| 1. Good reactor | 4. Poor reactor |
| 2. Late reactor | 5 & 6. Reactor but usually complicated with purulent peritonitis or pneumonia |
| 3. Non-reactor | |

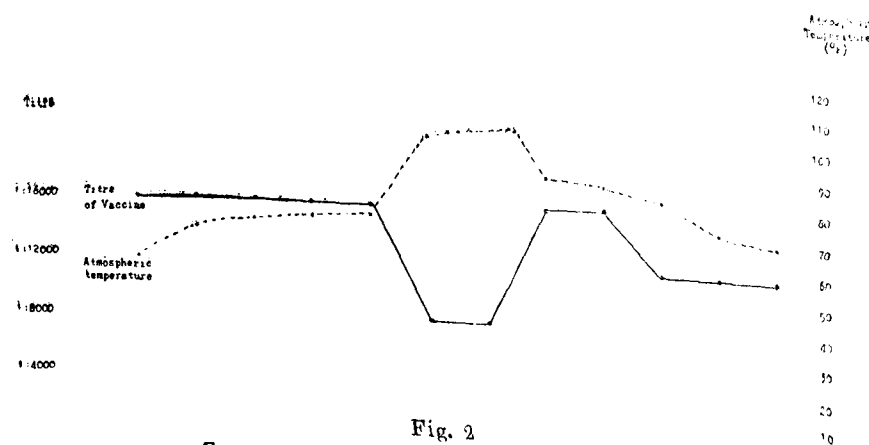


Fig. 2

Seasonal Variation in the titre of vaccine

There seems to be appreciable seasonal variation in the reaction time and percentage of reaction to the virus in donors. Whereas the thermal response seems satisfactory in warm-dry months, such a picture is off set in hot humid months and wintery days of the years. Observations are set out in Table I.

TABLE I

Seasonal variation in the reaction of donors.

1	2	3	4
Month	Number of goats inoculated	Number of goats not reacting	Percentage
January	578	120	20.7
February	754	150	19.8
March	573	110	19.0
April	342	12	3.5
May	310	28	9.0
June	129	16	12.4
July	337	70	20.7
August	247	63	25.5
September	619	112	18.0
October	363	104	28.6
November	515	141	27.3
December	742	212	28.5
Total	5509	1138	20%

Freeze drying:—It has been mentioned earlier that prior to loading the primary chamber, the material was frozen at -40°C . in deep freeze cabinets. This suppressed frothing and removed the possibility of a sudden load on the refrigerator. However it was observed that while pre-freezing for about forty-five to sixty minutes freezes the material satisfactorily and also allows certain amount of frothing, this if extended for one hour and half, rendered the material solid and did not froth at all. Certain amount of frothing is essential since this affords greater ease in grinding and evaporation of moisture is also quicker. No variation in the virus titre was however noticeable between the material which was partially prefrozen and that which was fully prefrozen. In order to find out the relationship between primary chamber temperature, condenser temperature and room temperature, some pilot observations were carried out. The temperature of primary drying chamber during the course of its exhaustion was checked by placing a Rototherm thermometer in the chamber supported with the walls of petri-dishes containing spleen pulp. The observation was carried with prefrozen material and material which was not prefrozen. Such materials were kept in two different units. Results are set out in Table II and III.

TABLE II
Relationship between chamber temperature, condenser temperature, room temperature and pressure in chamber with material without prefreezing.

1	2	3	4	5
Time	Condenser Temperature	Chamber Temperature	Room Temperature	Pressure in Chamber in m.m.
11-40	-43°C	72°F	72°F	—
11-43	-4°C	70°F	72°F	—
11-48	-25°C	58°F	72°F	—
11-55	-35°C	46°F	72°F	—
12-5	-40°C	32°F	72°F	.18
12-12	-41°C	26°F	72°F	.15
12-30	-43°C	16°F	72°F	.15
12-50	-45°C	14°F	72°F	.14
13-00	-46°C	14°F	72°F	.14
14-5	-47°C	22°F	72°F	.13
16-15	-49°C	37°F	72°F	.13
17-00	-50°C	42°F	72°F	.10
19-00	-52°C	64°F	72°F	.05
21-00	-53°C	70°F	72°F	.045
23-00	-53°C	72°F	72°F	.045
1-00	-53°C	72°F	72°F	.040
3-00	-54°C	72°F	72°F	.040
5-00	-54°C	72°F	72°F	.038
7-00	-54°C	72°F	72°F	.038
9-00	-54°C	73°F	72°F	.030
10-00	-54°C	72°F	72°F	.030

TABLE III
Relationship between chamber temperature, condenser temperature, room temperature and pressure in chamber with pre-frozen material.

1	2	3	4	5
Time	Condenser Temperature	Chamber Temperature	Room Temperature	Pressure in Chamber in m.m.
14-38	-40°C	72°F	72°F	—
14-42	-27°C	68°F	72°F	—
14-50	-40°C	52°F	72°F	—
15-00	-42°C	46°F	72°F	.14
15-15	-45°C	32°F	72°F	.095
15-30	-46°C	24°F	72°F	.072
15-35	-46°C	22°F	72°F	.064
15-45	-47°C	18°F	72°F	.064
16-15	-47°C	16°F	72°F	.058
17-00	-48°C	16°F	72°F	.058
19-00	-48°C	19°F	72°F	.058
21-00	-48°C	23°F	72°F	.055
23-00	-49°C	28°F	72°F	.050
1-00	-50°C	36°F	72°F	.050
3-00	-50°C	45°F	72°F	.045
5-00	-50°C	54°F	72°F	.045
7-00	-51°C	64°F	72°F	.035
9-00	-51°C	72°F	72°F	.035
10-00	-51°C	72°F	72°F	.035

It will be seen from the tables that as the pressure was reduced, the refrigerator temperature with material which was not pre-frozen rose to -4°C in three minutes and to -27°C after four minutes with pre-frozen material. This points out the heavy load on the refrigerator added to it when the material is not pre-frozen.

In the initial stages of drying the chamber temperature with material not pre-frozen passed on to 32°F after 25 minutes and to a minimum of 14°F after 1 hour and 10 minutes as against 32°F after 37 minutes and to a minimum of 16°F after 1 hour and 37 minutes with pre-frozen material.

With the approach of the time of full desiccation in the primary chamber, the temperature of the chamber equated with the room temperature after 11 hours 20 minutes from the time of loading of unfrozen material where it was 16 hours and 22 minutes in case of pre-frozen material. The pressure is indicative of the residual air in the chamber and this decreases with the final stage of drying. From the above observations it is evident that in order to prevent material being exposed to room temperature, since the chamber temperature is same as that of room temperature at the final stage of drying, the processing rooms be effectively air conditioned.

Titration:—The observations recorded here cover 118 batches of freeze-dried Goat Virus prepared during 1955-56. As a routine every batch of vaccine was tested for safety in guinea-pigs, rabbits and buffalo-calves. None of these batches was found to be contaminated with any pathogenic micro-organism. Freeze dried Mukteswar adapted Goat Virus did not produce any abnormal rise in the body temperature of buffalo-calves. Maximum rise noticeable was about 1-2°F rise above normal body temperature.

Every fifth batch of vaccine was titrated either in buffalo-calves or hill bulls. Usual dilutions used were 1:8000, 1:12000 and 1:16000. Vaccinated animals were challenged 12-14 days later. It will be seen from figure II and Table IV that there is considerable variation in the titre of vaccine if the vaccine is processed at high atmospheric temperatures, since the titre of the vaccine falls quickly in the later stages of primary drying and throughout the period of secondary desiccation. With not a very satisfactory air-conditioning system, results are apt to be less encouraging whereas if the rooms are air-conditioned at 60-65°F, uniform titres are obtainable. Another factor greatly influencing the titre of the vaccine is the type of donors, either they are fair type reactors or poor reactors. Such donors are apt to yield tissues with a low titre of virus.

TABLE IV
Seasonal variation in the titre of vaccine

Month	Titre				
	1 : 16000	1 : 12000	1 : 8000	1 : 4000	1 : 2000
January ...	12 Batches	—	—	—	—
February ...	13 Batches	—	—	—	—
March ...	10 Batches	—	—	—	—
April ...	9 Batches	—	—	—	—
May ...	6 Batches	—	—	—	—
June ...	1 Batch	—	3 Batches	—	1 Batch
July ...	—	—	6 Batches	1 Batch	1 Batch
August ...	7 Batches	—	—	—	—
September ...	9 Batches	—	—	4 Batches	—
October ...	—	10 Batches	—	—	—
November ...	—	12 Batches	—	—	—
December ...	6 Batches	7 Batches	—	—	—

It will be seen from Table IV and figure II that during summer there is an appreciable decline in the titre of vaccine, whereas with the advent of cooler months, the steady improvement is noticeable. Sometimes however, the results of titration tests are considerably vitiated on account of peculiar type of reaction in hill bulls and buffalo-calves. It is therefore considered worth while in assessing the titre by running parallel tests using buffalo-calves, hill bulls and goats to equate the results. Challenging the safety tested buffalo-calves further confirms the results. A vaccinating dose however was always assessed at 40 mids.

Keeping quality of vaccine:—Observations were carried out on the progressive fall in the titre of the vaccine stored at -20°C . and exposed to ordinary atmospheric temperatures during summer (June). Freeze-dried Mukteswar adopted Goat Virus when stored at -20°C was found viable and potent even upto 510 days after storage. Representative samples of freeze-dried Goat Tissue Vaccine were sent to the Superintendent, Biological Products Section, Bombay, Superintendent, Serum Institute, Orissa and Superintendent, Institute of Veterinary Preventive Medicine, Ranipet in June, 1954. These were returned by them on the day of receipt. On receipt, samples were stored at ordinary room temperature ($95-96^{\circ}\text{F}$) and titrated after 9, 15 and 30 days of this treatment. Sample exposed for 9 days and with an initial 1 : 8000 titre had undergone appreciable deterioration to the extent that even a dilution of 1 : 4000 was not immunising. Similar results were obtained after exposure for 15 days. The material exposed for 30 days was rendered inert.

It is therefore essential to transport the vaccine on ice and store it at -10°C to -20°C . Transport under ordinary atmospheric temperature is accompanied with great risk.

Summary

The principles of large scale production of freeze dried Goat adapted rinderpest virus are outlined. Atmospheric temperature exerts deleterious effect on the potency of the vaccine, and as such, the production establishment must be effectively air-conditioned at $60-65^{\circ}\text{F}$. Transport of vaccine at ordinary atmospheric temperature results in speedy deterioration of the product, and as such, it should be transported on ice.

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CEREBRO-SPINAL NEMATODIASIS. I: SETARIA OF BOVINES IN INDIA

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Introduction

In the last few years, considerable interest has been focussed on the invasion of the central nervous system of sheep, goats and horses, in Japan and Ceylon, by immature *Setaria*, and its relation to what has been known as "Epizootic cerebro-spinal nematodiasis" or "Lumbar paralysis". Innes (1951), Innes, Shoho and Pillai (1952a, 1952b), and McGaughey (1951) have contributed significantly to an understanding of the pathological effects of this invasion, from Japan and Ceylon. Kennedy, Whitlock and Roberts (1952) found in the brain and spinal cord of two lambs, in New York State, with paralysis of limbs, neck and trunk, a nematode which was named as *Neurofilaria cornellensis* Whitlock 1952. The immature (or adult?) female worm was located in the nervous system, and the condition was designated as "Neurofilariosis". The pathology of the central nervous system as a result of nematode migration was comprehensively treated by Sprent (1955), in which account various other filarioid parasites associated with the brain, spinal cord, and the enveloping tissues or spaces, were also enumerated.

Lumbar paralysis of animals has been known in India too, in several States, but its etiology has been variously explained. It has been encountered, for instance, in goats in Orissa, and in bovines in Mysore, Madras and Bombay. Mohiyuddeen (1956) has reviewed the subject systematically, in reporting upon Enzootic Bovine Paraplegia in Mysore, and attributed the condition to the presence of larvae and immature nematodes (filaroid) in the cerebro-spinal system.

The present study was undertaken to initiate investigations into the etiology of the disease in South India, directing especial attention to *Setaria* occurring in Madras.

Identity of *Setaria* in bovines

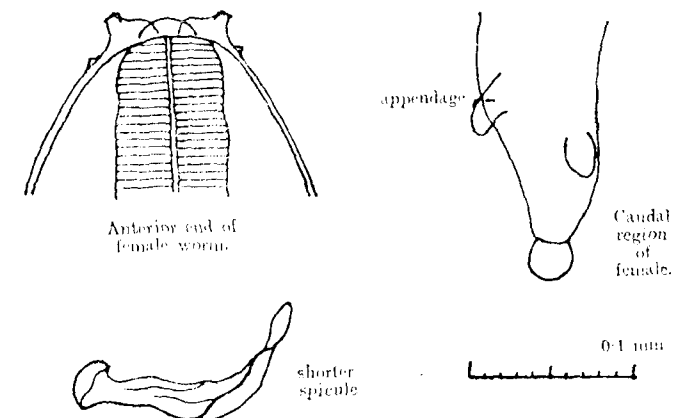
It was first considered necessary to identify the species of *Setaria* present in Madras, and accordingly a few collections were made from the Slaughter-house animals.

Several males and females in the peritoneal cavity of bovines (*Bos indicus* and *B. bubalis*) were obtained and identified as *Setaria digitata*, with the aid of descriptions provided by Thwaite (1927) and Sarwar (1946). According to the former author, *S. digitata* could be distinguished from *S. labiato-papillosa* (= *S. cervi*) by the presence of triangular lateral lips in the oral region, and of a smooth knob in the posterior extremity of the female. These two characters were distinctly observed in our specimens from the zebu cattle, as well as the buffaloes (Figs 1, 2, 4 & 5), except that, in some specimens from the latter, the knob in the caudal extremity was not quite smooth but somewhat wrinkled. This does not, at the moment, appear to have any taxonomic significance.

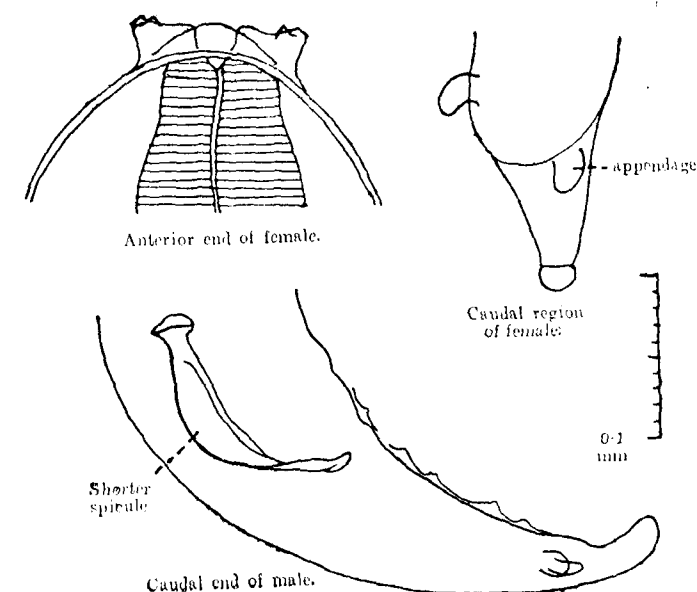
Boulenger (1921) and Purvis (1931) held *S. digitata* to be identical with *S. cervi*, but Thwaite (1927) differentiated the one from the other, as mentioned above. Sarwar (1946) made a more detailed study of specimens from cattle and buffaloes in India, and established the individuality of each of the two species. He added that the caudal appendages are conical in *S. cervi*, and oval in *S. digitata*; similar oval appendages were seen in the present collections too (Figs 2 & 5). The fourth differential character pointed out by him was that the short spicule in the male of *S. digitata* was smaller than that of *S. cervi*, and had an enlarged anterior end with a neck; the male worms from both hosts in Madras had spicules which conformed to this description (Figs 3 & 6).

There is no doubt then that we were dealing with *Setaria digitata* (von Linstow, 1906), as *S. cervi* possesses crescent-shaped lateral lips, the caudal end of its female is covered with a number of spines, its caudal

1. *Setaria digitata* from the zebu (*Bos indicus*).



2. *Setaria digitata* from the buffalo (*Bos bubalis*).



appendages are conical, and the shorter spicule in the male has a blunt anterior extremity.

Bhalerao (1935) described the species occurring in India as *S. equina* (horse and cattle); *S. labiato-papillosa* (buffalo and cattle); *S. digitata* (cattle); *S. marshalli* (cattle); and *Setaria* sp. (horse), of which only *Setaria* was recorded from Madras. No species was reported from ovines. The first description of one in goats was by Bhalerao (1933), on a female specimen from the peritoneum of a Hill Goat (*Capra sibirica*) in Muktesar, which he had named as *S. buxi* n.sp. (= *S. labiato-papillosa* according to Baylis, 1936). Sarwar (1946) adds about the notice of a single female of *S. cervi* in a sheep (*Ovis aries*) in Izatnagar. Shoho (1956) has found a male *S. digitata* in a goat in Ceylon.

In Madras, only *S. cervi* has been reported, apart from *S. equina*, as mentioned by Mudaliar and Alwar (1947). *S. digitata* was perhaps included in it, having been considered identical. The present account would therefore appear to be the first description of *S. digitata* from Madras.

No *Setaria* has been found in ovines by the authors in Madras, earlier or during this study. In their opinion, *S. cervi* in bovines—if it occurs at all in Madras—should be less common than *S. digitata*.

Paraplegia in relation to species of *Setaria*

In this country, Lumbar Paralysis is known to manifest itself (a) in goats, as in Orissa, in one of which Innes (1953) discovered lesions indicative of cerebro-spinal nematodiasis, and (b) in bovines, in contiguous tracts in Bombay, Mysore and Madras (records quoted by Mohiyuddeen, 1956). As Shoho (1955) remarks, "the pathogenicity of *S. digitata* is distinct in abnormal hosts (sheep, goats and horses), but is not evident in the normal host (cattle)". Accordingly, while ovine paralysis could be conditioned by the invasion of *S. digitata* from cattle, the paraplegia in bovines might be ascribed to *S. equina* of horses (Innes, 1952) or *S. cervi* from goats, although they have occasionally been found in cattle,—if this genus is involved in it. Mohiyuddeen (1956) however considers that in the Malnad area of Mysore, where his study was made, horses are scarce and *S. equina* should hence be precluded from suspicion. It has also emanated from our observations that the same species (*S. digitata*) occurs in the buffalo as well as the zebu, which eliminates, in a way, the probability of a bubaline species provoking these nervous symptoms in the other bovines.

Would *S. digitata* itself turn pathogenic to its normal host (cattle), in unusual circumstances? If not, what nematode—*Setaria* or any other—is the etiological agent in bovine lumbar paralysis in India?

The problem, indeed, requires a critical evaluation of the host-parasite relationships of the nematode *Setaria*, and its behaviour in strange hosts.

Setaria spp. are reputed to occur in several abnormal situations in the animal body. None the less, it is of more than ordinary interest that, in Madras, *S. equina* of horse and mule had been recovered from the spinal column, and *S. cervi* of the bullock, horse and antelope from the cranial cavity and spinal column (Mudaliar and Alwar, 1947).

The intermediate hosts of bovine *Setaria* in Japan are mosquitoes of the species *Anopheles hyrcanus sinensis*, *Armigeres obturbans*, and *Aedes togoi* (Shoho, 1955). Many species of *Anopheles* and *Aedes*, and five of *Armigeres* (*A. flavus* and *A. obturbans* as adults; *A. annulipalpis*, *A. magnus* and *A. theobaldi* as larvae, according to Horsfall, 1955), are distributed in India. The effective vector among these is yet to be named.

Future work

Further investigations undoubtedly lie in the direction of experimental transmission of the nematodes, after locating the appropriate intermediate host for completion of the life-cycle, and induction of nervous reactions in ovines or bovines with species of *Setaria* prevalent in this region. As a prelude to such work, we have attempted to transplant adult male and female *S. digitata* of bovines into the abdominal cavity of two goats, and a search for microfilariae in the peripheral blood is continuing. Results of this experiment will find expression in a subsequent article.

Summary

Cerebro-spinal Nematodiasis or Lumbar Paralysis in sheep, goats and horses in Japan and Ceylon is caused by young *Setaria digitata* of bovines. In India, it has occurred in goats in Orissa, and bovines in Madras, Mysore and Bombay.

Setaria from the zebu and the buffalo, in Madras, belong to the species *S. digitata* and could not be separated as distinct from each other on any specific character. Evidence has been adduced to show that the genus is of rare occurrence in sheep or goats. None has been encountered in ovines of Madras. *S. cervi* is also regarded as being less common than *S. digitata*.

Paraplegia has been described in goats and cattle in India. While that in the former may be provoked by *S. digitata* of bovines, the species involved in the bovine is unknown. This aspect of the problem is discussed briefly. Earlier observations on *S. equina* and *S. cervi* present in the cerebro-spinal region of animals in Madras are mentioned as being of interest.

The functional vector of *Setaria* may be among the several species of *Anopheles*, *Aedes* and *Armigeres* which are distributed in India.

Preliminary experimental work involving transplantation of *S. digitata* from bovines into two goats is also mentioned.

Acknowledgments

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CEREBROSPINAL NEMATODIASIS AMONG BOVINES

By

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The prevalence of an enzootic form of bovine paraplegia and paralysis in some Malnad parts of Mysore State bordering North & South Kanara Districts and a similar disease of cattle in South Kanara and North Kanara districts of Madras and Bombay States respectively, has been recorded by various Research workers. The disease is regarded as obscure and the exact etiological factors are not known.

Enzootic bovine paraplegia in Mysore State is non-febrile and occurs in acute, subacute and chronic forms. In acute cases the onset of complete paralysis is sudden and death results in about 2-3 days, while in subacute and chronic cases the disease starts with immobility of tail and paraplegia followed by gradual progressive paralysis of the anterior parts and the course extends from a week to a month or even more.

of the State especially in a heavy rainfall area, 9 animals consisting of bulls and cows were sent to District Livestock Farm, South Kanara on 11-9-51. The following study is now made on the performance of this breed at the Livestock Research Station, Hosur and at the District Livestock Farm, South Kanara.

Gir Breed at Live-stock Research Station, Hosur:—The Livestock Research Station at Hosur is situated in the village of Mattigiri at a distance of about 3 miles south of Hosur. This farm has a total acreage of 1,646 of which 453 acres are occupied by buildings and roads, 242 acres are used for irrigated and non-irrigated fodder and food crops and the rest of the area is being maintained under pasture for the purpose of hay making and grazing of animals. The nature of the soil varies from rich black and retentive clay loam to good hard and red gravel. It is situated at a height of about 3,000 ft. above sea level and has an average rainfall of 30" in a year. This farm maintains breeds of Sindhi and Kangayam also apart from the Gir breed about which the study is now undertaken.

(1) *Generation particulars:*—

(a) *Cows (foundation stock).* Out of the 52 animals purchased as foundation stock during 1949-50, 37 constituted the female stock, consisting of cows and heifers, of which four cows, which were affected with Brucellosis were disposed of along with two cows which were not breeding at all. Thus the 31 cows, which had progenies formed the foundation stock.

Cows (First generation):—Some of the foundation stock cows were received with calves and others calved at the farm. All these calves are taken as the first generation of farm bred cows. A total of 87 calves was born to the 31 cows of the foundation stock (which had one or more lactations at the farm) and out of these 48 were heifer calves, of which only 15 had calved. These 15 cows constituted the first generation of cows.

Cows (Second generation):—Though 26 calves at present are available at the farm for the 15 cows of the first generation, there are no completed lactation records of the progenies for the study of the second generation of cows.

(b) *Bulls at stud:*—The number of Gir bulls used for breeding purposes at this farm since 1949-50 is five. Of these, three were purchased along with the foundation stock which constituted the foundation stock of breeding bulls with numbers 1, 2 and 3.

Apart from the above three, two bull calves, which were received along with their dams at the time of purchase, were also used as farm bred breeding bulls with adult numbers 4 and 7. The details of the

performance of the above 5 breeding bulls used at the farm are given below:

Serial No.	Bull No.	Date of birth.	Period of stud at the farm.	Number of calves born.			Remarks.
				Heifer.	Bull.	Total.	
1	1	1942	1949-54	20	19	39	Received from Kathiawar State on 25-4-44.
2	2	1942	1949-54	31	30	61	" on 8-5-44.
3	3	18-2-47	1950-54	8	22	30	"
4	4	3-6-48	1954-55	5	7	12	Received with dam on 8-5-44.
5	7	7-10-48	1954 onwards.	6	7	13	"

* It is interesting to note that the progenies thrown by Bull No. 3 are about the ratio of 1:3 for heifer and bull calves.

(c) *Calves born at the farm:*—Since the inception of the herd in April 1949 till 31-3-1956, a total of 164 calves was born at this farm of which 88 are bull calves and 76 heifer calves. The details are given below:—

Serial No.	Year.	Bull calves.	Heifer calves.	Total Number of calves.	Average birth weight of bull calves in lbs.	Average birth weight of heifer calves in lbs.
1	1949-50	2	4	6	45.5	47.8
2	1950-51	11	11	22	50.7	48.7
3	1951-52	16	11	27	53.4	51.0
4	1952-53	18	15	33	52.6	50.2
5	1953-54	18	17	35	53.4	49.7
6	1954-55	11	8	19	57.8	51.8
7	1955-56	12	10	22	51.8	47.2

The percentage of male calves born is 53.7 and that of the female calves is 46.3 during the period of seven years. It is also observed that except in the year 1949-50, there were more number of bull calves born in each year than that of the heifer calves and on an average there were 23.4 births during a year.

The average birth weight of a Gir calf has been 51.4 lbs, much higher than that of the Sindhi calves born at this farm. On an average the birth weight of a male Gir calf is 52.9 lbs. and that of a female calf is 49.6 lbs. The details of the birth weight of calves for Sindhi, Gir and Kangayam at this farm are given below:—

Name of the breed.	No. of calves.	Average birth weight of bull calf in lbs.	Average birth weight of Heifer calf in lbs.	Average weight of calf in lbs.
Sindhi	952	46.5	44.8	45.7
Kangayam	1397	46.3	43.5	44.9
Gir	164	52.9	49.6	51.4

(2) *Milk yield:*

This breed is one of milch type and the milk yield performance of this breed, as recorded below, is under the farm conditions obtaining at this station.

(a) *Average annual production of milk:*—The following table gives the details of the total number of cows and heifers annually with their annual milk production.

Serial No.	Year.	Total No. of cows and heifers at the beginning of the year.	Average Number of cows.		Total milk production in lbs.	Average annual milk yield per cow (lbs.)
			in herd.	in milk.		
1	1940-50	37	31.0	7.9	28092	3555.9
2	1950-51	39	27.2	15.6	75761	1856.4
3	1951-52	43	30.0	18.3	96285	5261.4
4	1952-53	41	33.4	21.7	91177	1201.7
5	1953-54	55	38.6	23.2	103039	1441.3
6	1954-55	66	32.5	16.9	82184	1880.9
7	1955-56	51	28.0	17.0	95239	5602.3

There is a steady increase in the number of cows and heifers from 37 in the year 1949-50 to 54 in 1955-56. On an average for the last 7 years 32.0 cows remained in the herd, of which 17.2 cows were in milk with an annual average production of 4685.7 lbs of milk per cow.

(b) *Milk yield by generation:*—The 77 completed lactation records comprising the first to sixth lactations for the foundation stock and 21 completed lactation records from first to third lactations of the first generation of Gir cows, have been considered for the study. The average milk yield of the foundation stock is 3795.2 lbs and that of the first generation is 3874.5 lbs, showing an increase of 79.3 lbs in milk yield for the first generation over the foundation stock. When all the lactation records are averaged the milk yield is 3812.2 lbs for a completed lactation. This indicates that this breed is performing well and compares very favourably with that in the home tract.

(c) *Lactation period:*—The average lactation period with 21 records for the first generation of cows is 325.6 days and that of the foundation stock with 77 records is 281.2 days, showing a difference of 44.2 days. The overall average lactation period is 290.7 days.

(d) *Dry period:*—There are 9 records available for the first generation and 57 records for the foundation stock, as such the average dry period for all the 66 records is 142.9 days.

The average calving interval as observed for this breed at this farm is 431.9 days i.e., 1 year 2 months and 6.9 days.

(e) *Daily average milk yield:*—The daily average milk yield for the lactation period and the calving interval is 12.7 lbs and 7.7 lbs respectively.

While reviewing the performance of this breed of cattle, it is interesting to study the performance of other milch breed like Sindhi maintained at this farm. The following table gives the particulars as regards Sindhi and Gir at this Station.

Name of breed.	Average milk yield of completed lactation in lbs.	Average lactation period (in days).	Average dry period (in days).	Average calving interval (in days).	Daily average milk yield.	
					Lactation period.	Calving interval.
Sindhi	3922.2	310	201	513	12.5	8.2
Gir	3812.2	290.7	142.9	431.9	12.7	7.7

From the above particulars, it can be seen that the Gir breed of cattle during its short stay at this farm, has shown much progress and can compare well with Sindhi. The milk potentialities of these two breeds appear to be same and there is every indication for improving the Gir breed at this Farm by careful breeding and management.

(f) *Dry cows:*—While depicting the above picture on the performance of milk yield of this breed, it is necessary to know the calving efficiency of the cows at the farm.

The following table gives the particulars of dry cows and cows in milk maintained annually.

Serial No.	Total Number of cows.	Number of cows in milk.	Number of dry cows.	Percentage of cows in milk.	Percentage of dry cows.
1950-51	27.2	15.6	11.6	57.4	42.6
1951-52	30.0	18.3	11.7	61.0	39.0
1952-53	33.4	21.7	11.7	64.7	35.3
1953-54	38.6	23.2	15.4	60.1	39.9
1954-55	32.5	16.9	15.6	52.0	48.0
1955-56	28.0	17.0	11.0	60.7	39.3

Since at the time of the purchase of cows and heifers in the year 1949-50 they were in different stages of lactation, the remaining periods from 1950-51 to 1955-56 are considered. It is seen that the percentage of cows in milk was more than 60 in all the years except the years 1950-51 and 1954-1955 and on an average during the

last six years 59.3 percent of animals remained in milk. This shows that this breed is quite adaptable to the management practices prevailing at the farm and is capable of showing good efficiency as regular breeders.

(g) *Particulars of Gir cows which yielded more than 4500 lbs. of milk in a single lactation.*

Serial No.	Cow No.	Generation Number.	Lactation No.	Milk yield for the lactation in lbs.	Daily average yield in lbs.
1	7	Foundation stock.	2	4969.0	18.8
2	9		5	4834.8	14.3
3	12		1	4594.0	16.1
4	18		1	4665.8	16.7
5	19		4	4615.8	14.3
6	21		4	9832.8	23.6
7	23		4	9536.8	24.1
8	24		5	4586.5	11.5
9	26		1	5397.8	14.1
10	27		1	4903.5	17.0
11	28		4	5503.0	13.1
12	30		1	5843.0	14.9
13	31		5	5759.0	15.2
14	32		1	5330.0	13.7
15	33		1	6077.8	14.6
16	34		1	5166.8	12.6
17	35		1	4955.0	13.9
18	38	First generation.	2	5862.8	18.3
19	39		2	6081.0	14.8
20	40	Foundation stock.	1	6863.8	17.1
21	44		4	6182.0	14.4
22	48		4	5210.0	14.5
23	51		3	5220.8	14.8
24	55		2	7039.8	23.2
25	59		2	4657.0	13.6
26	60		1	4794.8	12.1

From the above table it is seen that out of the total of 56 milking cows in the herd so far, 26 animals have yielded more than 4,500 lbs. of milk in a single lactation. Thus it can be seen that with the small nucleus herd, it has been able to obtain some good milk yielders, among Gir cows.

(h) *Milk yield of cows distributed in different groups.*

Serial No.	Milk yield in lbs.	Number of animals.		Total.
		Foundation stock.	First generation.	
1	Below 3000	5	7	12
2	Between 3000-4000	8	5	13
3	Between 4000-5000	10	5	15
4	Between 5000-6000	7	3	10
5	Above 6000 lbs.	3	3	6
Total		33	23	56

Month-War Particulars about the Birth of Gir Calves at the Livestock Research Station, Hosur from 1949-1950 to 1955-56.

Year.	April. B.C.	May. H.C.	June. B.C.	July. H.C.	August. B.C.	Sept. H.C.	Oct. B.C.	Nov. H.C.	Dec. B.C.	January. H.C.	February. B.C.	March. H.C.	Remarks.
1949-50	1						1			1		Nil	6
1950-51	4	3	1	1	1		1	2	1			1	22
1951-52	2	1	1	1	3	Nil	1	1	1			1	27
1952-53				6	3	1	3	1	2	3	3	1	33
1953-54					1	4	5	2	1	1	1	2	35
1954-55			1	1	2	1					1	1	19
1955-56	4	1		4	1		1	1		2		1	22
Total	10	7	8	12	11	7	9	5	3	6	10	5	161
Grand total	17	20	17	23	16	8	12	15	15	7	5	9	164
Percentage	10.37	12.20	10.37	14.02	9.76	4.88	7.32	9.15	9.15	4.27	3.05	5.49	

(3) *Season of calving :—*

With a view to find out the season of calving of this breed at this farm, the details of 164 calves, born at this farm since its inception, has been tabulated above.

It is observed that more concentration of calvings occurred during the months of April, May, June and July and less concentration in the months of January and February. These findings go in accordance with the calvings of Sindhi and Kangayam breeds at this farm.

(4) *Age at first calving :*

Particulars of age at first calving of Gir cows at Livestock Research Station, Hosur.

Serial Number.	Cow No.	Date of birth.	Date at first calving.	Age at first calving in days.
1	28	5-7-46	15-4-50	1380
2	29	14-9-46	25-5-50	1349
3	30	1-10-46	24-8-50	1423
4	32	28-12-46	18-4-51	1572
5	33	18-1-47	18-10-50	1369
6	34	28-3-47	27-6-51	1552
7	36	5-10-47	4-7-51	1368
8	38	3-6-48	6-12-51	1281
9	39	24-6-48	16-4-51	1026
10	40	5-6-48	31-12-51	1304
11	41	15-11-48	25-12-51	1134
12	42	24-3-49	25-3-52	1097
13	46	18-9-49	6-7-52	1082
14	47	7-10-49	15-7-52	1012
15	48	5-12-49	11-7-52	949
16	49	2-4-50	22-8-52	873
17	50	11-4-50	19-6-52	800
18	51	18-4-50	2-6-53	1141
19	52	1-5-50	6-5-53	1101
20	54	25-5-50	6-2-53	988
21	55	9-6-50	3-8-53	1151
22	57	3-10-50	30-11-53	1154
23	58	12-10-50	2-5-53	933
24	59	21-3-51	12-2-54	1059
25	60	18-4-51	12-4-55	1455
26	62	4-7-51	16-2-55	1323
27	63	10-7-51	27-9-54	1158
28	64	10-7-51	10-10-54	1188
29	65	2-8-51	14-4-56	1717
30	66	25-10-51	24-5-55	1307
31	67	3-11-51	23-5-55	1297
32	68	11-11-51	1-1-56	1512
33	69	27-11-51	10-7-55	1321
34	72	12-7-52	18-3-56	1345

From the study of the above particulars of 34 Gir cows which calved for the first time at this farm, the average age at first calving was 3 years, 4 months and 12 days i.e., 1227.09 ± 73.08 days. For the Sindhi and Kangayam breeds of cattle maintained at this farm the

average age at first calving has been recorded as 1275 days and 1372 days respectively. Though the Gir cattle are massive in appearance and are of heavy type, the age at first calving is comparatively earlier than the other breeds at this farm. Thus apart from the calving efficiency of this breed, they obtain early maturity also, thereby indicating the economic utility of this milch breed.

(5) *Colour characteristics of Gir cattle :—*

The colour characteristics as observed of the Gir herd at this farm, comprise variety of colours of which red, white and brown are the predominant colours in different combinations with mottlings and in patches. The entire red colour was seen only in four animals, (one bull and three dams) which were purchased animals from the Kathiawar State and only one of their progenies in this farm has thrown an entire red calf so far. Out of the 164 Gir calves born at this farm, a major portion comprising of 78 calves was of red with white patches only, 28 with white and red patches only, 16 with brown and white patches only, one calf with solely red colour and the remaining 41 calves were of mixed colour of red, light red, white, dirty white, brown and grey mottlings and patches. For all the 164 calves, the sires used were only five and the colour of the sires is given below :—

Bull No. 1	... Red with white spots.
Bull No. 2	... Red with white spots.
Bull No. 3	... White with brown patches and legs brown.
Bull No. 4	... Red with white patches.
Bull No. 7	... Red.

The Dams that were mated with the above sires had mostly red and white patches; or very few white and red patches or brown and white patches or white with brown patches. Since three bulls with red and white patches in colour, are mated with a major portion of dams with red and white patches, more number of calves with these colours are thrown at this farm. It is very interesting to see the 13 progenies born to the Bull No. 7, which is solely red in colour. Out of the 13 dams mated to this Bull No. 7, 11 dams were of red with white patches or spittles and two white with red patches. None of the progenies were of red colour solely; 9 progenies born to the 11 dams of red with white patches, acquired the colour of brown with white patches, one with and brown spittles and one with red and white patches; 2 progenies born to the dams with white and red patches acquired the colour of one white and brown spittles and another red with white spittles. Thus a good number of progenies born to Bull No. 7 have acquired the colour of neither the sire nor the dam. This indicates that these varieties of

colours, occurring in the Gir breed are inherent characteristics of the breed. It may also be mentioned here that some changes in the colour take place, when the animal after birth reaches the adult stage.

(6) *Disease position.*

The Gir breed when purchased in 1949-50, were kept separately so as to get themselves acclimatised to the farm conditions. A few months after their arrival, it was observed that some of the animals in this herd were affected with Brucellosis; as such between 1940-50, 7 adult animals of Gir breed which proved positive for Brucellosis were destroyed. Hence barring the above destruction of seven animals, there were only 15 deaths among Gir cattle during the period of seven years. Out of these 15 deaths two were among adult cattle and thirteen among the young stock. Of the two deaths among adults one was due to Johne's disease and the other due to natural causes. Among the young stock, eleven deaths occurred in calves below one year of age and two due to the common causes such as gastro-enteritis, Peritonitis, Cystitis etc.

From the above disease position and with a review of the total stock of Gir cattle, it can be said, the percentage of mortality is very little. This is another reason to show that the health of Gir breed on this farm is satisfactory.

Gir breed at the Dt. Livestock Farm, Koila (South Kanara Dt.):—This farm is situated in the Malnad area of South Kanara Dt. about 40 miles from Mangalore. It covers an area of about 700 acres most of which is in the hilly tract. The rainfall in this area ranges from 150" to 200".

The foundation stock of Gir breed was sent from the Livestock Research Station, Hosur on 11-9-'51, for developing this breed at this rainfall area. The original stock transferred to this farm consisted of six cows, one bull and two bull calves; since then the stock has steadily increased to a strength of 12 animals at the end of 1955-'56. Though there are nine heifer calves born to the six cows of the foundation stock, none of the progenies has calved till now and hence the study on the milk yield performance of this breed at this station is confined only to the foundation stock of animals transferred from Hosur.

There are only 13 completed lactation records available for the study at this farm and the average milk yield is 4510.1 lbs. with an average lactation period of 324 days. The average dry period of these animals, as observed, is 124 days, with the result the calving interval is 448 days. The performance of this breed at this station is also comparatively good. This can partly be attributed to the good nucleus stock

transferred to this station as foundation stock. But it is also gratifying to note that during the short period of five years, this breed has been able to adapt well to the conditions prevailing in this area.

Conclusion:—The performance of the Gir breed of cattle at the Livestock Research Station, Hosur, and District Livestock Farm, South Kanara compare very favourably with that of the Gir breed in its home tract of Kathiawar. It is said that the average milk yield under well managed conditions varies from 3,500 lbs. to 4,000 lbs and the calving interval is between 14 to 16 months, whereas the average milk yield of this breed at Livestock Research Station, Hosur is 3,812.2 lbs. and the average calving interval is 14 months and 12 days. The average lactation period is also 9 months and 21 days, as compared with the lactation period of 8 to 10 months in the home tract. As observed at this farm they are regular calvers with an average dry period of 3 months and 23 days. The heifers have calved at the average age of 3 years and 4½ months.

This breed is thriving well at this farm and gives much scope for development in the State. It is also observed that the introduction of this breed, which has great potentialities for milk yield, is a step in the right direction.

TUBERCULOUS MASTITIS IN INDIA

BY

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Even in countries where tuberculous mastitis is considered to be quite prevalent, its incidence is usually low, and only 0.5% of tuberculous cattle are found to excrete bacilli in their milk. Mention of the occurrence of this condition in Indo-Pakistan sub-continent has seldom been made, records, mostly incomplete, being few and far between. Ware (1940) makes a passing reference to the existence of "records..... of about half a dozen cases of tuberculous mastitis in this country", but no more than four of these could be traced in original after a good deal of search and it is felt that Ware's estimate is at best only an approximate one. Mills (1898-99) seems to be the first in India to have recognised the presence of this condition in a cow. Gloster (1914) examined 101 samples of milk, principally from individual cows, with consistently negative results on biological tests in guinea-pigs. In a case of generalised tuberculosis in a Jafferbadi buffalo cow at Poona, Naik (1932) found nodular lesions in the udder as well. Mention of two

cases of generalised tuberculosis in cows, belonging to Military Dairy Farms, with udder involvement is found in the annual reports of the Indian Veterinary Research Institute for the years 1932-33 and 1940-41. The Indian Council of Agricultural Research scheme for the 'Investigation of Tuberculosis and Johne's Disease of Animals' also places on record, in its report for 1941-42, the isolation of tubercle bacilli from a milk sample from a Sahiwal cow received from Lucknow as also the finding of evidence of tuberculosis in a specimen of udder of a cross-bred cow from Peshawar. The same report contains mention of post-mortem examinations on 313 cases of tuberculosis in bovines, the results of which are recorded as follows: "Evidence of tuberculosis in the majority of cases is found mainly in the mediastinal and bronchial glands..... Mesenteric gland infection is frequent and is usually secondary to lesions in the chest cavity..... The abdominal organs, apart from the intestines and peritoneum, are rarely affected. Tuberculosis of the mammary glands is seen in 2.7% of the cases." Mallick, Aggarawal and Dua (1942) failed to infect guinea-pigs with any of the specimens of milk from 101 tuberculin positive cows in Amritsar, two of which showed even clinical evidence of mastitis. They opined that it was unnecessary to boil milk before use, unless it be for preventing human infections other than tuberculosis, e.g. brucellosis. Under the Tuberculosis and Johne's Disease Scheme referred to above, milk samples from 339 tuberculin reacting cows at five farms were subjected to biological tests in guinea-pigs during 1943-1950 with uniformly negative findings. It may be noted that this work was conducted on Government farms (3 civil and 2 military) which were better looked after and the possibility of a case continuing on the premises to an advanced stage was very slight. Mohan (1950) isolated acid-fast bacilli from milk samples of two goats out of a total of 332 examined. One more case has recently been observed by Singh *et al* (1956) in which they have found the causal bacillus to be of bovine type, and they have made interesting observations on its pathogenesis and transmission.

The incidence of tubercle bacilli in market milk has also been investigated. Joshi (1914), cited by Datta (1935), made a systematic examination of Bombay milk and though out of 674 samples 47 showed acid fast bacilli, none proved pathogenic to the guinea-pig. Similar work conducted at Bombay, Calcutta and Madras by workers at the Indian Veterinary Research Institute yielded negative results. Except on one or two occasions, no attempt at typing seems to have been made even in the few instances where cultures of acid-fast bacilli had been recovered from milk, though as explained below, this is extremely essential for establishing the authenticity of a case of tuberculous mastitis.

The importance (role) of typing

The importance of typing the causal organism in an investigation of any affection caused by Mycobacterial species has long been recognised. In recent years, Stuart of Harvey (1951) have described from three herds five cases of udder infection with acid-fast bacilli other than *Mycobacterium tuberculosis* (3 *Mycobacterium lacticola* and 2 unidentified) where the lesions resembled those of early tuberculosis, both macroscopically and histologically. Thirty-two such cases have also been recorded by Tucker (1953) in the U.S.A., where bovine tuberculosis is no longer menacing.

In the event of obtaining cultures directly from milk, without establishing simultaneously the presence of disease in udder, determination of the type of organism assumes greater importance on account of the frequency with which acid-fast saprophytes are met with in the animal environment, besides the possibility of milk samples getting contaminated with tubercle bacilli from extraneous sources. Joshi's finding of acid-fast, but non-pathogenic, bacilli in milk is of particular interest in this connection. The little information supplied by Mohan in respect of the two organisms recovered by him from goat milk does not amply justify their being reckoned as tubercle bacilli.

Apart from the identification of tubercle bacillus responsible for mastitis, typing also aids in assessing its animal and public health importance in so far as the avian type is relatively of lesser significance from that angle. Avian infection in cattle is usually retrogressive and is important because of its interference with tuberculosis eradication programmes by producing false tuberculin reactions. The few available records of avian infection in human subjects indicate its low pathogenicity for man. Since the isolation of fourteen strains from clinically normal udders by Wolters and Dehmel (1931), three cases of tuberculous mastitis caused by the avian type have been recorded, one each by Timoney (1939), Ottosen (1944) and Stuart and Marshall (1952).

Pathogenesis

A review of literature indicates four possible portals of entry into udder tissue by tubercle bacilli.

M^r Fadyean (1889) is "inclined to believe that in most, if not all cases, the blood is the vehicle of infection" and remarks, "so far as I am aware there is not on record any case in which the udder lesion was the only evidence of tuberculosis in the body." In such instances the affected quarter or quarters will, depending on the amount of infection being heavy or slight, show respectively either lesions of uniform age all over or the oldest ones in the centre. The supramammary lymph gland will get affected later than the udder and will thus present younger lesions.

The same author (M'Fadyean, 1898) has envisaged the possibility of udder invasion by way of lymphatics, in a centrifugal direction, i.e. against the normal lymph flow. This mode of spread is often explained on the basis of fluctuations in lymph pressure in the udder before and after milking, as also on gravitation. The occurrence of this condition is supported by the finding of more advanced lesions in the supramammary lymph gland as compared to pathological evidence in the udder; the upper posterior part of the hind quarters is the first to get affected and may, in recent cases, be the only evidence of udder involvement.

The entry of bacilli through teat canal has also been postulated. Thus, McFarlane *et al* (1944) have recorded cases of primary udder lesions where irrigation of the udder, probably with improperly sterilized catheter, was responsible for the spread of the infection to udder tissue in a herd. Ritchie (1946) has recorded during 1943-46 a number of cases in unattested herds, most of which (89 to 100 per cent) had a history of udder irrigation. Under this circumstance the oldest lesions are met with in the environment of the milk cistern.

To these can be added the possibility of transmission of bacilli through wounded udders, which can pick up infection from floors contaminated with infective discharges, secretions or excretions.

The authors, while admitting the possibility of any of these courses of udder involvement, regard the haematogenous path of spread to be predominantly the most frequent one. The scanty post-mortem findings available in respect of cases encountered in India, indicating association of lung lesions in almost all instances, might tend to favour this view. Comments in respect of the probable route of mammary infection in each case are given in table 1.

Rarity of records of simultaneous infection in all the four quadrants is not considered to be a feasible argument against blood being the commonest vehicle of infection, specially in view of the findings where udder tissue remained unaffected even when it had been known to excrete *Mycobacterium tuberculosis* over long periods. Gaiger and Davies (1933) have described a case where tubercle bacilli continued to be eliminated in milk for about 6 months before slaughter without any slight tubercular involvement of the supramammary lymph node being, however, available. Occasional finding of tubercle bacilli in milk by the recent work of Francis (1951). This fact, combined with the comparative rarity of udder involvement in tuberculous animals, tends to reveal the somewhat refractory nature of udder tissue

Lesions encountered in cases of tuberculous mastitis in India, with comments on probable pathogenesis in each.

Sl. No.	The source and year of report.	Extent of mammary lesions.	Extent of lung lesions.	Other lesions seen.	Comments.
1.	Mills (1898-99)	Not indicated.	Lungs involved.	—	Primary infection of the udder being uncommon, haematogenous spread from lungs can be postulated. Extensive lung lesions together with miliary tubercles in systemic organs point to infection of udder through blood stream.
2.	Naik (1932)	Both posterior quarters affected.	Extensive lesions in both the lungs.	Miliary tuberculosis in liver and spleen; lesions in other sites as well.	Lung lesions, involving pleura, appear to have been of primary occurrence. Infection in udder probably due to bacillaemia.
3.	I.V.R.I. (1932-33)	Not indicated.	Lungs and pleura involved.	Lesions in lymph glands of lungs and udder noted.	Generalised lesions point to mammary gland infection via blood stream.
4.	I.V.R.I. (1940-41)	Not indicated.	Described as a generalised case.	—	No comments possible.
5-6.	Scheme for investigation of tuberculosis and Johne's disease (1941-42).	Not indicated in one case and only milk examined in the other.	At least mediastinal and bronchial glands involved in most cases.	Secondary involvement of abdominal organs in some cases, but not extensive.	Although nothing definite can be said, the spread of infection seems to have followed the haematogenous route from primary lung involvement in most cases.
7-15.	Ditto (1941-42)	Not indicated.	Extensive lesions in left lung alone, pleura also involved.	Prescapular, mesenteric, superficial mammary and supramammary lymph glands and kidneys involved.	The case being well advanced, comparative age of lesions in different organs difficult to assess (lesions in kidneys, and prescapular and mesenteric lymph glands of comparatively recent origin; other lesions much advanced). Finding of lesions in one lung alone indicates this organ to be the primary seat of infection; secondary udder involvement possible only by way of blood stream, there being no extensive lesions in the abdominal cavity.
16.	Singh <i>et al</i> (1956)	Gross lesions in left hind quarter.	—	—	—

GOJA (AMARANTHUS SPINOSUS, LINN)—A DROUGHT RESISTANT EVER-GREEN—A USEFUL FEED FOR SHEEP

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The development of sheep industry for maximum and economical production depends on adequate nutrition. Proper feeding of the ewe during the gestation period in particular appears to be very necessary. A vigorous lamb at birth is a pre-requisite for successful sheep husbandry. Various breeds of foreign sheep have been imported recently in this country, mostly from Australia, with a view to improve the local breeds. The imported animals thrive well when fed on large quantities of concentrates. It becomes necessary at times to feed these animals with as much as 2 lbs. of the concentrate mixture each — a procedure which is obviously beyond the economic limit of an average farmer in this land.

Proper development of pasture in this country is undoubtedly beset with many practical difficulties. Firstly we have a very short monsoon; and secondly, very little is known about the habitat, chemical composition and nutritive value of the grasses, shrubs and tree leaves that are normally found in most of the areas. In the absence of such knowledge, it is difficult to determine which of the flora should be encouraged in particular localities.

We found *Goja* or *Amaranthus spinosus*, Linn, a wild drought resistant shrub, commonly found even under desert conditions, thriving well in the western tract of U.P. and sheep relish this plant well although cattle do not refuse the same. This plant gives an abundant green feed throughout the year and a 2 to 2½ feet high plant of the thorny variety of *Goja*, found commonly in U.P., is reported below. The nutrients composition, distribution of protein and minerals in various parts of the plant, the palatability of the shrub to sheep in values of dry matter consumption, the digestibility co-efficients of nutrients for sheep, the mineral balance studies, and the comparison of digestible nutrients in the plant with those of other common green feeds, are given in Tables I to VI.

Chemical Composition

The chemical analyses have been done according to A.O.A.C. (1950) edition and Talapatra, S. K., Ray, S. C. and Sen, K. C. (1942). The results are shown in the following Table.

TABLE I

Chemical Composition of Goja on dry and wet basis.

Constituents.	On dry basis (per cent)	On wet basis containing 25.6 per cent Dry Matter (per cent)
Crude Protein	16.13	4.13
True Protein	13.39	3.45
Amides	2.74	0.68
Ash	18.95	1.86
Ether Extract	2.51	0.64
Crude Fibre	20.29	5.19
N. free extract	42.12	10.78
Total Carbohydrates	62.41	15.97
Calcium (Ca)	2.28	0.58
Phosphorus (P)	0.28	0.07
Total Sulphur (S)	0.37	0.09

The chemical composition of the shrub during the month of March, when no other green feeds are available, has been shown in the above Table. It may be seen from the data that the shrub contains as much protein as can normally be found in most of the legumes. The content of fibre is also definitely lower than most of the green feeds. It is as high in calcium as the legumes are, while the content of phosphorus is comparable with any leguminous feed. The content of true protein indicates that the non-protein nitrogenous compounds are very low about 17 per cent of the total nitrogen. The amount of sulphur present in the stuff shows that in its content of total sulphur it is comparable with such feeds as cotton seed meal (0.46%), linseed meal (0.38%) and soya bean meal (0.45%).

The distribution of the crude protein, calcium and phosphorus in different parts of the plant has also been studied and is shown in the Table below:—

TABLE II

Distribution of Protein, Calcium and Phosphorus in different parts of the plant (on dry basis).

Particulars	Crude Protein (per cent)	Calcium (Ca) (per cent)	Phosphorus (P) (per cent)
Inflorescences with seeds	22.82	1.56	0.48
Spiny sub-branches	13.07	2.36	0.42
Leaves	25.54	3.71	0.32
Stem	10.01	2.10	0.19
Whole plant	16.13	2.28	0.28

It may be seen from the data that inflorescences with seeds contain a very high percentage of protein. The content of phosphorus in the inflorescences is very high and is comparable with grains. The leafy portion of the plant has a protein composition similar to that of an oil cake. Unlike other plants even the stem contains over 10 per cent of protein.

Palatability of the Shrub as measured by the dry matter consumption

TABLE III
Dry Matter Consumption.

Animal number	Body Wt. (lb.)	D.M. consumed per day (lb.)	D.M. consumed per 100 lb. body wt. (lb.)	Average (lb.)
1	81	2.2	2.7	2.73
2	71	2.3	3.3	
3	76	2.1	2.8	
4	96	2.0	2.1	

From the data shown in the Table III, it appears that the sheep relish the stuff very much. On an average they consume about 2.7 lb. of dry matter per 100 lb. body weight, which is considered very satisfactory.

The Nutritive value of the New Feed

For the purpose of evaluation, four adult sheep of an average body weight of 81 lb. were taken as experimental subjects. They were fed for a sufficiently long period of about 20 days to rule out the effect of any of previous feed. After this pre-experimental period, urine and faeces were collected quantitatively using special type of metabolism gears for the collection of urine and faeces. The sampling of the excreta was done in accordance with the technique followed at the Division of Animal Nutrition, Indian Veterinary Research Institute, Izatnagar. The samples of the feed and residue were collected and separately analysed.

The digestibility coefficients of the Dry Matter, Crude Protein, True Protein, Ether Extract, Crude Fibre, N. Free Extract and Total Carbohydrates are shown in Table IV.

TABLE IV
Digestibility coefficients of the organic nutrients.

Animal number	Intake (gm.)	Voided in faeces (gm.)	Amount digested (gm.)	Per Cent digestibility	Average
<i>Dry Matter</i>					
1	971.80	461.20	510.60	52.54	54.55
2	1039.80	472.50	567.30	54.56	
3	951.10	432.10	519.00	54.57	
4	898.60	390.60	508.00	56.53	
<i>Crude Protein</i>					
1	155.03	46.50	108.53	70.00	72.42
2	166.38	47.50	118.88	71.45	
3	151.58	42.13	109.45	72.20	
4	147.86	36.13	111.73	76.03	
<i>True Protein</i>					
1	125.93	44.41	81.52	64.73	66.61
2	135.96	46.21	89.75	66.01	
3	122.88	41.61	81.27	66.13	
4	115.55	35.15	80.40	69.58	
<i>Ether Extract</i>					
1	23.23	12.04	11.19	48.21	53.08
2	25.20	11.25	13.95	55.35	
3	22.64	11.37	11.27	49.74	
4	21.23	8.70	12.53	59.00	
<i>Crude Fibre</i>					
1	194.09	124.62	69.47	35.79	36.31
2	208.34	131.59	76.75	36.84	
3	189.37	122.67	66.70	35.22	
4	178.46	111.75	66.71	37.38	
<i>N. Free Extract</i>					
1	420.05	170.18	249.87	59.48	62.20
2	446.34	162.82	283.52	63.52	
3	412.06	157.41	254.65	61.71	
4	390.72	140.38	250.34	64.07	
<i>Total Carbohydrates</i>					
1	614.14	294.80	319.34	52.00	54.04
2	654.68	294.41	360.27	55.03	
3	601.43	280.08	321.35	53.43	
4	569.18	252.13	317.05	55.70	

It may be seen from the data that the average dry matter digestibility of the feed is about 55 per cent, as is normally found in most of the green feeds. The digestibility of the crude protein, as shown in the above Table, is comparable with any leguminous feeds. On an average the animals have digested over 72 per cent of the protein present in the feed. The digestibility of true protein indicates that the feed is definitely low in amide nitrogen. The digestibility of the ether extract is also more than the average green feeds, this is because of the fact that the seeds of the plant contain some oil. As is normally the case with high protein feeds, crude fibre digestibility is low, about 36 per cent, while that of N. free-extract is high about 62 per cent.

The balance of Calcium, Phosphorus and Nitrogen has been shown in the following table :—

TABLE V
Calcium, Phosphorus and Nitrogen balances under green Goja feeding.

Animal number	Intake (gm.)	Voided in faeces (gm.)	Voided in urine (gm.)	Total voided (gm.)	Balance (gm.)
<i>Calcium (Ca)</i>					
1	22.89	21.12	0.07	21.19	+ 1.70
2	24.29	22.35	0.07	22.42	+ 1.87
3	22.36	19.88	0.09	19.97	+ 2.39
4	21.18	17.73	0.07	17.80	+ 3.38
<i>Phosphorus (P)</i>					
1	2.68	2.95	0.02	2.97	- 0.29
2	2.88	2.93	0.03	2.96	- 0.08
3	2.62	2.77	0.02	2.79	- 0.17
4	2.46	2.42	0.02	2.44	+ 0.02
<i>Nitrogen</i>					
1	24.80	7.44	16.52	23.96	+ 0.84
2	26.62	7.60	16.21	23.81	+ 2.81
3	24.25	6.74	16.70	23.44	+ 0.81
4	23.66	5.78	15.20	20.98	+ 2.68

The data shown in the above table indicate that the animal can be kept virtually on a positive calcium (Ca), phosphorus (P) and nitrogen balance. In the case of phosphorus (P) a slight negative balance with animals No. 1, 2 and 3 is observed.

Some Practical Considerations

From the average digestibility coefficients, the digestible nutrients in the feed have been calculated and are shown along with some of the highly recommended cultivated legumes (Sen, 1937).

TABLE VI
Digestible nutrients in terms of 100 lb. of green stuff*

Particulars	D.C.P. (lb.)	Dig. True Protein (lb.)	Protein equivalent (lb.)	S. E. (lb.)	T.D.N. (lb.)	Per Pound of green stuff	
Goja	2.99	2.30	2.65	10.28	12.35	Ca.	P.
Berseem	2.82	—	—	11.00	12.90	(gm.)	(gm.)
Lucern	3.18	—	—	9.30	11.60	—	—
Senji	2.52	—	—	10.30	12.80	—	—

* 25.6 Per cent Dry Matter.

It is quite obvious from the data shown in the above Table that it is comparable with any legume.

From the data shown in Table III, it is clear that 100 lb. sheep are capable of eating about 10 to 12 lb. of green feed when fed *ad-lib*,

which should supply a minimum of 0.3 lb. of D.C.P. (equivalent to 2 to 2½ lb. of concentrate mixture) and 1.5 lb. of T.D.N. According to National Research Council standard, the above ration should be more than enough for ewes requiring 0.17 lb. D.C.P., 1.7 lb. T.D.N., 3.2 gm. calcium and 2.5 gm. phosphorus. Even with breeding rams of 100 lb. body weight requiring a maximum of 3.6 lb., 0.24 lb., 2.3 lb., 4.0 gm. and 3.4 gm. each of dry matter, D.C.P., T.D.N., Calcium and phosphorus, there appears to be no shortage of either protein, calcium or phosphorus. There is, however, slight shortage of energy which can very nearly be made good easily by introducing about one pound of hay. It may thus be seen that under the existing feeding practices, about two pounds of concentrate mixture supplemented by calcium should have been required to satisfy the nutritional requirement of the ram.

It has, however, been observed that when sheep were fed with large quantity of the feed, sometimes the pellets are not formed, as may be the case with any succulent green feed, when so fed. The authors have seen that under such circumstances a little of the dry stuff like oat hay can very easily correct the condition and proper pellets are formed.

Calcium and Phosphorus Nutrition of Sheep under Goja Feeding

It may be seen from Table I, that the ratio between calcium (Ca) and Phosphorus (P) in the feed, though not as wide as is normally found in many leguminous feeds, even then such a ratio is considered undesirable in the case of dairy animals (Talapatra and Barsaul, 1956). But in the case of sheep authoritative opinion (Marston, 1949) inclines to the view that a wide calcium (Ca) and phosphorus (P) ratio in the diet is of little consequence almost at any stage of their life, provided the minimum requirement is satisfied. From this stand point, such feed seems to have no drawback, because when Goja forms the major bulk of the ration, it is expected to supply the minimum phosphorus requirement of the sheep as has been shown earlier.

Summary

Goja (*Amarantus spinosus*, Linn.) an evergreen plant which grows profusely in Western tract of the Uttar Pradesh and probably in other parts of the country, appears to be a highly nutritious feed for sheep almost at any time during the year. It grows practically without irrigation and remains green and succulent even under desert like conditions.

During the month of February-March, when uncultivated green feeds are almost entirely absent, it contains 16.13, 13.39, 18.95, 2.51, 20.29, 42.12, 62.41, 2.28 and 0.28 per cent of Crude Protein, True Protein, Ash, Ether Extract, Crude Fibre, N. Free extract, Total Carbohydrates, Calcium (Ca) and Phosphorus (P) respectively.

Feeding experiments conducted on adult sheep indicate that they easily consume per 100 lb. body weight about 11 lb. of the green feed which contains on an average about 25 per cent of dry matter.

The digestibility co-efficients of the various organic nutrients, are 54.5, 72.4, 66.6, 53.1, 36.3, 62.2 and 54.0 per cent respectively of Dry Matter, Crude-Protein, True Protein, Ether Extract, Crude Fibre, N. free Extract and Total Carbohydrates.

The digestible crude protein, protein equivalent, starch equivalent, and total digestible nutrients are 2.99, 2.65, 10.28 and 12.35 respectively per 100 lb. of the green material.

The chemical composition and nutritive value of the plant indicate that it can very easily be compared with green legumes.

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PRELIMINARY REPORT ON RETENTION OF PLACENTA AND ITS TREATMENT IN THE BOVINE

By

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Introduction

Retention of afterbirth by cattle and buffaloes following normal or premature parturition is a serious problem.

Reference has been made by several authors Palmer, 1932; Gotze, 1941, 1942; Kennedy, 1947; Benesch and Wright, 1950) to the incidence of retention of foetal membranes in the bovine. Smith (1918) recorded a high incidence of retentions in cows delivering or aborting while infected with *Vibrio foetus* Biswal *et al* (1953), on the other hand, did not observe a single case of retention of placenta in a flock of 114 Hampshire

ewes where the abortion storm due to *Vibrio foetus* infection reached 28 per cent. Hart *et al.* (1933) noticed the occurrence of retained afterbirths in animals affected with leptospirosis. Fincher (1941) found that about one-third of placental retention cases were positive for brucellosis. Kennedy (1947) reported on the incidence of placental retentions of 8.3 per cent of 395 deliveries in English herds where brucellosis was absent or "quiescent". Palmer (1932) recorded the retention of foetal membranes in 11.7 per cent of 125 cows in two herds which were free of brucellosis and tuberculosis. Placental retention resulting from placentitis has also been reported (Hallman, 1924) Hart *et al.* (1932) and Ronning *et al.* (1953) reported upto 69 per cent of the cows had placental retentions when brucellosis-free cows were maintained on a Vitamin A deficient diet. Jordan (1952) believes that placental retention is associated with lack of uterine motility after delivery, whereas Kennedy (1947) does not believe that uterine motility affects placental expulsion. McDonald *et al* (1954) believe that deficiency of progesterone prior to delivery is suspected as being responsible for placental retention.

Skaarup-Thygesen (1949) stated that the incidence of after birth retention is little or nil with mare probably due to papilla-shaped uterine extremities in the fellopan tubes in contrast to the gradually narrowing ends of the uterine horns in the cows.

Notwithstanding the knowledge of physio-anatomical relationship of maternal and foetal membranes of the developing foetus, the mechanism which operates in the placental retention in cattle and buffaloes is not clear. The etiology of this condition is also not fully understood. Hence the control measures adopted are not always successful.

This paper records preliminary data on a line of treatment followed in cattle and buffaloes under Orissa conditions.

Animals under Observation

This study involved 181 animals—94 Red Sindhi Cows and 87 Murrah buffaloes, of the Government Dairy Farm, Cuttack, Orissa, India. All the animals were tuberculin tested and were found negative. They were all vaccinated with *Brucella abortus* S. 19 vaccine 6 months prior to commencement of the first treatment as majority of them were positive to a brucella agglutination test. They were clinically free from Vibriosis and Leptospirosis. No testing was done against these diseases as the incidence of these diseases has so far not been recorded in Orissa, India. The husbandry of these animals is good. All animals are given a balanced ration depending on their performances. All have had access to greens all the year round.

In addition, 32 local country-bred cows of the urban people with placental retention 24 hours and over brought to hospital for treatment

were included in this study. Unfortunately the history of these animals as to the disease status was unknown. Except the treatment no other examinations were possible in these animals.

At Parturition, materials from 15 animals (11 cows and 4 buffaloes) of the farm were examined microscopically for the presence of *Br. abortus*, *Vibrio foetus* and *Trichomonads*. No evidence of these infections was noticed except in two buffaloes in which *Brucella* organisms could be detected. Cultural examination of uterine swabs collected from 20 animals under observation revealed *Pseudomons* in three (1 cow and 2 buffaloes) and *E. coli* in three (1 cow and 2 buffaloes).

Incidence of Retained Placenta:—For purposes of this study it has been considered normal when expulsion of the foetal membranes took place spontaneously within 3 hours after parturition. When the expulsion is effected from 3 to 7 hours after parturition it is called delayed expulsion. An animal is considered to have retained membranes if complete expulsion did not occur within 7 hours after parturition. The total number of animals observed was 213 (94 cows and 87 buffaloes of the farm and 32 local country-bred cows)—Table I; and of these 31 (20 cows (21.2%) and 11 buffaloes (12.6%) of the farm) and 32 country-bred cows, had retained foetal membranes. Two cows (Farm) of these animals aborted at seventh month; these proved to be of non-specific nature as the microscopical examination of foetal membrane smears and cultural examination of uterine swabs revealed no organisms. Incidence of retained foetal membranes was fairly high at first calving [9 (45%) out of 20] in cattle; but in buffaloes the incidence appears to be more at 4th (54%) and 5th (36%) and it was nil in the first and 10% in the second calvings (Table I).

Line of Treatment:—Manual removal of all retained foetal membranes was attempted by a soft and gentle manual traction as soon as animal was presented. When expulsion by this means was not successful a second attempt was made at 48 hours after parturition. In most of the cases the membranes were removed within 48-72 hours. However, in a few cases, where this was not possible the retained membranes were left undisturbed. Treatment commenced in all cases after either the success or the failure of the first attempt. On the basis of the line of treatment adopted 63 animals (20 cows and 11 buffaloes of the farm and 32 animals brought to hospital) with retained foetal membranes were divided into 10 groups, (Table II). All animals received intramuscular injections of Stilboestrol dipropionate (M & B) 10 to 15 mg., every alternate day from 3 to 5 injections. Details of treatment adopted, involution of uterus and general condition of animals are shown in Table II.

TABLE I
Particulars of Retention of the Foetal Membranes in Cows and Buffaloes.

Sl. No.	Particulars of animals.	Total No. of calvings observed.		Number of normal expulsions		Number of delayed expulsions of foetal membranes.		Number of retained placenta	
		Cows.	Buffaloes.	Cows.	Buffaloes.	Cows.	Buffaloes.	Cows.	Buffaloes.
1.	First calving	16	9	5	6	2	3	9	—
2.	Second calving	31	6	14	4	14	1	3	1
3.	Third calving	19	15	5	5	12	10	2	—
4.	Fourth calving	9	34	5	6	2	22	2	6
5.	Fifth calving	15	20	5	5	8	11	2	4
6.	Sixth calving	3	8	—	—	2	3	1	—
7.	Seventh calving	1	—	—	—	—	—	1	—
8.	Local country-bred cows (with-out history)	32	—	—	—	—	—	32	—
Total ...		126	87	34	26	40	50	52	11

Note:—Normal - Membranes expelled within 3 hours
 Delayed - " from 3 to 7 hours
 Retained - Membranes not expelled even after 7 hours.

The gestation period of cows ranges from 273 to 288 days.
 The gestation period of buffaloes ranges from 301 to 316 days.

TABLE II
Result of Treatment of Retained Fetal Membranes in Cows and Buffaloes.

Group No.	No. of animals treated in each group		Mean time between parturition and first treatment (in hours)		Line of Treatment		Mean time for the complete involution of the uterus and stoppage of uterine discharge		General condition of the animals (Cows and Buffaloes)	Remarks
	Cows	Buffaloes	Cows	Buffaloes	Cows	Buffaloes	Cows	Buffaloes		
I.	1	—	23	—	Cows	1. Streptomycin 3 gms. Procaine Penicillin 12 lacs intramuscularly every 12 hours 5 days. 2. Stilboestrol dipropionate in oil 10 mg. intramuscularly every alternate day 3 injections. 3. Pitocin 8 c.c. intramuscularly for three days. 4. Terramycin 2 gms. intra-uterinely (1 gm. into each cornua given on the 6th day.)	21	—	Temperature, appetite and milk yield normal.	
II.	4	—	21	—	Cows	1. Sodium Sulfamezathine 50 c.c. Streptomycin 3 gms. Procaine Penicillin 12 lacs intra-uterinely every third day for 3-5 injections. 2. Stilboestrol dipropionate 10-15 mg. intra-muscularly every alternate day 3-4 injections. 3. Pitocin 8 c.c. intramuscularly for 3 to 5 injections. 4. Streptomycin 3 gms. Procaine Penicillin 12 lacs every 12 hours for 3 days intra-muscularly.	24	—	Temperature, appetite, milk yield normal.	
III.	4	—	25	—	Cows	Same as Group No. II except parental administration of Streptomycin and Procaine Penicillin.	27	—	In two cases there was slight rise of temperature (1 to 2°F) for 2 days. Appetite was normal. There was slight temporary reduction of milk yield.	
IV.	2	2	27	29	Cows	1. Streptomycin 3 gms. Procaine Penicillin 12 lacs intramuscularly every 12 hours for 3 days. 2. Sodium Sulfamezathine pessaries intra-uterinely every third day 4 to 5	28	33	Same as in Group III.	
V.	5	4	28	23	Cows	3. Stilboestrol dipropionate 10-15 mg. intramuscularly every alternate day 3 to 4 injections.	28	33	Two cows and 1 buffalo showed slight rise of temperature and temporary reduction in milk yield.	
VI.	10	—	31	—	Cows	Same as Group IV. In place of Sulfamezathine, Compron pessaries were used. 1. Streptomycin 3 gm. Procaine Penicillin 12 lacs intramuscularly every 12 hours for 3 to 5 days. 2. Liquid BIPP. 4 to 6 oz. into the uterus once in a week for 3 to 4 times. 3. Stilboestrol 10 to 15 mg. Intramuscularly every alternate day 3 to 5 injections.	33	—	4 cows showed slight rise in temperature and temporary reduction in milk yield.	The milk of all animals could not be used for a few days following BIPP.
VII.	3	1	26	27	Cows	Same as Group VI but in place of Streptomycin and Procaine Penicillin Sodium Sulfamezathine intravenously (100 c.c. first day followed by 50 c.c. a day for 3 days continuously).	34	39	All showed moderate rise of temperature, temporary reduction in milk yield and loss of appetite.	These were treated with 10% solution of Calcium Gluconate, 150 to 200 c.c. intravenously and 5% solution of Glucose 500 c.c. intravenously.
VIII.	7	—	29	—	Cows	1. Stilboestrol dipropionate 10-15 mg. intramuscularly every alternate day for 3 to 5 injections. 2. Followed by Pitocin 8 c.c. intramuscularly. 3. Liquid BIPP 5 to 6 oz. into the uterus once a week for 3-4 weeks.	38	44	There was rise of temperature nearly in all the cases. Temporary reduction in milk yield and loss of appetite.	Milk could not be utilised for a few days following Uterine BIPP. Those animals which were dull, were given Calcium Gluconate and Glucose intravenously as under VII.
IX.	5	—	24	24	Cows	Same as Group VIII. Except Pitocin. Same as Group II except Pitocin.	40	34	Same as in Group VIII. Temperature, appetite, milk yield normal.	
Sulfamezathine Sodium Sulphamezathine Stilboestrol							Compron	—	May and Baker.	
							Pitocin	—	Parke and Davis.	
							Terramycin	—	Pfizer.	

Subsequent breeding history:—Only farm animals could be followed; out of 20 cows, 45 percent conceived by first insemination, 15 per cent by second insemination, 10 per cent by third insemination and 10 per cent have not conceived due to ovarian disfunction and adhesions of bursae and the rest of the 20 per cent have been disposed off due to poor milk yield. Of 11 buffaloes 72.8 per cent conceived by first service 9 per cent by second service and the rest of 18.2% have been disposed of due to peri-metritis and ovarian tumour.

Discussion

We feel that normal expulsion of foetal membranes, should be effected within 3 hours after parturition. When the foetal membranes are expelled from 3 to 7 hours after parturition we call it delayed expulsion. But, when expulsion of foetal membranes is not effected beyond seven hours after parturition we call them retained. According to Benesch & Wright (1950), it is generally believed that retention of the foetal membranes for longer than 12 hours in the bovine should be considered pathological. Coid and McDiarmid (1954) believe that animals are considered to have retained foetal membranes if complete expulsion do not occur within 72 hours after parturition. Lagerlof (1953) and Lundgren (1953) are of opinion that if hygienic conditions are good at calving, and during a week or so after calving, it is in most cases not dangerous to leave the placenta and wait for the spontaneous expulsion.

Methods of treating cases of retention have been widely discussed and most of the workers are of opinion that manual removal of foetal membranes is often not advisable (Gould, 1944) (Lang, 1944). Bosshart (1954) recommends the use of posterior pituitary extract (ppe) in case of retained placenta. Eight animals with retained foetal membranes over 5 to 9 days old were successfully treated with intramuscular injection of Stilboestrol dipropionate by Coid and McDiarmid (1954). Sixty-three cases under present study were given Stilboestrol dipropionate 10-15 mg. intramuscularly every alternate day from 3 to 5 injections. The gentle and soft manual traction applied 24 to 72 hours after parturition were an adjuvant to the treatment done. The line of treatment adopted by us (Table II) indicates that involution of the uterus took place early (21 days) in animals of group No. I, but it cannot be taken as a standard as it constitutes only one case. Animals of group No. II gave the maximum desired effect in that (1) involution took place early (24 days) (2) milk yield, appetite and general condition remained normal and (3) the disadvantages of BIPP imparting odour to milk is avoided. Animals in group No. 10 follow a similar pattern as in Group No. II. However, the absence of pitocin in Group No. X, perhaps, delayed the time of involution. The results obtained in group Nos. III, IV and V appears to be almost the same. Similar results in group Nos. VI and

VII constitute one pattern. Nevertheless the combined action of antibiotic and Stilboestrol in group No. VI may be considered superior by the effect on the time of involution of the uterus. The results in group Nos. VIII and IX appear to be the same as to the time of involution of the uterus, rise of temperature, loss of milk yield and loss of appetite. The combined effect of Stilboestrol and pitocin in the process of involution of uterus in some of the animals appears to be superior to that of Stilboestrol alone. However, it requires further investigation. The time required for the involution of the uterus in buffaloes is one week more than in cows.

Lundgren (1953) advises Stilboestrol treatment 10 days after expulsion in order to stimulate the uterine contraction and involution. This treatment can be repeated if the cow has discharge. Lagerlof (1953) advises also Hydrogen Peroxide (H_2O_2) irrigation along with stilboestrol injection. This injection can be repeated after 10 to 20 days. Lundgren (1953) advises the use of BIPP in cow which still has discharge after involution. None of our cases under observation showed discharge after involution.

During the course of treatment no animal was seriously ill, though some, as shown in Table II, showed rise in temperature, lost their appetite and consequently showed a slight loss in condition and milk yield. Such animals were given glucose and Calcium Gluconate intravenously.

The line of treatment adopted by us in this study appears to be too exhaustive.

The farm animals had had access to plenty of greens all the year round and were on a balanced ration; hence a Vitamin deficiency in diet as a factor in retained placenta (Hart *et al.* 1944; Ronning *et al.*, 1953) has not been entertained in this study.

The etiology of the placental retention has been ascribed to infectious diseases—Brucellosis (Fincher, 1941); Vibriosis (Smith, 1918); Leptospirosis (Hart *et al.*, 1933; Reinhard, 1953). The retention of placenta in the herd under study may be attributed to Brucella. It is interesting to note though the herd showed heavy incidence of brucellosis as discovered by agglutination test and where at one time the abortion rate was also heavy, out of 15 cases of retained foetal membranes only foetal membrane sincars of two buffaloes revealed Brucella organisms. Under the same animal husbandry and mass vaccination of herd with S. 19 vaccine the percentage of abortion markedly reduced, though there was no appreciable decrease in percentage of retention after vaccination. It is possible that some other factor(s) are operating in the causation of retention, which need further investigation.

The isolation of *Pseudomonas* and *E. coli* from the uterine swabs of some of the affected animals incites interest. Whether these organisms play any pathogenic role in etiology of retention or they are the normal flora of the tubular genitalia of the bovine needs further study.

Summary

1. The incidence of foetal membranes retained for longer than 7 hours in 213 animals (126 cows and 87 buffaloes) is described.
2. The line of treatment adopted is discussed.
3. For the involution of uterus to take place it takes nearly a week longer in buffaloes than in cows.

Acknowledgment

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RATS AS CARRIERS OF *LEPTOSPIRA*

By

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Introduction

Several species of *Leptospira* are known to give rise to infections in man and animals. Infection usually occurs by the consumption of food or water which has been contaminated by the urine of infected rats, dogs, pigs etc. Infection can also occur through abrasions on the skin or even through intact mucous membrane. It has been established by many workers that wild rats and field mice frequently act as carriers of *Leptospira*. The presence of natural leptospiral infection in wild rats was first recognised by Miyajima in Japan (quoted by Gupta 1940). Subsequently, many workers showed the various species of Muridae also acting as carriers of pathogenic leptospirae. In India, Knowles (1932), Gupta (1940) and Lahiri (1941) described natural leptospiral infection in the rats. Lewis (1942) reported this infection in rats trapped in retail food establishments in Philadelphia. Rust (1948) showed the infection rate in Puerto Rican wild rats as 39%. Monlux (1948) examined *Rattus norvegicus* and found the infection rate as high as 55%. Among recent workers in this field can be mentioned Humphreys *et al* (1953) and Broom and Gibson (1953) who have reported leptospiral infection in rats. van der Hoeden (1955) has shown the vole, *Microtus guentheri*, as the chief reservoir host of *Leptospira grippo-typhosa*.

Material and methods

In the present investigation live and mostly adult rats, trapped in different localities of the City of Hyderabad, were used. The rats were examined within two hours of destruction. The material used for examination consisted of the kidneys, urine and heart-blood. For demonstrating the presence of leptospirae, the kidneys, after removal, were incised and the incised portion was lightly smeared at three places on a numbered slide; one slide for each kidney.

The smears were then stained with the silver method of Fontana as described by Mackie and McCartney (1948), and mounted under a cover-slip in D.P.X. mountant. This was done as a precaution as some workers have reported fading of the uncovered organisms under different immersion oils. Thinly spread areas were then selected for examination under oil-immersion objectives. For microtomic sectioning 2-3 mm. thick pieces of kidney tissue were fixed in 10% formalin for 24 hours. For staining, Levaditi's technique was used and sections were cut at 5 micron thickness.

Air-dried smears of urine were treated according to Fontana's method. Besides, a drop of urine under coverslip was also examined in few cases in fresh condition, either under the Darkground illumination or with the Phase contrast microscope. Heart-blood smears were stained with Leishman's stain and examined to detect any evidence of putrefaction in order to keep a check on the material to be used for Leptospiral work. Pathogenicity test was conducted by emulsifying the kidneys in normal saline solution and injecting intraperitoneally into guinea-pigs. The details of the procedure adopted are described along with the observations.

Observations

(i) *The kidneys*:—A total of 371 kidneys from 188 rats were examined. Typical leptospirae, elongated, with characteristically hooked ends and measuring 10 to 12 microns were found in the kidneys of twenty rats, thus showing 10.6% infection. The size of the kidneys was also noted, but this did not bear any relation of the presence of infection. While smears were examined from all the 371 kidneys, sections were cut only of 29 kidneys. Examination of the sections did not yield satisfactory results as kidneys which showed infection in the smears did not reveal the organisms in sections.

(ii) *The urine*:—A total of 16 coverslip preparations of fresh urine from different animals were examined. All these proved to be negative. The reaction of urine was also tested by wide-range pH test papers. Urine smears from nine specimens were stained; all with negative results.

(iii) *Heart-Blood Smears*:—These smears did not show any evidence of putrefaction as judged by the absence of putrefactive organisms; however in about 14% cases infection by *Trypanosoma lewisii* was seen.

(iv) *Pathogenicity Test*:—Emulsion of kidneys from rats was injected into guinea-pigs intraperitoneally. As guinea-pigs were not available in sufficient numbers it was not possible to use one guinea-pig for testing each specimen; instead, material from groups of four rats each, was pooled and used for inoculation into two guinea-pigs separately. Kidneys from each group were ground up with normal saline solution. The emulsion was poured into a petridish which was kept in a slanting position for allowing heavier particles to settle down. One c.c. of the supernatant was inoculated. The two guinea-pigs thus treated were kept in separate cages for observation. Guinea-pig No. 1, during the second week after inoculation, showed gradual loss of weight and developed anaemia. The animal was jaundiced. These symptoms became aggravated by the end of second week at which stage it was destroyed. The post mortem findings showed emaciation, anaemia and jaundice. The

abdominal and other skeletal muscles were pale. Petechial hemorrhages were seen on the pleura and the peritoneum. Intestines showed severe congestion. Liver was extremely pale. Lungs revealed patches of congestion. Kidneys were slightly enlarged and showed hemorrhagic spots. Material from this guinea-pig was taken for microscopic examination. Smears from heart-blood and impression smears from the liver and the kidneys were obtained and stained by Fontana's method. Typical leptospiral organisms were present in all the smears. Guinea-pig No. 2 was healthy and did not show any abnormality. It however died suddenly eleven days after the inoculation of the material. On post-mortem examination the animal was found to have died of ruptured stomach; other organs were in healthy condition and there was no reason to suspect infection by *Leptospira*.

Discussion

The present investigation has revealed leptospiral infection in 10.6% of the total of 188 rats examined. The rats used for pathogenicity test were identified as *Rattus rattus norvegicus*. The rest of the rats were not identified. Although rats are commonly found in houses and food grain shops, certain barriers against leptospiral infection, at least in the case of man, seem to exist. The leptospirae cannot survive outside the body of the carrier host for a long time nor can they remain viable in urine for long duration. The infected urine when allowed to dry after excretion will be devoid of pathogenicity. On the contrary, when fresh urine contaminates stagnant water the organisms can survive for longer time. The environmental factors have an important bearing on the spread of infection. In the case of animals, particularly dogs and cats such barriers do not exist since they have access to all sorts of insanitary places. It is possible that leptospirosis particularly due to *L. icterohemorrhagiae* in these animals is not uncommon but due to the difficulty in establishing diagnosis clinically the cases are not reported frequently.

The present study indicates that of the different methods adopted here for the detection of leptospiral infection in rats, the kidney smear technique provides a more reliable guide to the presence of infection. Even when positive infection is indicated by the kidney-smear method, the urine examination methods do not reveal the infection in all cases.

Summary

Rats from the City of Hyderabad were investigated for the presence of leptospiral infection. Infection was detected in 10.6% of the rats. For demonstration of organisms smears of kidneys stained by Fontana's method; microtome sections of kidneys stained by Levaditi's technique; urine smears and coverslip preparations of fresh urine were

examined. Pathogenicity test was conducted by injecting into two guinea-pigs separately emulsions of kidneys prepared by pooling material from four rats in each group.

The kidney smear method is found to be more reliable for the detection of infection than the methods of urine examination.

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WORLD SHEEP NUMBER AND WOOL PRODUCTION

BY

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Sheep Numbers:—Estimates of world sheep numbers and of numbers in the main producing countries are given in Table No. 1.

TABLE I
Estimated World Sheep Numbers.
(in millions)

Country	Average 1936-40	1950	1951	1952	1953	1954	1955	1956
Australia	113	113	116	118	123	127	131	139
New Zealand	31	34	35	35	36	38	39	40
Union of South Africa	40	32	31	35	36	36	37	38
Total Wool growing Dominions	184	179	182	188	195	201	207	217
Argentina	45	50	54	55	55	54	52	n.a.
Uruguay	18	23	23	25	26	27	28	27
U.S.A.	51	30	31	32	32	31	32	31
Total American countries	114	103	108	112	113	112	112	n.a.
Total main producing countries	298	282	290	300	308	313	319	n.a.
Europe (a) excluding USSR & Eastern Europe	128	82	83	86	89	93	97	n.a.
USSR, China and Eastern Europe (b)	n.a.	128	140	151	179	183	195	n.a.
Other countries	n.a.	250	257	265	275	277	276	n.a.
Estimated world total	749	742	770	802	851	866	887	n.a.

n.a. Not available. (a) includes the United Kingdom, Spain, France, Yugoslavia, Italy, Greece, the Irish Republic and other Western countries. (b) The Soviet Union, Albania, Bulgaria, Czechoslovakia, Eastern Germany, Hungary, Poland, Rumania, China, Mongolia and Tibet.

In 1955 sheep increased to 887 million, a rise of 21 million (2.4 %) since 1954; and of 138 million (18.4 %) from the pre-war (1936-40) average of 749 million. The total in the main producing countries was 319 million (36 % of the world total), an increase of 6 million or 1.9 % from 1954. The number in the wool growing Dominions was 207 million (23.3 % of the world total, and 64.9 % of the total in the main producing countries), an increase of 6 million or 3 %.

Over the five years 1950 to 1955 world sheep numbers grew by 19.5 %. Countries contributing to this increase were:—

	million	%
Wool-growing Dominions	28.3	3.8
Argentina, Uruguay and U.S.A.	8.2	1.1
Europe (excluding USSR and Eastern Europe)	8.4	1.1
USSR, China & Eastern Europe	67.0	9.0
Other countries	33.1	4.5
Total	145.0	19.5

Preliminary reports indicate that during 1956 world sheep numbers have continued the upward trend of the previous nine years. There have been increases in Australia, New Zealand and Union of South Africa, but in the United States of America and Uruguay there were small declines. No figures are yet available for Argentina. Numbers in U.S.A. have been declining steadily in recent years mainly because of the more profitable nature of alternative enterprises. The decline in Uruguay was not large and was probably the result of dissatisfaction with returns from woolgrowing on the part of farmers, many of whom are running cattle as well as sheep to increase profits. The New Government in Argentina has embarked on a policy designed to assist primary production and a revision of exchange rates has greatly increased returns to wool producers. For this reason the downward trend in sheep numbers in that country may now be arrested.

Sheep numbers in Europe and Asia are expected to continue to rise, especially in the U.S.S.R. where the current five-year plan aims at a substantial expansion of both sheep numbers and wool production. A census held on October 1, 1955 revealed that there were 124.9 million sheep in the U.S.S.R.

Wool Production:—Table No. 2 gives figures for wool production in the main producing countries, and in the world as a whole.

Total world production in 1955-56 is now estimated at 4,802 million lb. greasy, 191 m. lb. or 4.1 % more than in the previous season. The main changes were increases of 116 m. lb. in Australia, 67 m. lb. in the U.S.S.R. China and Eastern Europe, 7 m. lb. in New Zealand, 7 m. lb. in the Union of South Africa and a fall of 6 m. lb. in the U.S.A. Production in other countries remained practically unchanged. The Commonwealth Economic Committee's preliminary estimate of production in 1956-57 is 4,940 m. lb. greasy, a rise of 2.9 % above the 1955-56 figure.

TABLE II
Estimated World Wool Production.
(in million pounds)

Country	Greasy basis							
	Average 1931-38	1950-51	1951-52	1952-53	1953-54	1954-55	1955-56	1956-57
Commonwealth								
Australia	995	1118	1080	1281	1246	1283	1399	1480
New Zealand	300	390	407	418	426	455	462	470
Union of S. Africa	216	235	251	274	283	306	313	320
U. K.	111	89	93	102	105	111	104	108
India	96	72	72	72	72	72	72	72
Pakistan	96	30	30	30	30	30	30	30
Canada	16	8	7	8	8	8	8	8
Total (including other Commonwealth countries)	1785	1960	1948	2193	2178	2273	2396	2496
America								
S. America								
Argentina	376	419	408	406	397	364	363	380
Uruguay	114	185	188	190	203	198	200	200
Brazil	39	43	45	47	53	56	55	55
Chile	35	42	42	44	40	39	39	39
N. America								
United States	470	272	272	290	304	310	304	302
Total (including Peru and other American)	1080	1011	1007	1029	1049	1019	1014	1024
Europe (excluding USSR & Eastern Europe)								
Irish Republic	17	14	14	15	16	17	17	18
France	40	42	49	49	53	55	55	55
Spain	65	85	85	85	85	83	85	88
Italy	31	36	38	38	39	37	36	36
Yugoslavia	33	35	35	33	35	37	36	36
Greece	22	17	17	19	21	23	23	24
Total (including other Western Europe)	288	285	291	291	301	304	303	308
U.S.S.R., China & Eastern Europe	435	577	614	684	723	733	800	823
Africa (excluding South Africa)	64	60	63	74	78	79	81	79
Asia (excluding China)								
Turkey	52	67	73	78	81	80	81	82
Total	136	168	181	195	201	203	206	209
World Total	3788	4061	4104	4466	4530	4611	4802	4910

The U.S.A. is the only major wool producing country in the world in which present production is below the pre-war level. It is estimated at 304 m. lb. for 1955-'56, about 35% less than the 1934-38 average of 470 m. lb.

The Commonwealth Economic Committee estimate of world wool production for the 1955-'56 season involves increases of 81 m. lb. (5.8%) in Australia, 23 m. lb. (2.9%) in the U.S.S.R., China and Eastern Europe, 17 m. lb. in Argentina and smaller increases in the Union of South Africa and New Zealand.

The comparison of wool production and sheep numbers shown in Table No. 3 indicates that the main producing countries account for 63% of the world's wool with only 36% of the world's sheep. The three wool-producing Dominions produce 45% of the world output with only 23% of its sheep.

TABLE III
Productivity per sheep.

Country	Production 1955-56		Sheep numbers 1955		Productivity per sheep
	m. lb. greasy	%	million	%	
Australia	1399	29.1	131	14.8	10.68
New Zealand	462	9.6	39	4.4	11.85
Union of S. Africa	313	6.5	37	4.2	8.46
Total wool producing Dominions	2174	45.2	207	23.4	10.50
Argentina	363	7.6	52	5.9	6.98
Uruguay	200	4.2	28	3.2	7.14
Total	563	11.8	80	9.1	7.04
Total exporting countries	2737	57.0	287	32.5	9.54
U.S.A.	304	6.3	32	3.6	9.50
Total main producing countries	3041	63.3	319	36.1	9.53
Europe (excluding U.S.S.R. and Eastern Europe)	303	6.3	97	10.9	3.12
U.S.S.R., China & Eastern Europe	800	16.7	195	21.9	4.10
Other countries	658	13.7	276	31.1	2.38
Estimated world Total	4802	100.0	887	100.0	5.41

Figures in Table No. 3 show that productivity per sheep was much higher in the six main producing countries than in the others. The country with the highest productivity was New Zealand with Australia next and the U.S.A. third.

TABLE IV
Estimated World Wool Production: By types.
(million pounds)

Type	Average 1935-39	1950-51	1951-52	1952-53	1953-54	1954-55	1955-56	1956-57
<i>Greasy basis</i>								
Merino	1579	1529	1509	1713	1740	1785	1895	1963
Crossbred	1265	1467	1652	1744	1769	1797	1850	1904
Other	944	1065	943	1009	1021	1029	1057	1073
Total	3788	4061	4104	4466	4530	4611	4802	4940
<i>%</i>								
Merino	41.68	37.65	36.77	38.36	38.41	38.71	39.46	39.74
Crossbred	33.39	36.12	40.25	39.05	39.05	38.97	38.53	38.54
Other	24.93	26.23	22.98	22.59	22.54	22.32	22.01	21.72
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
<i>Clean Equivalent</i>								
Merino	742	825	815	924	923	947	1006	1043
Crossbred	810	949	1070	1124	1134	1157	1189	1222
Other	472	533	472	505	511	515	529	537
Total	2024	2307	2357	2553	2568	2619	2724	2802

Production of greasy wool of Merino type increased by 6.1% in 1955-'56 (see Table No. 4) and was 316 m. lb. above the 1935-39 average. A further increase of 68 m. lb. (3.6%) is expected during the 1956-57 season, but the proportion of the merino wool to the world total (39.5%) is still below the 1935-39 average of 41.7%.

Clinical Articles

A CASE OF CONGENITAL CONTRACTED TENDONS IN A BULL CALF

By

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U.P. College of Veterinary Science & Animal Husbandry, Mathura.

A two-day old calf was brought to the College hospital on 20-9-'56 with the history that it was born with both the fetlocks of the forelimbs flexed. The animal was seen walking on the anterior aspect of the fetlocks (Fig. 1).

The examination of the animal revealed an extreme case of contracted tendons. Manipulation could not succeed in bringing the joint to normal position. So it was decided to perform flexor tenotomy in both the limbs.

Operative technique.—The site of operation *viz.*, the posterior part of the middle of the cannon-bone was duly prepared. 1 c.c. of 2% Procaine Hydrochloride solution was injected subcutaneously on each side of the tendons. A longitudinal incision of about 2" long was made along the tendon. The superficial flexor was exposed and severed. An attempt to bring the fetlock to its normal position failed. On further examination the deep flexor also was found to be severely contracted. This was also severed and the joint was restored to its normal position. The wound was insufflated with Sulphanilamide powder and was closed with interrupted sutures. It was finally sealed with Collodium.

The other leg was similarly operated upon.

After-care.—The legs were kept extended and fixed in the normal position by the aid of cotton wool and splints from the bend of the knee to toe (Fig. 2). The wounds healed by first intention. The bandage with splints was left for a fortnight more.

The animal showed considerable improvement and was able to walk and run about normally. Wool padding and bandages without splints were continued for a week more before discharging the case as cured on 11-10-'56 (Fig. 3).

Acknowledgment

I am greatly indebted to the Principal, U.P. College of Veterinary Science and Animal Husbandry, Mathura, for his valuable advice and guidance in the compilation of this article. I thank Shri D. C. Kulshrestha for his kind help during the operation.

TWO CASES OF DRACONTIASIS IN DOGS

By

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Dracunculus Medinensis (Guinea-worm) primarily parasitizing man is known to infect occasionally ox, horse, dog, wild cat, jackal and leopard. Two such cases of infection in dogs treated in the Veterinary Hospital, Nainital are recorded below:—

The first case (O.P. No. 366, dated 22-10-'53) was a Terrier which was brought to the hospital with the complaint of an ulcer in the leg. The worm which was extracted measured 52 cms. in length and 2 m.m. in breadth.

The second (O.P. No. 1194, dated 14-6-'56) was a bitch, an Alsatian cross, aged 4 years and was admitted with the history that it had blisters on the internal aspect of both the fore legs over the

A Case of Congenital Contracted Tendons in a Bull-Calf

By

R. P. S. TYAGI



Fig. 1



Fig. 2



Fig. 3



Sitting:—
Left to Right:—
Standing:—
1st Row:—
" 2nd Row:—
" 3rd Row:—

S. G. Iyer (H. D. I. A.), N. D. Keher (H. D. A. N.), L. Sahai (Director), H. D. Shrivastava (H. D. I. A.), K. Sahai (H. D. I. A.), K. N. Shrivastava (H. D. I. A.), T. Ramabrahmalah (H. D. I. A.), B. P. Patel (H. D. I. A.), P. C. Tanuja (H. D. I. A.), K. R. Gupta (H. D. I. A.), M. S. Chatterjee (H. D. I. A.), R. Madhusudan (H. D. I. A.), P. C. Mukerji (H. D. I. A.), V. B. Trivedi (H. D. I. A.), Lachhman Singh (H. D. I. A.), R. Y. Pandey (H. D. I. A.), R. L. Deb (H. D. I. A.), Y. I. Pandya (H. D. I. A.), S. R. Shukla (H. D. I. A.), J. V. Kale (H. D. I. A.), N. Dewan (H. D. I. A.), P. N. M. Nair (H. D. I. A.), V. K. Madala (H. D. I. A.), R. K. P. Shrivastava (H. D. I. A.),

A CASE OF CONGENITAL CONTRACTED TENDONS IN A BULL-CALF 215

metacarpal and radial regions and that the animal was 'off-colour'. One of the blisters which was found ruptured was cleaned with Dettol lotion. A few drops of milky white fluid were oozing out. On sponging with cotton a small white piece of thread—like worm was seen protruding out. This was grasped with an artery forceps and was gently pulled out for some length. Further extraction was done by twisting the end of it round a pin. Unfortunately during the process it broke. The wound was dressed and after two days another small piece of worm was removed. Leg was emphysematous and there was pus in the wound. Penicillin (4 lacs) was injected daily for six days. Pus and emphysema subsided but the ulcer persisted. For further days, Chloroform plugs were inserted into the wound. A fine thread like piece of worm was visible at the aperture of the constricting ulcer. This was extracted and antiseptic dressings of the wound were continued for a few days more. The bitch is reported to be well to date.

Acknowledgment

I am thankful to the Principal, U.P. College of Veterinary Science and Animal Husbandry, Mathura, for identifying the worm pieces.

News and Views

An Important Announcement:—We invite attention to an announcement under 'Association News' from the Mysore Veterinary Medical Association of holding the next All-India Veterinary Conference in conjunction with the Silver Jubilee Celebrations of the Mysore Serum Institute at Bangalore, in the third week of June 1957. This is happy news indeed and we wish the members attend the Conference in record numbers and make it a tremendous success. Bangalore is always a place to be visited and the Bangalore "Season" would be in full swing late in June. With such double attraction and the prospect of meeting a large number of Veterinary Surgeons, who had come into New Mysore, the Conference promises to be highly stimulating and beneficial. Knowing Mysore as well as we do, we know, visits to several places of interest will also be arranged and the social side will even be more attractive than the business side. Bangalore is calling and so get ready!

Sri M. Y. Krishna Rao, G.M.V.C., P.G. (A.H.), Sheep, Goats and Poultry Development Officer, Andhrapradesh, left for Australia under the Colombo Plan for one year for higher studies in Sheep-farming and Wool Production, on 1.3.57. He is to work at the New South Wales University of Technology at Sydney. We hope he will make the utmost

use of his stay there and come back fully equipped for the task that awaits him in the new and expanded State of Andhrapradesh.

Sri T. Ananthapadmanabhan, G.M.V.C., is yet another Officer to go out under the Colombo Plan. He is a Deputy Director incharge of Livestock work in the State of Madras. He left for the United Kingdom on 3-3-57 for a period of six months to study certain aspects of Animal Breeding, General Livestock Development and the work of the Milk Marketing Board. Madras has many problems on her hand and such training for her Officers is bound to be of great benefit to the State.

Sri F. D. Wilson and Sri Y. D. Ratnam :—It is an admitted fact that comparatively speaking, members of the Veterinary profession are not so well off as some in other professions and yet this year's College Day of the Madras Veterinary College, heard the Principal announcing two cash endowments for Gold medals, by two of the members of our profession. Perhaps (we write subject to correction) these are the first of their kind in this country from members of the Veterinary profession, out of their hard-earned income. This honour goes to (1) **Sri F. D. Wilson, G.M.V.C., B.V.Sc.**, who endowed Rs. 2,000 for a medal to be presented every year for the best student in the subject of 'Meat and Milk Inspection'. This is in memory of his late father, **A. J. Wilson, G.M.V.C.**, who was one of the pioneers of our profession in Madras State.

(2) The next one is from **Mr. Y. D. Ratnam, G.M.V.C.**, a well known Private Practitioner in racing circles. He had to go through 'fire' to establish himself on a sound footing, after he left Government service, in which he served for some time. Stouter hearts might well have quailed at the hardships he had to face. But yet he struggled hard and rose step by step and to-day enjoys a vast field of practice. He has endowed Rs. 2500,- for a Gold Medal. **Mrs. and Dr. Y. D. Ratnam's Gold Medal**, is to be awarded every year to the student who stands first in both Medicine and Surgery put together. We thank these donors on behalf of the profession. Posterity will remember their names with gratitude.

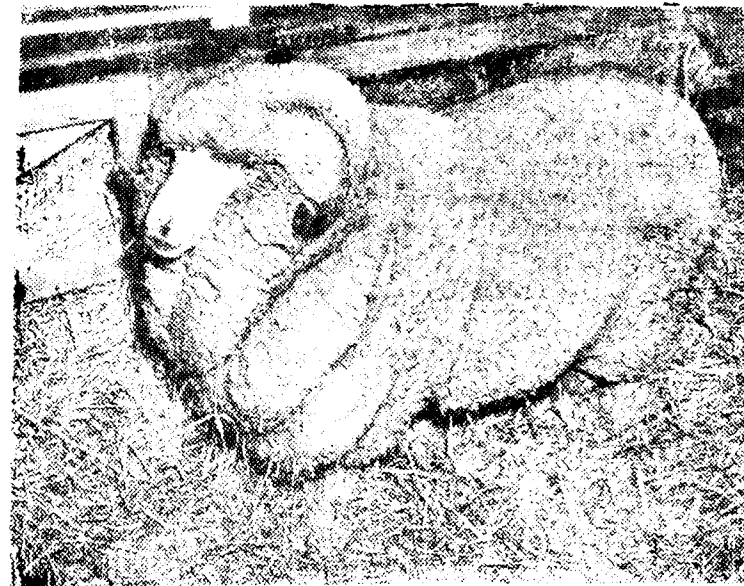
The Australian Merino

After more than 160 years the wool-growing industry in Australia has emerged with a well-defined and now fairly stable pattern in which the Merino still stands pre-eminent, though not unchallenged, as the present secure basis of Australia's national economy. Out of the crucible of the 19th century, the modern Australian Merino has emerged in

three main forms—the fine, medium and the strong—each different in many salient features from the original Spanish and other European Merinos that contributed so largely to its development. In this, the Merino has but repeated the function it has always served since its emancipation from the early Spanish monopoly. For, in each country that has possessed the breed it has occupied a somewhat different place and faced a wide range of demands upon its adaptability. No other breed in this or any other country has been asked to give or to endure so much or has responded with quite such versatility and success.

So too in Australia, a large continent of many climates and conditions, various types of Merino have grown to their present maturity often in widely isolated areas to the needs of graziers and farmers and many different forms of husbandry. In all such places, the Merino can be found growing the wool it has been bred to produce, and as our husbandry advances in ever greater weights.

The total Australian Merino population in 1953 was 90,714,000 and represented 73.6 per cent of the total sheep population of 123,072,000. Probably, at no time in past history has the Merino ever exceeded 90 per cent (about 85 millions) of total sheep numbers. Thus, there are probably as many Merinos in Australia to-day (139,124,000 sheep) as at almost any time previously, although here the statistics fail us for adequate records do not exist to prove the point to everyone's satisfaction.



A fine-wooled Merino ram which fetched the world's record price.

—By the Courtesy of The Hindu.

Sheep numbers have increased steadily in the last 50 years but this has been mainly in new breeds such as the Corriedale and Polwarth, based on the Merino and in cross-breds and come-backs.

The average fleece weight for all Australian sheep lies now between 9 and 10 lbs. It is not possible accurately to determine from available sources what the average Merino fleece weight might be, but this is almost certainly now in the vicinity of 11 lb. and shows signs of a slow but steady increase. The general average for fleece weight tends to be depressed by the recent increase in the proportion of the non-Merino sheep in Australia, especially in southern N.S.W., Victoria and Tasmania. Thus, the tendency for the general fleece weight increase to cease should not necessarily be taken as a sign that the average Merino fleece has yet reached its limit either by breeding or by feeding and management. Among existing Merinos the Australian fleece in all its types—fine, medium and strong—is distinguished by its high content of clean wool in relation to the amount of yolk or combined skin secretions.

In all types the Australian Merino of the present time is a relatively smooth-bodied animal with reasonable neck folds, of medium weight, with a high yielding dense fleece of long staple and excellent character. This is another example, not only of the efficiency of the Australian breeder but also of the suitability of the Australian environment.

Thus, the Australian Merino, though differing somewhat within itself to form at least three broad types, bears little resemblance as a whole to the original Spanish Merinos from which in various ways it was derived. Moreover, it appears to differ in important features also from the Merinos and the related Rambouillets of America as they exist to-day, though all have depended on Spanish and other European Merinos over the same period and in much the same way. This remarkable divergence in type appears to have been achieved almost entirely by differences in selective breeding between the various countries. In part, this has been done by selection within the original Merino stock, though much of it has also unquestionably been due, both on historical and biological evidence, to the grading up of mixed ewe flocks by the continued use of authentic Merino rams combined with intense and rigid selection.

Only in this way can we account for the emergence in its present successful form of the modern medium and strong-wool Australian Merino. These two, coupled with the achievements of the Tasmanian fine-wool breeders, stand as tributes to the perseverance and genius of relatively few Australian studmasters. If scientific evidence means anything then the Australian Merino is inherently different to the Merin

elsewhere to-day and is on many counts superior in its wool growing efficiency. *Hindu*, 1-1-57.

Plastic boots for foot-rot.—Plastic boots for sheep are probably the most unusual of the thousands of different products being manufactured by the rapidly growing plastics industry in Australia. The boots are being used by some Australian farmers to combat foot-rot, a serious and highly infectious disease common among sheep in some parts of Australia. *Hindu*, 1-1-57.

India buys Polwarths.—Two shipments of Australian Polwarth stud rams and ewes arrived in Calcutta from Melbourne in November. The shipments, each of which numbered more than 200 sheep, have been purchased by the Governments of Uttar Pradesh and Himachal Pradesh for breeding experiments. *Hindu*, 1-1-57.

Livestock farm for Chettinad.—Chidambaram, March 1957 :—A Livestock Farm and a Research station will be started at Chettinad on an extensive plot of 1770 acres adjoining the 1000 acre site of the Annamalai Polytechnic. Mr. M. A. Muthiah Chettiar has donated the plot.

The scheme has been sanctioned under the Second Five Year Plan at an estimated cost of Rs. 20/- lakhs. FOC. *Hindu*, 16-3-57.

Veterinary & Agriculture Studies in U.S.A.—Forty-five Americans experienced in the field of Agriculture and Veterinary will be deputed to India for teaching and research work, and 43 Indians will be sent to the U.S. for advanced training in connected subjects, under arrangements made by the Government of India with five Universities in the U.S.

India will also be supplied with class-room, laboratory and field equipment including technical books and journals on these subjects not ordinarily available in India.

The Government have so far approved the deputation of 18 Indian trainees for training in U.S. Of these nine have already left, in January. Twenty-four U. S. Experts are already in India.

Indian Express, 6-3-57.

Artificial Penicillin.—Cambridge (Massachusetts), March, 10. Two Professors at the Massachusetts Institute of Technology have succeeded in producing artificial penicillin, they announced yesterday.

Dr. John Seehan, Professor of Chemistry and Dr. K. Henry Logan, in charge of research, said that ten different types of synthetic drug are being tested, with a view to their medical use.

The synthetic product was considered less likely to cause allergies, but it was indicated it would be more expensive than the natural product. UPI—AFP.

Hindu, 11—3—57.

* * *
"Some impressions of India" was the subject of a talk by Mr. Escott Reid, High Commissioner for Canada in India at the Rotary Club, New Delhi. Strangely enough he touched on the livestock wealth of the land. He said:—

"I know you want to improve the breed of your livestock, and that artificial insemination is one of the methods. But it must be a staggering number of artificial insemination centres which will be required to deal with your 160 million cattle alone, and I suppose you will also want to improve the breed of your 45 million water buffaloes, your 40 million sheep and your 50 million goats.

"Your problems are so numerous, so intractable, so immense, so varied, covering so many fields - political, economic and social - that a people less courageous than the people of India would give up hope."

Let the sons of India in every walk of life realise their responsibilities.

* * *
Baby Chicks from U.S.—"Madras State has been allotted 800 of the eight-week-old chicks of the White Leghorn and Rhode Island Red breeds in equal number from the consignment of 30,000 baby chicks flown to India from U.S.A. in mid-February under the T.C.M. Aid programme for Poultry Development under the Second Five-Year Plan.

A specially chartered plane bringing them covered a flight of almost half-way round the world and the consignment represented the largest shipment of baby chicks ever known to have been made. The flight took just 50 hours of flying time and 8 hours for refuelling stops. After having been reared for about eight weeks at the Government Farm at Delhi, they were distributed to the different States. The allotment for Madras State comprises 15 per cent male chickens and the rest females.

Drawn from high-yielding strains intended to serve as foundation stock in the State Government Farm, the chicks raised from this stock will be distributed in the Community Project and National Extension Service Blocks for setting up Poultry Demonstration-cum-Extension

Blocks and also to supply an equal number of chickens to the Regional Farms to be set up by the Government of India." *Hindu*, 19—4—57.

Aid for Wool Production.—New Delhi, April 23, 1957. For development of sheep and wool production in India, 396 extension centres will have been set up by March 31, 1959, at a total cost of Rs. 150 lakhs.

The object is to improve sheep breeding and utilisation of wool and conduct research on cross-breeding and selective breeding with a view to up-grading local sheep with the higher species.

Already 24 such centres have been established — 8 each in Uttar Pradesh and Punjab and 4 each in Bombay and Andrapradesh in 1956-57.

During the year 1957-58, 166 additional centres will be established—39 in Rajasthan, 25 each in U.P. and Bombay 16 each in Punjab, Mysore and Jammu and Kashmir, 15 in Madhya Pradesh, 8 in Madras and 7 in Andhra Pradesh.

It is also planned to establish in 1957-58, three wool utilisation centres — one each in Uttar Pradesh, Bombay and Rajasthan. A similar number of sheep breeding farms will be set up in Bombay, Himachal Pradesh and Madhya Pradesh, each farm having a wool analysis laboratory as well.

The Government of India have sanctioned a total grant of Rs. 10 lakhs and Rs. 4 lakhs as loan to States for 1957-58 for this purpose. *Hindu*, 24—4—57.

Hormone Discovery.—Washington, April 24, 1957. A University of Chicago Researcher has told the annual meeting of the National Academy of Sciences that a hormone named "secretin" is the "safest valve" that reduces excess gastric juices that can cause ulcers. Dr. Lester Dragstedt, Head of the University's Surgery Department, said a study team discovered the unknown role of "secretin" through recent experiments. *Hindu*, 26—4—57.

Grant for Vellore Medical College.—New Delhi, April 25, 1957. Among a number of substantial benefactions announced by the Wellcome Foundation of London, which is financed by the well-known pharmaceutical firm of Burroughs Wellcome, Limited, is a grant of £10,000 to the Christian Medical College at Vellore, South India for the setting up of a metabolic research unit and maintaining it for five years, says a London Press Service Message, released by the British Information Services, here to-day.

The research unit is to be used in the first instance for the study of the metabolism in relation to tropical *sprue*, a condition associated with dysenteric diseases. FOC. *Hindu*, 26—4—57.

Black 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.]

OUR NUTRITION, HEALTH AND LIVESTOCK

By

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We consume food to support growth and for making good the wear and tear of the body taking place as an inevitable result of living. It also provides energy for the various vital processes of life. Our diet in the main contains proteins, carbohydrates and fats, mineral matter, vitamins and water.

Carbohydrates and fats are the chief sources of energy. They do not play much part in building new tissues but are used as fuel in the body and are known as energy producing foods.

Proteins are needed for building tissues for growth and for replenishing loss occurring through work. In times of emergency proteins may also be utilised by the body as a source of energy e.g., during starvation or when the diet is deficient in carbohydrates and fats.

Human food is derived both from the vegetable and the animal kingdoms. Commonly, foods of vegetable origin are cereals like wheat, barley, maize, rice, etc. These are rich in carbohydrates but poor in proteins. The legumes like grams, peas, pulses, soyabean, etc., are the main sources of vegetable proteins. Vegetable fats are derived from oil seeds. They are devoid of vitamins except red palm oil. Proteins consist of different amino acids and those of vegetable origin being deficient in certain essential amino acids are judged as of low biological value and hence they are of inferior type from nutrition stand point of view.

Foods of animal origin are milk and its products like butter, ghee, cream, cheese, Khoa, Dahi and mutton, pork, fish, meat, eggs, etc. Milk and flesh foods are a rich source of protein and vitamins. Fats, derived from animals, like cream, butter, etc., also contain vitamins in sufficient quantity. These foods of superior quality are derived from livestock. Thus livestock provide the most essential supplies of proteins necessary for growth, wear and tear of the body. Animal proteins are of high biological value and contain a wide assortment of essential amino acids, which are very often lacking in proteins of vegetable origin.

Milk is an indispensable food for children, invalids and adults. In India per-capita milk consumption per day is only 5 ounces against 56 ounces in New Zealand, correspondingly the average age of our countrymen is 32 years while it is 70 years in the case of a New Zealander. The nutritious value of milk was illustrated by an experiment conducted in a Scottish school where extra milk was given to 1500 children for seven months. Their rate of growth was 20 percent higher than those children not receiving extra milk. An experiment was conducted at Simla too for demonstrating the effect of whole-milk supplement given for 3 months to school children. The result was in conformity with the Scottish experiment. Boys and girls of milk-supplemented group made on an average better weight and height gains (of 3.84 lb. and 0.54 lb. respectively) as compared to their counterparts (of 0.49" and 0.41" respectively).

in unsupplemented group ($\frac{1.64 \text{ lb.}}{0.49''}$ and $\frac{0.92 \text{ lb.}}{0.06''}$ respectively.)

Indian diet is deficient in proteins. A predominantly vegetarian country like ours needs 30 ounces of milk per head per day which means there is an existing deficiency of 600 per cent in milk. The average annual milk yield per cow in India is 413 lb. against 7559 lb. in Netherlands, 7005 lb. in Denmark, 6498 lb. in Switzerland and 5516 lb. in U.K. It is shocking to know that the quantity of milk that we draw from 18 crores of animals is equal to that drawn from 2.5 crores in Germany and 3.5 crores in U.S.A. Merely telling the people to take more milk serves no purpose. The right approach to the problem is that its production should be increased.

Eggs are an invaluable article of diet. These can be consumed in one form or the other with advantage by human beings of all ages and are easily assimilable. Further they contain a wide array of substances which are often lacking in ordinary diet and are so essential to protect against nutritional failure. Thus they constitute an important protective food. They help to a great extent towards raising the health standard. Statistics tell us that we are grossly deficient in egg production. An Indian consumes 4 eggs a year, whereas the optimum need is one egg a day. So there is 9,000 per cent gross deficiency in regard to egg production. Further we have a poor quality hen as the average annual egg production per hen in India is 53 while it is 137 in Belgium, 130 in Ireland, 120 in Denmark and 117 in U.S.A.

Mutton, pork, etc. provide protein of high biological value. But let us examine our production. Average weight of an Indian sheep is nearly 50 lb. while the sheep of European countries weigh about 3 times as much and yield better quality of meat. There are hardly any

organised piggeries. The sheep, pigs and goats can be reared easily and efforts made in this direction will be the surest means to safeguard public health.

The health standard of our countrymen is deplorable. According to the report of Bhore Committee, out of every 100 babies born 25 die before they are one year old. When their 5th birthday arrives 40 per cent have expired and at 20th birthday only 50% are left. Hardly 15 per cent reach 60th birthday. Expected longevity of life is the lowest in India. Maternal deaths are also very high. The increasing number of spectacle wearing students in colleges and schools and other young men indicates deterioration in eye-sight and general health. In schools majority of the students are underweight and undersized. The greatest malady is malnutrition which predisposes a man to all sorts of diseases, besides producing deficiency diseases. An ill fed man falls an easy victim to disease. Further malnutrition lowers the general vitality and decreases efficiency in work. Five lakhs of people die of tuberculosis every year. Broadly speaking tuberculosis is more a symptom of malnutrition than a disease. Any amount of medical research, increase in number of medical graduates and health centres, campaigns against disease and other public health activities alone cannot attain much where malnutrition prevails. Mere tonics would not help in improving health standard of poorly fed people. Malnutrition multiplies sick people which requires a large medical service. An under-nourished nation loses enormous man-hours, as its people cannot come in peak efficiency.

Annual per capita meat and milk consumption and health
(United Nations Figures)

Country	Meat (seers)	Milk (seers)	Total (seers)	Average age (years)	Infant mortality per thousand
New Zealand	106	270	376	70	22.8
U.S.A.	75	253	328	69	28.6
Canada	70	237	307	68	19.7
Australia	110	190	300	68	25.2
U.K.	49	219	268	66.5	30.9
France	56	156	212	66	46.2
Western Germany	37	155	192	60	53.8
South Africa	41	77	118	41	33.5
Pakistan	4	73	77	Not available	
India	2	43	45	32	122.8

The health standard of people can be improved only by providing more proteins in their diet especially those derived from livestock. It has been found that wherever livestock is a flourishing industry, human beings are healthy, sturdy and beaming with happiness. It has been rightly said that livestock is an index of a country's prosperity. Surely

the health of the people can be judged from the performance of their livestock richness and variety of diet. Rich diet invariably contains proteins of superior make. Above given statistics amply bear out the fact that nations with high per-capita consumption of foods of animal origin (like milk, meat and eggs) have better health standards, live much longer and have far lower infant mortalities as compared to those with lower per-capita consumption of these foods.

Experiments in Rhonda Valley in England showed that the improvement of ante-natal health services effected no reduction in maternal mortality rate, but the provision of better diet for expectant mothers reduced the maternal mortality by 75 percent. It is well realised that diet rich in proteins especially of animal origin are exorbitantly costlier in India which is mainly due to the country's low production in them. We maintain a large population of livestock of the poorest quality. Evidently the greatest need of the hour is the improvement of livestock through judicious feeding and breeding. This task is to be accomplished by veterinarians who form the first line of defence against disease.

Under alien rule both livestock and the Veterinarians were neglected to the utmost. Consequently livestock efficiency fell to the utmost and national health and prosperity suffered an enormous setback. Therefore, for better health standards, livestock and experts in their management and disease i.e., veterinarians should be given their due place of honour in the national economy.

ROLE OF SERA IN VETERINARY PREVENTIVE MEDICINE

By

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In this article I shall attempt to give you a rough idea of what is ordinarily known as serum therapy.

In my previous article I told you how immunity against a particular disease can be set up through the use of vaccines.

Following the same procedure and using the same infective agents viz., bacteria or their toxins or viruses with judicious care a much higher pitch of resistance called hyper-immunity can also be induced in animals. In this case of hyper-immunity, the animal's blood contains a very large quantity of anti-bodies—much more than what is necessary to protect that animal. These extra anti-bodies in the blood of such hyper-immune

animals can be tapped and utilised to protect other animals exposed to similar infection. This form of treatment to combat infectious diseases with the so called serum from hyper-immunised animals is called 'Serum Therapy' or Serum Treatment. This can be both preventive and curative.

(Anti-) Sera are classified as Anti-Bacterial or Anti-Viral or Anti-Toxic depending upon their use against bacteria or viruses or toxins of bacteria respectively.

Preparation of Anti-Bacterial and Anti-Viral Sera

Suitable animals in healthy condition are taken. Small doses of killed or non-virulent viruses or bacterial cultures are given preferably intravenously. The doses are progressively increased at suitable intervals. Immunity becomes stronger and stronger with successive injections. A stage is soon reached when the animal's state of resistance is such that it can withstand many lethal doses of virulent culture itself. At this stage killed or non-virulent cultures are replaced by highly virulent ones, and the process of repeated injections is continued till the blood is very rich in anti-bodies. When the level of anti-bodies in the blood is satisfactory, blood is drawn from the animal.

Preparation of Anti-Toxic Sera

This kind of serum is produced by utilising not the whole cultures of bacteria as in the preparation of Anti-Bacterial Sera, but by using the filtered-out poisons or toxins of bacteria which alone are responsible for such diseases.

Initial injections for production of hyper-immunity are done with modified toxins called toxoids. Toxoids are devoid of harmful effects but are capable of giving rise to anti-bodies. When sufficient immunity develops to withstand many lethal doses of toxins, toxoids are replaced gradually by potent toxins. By the process of repeated injections with toxoids and toxins blood gets saturated with anti-bodies. When the titre or level of anti-toxin reaches its peak, blood is drawn from the animal.

Processing of the drawn blood for Anti-Sera

Blood consists of two portions (1) a cellular and (2) a liquid portion called plasma in which the former is in suspension.

Processing of the blood consists in getting rid of the cellular portion and making use of the fluid part in one of whose constituents (protein-globulin) are to be found the anti-bodies.

Blood that is drawn is allowed to clot. The fluid that separates from the clot is called Serum. Serum is plasma minus fibrinogen

(another protein constituent of plasma) which is removed as fibrin during clotting of blood. Serum that is collected is preserved by the addition of certain chemicals like phenol. Serum thus obtained is called native or un-concentrated Serum.

Sometimes plasma is so processed as to get rid of all those non-specific constituents which are unrelated to anti-bodies and thus obtain a highly potent and purified product. The serum thus produced is called concentrated Serum.

How Anti-Sera Act?

Anti-Bacterial Sera acts in one or more of the following ways:—

- (1) Prevention of bacterial multiplication.
- (2) Disintegration of bacterial cells.
- (3) Localisation of infection and rendering the germs an easy prey to the other defensive mechanisms of the system.

Anti-viral Sera prevent the entry of the virus into the susceptible cells. Once the cells are parasitized Anti-viral serum will be of no avail.

Anti-Toxic Sera.—These neutralise the specific toxins of the bacteria and thus prevent damage to tissue cells. Anti-toxic Sera are incapable of repair to damaged cells. Hence the necessity to adopt very early treatment. Where it is used as a curative it is better to give a large dose of serum rather than risk the life of the patient with an insufficient dose.

The following table gives the differences between serum treatment and vaccine therapy:—

Vaccine treatment.	Serum treatment.
1. Vaccine stimulates the formation of anti-bodies in the system.	1. Serum supplies anti-bodies ready made to the system.
2. Formation of anti-bodies takes some time; hence no immediate protection is given.	2. Anti-bodies on injection are available immediately to combat infection.
3. Once the anti-bodies are formed they are retained for a long time.	3. Since anti-bodies are from outside source it is lost from the system in a few weeks.
4. Vaccines are used as a long term policy.	4. Serum treatment is an emergency measure.
5. Vaccines can be used only as a preventive.	5. Serum can be used both as preventive and curative in infectious diseases.

I. C. A. R.

Farm News Releases

Rhodes Grass-Manuring Pays.—Rhodes grass yields well if properly fertilized. Trials show that if you apply 120 pounds of nitrogen per acre to the grass, you get 465 maunds of green herbage per acre per year. Without nitrogen application, the grass yields about 235 maunds of herbage per acre.

Under sewage irrigation, as high a yield as 650 maunds per acre per year has been obtained.

Give the grass a basic dose of 10 to 12 cartloads of cattle manure. In addition, give four to five maunds of ammonium sulphate and 1½ maunds of superphosphate in two equal doses, in the spring and at the beginning of the monsoon.

Trials also show that growing a mixture of Rhodes grass and lucerne (a legume) not only improves the nutritive value of the fodder, but the legumes will also help the grass to grow better. —No. 266.

Napier Grass-Manuring Pays.—The yield of Napier grass can be very much increased if properly manured.

Before planting the grass, apply 12 to 15 cartloads of cattle manure per acre. Top-dress the grass every year with six to eight maunds of ammonium sulphate, preferably in three or four doses. The top-dressing should begin in February and end in October.

In fertilizer trials, by following such a manurial programme, the yield of fodder rose from 335 maunds to 410 maunds per acre.

The *kudzu* during *kharif* and *senji* (legume) during *rabi*, make a good mixture with this grass, increasing the yield of its fodder. *Senji* will begin supplying fodder when the Napier grass is dormant.—No. 270.

Association News

THE ALL-INDIA VETERINARY ASSOCIATION

THE THIRTEENTH ALL-INDIA VETERINARY CONFERENCE

Mysore is once again up and doing! She is a much bigger unit now after the recent reorganisation of States. What could be more practical and beneficial than to hold a Conference now to consolidate what she has gained in the Animal Husbandry field and to bring together all members of the profession—both old and new—to meet, to plan and to work! That needs the inspiring guidance of the Head of the Department and it is hardly necessary for us to state that she is blessed in that way. Expanded Mysore evidently wants to share the happiness of such a Conference with the rest of India and she has resolved to invite the 13th All-India Veterinary Conference to Bangalore on that occasion.

The Silver Jubilee Celebrations of that great institution, the Mysore Serum Institute, are also due to be held then. It is indeed a very rare occasion and the opportunity of meeting in Conference at Bangalore again may not recur for another decade or so. Let us not therefore miss this opportunity. We call upon all Branch Associations to send in Delegates in as large a number as possible and make the session a memorable one.

The Lay Press all over India will be requested to announce the dates and other particulars in due course and the Railway authorities addressed for the usual concession.

M. S. Sastry,
President,

T. Vinayaka Mudaliar,
General Secretary.

30th April 1957.

A. I. V. A.,
23, First Street,
Vidyodaya East,
T. Nagar, Madras-17.

THE MYSORE VETERINARY MEDICAL ASSOCIATION

THE THIRTEENTH ALL-INDIA VETERINARY CONFERENCE

At a Meeting of the Executive Committee of the above Association held on 22-2-'57, it was resolved to celebrate the Silver Jubilee of the Mysore Serum Institute in a fitting manner and to invite the 13th All-India Veterinary Conference to meet at Bangalore on the occasion. The third week of June 1957 has been tentatively fixed for the Celebrations and the Conference. Exact dates and other particulars will be intimated to the Members of the profession through the Lay Press and through their respective State Veterinary Associations and through special bulletins.

This advance intimation is given through the *Indian Veterinary Journal* so as to enable the members to have sufficient time before them, to attend the Conference in large numbers. All are cordially invited to attend.

Mysore Serum Institute, }
Hebbal, Bangalore-6 }
24-4-'57.

R. D. NANJIAH,
Hon. Secretary.

THE BOMBAY VETERINARY MEDICAL ASSOCIATION

Corrigendum

Vol. XXXIV, No. 2 (March 1957), I.V.J.

Page 145, paragraph 4, please read "Four films by the courtesy of the British Information Services, Bombay" instead of "Four films from the Imperial Chemical Industries".

V. G. KHARE,
Hon. Secretary,
The Bombay Veterinary Medical Association,
Aarey Milk Colony, Bombay.

THE PUNJAB STATE VETERINARY ASSOCIATION

Proceedings of Indore Conference

An extraordinary conference of the Punjab State Veterinary Association was held at Indore, on 8th January, 1957, in conjunction with the All India Cattle and Poultry Show and Indian National Congress Session. Dr. Sena Pati presided.

Dr. Karnail Singh, General Secretary of the Association explained the activities of the Association and exhorted the members to stand united and firm against all odds and do their best to raise the prestige of the Veterinarians in general. He said that their primary duty was to improve the livestock breeds of the motherland and by so doing they could supply superior foods of animal origin like milk, butter, cheese, cream, meat and poultry products. At the present juncture their services were badly needed as there was an acute famine of these commodities. In India the daily milk consumption per head was 5 ounces, while the optimum need was 30 ounces and an individual got only 4 eggs per annum against the requirement of one egg a day.

He pointed out that though their services to the Nation were of utmost importance, in the Punjab they were being accorded a step-motherly treatment. No benefit of past service was given to the Veterinary Assistant Surgeons when their pay scale was revised after a lapse of 35 years, in 1955, though such benefit was given to teachers, college lecturers, assistant surgeons (Non-gazetted) etc., but had been so far denied to them. This was inspite of the fact that the Government of India recommended two increments to old personnel and so did the present Chief Minister while he was Development Minister. This matter was hanging fire for the past two years but nothing definite had been decided so far.

A resolution moved by Dr. Phul Chand urging the Punjab Government to grant two additional increments to the Veterinary Assistant Surgeons already in service with effect from April, 1955 forthwith was passed unanimously.

The President, Dr. Sena Pati wanted the members to do their best to improve the livestock wealth as they could improve the health standard of the Nation by doing so. He said that justice demanded that two additional increments to the old hands should be granted forthwith.

KARNAIL SINGH,
General Secretary, P.S.V.A.

Copies of the above have been forwarded to the Governor, Punjab, Chief Minister, Punjab, Union Agriculture Minister and other Government authorities.

[The above facts add greater weight to what we had already written in our editorial on the Punjab Veterinarians in March '57 issue. We wish the Government bestow their kind attention to this question as early as possible and remove this sense of frustration which seems to weigh down the profession in the Punjab. *Editor, I.V.J.*]

THE MADRAS VETERINARY ASSOCIATION

Proceedings of the General Body Meeting held on 25—3—57
at the Congress Grounds, Teynampet, Madras.

A General Body Meeting of the Madras Veterinary Association was held on 25th March 1957 at 11-30 A.M. Sixty-eight members of the Association were present. Dr. G.O. Khan, President of the Association was in the Chair. Sri K.P. Chandrasekara Nair, Secretary of the Association, read the report of the Managing Committee from 26—4—1956 to 21—3—1957, including the audited statement of receipts and expenditure (copy attached).

A condolence resolution on the sad demise of Dr. Kelappan and Dr. J.C. David was moved from the Chair and adopted, the house standing in silence for two minutes.

The following resolutions were moved and passed after some discussion by the members :—

1. Resolved to request the Government to take necessary action to abolish the distinction now made between the Graduates of the Indian Veterinary Colleges and the Members of the R.C.V.S. United Kingdom with regard to certificates issued for purposes of identification of (i) imported animals (ii) for Insurance purposes and (iii) for registration of the racing animals with the different Turf Clubs in India.

Proposed by Dr. V. D. Ratnam and seconded by Dr. S. Balasubramanian.

2. Resolved to request the Government to revise the pay of the Veterinary Assistant Surgeons and raise it to Rs. 200—400 so as to bring it on a par with that of the Medical Graduates and to gazette them similarly.

Proposed by Dr. S. Balasubramanian and seconded by Dr. V.S. Alwar.

3. Resolved to request the Government to suitably revise the scale of pay of the present Officers of the Animal Husbandry Department so as to start them at a stage above the maximum pay of the Veterinary Assistant Surgeons.

Proposed by Dr. A. Ramaswamy Ayyar and seconded by Dr. P. Subramanyam.

4. Resolved to request the authorities of the Madras Corporation to raise the pay scales of the Veterinary staff serving under them and bring them on a par with the pay scales of the Veterinary Assistant Surgeons of the Animal Husbandry Department in Madras State.

Proposed by Dr. V. Venkatanarayanan and seconded by Dr. C. Bharadwajan.

5. Resolved to request the Government that urgent steps may be taken to provincialise the services of all the Veterinary Assistant Surgeons serving under the Corporation of Madras and other Local Bodies, so as to bring in line and co-ordinate all the activities of the Animal Husbandry Department within the State of Madras.

Proposed by Dr. V. Venkatanarayanan and seconded by Dr. C. Bharadwajan.

The following Office-bearers of the Association were then duly elected :—

President: Sri T. Vinayaka Mudaliar.

Managing Committee Members:

Sri Bertie A. D'Souza,	Sri A. R. Madhusudhanan,
" I. D. Mantramurti,	" C. I. John,
" V. S. Alwar,	" M. Ranganathan,
" V. Venkatanarayanan,	" F. D. Wilson,
" S. Vancheswara Iyer,	" V. Satchidanandam,
" G. Osman Khan,	" T. A. Natarajan,
" M. C. Chellam,	" J. C. Victor.

The President in his concluding remarks thanked the members for their co-operation and for the opportunity given him to serve the profession.

Next, the incoming President thanked the members in suitable terms for electing him as the President and said that he looked forward to their unstinted support and co-operation. He conveyed the thanks of the Association to Dr. G. O. Khan, who, he said had filled in the high office of the President of the Association at a time of its greatest need.

With a vote of thanks proposed by the Secretary, the meeting came to a close.

The Managing Committee met immediately after the General Body Meeting and elected Sri J. C. Victor as the Secretary and Sri M. Ranganathan as the Treasurer of the Association.

Then the Members adjourned for lunch, which was highly enjoyable in the company of this great gathering. It was a social hit of high order, which the Association always tried to maintain in its long and arduous career.

J. C. VICTOR,
Secretary,

The Madras Veterinary Association,

M. V. A.,
15, Marshalls Road,
Egmore, Madras-8.

Animal Husbandry Department, Egmore, Madras-8.

MADRAS VETERINARY ASSOCIATION

Receipts & Charges—16-1-56 to 28-2-57.

Receipts		Charges	
Opening balance	...	Stationery	...
Kailasamier Fund 168 0	1,278 5 0	Tea and Dinner to General Body	6 0 0
Panikkar Memorial Fund 669 0		Secretary	88 2 0
Association Funds 441 5		Closing balance	10 0 0
Subscriptions	...		1,407 0 8
Interest on bank accounts	200 0 0		
	32 13 8		
	1,511 2 8		

Accounts were audited by
Drs. C. I. John and V. Satchidanandam.
Closing balance of Rs. 1,407-0-8

M. RANGANATHAN,
Treasurer.

Kailasamier Fund	168 0 0
Panikkar Association "	669 0 0
"	570 0 8
Savings Bank A/c	442 3 0
I.C. Bank	896 6 6
Cash	68 7 2
	1,407 0 8

THE ALL-INDIA VETERINARY ASSOCIATION
HYDERABAD BRANCH

The Members of the All-India Veterinary Association, Hyderabad Branch, met on 22-3-57 at the Office of the Director of Animal Husbandry and Fisheries to express their deep sense of sorrow and grief at the sad demise of Dr. S. A. Jabbar, a retired Director of the Veterinary Department, Hyderabad and to convey their heartfelt condolences to the members of the bereaved family.

The meeting began with a brief sketch portraying the character and traits of Dr. S. A. Jabbar by the Secretary Dr. M. Mahalingam. Next, Sri K. J. Devadanam, Deputy Director, Livestock, who was visibly moved gave a vivid account of the personality of Dr. S. A. Jabbar who endeared himself to one and all, through his kindness, courtesy, frankness, love of the profession, thirst for knowledge, devotion to duty and absolute unostentatiousness in thought, word and deed. He went on to say that by sheer dint of merit and hard work and thorough mastery of his subjects, Dr. Jabbar rose step by step to the topmost place open to a Veterinarian in the State and that he was in the habit of planning things to the minutest detail. Many other speakers paid equally glowing tributes to his patience, practical philosophy and his endearing nature.

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1956-57

Sitting:—Left to Right:

Standing:—1st Row:

" 2nd Row:

V. N. Murty (A.I.C.O. Bho.), A. K. Pal (O.C. Class), S. Bose (R.O. Farm), P. Bhattacharya (H.D.L.G.),
S. G. Iyer (H.D.P.R.), L. Sahai (Director), H. D. Shrivastava (H.D.P.), C. Seetharaman (H.D.B.P.),
H. P. Tandon (A.I.C.O. Farm), T. D. Mahadevan (A.I.C.O. Ind. Chem.),
B. R. Gupta (A.A.), C. P. Pal (Orissa), Karnail Singh (Punjab), S. Tarania (Orissa), N. B. Patel (Bombay),
T. Rama Rao (Andhra), S. Singh (U.P.), S. D. Sudarshanam (Andhra), S. Narayan (Bihar), N. V. Bhaskar
(Andhra), Srinivasan (A.A.),
P. Papa Reddi (Andhra), G. A. Laherwal (J. & K.), R. C. Saxena (U.P.),
D. P. Gupta (Mondor; Rajasthan), B. P. Gupta (U.P.), Yashpal Neb (Delhi), N. D. Seth (U.P.).



Late Dr. S. A. JABBAR, G.B.V.C., I.D.D., M.S.
*Retired Director of Veterinary Services,
 Hyderabad State.*

The house then stood in silence for two minutes and passed the following resolution:—

“The local Members of the All-India Veterinary Association, Hyderabad-Deccan are deeply grieved at the sad demise of Dr. S. A. Jabbar, retired Director of the Civil Veterinary Department and convey their heartfelt condolences to the members of the bereaved family.”

Hyderabad-Dn, }
 16--4--'57. }

M. MAHALINGAM,
Secretary.

Obituary

Dr. S. A. JABBAR PASSES AWAY

We are shocked to hear of the sad demise of Dr. S. A. Jabbar who retired as Director of Veterinary Services in Hyderabad State. We have known him personally very well and our grief is all the more poignant. He was one of those Nature's born gentlemen who adorned society wherever they were. His transparent sincerity, his love for his professional colleagues and his pride in his profession are qualities that come crowding to our mind now.

Passing out of the Bombay Veterinary College in early twenties, he foresaw the need for Veterinarians to specialise in dairying and he underwent the I.D.D. course and took that diploma. Later he took his M. S. degree in Animal Husbandry from Cornell University. Not satisfied with all these, he underwent the post-graduate course in Animal Husbandry at the I.V.R.I., Mukteswar. He was on a year's study tour of the continent visiting important dairy farms and allied institutions.

From the lowest rung of the ladder, he rose step by step and reached the topmost position in the State. He was a popular officer, who infected others with his zeal for work. Always polite and courteous, he inspired confidence in his subordinates. His spirit of love and goodwill is no more to be seen! A good man and a great Veterinarian has passed away but his example will linger long in the memory of all those who knew him. May his soul rest in peace! We offer our heartfelt condolences to the members of the bereaved family.

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.]

Sir,

Sub: Late Sri N. K. Ayyar, G.B.V.C., (Bombay), ex-Veterinary Assistant Surgeon, Madhya Bharat Government, Gwalior.

An arrear pay bill of Sri N. K. Ayyar, an ex-employee of Gwalior, Veterinary Assistant Surgeon, (Madhya Bharat) is received in my office from the Accountant General, Gwalior.

I shall feel highly obliged, if you can very kindly take the trouble of informing the nearest relatives of Sri N. K. Ayyar's nearest claimants such as wife or son, so that this amount can be remitted to them.

Thanking you very much for the trouble.

Yours faithfully,

G. V. NARUSU,
Veterinary Inspector, Gwalior,
Gird & Morena District, M.P.

Gwalior, }
30-3-57 }

[We shall be happy if any of our readers could help us with the address of his nearest relatives—Editor, I.V.J.]

College News

THE MADRAS VETERINARY COLLEGE

The following candidates have passed the Final Post-Graduate Diploma Examination in Veterinary Parasitology held in March 1957:—

1. A. Venkataratnam (*Andhrapradesh*),
2. S. Sundaram (*Madras*),
3. Devendra Nath Das (*Orissa*),
4. D. N. Yadav (*Bihar*),
5. M. V. Sankaranarayanan (*Madras*).

Madras, }
23-3-1957. }

BERTIE A. D'SOUZA,
Principal.

Reviews

Monnig's Veterinary Helminthology and Entomology.—Fourth Edition, 1956. By Geoffrey Lapage, M.D., M.A., M.Sc. 511 pp. XXIV Plates, Figs. 252. 42 s. Bailliere, Tindall & Cox, London.

Few books on parasites of animals have had such a popularity as this text-book on helminths and arthropods, which had gone through

REVIEWS

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three editions and four reprints. It has been widely used by students and teachers alike.

In this fourth edition, revised by a renowned teacher and researcher in the subject, Dr. Lapage of Cambridge, the original pattern and approach are preserved. The book is divided into four sections, as before, but Section I dealing with the general aspects of parasitism, *viz.*, host specificity, modes of infection, etc., has been entirely re-written in a most readable and intelligible manner. Technique and Diagnosis is treated, rightly so, under Section IV instead of under Section II, while Sections II and III relate to Helminth Parasites and Arthropod Parasites respectively. A few changes are made, like defining the Order Pseudophyllidea and bringing the genus *Diphyllbothrium* under it. Otherwise, the representatives of the various groups are dealt with as before, in the light of recent knowledge and with the requisite stress laid on the aspects with which the Veterinary Practitioner is most intimately concerned. The Section on Arthropods reveals extensive revision, particularly of classification of the group and the account of insects.

The volume is enhanced in its appeal to the student by the addition of eight plates containing some rare half-tone illustrations of parasites or lesions. The footnotes have been compiled into Bibliography at the end.

There is scarcely any mistake, typographical or otherwise; one error that was discovered after much search is "Krull and Males" (P.37) instead of "Krull and Mapes"!

This is but an imperfect estimate of the book, but any one who had had occasion to see it in any of the earlier editions, and also to peruse the most recent and authoritative account of parasites, *i.e.*, Veterinary Parasitology by Lapage himself, could guess what a treasure it should be. The study of Parasitology at one time bewildering to the Biologist has been changed into a fascinating one with the publication of such treatises.

May we hope that, in the next edition, the book would appear as "Monnig's Veterinary Protozoology, Helminthology and Entomology" by Lapage?

M. ANANTARAMAN.

Neoplasms of the Domestic Mammals—By E. Cotchin, M.R.C.V.S., Department of Pathology, Royal Veterinary College, London. Review Series No. 4 of the Commonwealth Bureau of Animal Health. 1956. Price 20 s.

Oncology is a comparatively neglected field in Veterinary Pathology and as such the above review written by Cotchin, an experienced

Pathologist who has contributed a number of papers on the subject, is to be greatly welcomed.

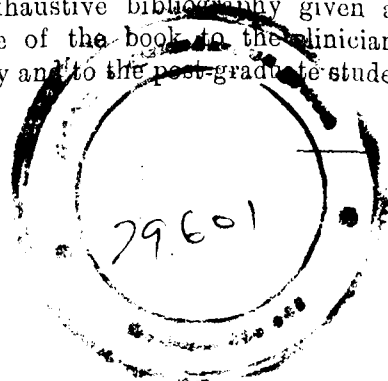
In the above work the author gives a useful and somewhat critical review of the literature on tumours in domestic mammals. The material included were mostly those that appeared after the publication of monograph on the subject by Feldman (1932), though in occasional cases some of the important earlier contributions were also consulted. After outlining in the introduction, the general incidence of tumours in domestic mammals (horse, ox, sheep, pig, dog and cat), the author deals in the first fourteen chapters with the condition as it occurs in the various body systems—skin and related structures, mammary gland, musculo-skeletal, respiratory, cardio-vascular, haemopoietic and lymphatic, alimentary, urinary, male and female genital, endocrine, nervous, eye and ear. In the fifteenth chapter, some of the rare tumours (mesothelioma, endothelioma, lesions of notochord, branchial cleft remnants and teratoma) are outlined. In the final chapter, the author discusses briefly the broad conclusions arrived at by him after exhaustive study of the neoplastic conditions in mammals. A table showing species differences in occurrence of neoplasms in domestic mammals is also given. This table is useful to obtain information on the frequency of some of the common tumours in animals. The author lists tentatively the tumours met with in mammals under two great groups—those that might be called 'wide range' and the 'narrow range' neoplasms respectively—"that is, those that affect with some frequency two or more species of domestic mammal, and that those that appear either to be restricted to one species or to be of predominant importance in one species only." Such grouping, the author feels, might be useful in probing into the factors concerned in the etiology of tumours.

The above work has brought out sharply the variation in the site of occurrence of tumours in different countries *e.g.*, circumanal adenoma has been frequently described in dogs in England and other countries, whereas it is of rare occurrence in India.

The author's comment on the inadequacy of our knowledge of certain types of tumours like leukaemia, mast cell lesions etc., should foster co-operative research in the clinician and the pathologist.

Exhaustive bibliography given at the end of the book enhances the value of the book to the clinician, to the teacher in Veterinary Pathology and to the post-graduate student.

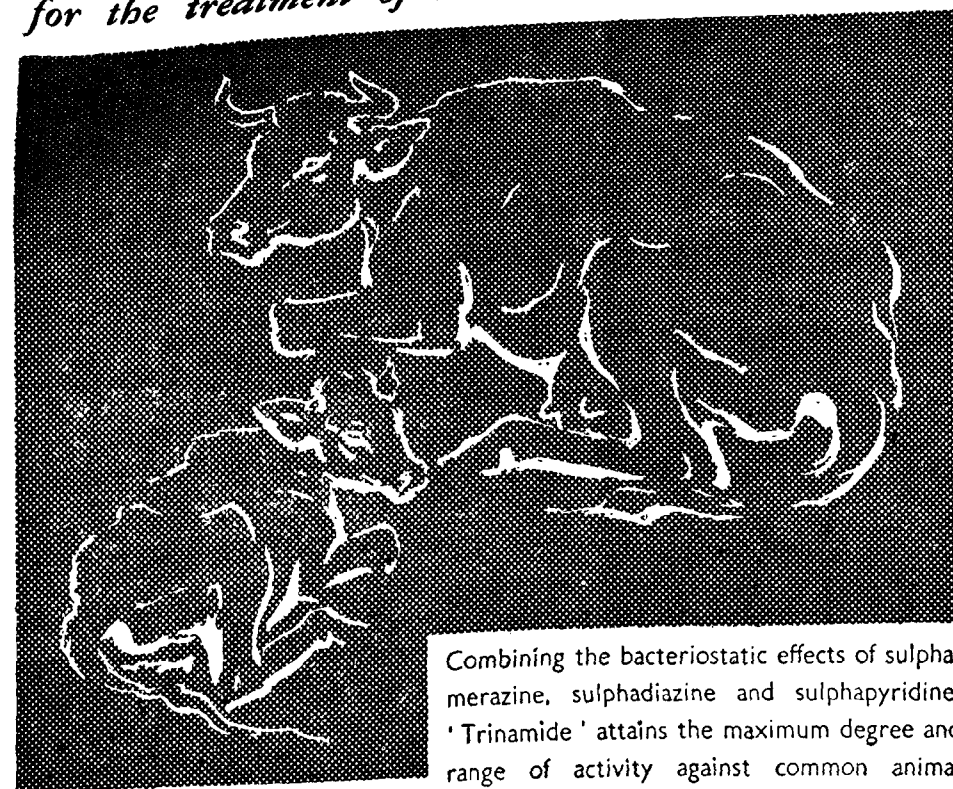
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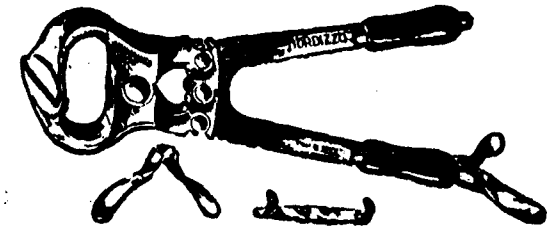
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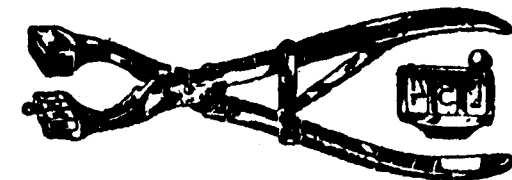
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